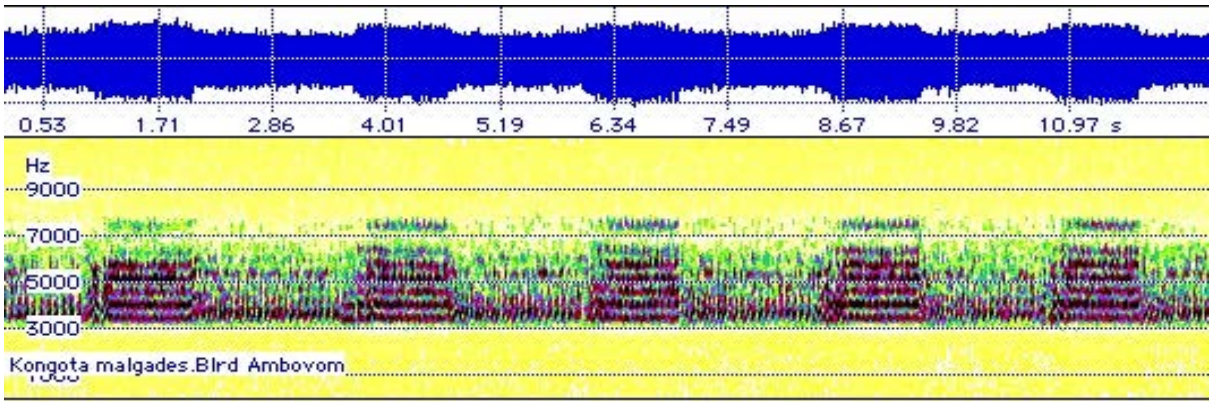
My life with the Cicadas,

some nearby relations and others



Michel M. Boulard

My life with the Cicadas,
some nearby relations and others

By

Michel, M. Boulard *"the famous French Cicadologist"*
(Tailor & Francis, 2006 & see p. 374)

Entomologist, acoustician, eco-ethologist, mimetologist and animal-life photographer

On the cover: *Kongota malgadessica* Boulard, 1996, a mimetic and twilight species.

Male tymbalizing, wings spread on the sides, force aubades for the females of the neighborhood. But also signal for the cicadologist who can detect it, record it and photograph it... Then, in the laboratory, draw up its specific CIA, *Acoustic Identity Card* of the species.

Xeric South-East of Madagascar, north of Ambovombe, January 1997 (MB phot & *Signalyz*

Chassiron*

© Michel, M. BOULARD (EPHE et MNHN)

Memoir closing my EPHE Review

Legal deposit: September 2022
ISBN 2-9502395-**9-5**$^{2(En)}$

*) This small fossil (17 cm), the only witness of an eight Ammonites 2 to 3 times bigger than my father, ***Maurice Boulard*****,** and me, on July 1955, 56 and 57, had been excavated from a cliff near the Chassiron lighthouse on Oléron island in Charente-Maritime (*see p. 7*). This interesting collection, as well as a collection of old cameras recovered here and there, were stolen from me during my second stay in tropical Africa.

Foreword

Bonjour, thank you for opening this big Book, whose cover could tempt you...

What are you expecting to find, just open?

First of all, the fundamental, statutory base of a simple human being, somewhat wandering and observant, wishing to retain and make known through a work faithfully illustrated, the professional accomplishment of an unusual existence, since dedicated to the approach and study of the entomic world, **that of Insects**, more or less extemporaneously mixed with **'mimetological' facts and / or with sound emissions.** Existence based and conducted from Paris, both at the École Pratique des Hautes Études (EPHE), and at the Muséum National d'Histoire Naturelle (MNHN) of which, jointly, I was member.

The first guests were the **Cicadas** or *Cicadidae*, the musical muses of warm and temperate countries, strange beings having extraordinary newborns equipped to, in solitary, grow up underground, become adults outdoors, ***tymbalize*** (*vulgo song*) mate and lay eggs in the sun. Then will come the **Tree-hoppers** or *Membracidae*, "*little tropical devils*" of yesteryear with a strange back and that accompany a few "*remarkable cousins*" from the *Cercopidae, the Cicadellidae* and the *Fulgoridae*, all ***Auchenorhynchus Hexapods***. With them and some others "especially **Six**, but also **Eight** and even **Mille-pattes**" of the neighborhoods, a number of natural environments prospected in Europe and much more between the Tropics. All allowed me to discover their existence, revealing in many of the radical or mimetic manners of beings often astonishing that, fortunately, my cameras, sono-recorders and camcorders allowed to record.

In a series of impromptu strides, the seductive snapshots gleaned by supervising a *number of nearby liaisons* will increase, by the addition of slides most often unpublished or specially commented, the main figurative and bionomic capital, added to a large extent captured on other terrestrial Arthropods, or even Vertebrates.

In the meantime, some confirmed or new information on Insects harmful to "*Stimulating Plants, including Pepper*" grown in Central Africa in the 1960s was recalled, although published elsewhere.

Finally, space-time documents, often precious snapshots evoking at a "**t**" time, the intertropical Regions and Countries prospected, are scattered throughout the text.

I owe this brief to several friends and colleagues, first and foremost the naturalist **Philippe Defranoux** and the historian **Hubert Bost**, their support and appreciation were decisive.

This autobiography, **first of all widely imaged by a thousand and one cicadidian harmonies metamorphosed into identity graphics,** an instant "*difficult*" interview, quickly became a penetrating "look back" opening, in a symbiotic style, not only the striking episodes, but also a few others too quickly forgotten, or even left out... Some data, revived, digitized, sonorized could well pretend to Natural History.

This is why, tested by advanced old age, it is mainly a **"manuscript with eloquent slides and acoustic diagrams"** that I will leave to my future condisciples and other curious people, before inadvertently leaving ***"the amazing blue Planète".***

Michel M. Boulard, EPHE et MNHN, Paris
< michelcicada@gmail.com >

*English version with the help of **DeepL Pro,** the professional translator*

NATURE PHOTOGRAPHY

WWF

Entomological Photography— Blending Aestheticism with Biology

by Michel Boulard

It began as a passion for animals in general, and then evolved into an infatuation with insects in particular. The physical aspects of insects — their multiplicity of form — has always been an object of curiosity and astonishment for me. Their life-styles are as varied as they are captivating, often unexpected, sometimes even stupifying or unimaginable. Thus the study of insects, which I regard as the prodigies of nature, became my profession.

Insects live everywhere, eat everything, walk on six feet, fly with two or four wings and follow a diverse range of destinies. In addition, there is the world of spiders and myriapods, those of eight and of over one hundred feet. How to document such a macrocosm of nature? My work as an entomologist demanded accurate representations of differing species.

Photography was the answer. By this means the precision and scientific logic required of entomology could be captured using reliable and rapid technology.

By fixing a fleeting moment of life as well as providing a graphically identical reproduction it allows study to advance rapidly. Utilizing macrophotographic techniques details can be revealed that were invisible to the naked eye, greatly contributing to scientific knowledge.

It was extremely fortunate that my entry into entomology coincided with the introduction of the Olympus OM System in France.

Michel Boulard and Pierre Jauffret in their dugout canoe, ecologically sound transportation providing advantageous observation. Rio Xingu, Brazil. 100mm F2.8 Zuiko.

This equipment is ideal from practically every standpoint for entomological fieldwork and use in the laboratory. The lightweight compactness and range of accessories, coupled with the superb optical quality of the lenses, made the OM System the perfect choice for me.

The images accompanying this article show how photography can enrich one of

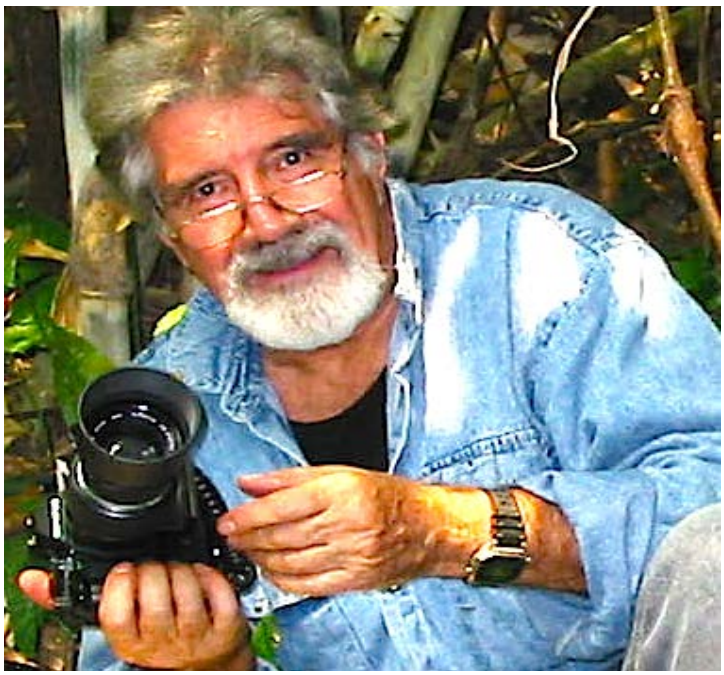
Michel Boulard

Michel Boulard is Directeur of the laboratoire d'Entomologie de l'Ecole Pratique ses Hautes Etudes et de la Section des Hémiptères Auchénorhynques, (Cicadas & adjoinings) au Muséum National d'Histoire Naturelle, in Paris. He also holds the position of Secrétaire Général of the Société Entomologique de France. He has authored numerous scientific treatises on the fascinating world of insects, spiders and myriapods. In May 1984, he was an organizer, participant and contributor to "INSECTIMAGES," a five-day presentation of photo, films and conferences held in Paris. His reasearch has necessitated field trips to many areas of the world to study and document, in their natural environment, the varied species found only in these regions. The images accompanying this article were shot in South America and Africa as well as in the author'native France.

Olympus *Visionage*,
Tokyo International Magazine of Photographic Information, 13, 1990: 41-44, 26 slides.

Michel M. BOULARD

Born on 9 April 1935, Orléans (France)



PROFESSIONAL BIOGRAPHY

Entomology, Eco-ethology, Acoustics, Mimicry, wildlife Photography

Prosopographical dictionary of the EPHE, Paris

Liminaries

F.1) The unforeseen, brutal career instigator

Having passed my 'baccalauréat' (Modern and Experimental Science series, 1955), I was not very concerned with entomology, although I kept the animal fibre, which was reactivated somewhat during the months of the Great Holidays in Oleron island and Indre-et-Loire. Nevertheless, the schoolboy had put away, somewhere, a semblance of an Insect collection. As well as an admirable little box of geological samples bought by my dear parents at Boubée, place Saint-André des Arts, in Paris.

Accomplished sportsman, basketball and volleyball player, I wanted to become a "gym teacher"... A terrible sprain, broken ligaments in my right knee cancelled out my hopes. At the time, even at the great Foch Hospital in Suresnes, they didn't know how to treat this type of accident... I was left with a horrifying scar of about ten centimetres, a weak joint, and an adolescence devoted to ballooning.

Reviving my innate penchant for animals and Natural History, I enrolled at the Faculty of Sciences (Paris Jussieu), then a neighbour of the Museum. For a Licence-ès-Sciences naturelles, thinking more or less about teaching. At the same time, I became a day school teacher. And above all, an amateur in animal photography, following as much as possible, at the Museum, the superb "Entretiens photographiques" of **Roger-Honoré Noailles** at the SPHN, Société de Photographie d'Histoire Naturelle where I entered, registered under the number **M 71** (*cf*. p. 500).

My Licence-ès-Sciences was acquired in June 1962. Six certificates. Physical, Chemical and Natural Sciences (P), General Biology (B), Zoology (P), General Geology (AB), Animal Physiology (B) and Botany (AB). My result in "General Bio." earned me, in September 1959, a fortnight's training course at Les Eyzies-de-Taillac, at the annex station of the Laboratory of Evolution of Organized Beings, Professor **P.-P. Grassé**, Director. Was there for her research, Miss **Simone Kelner**, Assistant Professor at the Museum... Where she happened to talk about a young "*Ento*" passionate about macro photography.

What's next and why the Cicadas? Two drawer thumbs up.

1a) In 1960, the Certificate of Geology passed with honors, I was lucky enough to be able to participate in the End of Year Outing offered by the Geology Laboratory to the first thirty students received. Title: "Excursion of Provence and the Southern Alps, June 27-July 2, 1960", organized by Mr. Auboin and Mr. Lucas, much appreciated teachers. An excellent excursion guide was given to us, monetized as it should have been at the time.

1b) During the occasional lectures, precisely in the Drôme and the massifs of the Maures and the Tanneron, we were welcomed by fantastic concerts delivered by big Insects of which, as a Parisian, I had no idea: Cicadas! Numerous. On the olive trees, pines, holm oaks... Noisy, but not easy to see... In me, who had hardly crossed the Orleans Loire, there was like a click! A Cicada, what was it exactly? I went back to the Museum. There I was welcomed and guided by Miss Kelner the scholarly gentleness personified. There was an old Collection of Cicadas, reviewed and classified at the very beginning of the last century by an English specialist with a French name, William Lucas Distant[1], who died in 1922.

2a) During the academic year 1962-1963 the Certificate of Advanced Entomology was created. I registered for it immediately.

2b) Received with honors, I became better acquainted with the professors, notably Mr. Balashowsky[2] and Mr. Carayon[3] of the Museum and Mr. Lamotte[4] of Normal Paris School. These "prof." for whom I still have a deep respect, taught me a lot. And, also that a post of assistant had to be created at the Museum to manage and improve the "Auchenorhyncha Hemiptera Section" - a systematic group of which the Cicadas are the "*head of the queue*".

Thus, the dice of my career were thrown... Without knowing more that the Cicadas were going to make me discover a little bit of their planet!

The Certificate of Advanced Entomology obtained, my Licence-ès-Sciences Naturelles was transformed into a Licence de Doctorat de l'Université de Paris in June 1963. As a trainee assistant at the Museum, I was offered a research program, the Cicadas as my exclusive companions, summer Provence as a prospecting ground, with lodging and laboratory at the Harmas of Jean-Henri Fabre, "*that inimitable observer*", the cantor of the Provençal Insects.

My thesis for a Doctorate in Entomology (3rd Cycle of Animal Biology) from the University of Paris was defended in June 1966 (very honourable mention and congratulations from the Jury).

---

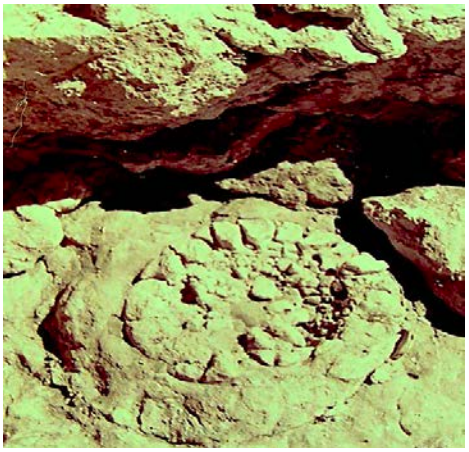
1) W. L. Distant (12 November 1845 - 4 February 1920). I was indebted to this enlightened entomologist for some of my first notions of taxonomic cicadology.

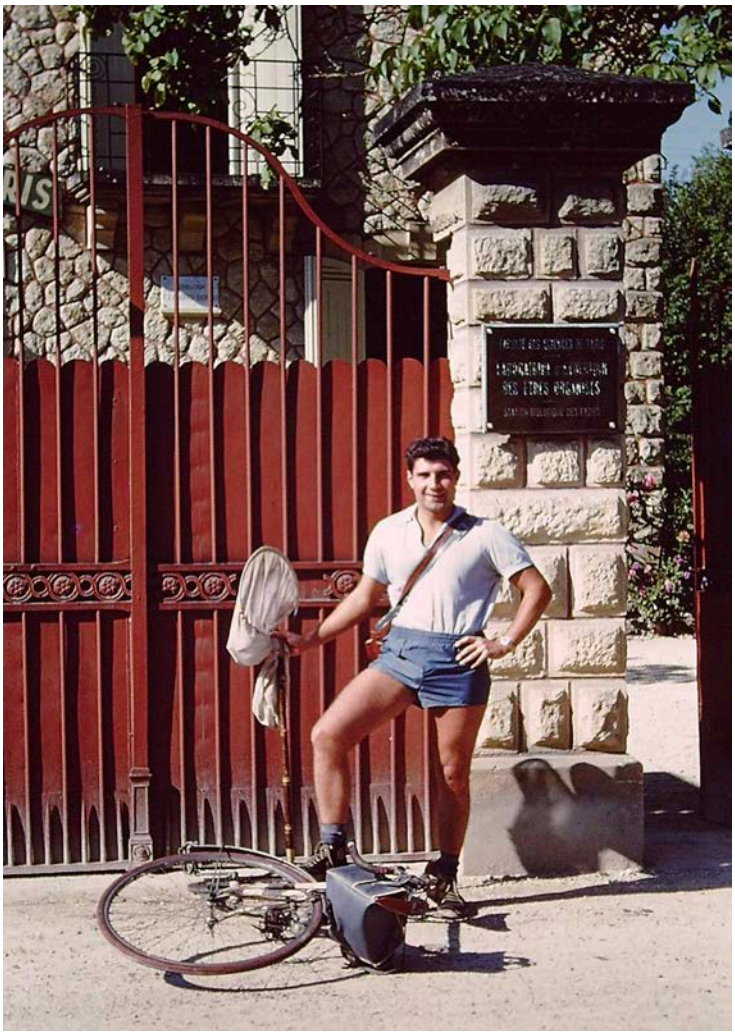
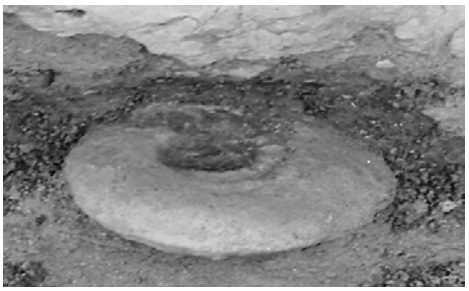
2) Alfred Serge Balachowsky (Karotcka, Russia,15/09/1901 - Paris, 24/12/1983), agricultural entomologist and coccidologue, great traveller. Head of Department at the Pasteur Institute of Paris, Professor at the Museum, Member of the Academy of Sciences, Founding President of the O.I.L.B., the International Organization for Biological Control, he wrote several important and widely distributed entomological works. **A. S. Balachowsky** was also a great Resistance fighter, leader of the anti-Nazi network during the Second World War, which led to his deportation to Buchenwald and then to Dora. Director of the Entomology Laboratory of the MNHN and Professor at the Faculty of Sciences in Paris, he was admired and loved by his students, who affectionately called him "Bala" or, mischievous as a student, "Zeus imperator".

3) Jacques Carayon (Toulouse, 11/11/1916 - Paris, 07/02/1997). Entomologist, anato-morphologist and histologist, great specialist of Cimicoidea Heteroptera, revealing and explaining the disconcerting bionomies of certain species (traumatic extragenital hetero- and homosexual inseminations, which are followed by a haemocelian distribution of spermatozoa in inseminated bedbugs). A complete researcher and administrator, he was simultaneously Director of the Laboratory of General and Applied Entomology of the MNHN and of the Laboratory of Economic Entomology of the EPHE, École Pratique des Hautes Études (Sorbonne). In 1980, J. Carayon became a world-renowned member of the Standing Committee of the International Congresses of Entomology. On his retirement, a jubilee volume was dedicated to him (Annales de la Société Entomologique de France, 1986, 22 (2).

4) Maxime Lamotte (Paris, 26/06/1920 - Collobrières (Var), 31/08/2007), naturalist, ecologist and geneticist. Explorer, then co-manager of ***the Monts Nimba Integral Reserve***, which was created in 1944 on the Guinean-Ivorian border; he also founded "***Lamto***", an Ivorian station of tropical ecology mainly programmed for the quantitative analysis (animal biomass) of savannah and savannah ecosystems. Specialist in Anuran Amphibians, Director of the Zoology Laboratory of the École Normale Supérieure for 30 years, he was also one of the theoreticians of Evolution, writing several important works. Professor at the Faculty of Sciences of Paris, he created the Third Cycles of Ecology and Genetics. In 1976, **M. Lamotte** was elected President of the Ecology Commission of the CNRS.

For the record



Two kinds of Oleronian Ammonites (**MB Phots IX.1957**), the Biological Station of **Pr Grassé** and 'MB'a young biologist having tired his mount, then mowing on the banks of the Vézère river **(MB Phots, september 1959).**

F.2) Studying the Insect for the Insect, first.

From the teachings received in the Certificate of Advanced Entomology, the stays at the Museum, I learned that studying insects was to integrate their multiple anato-morphological originality, the profusion of bionomic structures and functions, the prodigious vitality of these representatives of a terrestrial world so different from ours. In all fields these animals, with their specific and often plethoric existences, offer an immense field of investigation. 'Fantastic biodiversity', 'Bio-mass' of the most important produced by this living entity which constitutes one of the most beautiful achievements of Life on Earth. The phylum of Arthropods accounts for 8/10ths of the animal kingdom (didadictically staged by Prof. **Mario Pavan**[5] in the "Charter on Invertebrates", 1986). Of these 8/10ths, 6 to 7/10ths are terrestrial, including a large majority of these beings running on 6 legs and flying thanks to 1 or 2 pairs of astonishing wings!

The knowledge of the biological specialisations developed and the related facts accumulated since Entomology as such exists (*cf. J. d'Aguilar*, 2006), already considerable, is being increased year after year by entomologists, the appointed researchers. For a large part, the genera are statutorily established, but for a much larger part, not all the species composing these genera. They are either eco-ethologically unpublished, or totally unknown and today potentially on the verge of extinction for what remains of tropical forest forms.

Finally, the diverse sequence that prevails among insects, and first of all the evolution from egg to adult, is not always in line with the explanatory theories that focus more on vertebrates.

Insects. An immense capacity to invent in natura, prodigious faculties of adaptation have enabled them to take advantage of the most varied environments and to colonise all terrestrial environments, even the harshest or most unexpected.

These dispositions are expressed at all physical and dynamic levels of living organisms with, in major opposition to vertebrates, the appearance of tools shaped from certain parts of the body of the insect itself and adapted according to bionomic or eco-ethological regimes.

-> Diversity of constituent planes, there are far more differences between a Silverfish from old books or papers and a Bee, than between a mouse and a whale.

-> Diversity of diets; evolution of mouth parts and digestive system; practice of endosymbiosis leading to "metabolizing the impossible, including pesticides".

-> Diversity of modes of locomotion, relative and varied adaptation of the legs. **Invention of entomic wings [***adjective here only suitable* (*cf*. **Littré**) *as opposed, emphasis added (Boulard, 1991a) to "entomological"***,** the **entomological** world studying the **entomic** world**]** and their original mode of operation (*cf. infra-note N°8, next page).*

-> Diversity of reproductive modalities, developments in copulating devices and insemination, as well as in the mechanics of egg-laying with differentiation of specialised ovipositors.

-> Diversity of types of post-embryonic developments, growth mutations, bodily transformations and completion without, or more spectacularly, with **metamorphoses**, which can only be complete, intrinsically.

-> Ecological diversity: at the generic and specific levels by changes in environment or physiological activity. Some juveniles, some larvae occupy other topographical spaces than adults and, for the latter, trophic divisions. Imaginary conversion with or without slides and/or migrations. Cycles of "hyperparasites".

-> Infra-specific diversity, access to deceptive appearances under mimicry.

-> Ethological diversity, olfactory, sound and tactile relationships at the specific or higher level.

---

5) Mario Pavan (Italy, Vado Ligure, 9/10/1918 - Pavia, 16/05/2003), speleologist, ecologist, entomologist, inventor of the pederine, responsible for dermatitis experienced when handling certain insects. Professor at the University of Pavia and fervent supporter of the I.L.O. (International Organization for Biological Control), he devoted a large part of his activities to the protection of nature, participating in the creation of many national parks and integral reserves in Europe and even more in the tropics. I had the humble chance to meet him when, invited by Pr Balachowsky, Pr Pavan came to the Central African Republic to visit our forest station of La Maboké... It was in 1967, a fatal year for one of his companions, killed in the bush by an elephant.

All these particularities, rich in teachings and supports for reflection, make Insects one of the materials to be privileged in the study of the Living. Their contribution, already considerable resulting from the research conducted by the Ancients (Swammerdam, Maria Sibylla Merian, Réaumur, Linné, Bonnet, Fabricius, Fabre... T.H. Morgan, P-P Grassé, V.B. Wiggleworth, P. Pesson and so many others) must still be solicited, at least to account for the multiple micro-aspects proposed by the scientific disciplines, old and new, of Natural History. Many problems that do not exist elsewhere are brought to light... Starting with the prodigious evolutionary leaps that metamorphose, for example, a maggot, the end of an autonomous intestine, into a Fly, one of the most accomplished and lively winged adults on Earth. The selective pressure, the Evolution, which is well felt in the opposite world of the Vertebrates, comes up against the various post-embryonic developments invented in this fabulous animal class.

Finally, Insects, although we have entered into competition with them, some of them multiplying in agricultural fields that they degrade before harvesting, let us not forget that we are obliged to them. If they are indeed our greatest bio-ecological competitors, they have become insatiable crop pests and pernicious disease vectors, forcing us to create insecticides (sometimes difficult to use). We must realize that without Insects, indispensable pollinators and tireless recyclers, the Hominoids, of which we are, would not have found a place on Earth.

Since the creation of the **Entomological Unit**[6] of the EPHE, my predecessors, the Professors at the Museum **Paul Vayssieres**[7] and **Jacques Carayon**, have contributed much to the global and particular entomological knowledge. Personally, I have been able to make known some new facts, some of general interest, on this vast animal phylum, overcoming financial difficulties that I thought could only be temporary. This was hardly the case! Our Laboratory, Biology and Evolution of Cicadomorphic Insects, was unable to continue and develop its activities in the fundamental field of Natural Sciences, that of observing and providing information on these beings *in situ*, "beautiful things remain to be found outside of statistics and exponentials", ***Jean Rostand*** said in his time... Or of biomass and molecular genetics, I might add, as I was consolidating my interest in acoustics. Precisely, I pointed out that the Cicadas had a sound instrument of a complicated 'from nowhere', associated with a *'dedicated utility software'* developing a set of specific applications as extraordinarily functional as the **entomic wings**[8] with astonishing faculties, wonderfully expressed in Dragonflies, Bees, Flies, among many others, including the Cicadas of course, although less expert. The Cicadas, therefore (ribbed wings, an acoustic system just glimpsed, a surprising post-embryonic life), they had and still have a lot to offer. In my whole life as an entomologist, devoted mainly to anato-morphological and eco-ethological research, mostly conducted in their company, they have never ceased to surprise me, to the point of making me a cicadologist / cicadologue. This biography will bear witness to this.

---

6) Entomological Unit: Research unit born in 1953 from the transformation of the Tropical Entomology Laboratory (originally called 'colonial') created in 1937 by the Third Section of the E.P.H.E. and which became "Laboratory of Economic Entomology", then finally "EPHE, Biology and Evolution of Cicadomorphic Insects". The first Director was Professor Paul Vayssière.

7) Paul Vayssière (Saint-Barthélémy, 24/08/1889 - Paris, 5/11/1984). Agricultural engineer, mainly acri- and coccidologist, a great traveller, he was a specialist in fauna harmful to tropical crops. Professor at the Museum and Director of the Harmas, where he had a small building built which became a country laboratory, of which I was one of the first occupants. He was also a Member of the Academy of Agriculture and the Overseas Academy of Sciences. Honorary President of the O.I.L.B. (Organisation Internationale pour la Lutte Biologique), Paul Vayssière was a tireless forerunner, making scientists and farmers aware of the imperative need to protect Nature.

8) Entomic wings. Dorsal and mobile organic inventions (ribbed membranes with thoracic micro-levers) much more than ante-diluvian! They are said to have appeared during the Devonian (ancient Paleozoic), but the fossil "winged milestone", according to *André Nel* (Museum, Paris), is missing. The Odonates, Orthopterans and Hemipterans were the first animals to conquer the air.

Sérignan-du-Comtat, **l'Harmas de Jean-Henri Fabre**, la Maison du Maître (J. Carayon, Phot)

The small 'Labo' of entomological research created by Paul Vayssière, in internal limit of the **Harmas...**
And the *Lyristes* 'tymbalizing' in the sun and during the hot and night evenings of Provence.
(Photos Lucien Gérin† *ex-volunteer manager* of the Harmas and MB)

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My life with the Cicadas and some neighbouring groups, Arthropods or others

-> Domain

My professional activities have mainly concerned two distinct and yet often complementary fields of Practical Entomology.

-> Biosystematic research on Insects, mainly those making up the 'Cicadaires': Cicadoidea (Tettigarctidae and Cicadidae), Cercopoidea and Cicadelloidea (Cicadellidae and Membracidae), while managing the Section called Auchenorhyncha (Cicadomorphs and Fulgoromorphs) then newly created at the MNHN.

-> Entomological research applied to tropical agriculture and more specifically that concerning the cultivation of stimulant plants affected by numerous insects in Africa.

However, my **interest in insectofauna** in general led me to study various orders of insects, sometimes spilling over into **Arachnids** and **Myriapods**, while the observation in extenso of animals in their biotopes and the relationships between prey and predators led me to study the phenomena of camouflage and more mimicry. This field of investigation, which includes a number of facts typical of Natural History, led me to attempt to codify it as a concrete scientific discipline under the name of "**Mimetology**", a strategy for safeguarding biodiversity.

In addition to the indispensable laboratory work, I therefore conducted my scientific explorations "in the field", an indispensable source of new facts and study materials, in France, but more intensely in the Tropics, collected during 45 very long missions, ending with long personal stays. For this rather varied set of activities, I used most of the classical techniques. The techniques of photography and sound recording were largely associated, decisive additional techniques for the study of the 'Living', allowing the collection of precious documents, graphic, pictorial and sound supports, faithful memory aids for publishing, teaching and information.

-> Professional key

1964 Assistant stagiaire in charge of Auchenorhynchus Homoptera, National Museum of Natural History (MNHN), Paris. Entomology, Pr Alfred S. Balashovsky, Director.

1965 Assistant MNHN detached to the French Coffee and Cocoa Institute (Mr. René Coste, Director) and appointed Head of the Entomological Service of the Agronomic Research Center of the I.F.C.C. in Boukoko, Central African Republic.

1970 Appointed Director of Studies, Assistant of the Laboratory of Economic Entomology, École Pratique des Hautes Études (EPHE)/**In charge of the Auchenorhyncha Service** at the MNHN. Pr Jacques Carayon, Director.

1986-2005: Director of the Laboratory of Entomology of the EPHE with the new title: ***Biology and Evolution of Insects, mainly Cicadomorphs*** also ***in* charge of the Auchenorhyncha Service** at the MNHN.

2005 Attaché honoraire, MNHN/EPHE, Paris.

-> Panoramic shortcut

-> **Advertising,** to a large extent and under various aspects (*form and function, histology, ecology, ethology, taxonomy, evolution*) our knowledge on **Cicadomorpha**. **341** original titles, including **3 notes of Bio-ethology** at the Academy of Sciences (1969a, 1973g, 1977e, at a time when Natural History had every consideration). **Two films**, under my name and that of the EPHE, were produced, one by the Film Service of Scientific Research (1973h), the second by the National Centre of Pedagogical Documentation (1982e). **Three syntheses** reviewing the acquisitions on the morphology, biology and ethology of Cicadidae (1990a) and Membracidae (1999e), as well as on the History of Cicadological Taxonomy and Nomenclature (1988c/1998b, 2001c, 2014/15). Four fundamental works on Cicadas, (1995a/1996c, 2006f, 2007a and 2013c) and first synthesis on the Cicadogeography of France, EPHE Report to the Ministry of the Environment, 2000, 136p., 122fig., 21 maps, in collaboration with **Stéphane Puissant**, then a student at EPHE.

-> **Abstracts and reflections** on Metamorphoses and animal transformations (imaginaison) and on Evolutionary Obliterations. A work (2000a, Travaux de l'Institut Charles Darwin International, Director Patrick Tort). Preface by **Maxime Lamotte**, afterword by **Michel Delsol**. Analysis by **Roger**

Roy (*Bull. Soc. Ent.* 106 (1) 2000) and **Gérard Luquet** (Alexanor, 21, 2002). Finalization, outside the didactic routine, assuming the post-embryonic juvenility of Cicadidae (MB, 2020).

-> **Contributions and reflections** increasing our knowledge (new natural facts, classification, terminology, iconography, synthesis) **on Mimicry**: 4 titles, 1 note of ethology at the Académie des Sciences (1978b); two works: 2007b, Analysis by Jacques Pierre, *Bull. Soc. Ent.* 2007: 112(2),) and 201 2c. Preface by **Georges Bernardi,** Afterword by **Patrick Tort**).

-> **Valorization** of the basic Cicadological tool through enrichment or constitution:

> **A Collection of Cicadas from the intertropical zones.** Including more than 32 genera and more than 285 previously unknown species. Important and not yet perfectly classified.

> **A Collection of African Membracidae**. Including, among others, 11 genera and 78 species described by me. Almost non-existent at the time of my beginnings, this collection, although not completely classified, appears to be one of the most important at present.

> **A Collection of Neotropical Membracidae**. Mainly Guyano-Amazonian (including, among others, 1 genus and 17 newly described species), based on a fauna that has been under construction for more than thirty years, containing nearly 150 drawings of species suspected to be new, made by the Museum's draftsmen **Hélène Leruyet-Tan** (HLRT) and **Gilbert Heudebert** (GH), now retired and not replaced. Just like the French specialist of this family. Sleeping drawings... Materials of the future?

> An Entomophototthèque, rich in eco-photographs, taken in natura, sometimes in reconstituted environments, finally focused on the Living. With more than 12.000 slides, high level 'snapshots' on most entomic groups, but still **unique** for Cicadas and Membracids. It also contains original slides on Fulgoromorphs, a neighbouring supergroup, as well as on Arachnids and other terrestrial Arthropods. Many of these "slides" have been scanned by the Audio-Visual Service of the MNHN, which can, if necessary, use them, without any obligation other than the indication of my first name and surname.

> An **Entomophonothèque gathering the tymbalizations** (*vulgo* songs) of more than 230 species of Cicadas, entomophonators par excellence, tymbalizations gathered, for the most part, in 5 CDs (MB1/1995, MB2/2004, MB3/2006, MB5/2008, MB6/2009) and 2 Memory Cards (CM1/2012 and CM2/2013). Also, some stridulations (*vulgo* chants) of about fifteen Orthopterans. The management of the tymbalizations recorded by me is entrusted, or about to be, to the "Sonothèque" of the MNHN, Paris.

> **An α'Video library** focused on the biology and ethology of the Cicadas of South-East Asia.

-> **Creation** (1988) **of an entomological Review specific to my EPHE laboratory**. 21 annuities, 21 fascicles, an average of 120 p./year. First devoted to Cicadaires and more intensely to Cicadidae (*cf.* the 1990a fascicle, "*Vade-mecum du cicadologiste*" revisited ± partially under anglophony) this Review tried to propose syntheses concerning general or crucial phenomena of "Natural History" such as Mimicry (1991g), Metamorphoses and Animal Transformations (1993d), Species, Environment and Behaviour (2000e), *Sound Communications in Insects* (2000h).

These syntheses were so well received that the first two, which came just in time, were the matrices for the fundamental articles "**Métamorphoses animales**" and "**Mimétisme animal**" that the editorial staff of the "Presses Universitaires de France" wished for the monumental **Dictionnaire du Darwinisme et de l'Évolution**: P.U.F., 1996, created under the direction of the Philosophe **Patrick Tort**. Work in 3 large volumes, of which ***the 3 jackets have 3 of my eco-photographs as coverts:*** mated Provençal dragonflies, evoking a "D"; Kenyan "mimésienne" cicada wearing colours similar to those of the trunk on which it fed; European Scolopendre coiled around its eggs.

1) Cicada, introductory concepts and new data

***Cicada orni* Linné, 1758, the cicada type of cicadologists (Fr-Provence, MB Phots).**

a) Authentic status (*cf.* Boulard, 1990a, 1995/96, 2006f, 2007a ... 2020).

Flagship endopterygote of the **Auchenorhyncha**[9] (oral apparatus folded up shortly after the forehead and distinctly integrated under the head, the rostrum lodged under the thorax), feeding on sap, cellular juices (sucivore) and sometimes water (hydropote); with three small smooth eyes or ocelli (only two in the other auchenorhynchus) – in addition to the two large faceted eyes common to all Hexapods – a pair of small and fine antennae, and four large wings with strong nervures.

Ventriloquist, the male Cicada has in the abdominal base, a neoformed apparatus linked to acoustics comprising a double sound structure by accelerated vibrations, the tymbals, and a double sound-receiving structure, the eardrums associated with auditory capsules.

Silent, the female Cicada does not have tymbals, but has ear capsules and eardrums. It has an ovipositor with an auger that is lanceolate and bi-cerratulated at the apex, facilitating egg laying in stems, twigs or bark. Both sexes can sometimes strike the abdomen with their wings.

Hemimetabolic bionomy, according to three successive and trenched ecophases:

-> endophytic embryogenesis, from a few months to a year, in the same place where the eggs are laid;

-> endogenous ecophase, very long, pluri-ecdysisal in one or more years, or even longer, but always underground;

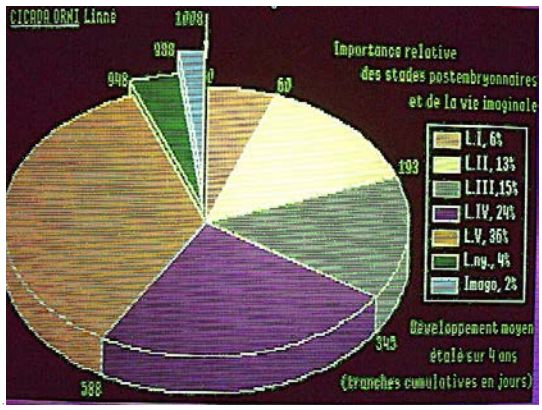
-> epigenous ecophase, imaginary outside, noisy, but very short, a few weeks used for reproduction, sex and egg-laying.

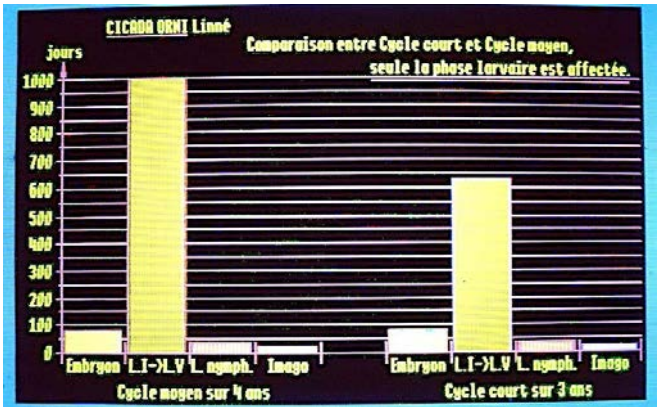
---

9) Auchenorhyncha, a *scientific term of modern construction*, should be written, not with two, but with **one r**: *Auchenorhynches*, priority orthographic, simplification wanted by its inventor *(a hellenist)* understood, perpetuated by the **Editors of the Bibliographies, dedicated Catalogues and imperative works** (*cf.* Duméril, 1806. Amyot & Audinet-Serville, 1843. Duméril, 1860. Kramer, 1950. Pesson, 1951. Robert, 1960. Metcalf, 1962/63. Cobben, 1965. Séguy, 1967. Boulard, 1983. 1988/98. Duffels & van der Laan, 1985. Gogala & Trilar, 1999, among others).

b) The life cycle in *Cicada orni*, star of the Cicadidae

-> **Early stages.** First of all, and for the record, two of my first histograms, composed with the help of a personal Apple II GS, on the Cicada bionomy developing underground.





According to certain ecological contingencies linked to the hazards of underground life, difficult progression, sap abundance or not, the life cycle of the Cicadas can be ± long. However, only the endogenous phase (LI-LV) is affected (**MB, 1985**).

Today, the outdated abbreviations 'LI-LV' must be replaced by 'JI-JV'. Explanations.

1-> Cicadas do not have larvae, but juveniles

To become an adult, Cicadas do not, in fact, undergo metamorphosis[10]. The Cicadidae natal hatching liberate new-born, '*nouveau-né*' thus named by Jean-Henri Fabre, but that alas his magnifying glass showed him ' *larve primaire* ' (sic, 1897), which are not more *'larva neonata'*, a kind of duplicate proposed in 1921 by Filippo Silvestri, the 'Italian Fabre'... Nor, finally, '*larvules*' as too often I have written... Without a magnifying glass, Fabre was right: ***to the letter, the immediate destiny of any newborn can only be juvenile,*** but of entomic constitution, since growing up without parents but under cover, underground. Fantastic, as soon as they are born, without metamorphosis[10], they find themselves equipped with ecologically resolute auxiliaries, skilled picks and shovels.

Each Cicada leads two active and successive lives in two different environments. Ecological opposition, which implies two post-embryonic stages.

The first stage is that of a Newborn, "**animalcule already *Cicada* constituted**", equipped with a stinging-sucking rostrum and with accessories innately related to the immediate endogenous life. Thus constrained, it will evolve slowly in the soil towards the large adult size, with the help of overdeveloped antennae, front legs cutting, digger-shovelers, medium legs, possible crutches, silk-clypeal plugs (where muddy loads are impaled) and scattered dorsal tactile bristles. The growth will require, in principle, four juvenile stades acquiring, from moult-to-moult head with increasingly large cloudy eyes, femoral saw of the forelegs more and more toothed and finally the thorax, equipped with magnifying pterothecas where the wings are elaborated.

10, a) Metamorphosis: change from one form to another, such that the subject is in no way recognizable [*Dictionary*]. In Descriptive Entomology, the term applies only to endopterygota, holometabolisms undergoing the extraordinary biological leap that histolysis their real larvae into cellular slurries destined to pupilate, creating new, intermediate beings. **Nymph** (Coleoptera, Hymenoptera), **Pupa** (Diptera), **Chrysalis** (Lepidoptera). This is spectacularly true for the majority of Hexapods (*cf.* **Boulard, M. 2000**, ***Métamorphoses et Transformations animales. Oblitérations évolutives.*** Paris, Boubée éd., mars 2000: 311 p., 49 fig., 23 Pl., including 16 in color).

10, b) Cigalou: Occitan term used by H. Pelletier, *Petit d'entomologie, p. 45, Blois, 1868*, for 'the little cicada of the elm'... Term which, for me, was best used to designate the newborn cicada.

Here is, from left to right, then from top to bottom, a condensed *in* eight slides of the birth and the juvenile aspects of a Cicada, until exuviation:

> **1, 2, 3 Newborn**, Cicada consisting of an oscillating crawl ‘1’, from the collective woody nest. Shaped head, including eyes; first thoracic segment very developed, distinct, robust forelegs. Of which in '2', ventral view, the model already evokes a particular function, confirmed in '3', chorion abandoned.

> **4 Juvenile (***stade* **I)** having just fallen to the ground. Profile specifying the eyes, the long rostrum under the thorax (sucivorous, perennial tract), long and moving antennae; first pair of legs **immediately suitable for endogenous life:** strongly muscled femurs associated with shins ending in sharp peaks, suitable for digging and moving loads, functions guarantors of an underground life in the primordial search for succulent roots. Other legs, normal.

> **5 Juveniles (II/III); J. III** disturbed in its burrow uncovered (then placed under glass), surprised undertaking the building of a (anti-light) fence of the forelegs. Laborious "to do everything" becoming more and more powerful, the useless tarsals, overturned, each flat on the tibial peak.

> 6 Juveniles (III/IV); J. IV characterized by the more or less important wing sketches on the second and third thoracic segments, future pterotheca. The medium legs, more amply developed and of **possible total inversion,** become "**crutch legs**" particularly useful during progress in a sloping burrow. Hind legs, pushing and stabilizing. The shaping towards the cicada facies becomes more and more pronounced.

The second stage prepares for ***'aerial emergenc***e' in two relatively quick steps. As the juvenile **V** ends **mature**, the Cicada finalizes, *in itself*, the imagining of a new and last exoskeleton with its definitive attributes during a stage of about a month, an anato-morphological completion that will affect it without any great upheaval (*free of any pupigenetic cellular slurry*), inside of old exoskeleton **V** itself.

> **7 Juvenile V** (whitish, eyes included, blind, here flashed in defensive position) / **J.V mature** (pigmented integument, black eyes, functional); long and increasingly "turgescent" pterotheca; **legs-crutches** in function,

stabilizers proven during the round trips progress in tubular burrows leading to the surface; also associated with posterior shoots; equal antennae.

> **8 'Imaginaison' / exuviation**, actions preparing the imaginal moulting in the open air. **J.V** is maturing inside the same exoskeleton, coming under a *nymphoid aspect.* Imagination will become eminent when the forelegs are intimately transformed (not burrowing), the femurs, hardly thickened, will still have powerful muscles and the tibias, turned over, become long and filiform prolonged by normal, catchy tarsals. Medium and hind legs inverted. At the same time, the wings realize their fullness.

The last post-embryonic stage will be masterfully concluded by the imaginary hatching out of the ground, 'in working clothes' and head high, called **exuviation.**.. The whole, finalized by simple punctual exoskeletal transformations, in 8/15 hours, without metamorphosis. After which, the new Cigale, all dashing in its specific colours, will fly away, leaving its exuvie, the last juvenile remains, on the spot, providing information on the size and volume of the imago.

Hemimetabole and self-fulfilment, the Cicada is born, grows with the liking of juvenile stages *'au long court'*, the mould initiated at the time of its natal hatching, being then provided with dedicated edaphic tools 'larvoids' which have aspects and functions of larvae without being of it; temporary tools which will become aerial catchers at the time of the imaginary moult!

2-> The enigmatic underground bionomy of the Cicadas

Our beautiful Cicadas, after having taken advantage of sunny beans and aubades, then having mated, will make eggs. But **unexpected eggs**, because they are genetically worked to produce terrestrial new-born, equipped with terracing tools! The Cicadas are born equipped with front paws digger-pickers working together ... A pair of **organs**, coming from elsewhere*, performing *illico presto* their **function** … In agreement with the Darwinian thought.

The cicadidaean enigma is ovigerous, carried by eggs under biotic diffraction, an innate eco-strategic leap allowing the underground development of a sucivorous, defenceless juvenile progeny, while acquiring a size that would quickly be appreciated in an environment other than edaphic, this one "fortunately" without hunters, or almost (*cf.* pp. 298!). Remaining question: when and under which injunction, does genetics trigger the suggested diffraction, reactivating at once the very ancient and genial "code" of entomic wings.

*) *Fom elsewhere*, drawn perhaps from an old **gryllotalpidian** stock...

For the record

The Cicadas have acquired and practice an astonishing post-embryonic underground interval, isolating drastically juveniles and nymphoids (*emerging adults*), bionomically quite different from the Auchenorhyncha lineage that however, taxonomically, they preside. *Above, a* ***juvenile*** **Cicada orni** ***at 'stage V'*** *(actual length 2,5 cm) in a 'feeding break' and just where it goes, from its rostrum, to puncture the root in place.*

France, Sérignan-du-Comtat, May 1965 (MB Phot).

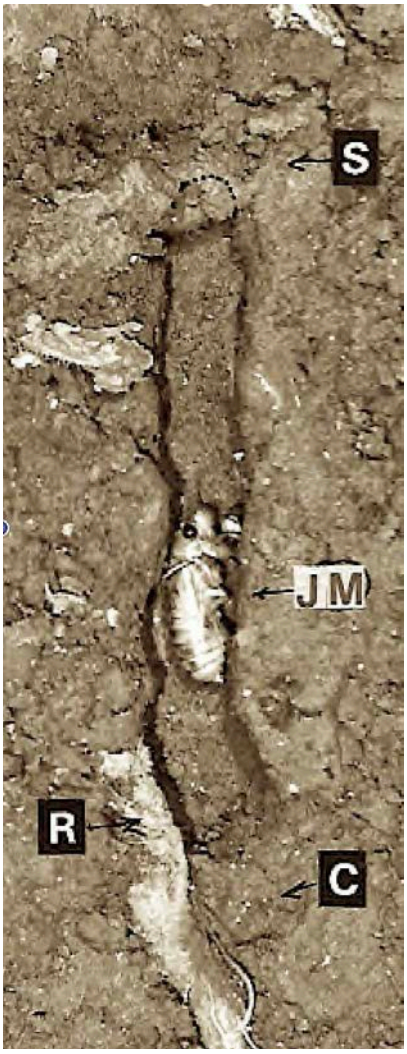
Examples of exuviation presented by *Tibicina haematodes* (Scopoli, 1763), European Cicada

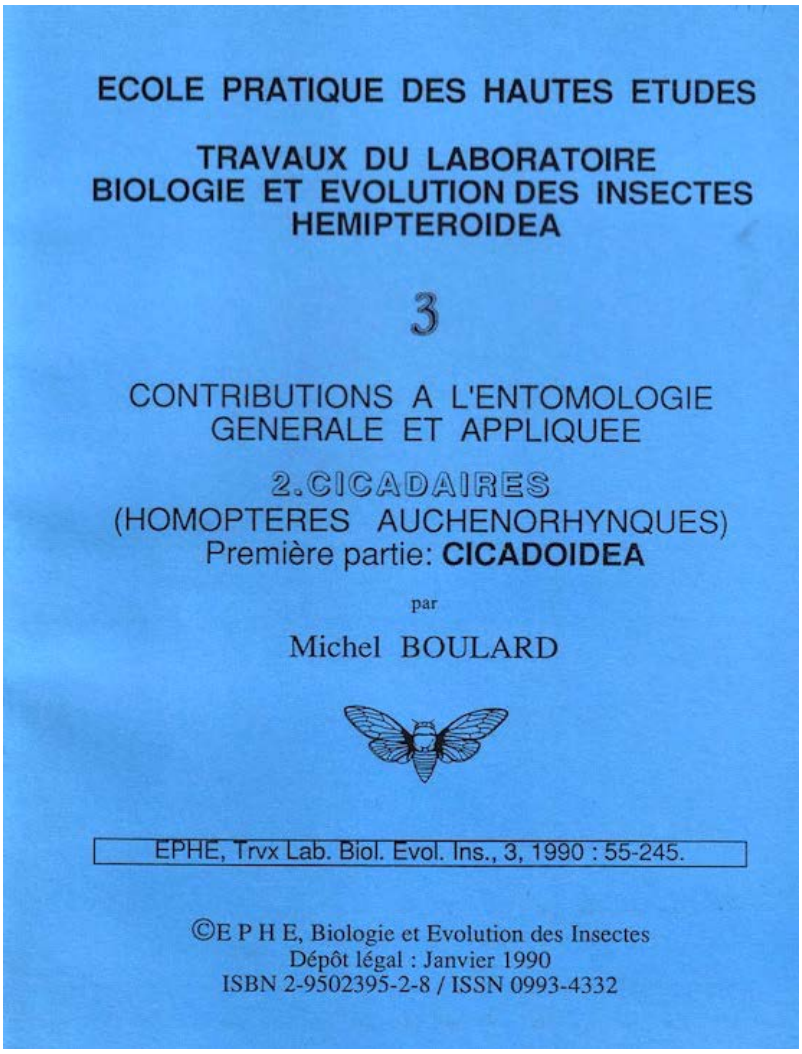
The Imagination in ***Tibicina haematodes*** (Scopoli, 1763), ultimate phases, which are completed by the final extension of the wings and the acquisition of the specific colours. **Vaucluse, July 1987 (MB phots).**

c) Cicada. General and genital morphology, definitions, directed readings

Global and particular revisions, highlighting the many new additions and developments ***cf.*** **Boulard**[11]**, 1965b, 1965c, 1966d, 1969a, 1990a... 2020.**

For the record





On the left, para-axial section of the ascending gallery of ***Cicada orni***: **JM**, ***JV mature*** in ultimate ascent phase, crutch legs in function. **C**, rear filling of the structure, by consecutive deposits of the material removed in front of the "ascending" gallery; **G**, the so-called emergence gallery; **R**, nutritive roots; **S**, soil surface.
On the right, cover of Fascicule 3 des Travaux du Laboratoire entomologique de l'EPHE, (Boulard, 1990a).

d) Evidence for research on the major taxonomy of Cicadidae

The major taxonomy of the Cicadidae, inconsiderately upset in the early 20th century (Van Duzee, 1914 and successors against all bibliographical and scientific truth) was finally corrected, following the fundamental lines of its History **(Boulard, 1972a, 1988c, 1998b... Boulard et Puissant, 2013... Boulard, Puissant, Hayashi, Lee & Cong Wei, Sept. 2015, *Bulletin of Zoological Nomenclature 72(3): 1-2.)*.**

After having reviewed the chronology establishing the historical bases of Cicadology, chronology not only of dates, but also of unavoidable facts of writing, a single application has proved to be totally conclusive in the choice of standard genera governing the first nomenclatural levels of the Cicadofauna... Starting with "**Genus. CIGALE, *cicadae verae* **" according to **Pierre André Latreille,** inventor of the Cicadidae family and of Cicadology.

---

11) Boulard: in bibliographical citations in these pages, my patronymic will often oblige itself in this way, in its four consonants "**Blrd**", or with its two initials "**MB**", thanks to take care of it.

-> ***Cicada*** Linné 1758, species type ***C. orni*** Linnaeus, 1758: Latreille 1802; genus type Cicadini, Cicadinae, Cicadidae Latreille, 1802.

-> ***Tibicina*** Kolenati 1857, Boulard 1972a, type species *Tibicina haematodes* (Scopoli 1763), type genus of Tibicinini and Tibicininae Distant, 1905.

-> ***Lyristes*** Horváth 1926: Boulard 1972a, 1988c, type species *Lyristes plebejus* (Scopoli, 1763), genus belonging to the tribe Cryptotympanini (Handlirsh, 1925): Boulard, 1979, subfamily Cicadinae Latreille, 1802, family Cicadidae Distant, 1906.

-> ***Cicadetta*** Kolenati 1857, type species *Cicadetta montana* (Scopoli, 1772), type genus of Cicadettini, Cicadettinae Buckton, 1889.

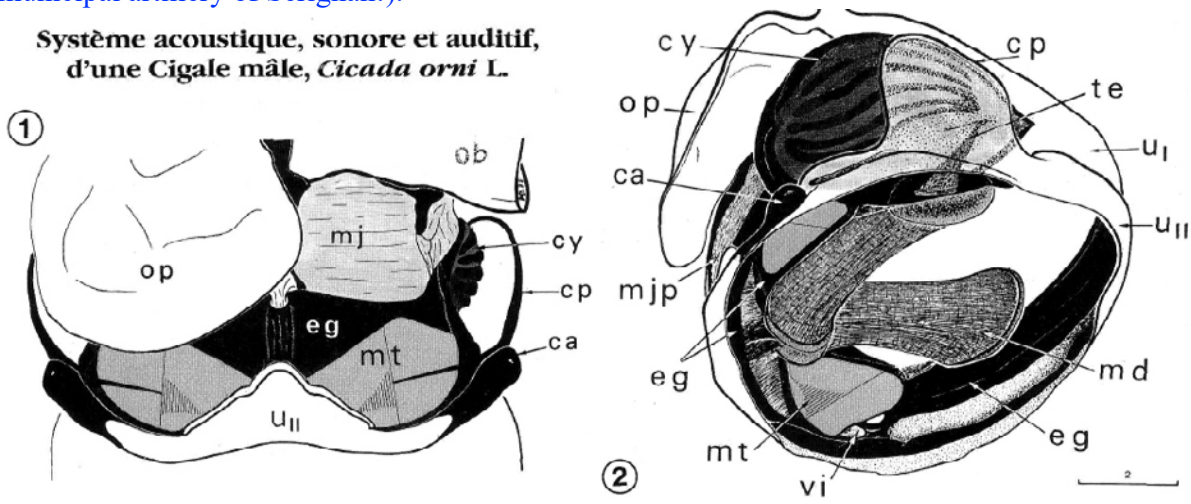
For all the Cicadofaunes, I have adopted the reviewed classification by my colleagues **M.S. Moulds** (2005, *An Appraisal of the Higher Classification of Cicadas)* and **M. Hayashi** & **Y. Saisho** (2011: "*The Cicadidae of Japan").* This is before the molecular and its unpredictable data.

e) Cicadas Sound ethics. Conformations and functions of sound emitting and receiving devices; explanation of the abbreviations 'AIC' and 'AEC'.

Deeply interested, seduced by the Cicadaean sound manifestations, curious about their ethological meanings, I first had to try to define the bionomic steps intrinsically followed by these insects. In France, studied in particular with the Provencial *Cacan*, ***Cicada orni*** L., 1758, the Red Cicada, ***Tibicina haematodes*** (Scopoli, 1763) and the Black cicada ***Cicadatra atra*** (Olivier, 1790), a solitary species, the acoustic function brought into play, in a precise chronology, two main types of acoustic productions known as the very sonorous "**callship**" and "courtship", squeaks interspersed with wing flaps on the abdomen, which precede copulation (**Blrd, 1990a, 1992e**).

However, before familiarizing myself with the "sound performances" of my subjects and trying to understand them, it was essential to review in detail, the morphology and anatomy of the sound and auditory system of the Cicadida, as of all Cicadidae. Quickly described as prodigious in its acoustic performances.

In most of the Insects called "singers", the acoustic possibilities are devoted to mobile organs intended for primary functions such as legs or wings. Not in the Cicadas, which are equipped with organs solely for the production and reception of cicadidian sounds! (*Cf.* **J.-H. Fabre, 1897** and the municipal artillery of Sérignan!).



(1) Ventral base somewhat stretched from the abdomen with the left operculum turned over.
(2) Acoustic system isolated and seen from ¾ left rear.

Explanation of the letters : ca, left auditory capsule; **cp**, tymbacalypte (lateral-dorsal protective flap); **cy,** left tymbal; **eg**, entogastrium (internal framework); **md**, right tymbal muscle; **mj**, distended yellow membrane (during emission); **mjp**, mj-folded as at rest; **mt**, tympanic mirror; **op**, operculum (lateral-ventral protective flap); **te,** tendon connecting by transparency the left tymbal muscle to the internal face of the tymbal cy; **UI, UII**, acousticalia, first abdominal uritis supporting the system; **vi**, velum internally delimiting the right auditory capsule
(*After Boulard, 1990a;* MB picts).

e_1) Phonogenic capacity and name of cicadidae sound productions

Complete, the Cicadidae's sound emitting and receiving apparatus is, etho-significant singularity, the prerogative of the males. They alone possess the phonogenic system based on the tymbalic organ, the sound elements being two symmetrical membranes, the tymbals. Parchment-like cuticle surfaces, purposely reinforced with ribs and platelets, the tymbals are subtended in a subcircular frame, a typical tymbal part of the exoskeleton of these insects. No tymbals in females.

1)*Tibicina hœmatodes* (Scopoli, 1763), a species chosen here for its directly visible tymbals. Male in one of its characteristic attitudes emitting, wings raised and not very far apart, its nuptial call.
2) Close-up of the **left tymbal**, in place in the **acousticalia UI**, showing the structural complexity of this organ only dedicated to the production of "**cicadidian sounds**". **Vaucluse, July 90 (MB Phots).**

Internally, each tymbal is connected to a strong muscle. Contractions depress the cymbals, while relaxations allow the cymbals to return to their original shape. These actions, conducted energetically, release a series of sounds, coming from the ribs and platelets in turn solicited, then released (Blrd, 1990a: 136), will be amplified and more or less modified by the abdominal sound box of the males. Finally, the very rapid repetition of these actions, following rhythms that vary with the species and modulated by abdominal movements, thus generates "**tymbalizations**" (*from the French **cymbalisations***), often with high decibels.

To each species its own music, its own tymbalizing function. First of all the **nuptial call**, then possibly a second tymbalization, the **courtship** emitted as soon as before copulating... Prowess of the tymbal system, the "tymbalic machinery" is specific and the sounds emitted, mainly those of the nuptial call, constitute the fourth taxonomic and identity-related dimension in this family of insects (Boulard, 1995: 34). This allowed me to highlight French and tropical species, more precisely African, Malagasy and South Asian species (Boulard, *passim*). Each one specifically vibrating the two tymbals, or, one after the other and, in turn solicited, the ribs and different intercostal sticks (*like piano keys*) of the tymbal structure.

Conclusion: Cicadas neither sing (no larynx), nor stridulate (no noisy organs, crackling against each other), but **tymbalize,** by vibration tymbals emitting **tymbalizations** (Boulard, 2006; 2007; 2013); (from *cymbales, cymbalisations, cymbalique*... Boulard, 1977m, *passim*; **Yveline Leroy, 1979, "*l'Univers sonore animal*"**, Gauthier-Villars, p. 70);

Depending on the species, the tymbalizations can be modulated, rhythmed by various abdominal movements, as shown by the male of the great Provençal and largely North-Mediterranean Cicada.

Lyristes plebejus (Scopoli, 1763). **Tymbalizing male** a music rhythmed by rapid movements of the abdomen from bottom to top. **Harmas of J.H. Fabre, 1965 (MB Phot).**

Or, very strangely, as the males of ***Chremistica guamusangensis*** camcorder in Thailand do, retracting the abdomen strongly at the end of each verse.

Thaïlande, Chiang Rai Province, Huai Nam Ghun, May 2007 (MKBvdo).

e_2) Hearing ability

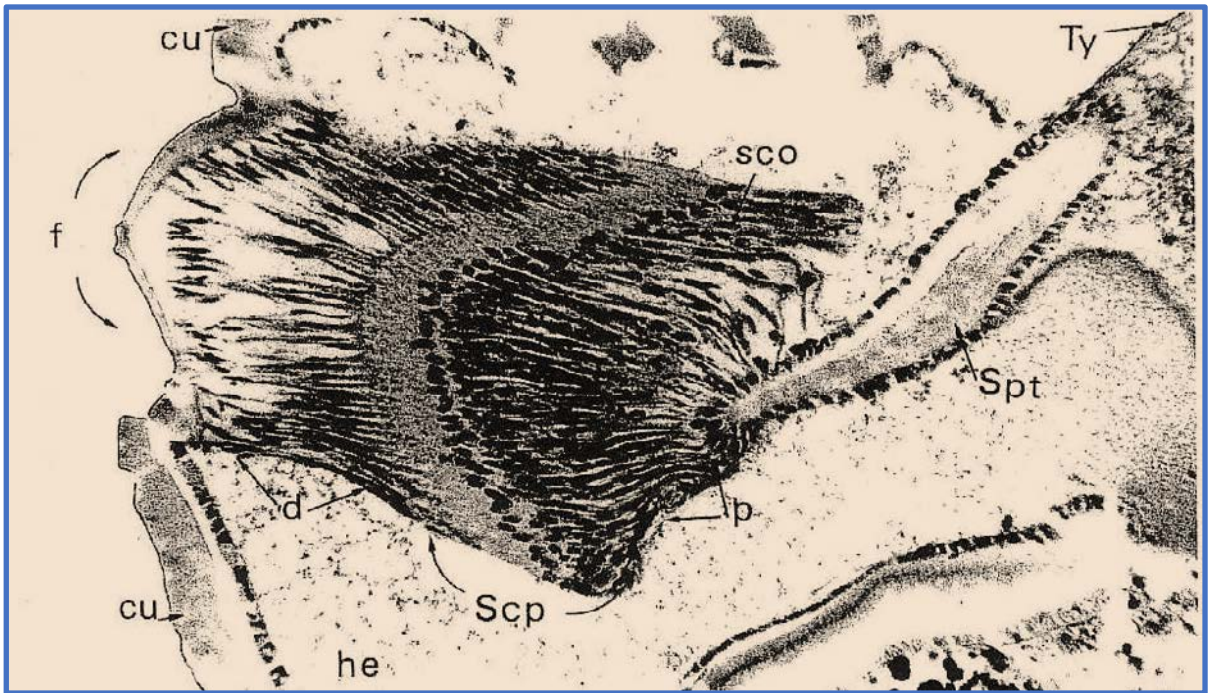
Cicadas of both sexes perceive sounds thanks to somewhat singular "organelles", which they also wear at the beginning of the abdomen. Two pairs of organs are devoted to hearing, the **eardrums** (sometimes called *tympanic mirrors*) and the **auditory** or **ear capsules**, which are integrative. The former is inscribed in the first inter-segmental base of the abdomen; the latter are located on the sides of the second abdominal segment.

Each ear capsule is a scoloparium containing sound-sensitive organelles or scolopidia, making up a scolophore which receives and integrates the sound vibrations perceived by the eardrums. The scolopidia, which have long axons, conduct the sound vibrations that activate the eardrums to the axial nervous system.

Curiously enough, the eardrums are always more widely dimensioned in males, an arrangement which could be related to a better external transmission of sound power through the

abdominal sound box of males. In any case, the acoustic device of the Cicadas is an accomplished system, or "arrived at the height of its evolution", but whose properties are not all frankly admitted... Those inherent to echolocation in particular (*cf.* the sound ethology of ***Pompanonia buziensis***, p. 175), expression of the duality of the components of their acoustic system.

Almost newly formed, this device separates the Cicadas from the other families of Auchenorhynchous and from most of the other phonating insects. Figures 1 and 2, Pl. XVI in Boulard, 1990; repeated in 1995/96 recall the situation and the anatomy of the acoustic system of the Cicada, dissected in *Cicada orni* L., a historical species best characterising the family Cicadidae. The structural anatomy of the auditory capsules could be clarified by histology, providing the main descriptive data:



First transverse histological section in the left ear capsule of a cicada

Explanation of letters: **cu,** sclerified wall (cuticle) of the capsule; **f**, centrally domed dimple giving insertion to distal attachment cells, **d**, of the scolophore, **Scp**; **he**, haemolymph; **sco**, scolopidia; **Spt**, spatula for internal insertion of the scolophore via proximal attachment cells, **p**; **Ty**, distal part of the eardrum.

(Boulard, 2000h / 2006f).

The musical productions of the Insects constitute a major link in the rapprochement of the sexes. In Cicadas, as in Orthopterans, the males, by their acoustic manifestations, generally "sono-guide" the females towards them, in the procreative accomplishment. In addition, they constitute a taxonomic dimension increasingly used in the apprehension, the precise identification of phonating insects.

e_3) "Metamorphosing" sounds into images

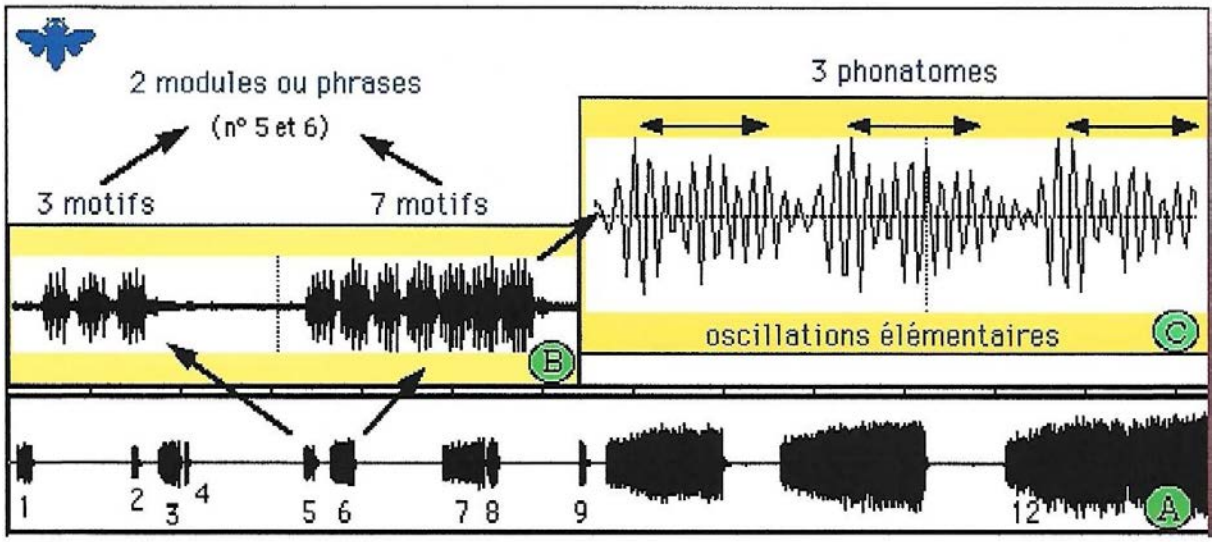
Thanks to computer science - *many thanks to* **Eric Keller**, creator of the ***"Signalyze***" software, of which I made one of my primary tools, as well as to the authors of the ***"MacSpeech Lab II"***, often used, two new software and hardware that, in 1985, I had to buy personally. Then, as a pioneer in the field, I was able to transcribe tymbalizations into images and visualize them. From then on, it became possible to analyse them with enough subtlety to draw up the first **Acoustic Identity Cards** (AIC), as well as **Acoustic Ethology Cards** (AEC), initiated in "***Vies et mémoires de Cigales***" (**MB, 1995a, 1996c)** and which help to understand the intra- and inter-specific relationships in the "sound space" of the biosphere accessible to Cicadas and, through them, taxonomically put to good use.

As the excellent Slovenian colleague, **Pr Matija Gogala**, pointed out in a recent book (2011/2013, precise and magnificently documented), my EPHE Laboratory was at the forefront of this field, affirmed by 3 long fundamental articles published in the ***EPHE Entomological Review,*** on the ***Tymbalization Postures of Cicadas***, with the **AICs** of 74 species, both Mediterranean and inter-tropical (**Boulard, 1995c, 1996j, 1999b**). They were associated with a fourth article, no less fundamental in terms of the **distinction between Tymbalization / Stridulation** (**MB, 2000h**). **The procedure to be followed to obtain AICs and AECs was thus widely divulged:**

->Tymbalizations are first trancribed in real time, giving the temporal signal, which it is often necessary to "stretch" in arbitrary "space-time" to better highlight the structure, originally compacted by the recordeur.

->For the most part, tymbalizations are made up of sequences that are repeated in loops; they comprise phrases or trains of modules, bringing together motifs formed by one or more phonatomes, sound units that are repeated almost identically on the same rhythm (the musicians' leitmotiv).

->The sustained expansion of the phonatomes makes it possible to appreciate the pace of the elementary oscillations that make them up. What we have been able to bring together in the following diagram, with the help of concrete elements borrowed from a male ***Cicadatra atra*** beginning to tymbalize the first phrases entering into the composition of the first sequence of the temporal signal:



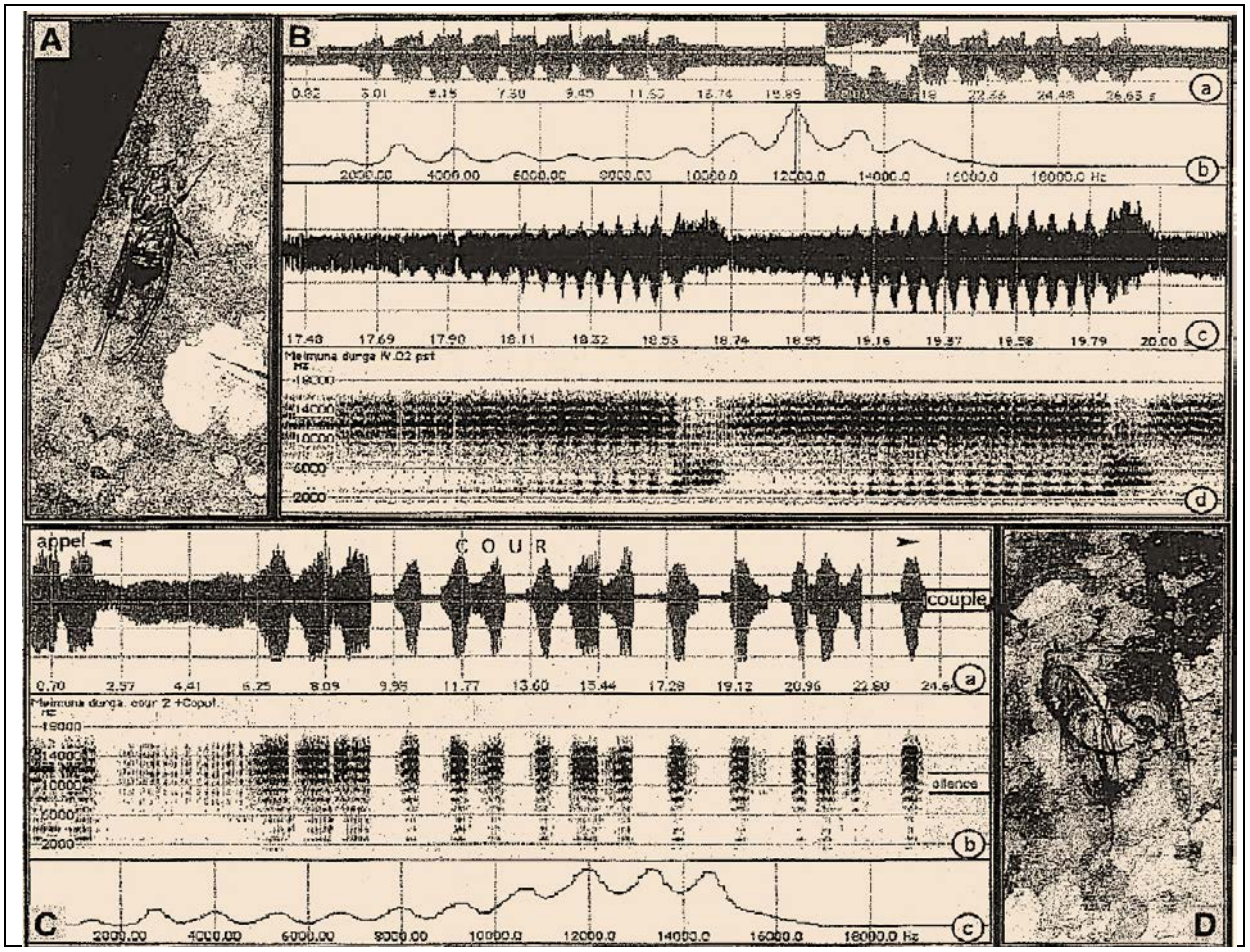
First sentences of the temporal signal of a tymbalization (**A**)**:** 1... 12, structural decomposition, according to increasingly stretched space-time (**B**), (**C**) until the individualization of the elementary oscillations, whose primordial groupings constitute phonatomes **(Boulard, 1995a, c).**

Following the requests of Dr. Michael Claridge and Dr. Sakis Drosopoulos, eminent colleagues, I wrote Chapter 25, *"Acoustic Signals, Diversity and Behaviour of Cicadas"* of a collective work (**Insect sounds and Communication**, *Taylor & Francis Group, 2006*). This initiative led me to produce, on the same subject and within the framework of the EPHE, a textbook directly accessible to students, precisely documented and accompanied by a "**Compact Disc Audio**" made with the precious help of **André-Jaques Andrieu**, acoustician and 'discographer' of the INRA. This CDA gathers the tymbalizations emitted by a hundred species (exactly 99, full CD!) gleaned by my care of bourlingueur, then determined and listed (*Cf.* **Boulard, M. 2006f + CD MB3**, ISBN 2-9502395-2-8). See, page 372, a reminder of the red Cover of the volume.

e4) Tymbalization, a nuptial call... Not always obvious!

It seemed obvious, from cause to effect, when following some Mediterranean cicadas of the *Cicadatra, Lyristes* and *Tibicina* genera (*cf.* Blrd, 1992e; 2006f), but much less so in others, especially in tropical environments, and I will agree a few pages later (*cf.* the tymbalic exercises of the numerous European, African-Malagasy and Asian cicadas, given in these pages). The best ethological examples, allowing to give an account, graphically, of the acoustic function in the exercise prejudice, have often been offered to me by the Cicadas living in France, but also from elsewhere.

Witness invited here: ***Haphsa durga*** (Distant, 1881). It is a tropico-asian species whose male emits, from the same place, a *call tymbalization*... Until, a pregnant female of the neighborhood tries to approach it, clinging on the same branch, or on one very close. Immediately, the ♂ changes register, emitting a courtyard tymbal, with a split "speech" which motivates the ♀ to join it and copulate, the male hurrying a few steps towards it:



***Haphsa durga* (Distant). On the sonic behavior and acoustic function of this dendro- & heliophilous Thai species.**

(A) Identité photographique d'un mâle tymbalizing / Photographic ID of a tymbalizing male;
(B) A.I.C. based on nuptial call tymbalization, which is alternately whistled and sizzled / calling tymbalization (nuptial call) which is alternately whistled and sizzled;
(C) A.E.C. based on courtship tymbalization / *cymbalisation de cour*;
(D) Mating / male and female mating.

Board extracted, shortened, from Boulard 2006f (MB Phots & Signalyze 3.12)

But the acoustic manifestation can be quite different ...

e_5) Tymbalization, a possible expression of "well-being"

This is what some Cicadas seem to feel, historically the males of the great Provençal ***Lyristes plebejus*** (Scopoli, 1763). Diurnal par excellence, it happens that during the hottest summer heat, males, at night, improvise something like a "chamber music" ...

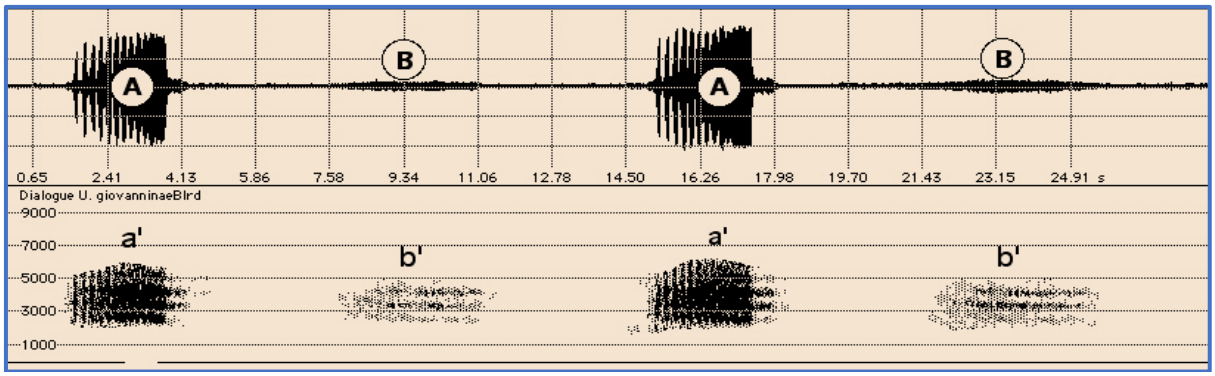
Normally, the **tymbalizers** stop at the end of the day. Nevertheless, during the calm and warm twilight-night evenings, the tymbalisations resume and become more beautiful. The "bow strokes" being less hard, the "Lyristesian music" flows without the strong resurgence of the day. This almost gentle intensity of the concert was underlined, but not appreciated by Jean-Henri Fabre in his Souvenirs published in 1897. However, in his Harmas, Pierre Téocchi, Jacques Coffin and myself, presumed successors of the ending 20th Century, appreciated it many times, pardon Master, while being as astonished as you are. No question of sexual appeal, then ethologically noted without appeal, but that of a beneficial temperature scale, leading to a 'mechanical' functioning of the cymbals, became obvious... To the point of conceiving that the Cicadas 'feel good' **and make a 'jam!'**

I camcoded similar behaviour in Madagascar and even more in Thailand, during concerts of the great ***Pomponia linearis***, ***Chremistica atratula*** and ***C. moultoni*** and more with ***Platypleura mira*** (*cf.* p. 270) on particularly hot and not very windy days (± 38° C), but where no mating could be spotted, or just a few short changes of place, during such events.

e_6) Concurrent or successive sound plays:

Several species can evolve at the same time, tymbalizing side by side, each living in parallel with the others. This is what *Cicada orni, Lyristes plebejus, Cicadatra atra, Tibicina haematodes*, more or less neighbouring species in open environments.

In tropical forests, closed or relatively closed environments, the males of species with more or less diluted populations may seem to engage in sonic jousting. A first observation of this fact, was provided to me in Central African rainforest, in the middle of hot and calm days, by the great ***Ugada*** of the place. It was a pathetic dialogue between two males as reproduced below, tymbalizing the same stanza in a regular alternation: Territorial requests, or "associated calls" to distant females. Hypotheses remained hasty, not cut, but of striking listening in a large forest then almost silent:

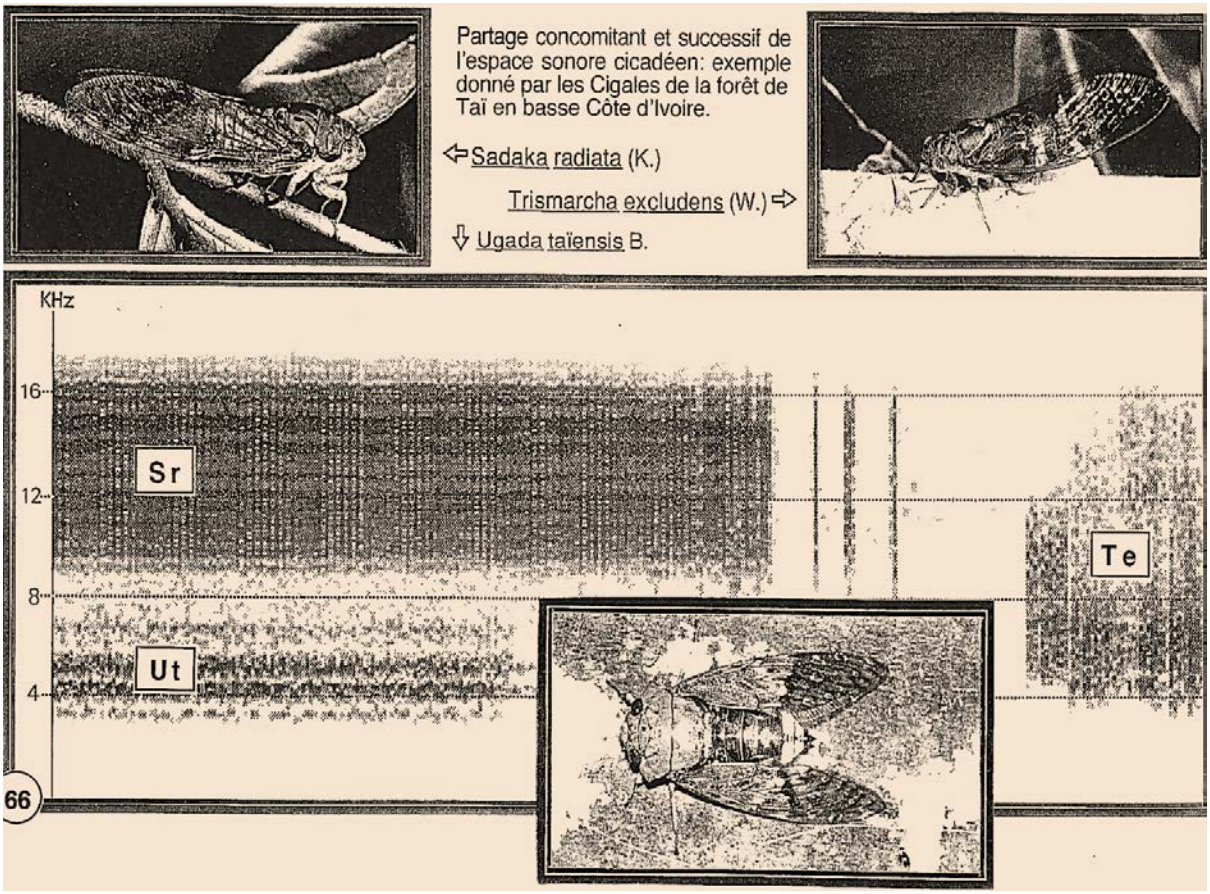


Graphic portion (Oscillogram / Spectrogram) of the dialogue between males **A/a'** and **B/b'** of *Ugada giovanninae* Boulard, 1973, about 20/30 meters apart, **A/a'** being close to the microphone...
(Boulard, 1996j).

Sympatopic and syntopic species inhabiting the same biotope at the same time may be heard, either one, then the other, at different times and intervals, or together, manifesting themselves in frequency ranges of different pitches, following different rhythms of action.

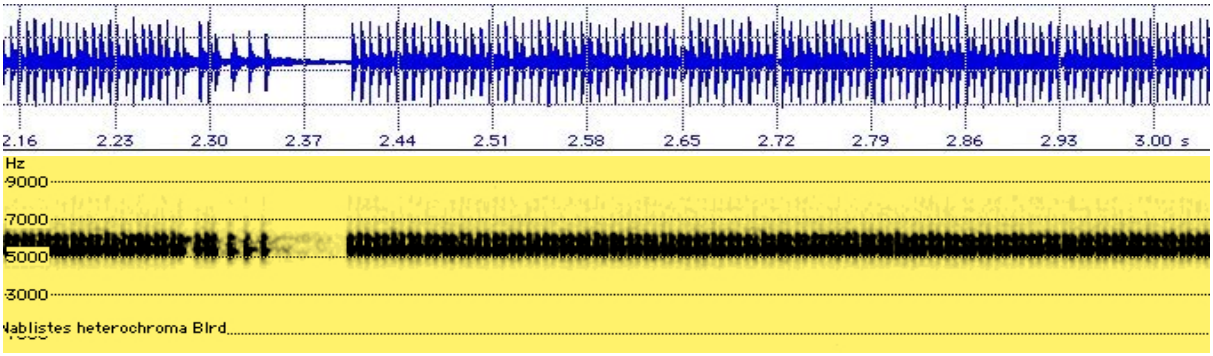
A first demonstrative example was provided by four West African species. Three heliophiles, two of them solitary, ***Sadaka radiata*** (Karsh, 1890) and ***Ugada taiensis*** (Boulard, 1986); one gregarious, ***Trismarcha excludens*** (Walker, 1858) and a fourth, solitary and twilightly, ***Nablistes heterochroma*** Boulard, 1986. All observed and recorded in the Taï forest in Lower Côte d'Ivoire.

When I was there, in April 1986, the four species were adjacent in a dense forest. At the end of the morning, the first two (**Sr**) and (**Ut**) were tymbalizing together, but with decibel, rhythmic and frequency performances that were out of all proportion. When one (**UT**) and then the other (**Sr**) became silent, the males of the third species (**Te**) tymbalized in chorus, emitting another temporal signal with a different rhythm and occupying another wide frequency range:



(From Boulard, 2000h)

In the late afternoon, when the heliophiles fell silent, the sound space was soon occupied by the scattered males of the Ivorian ***Nablites***, a species that manifests itself acoustically at dusk and until nightfall (*Boulard, 2000h, 2005n, 2006f*). A specific singularity, the sexes of *Nablites* are *heterochrome*, which is underlined by its scientific status. Below, slide **(MB Phot)** of a couple (male on the left), then the very first printed Acoustic Identity Card:



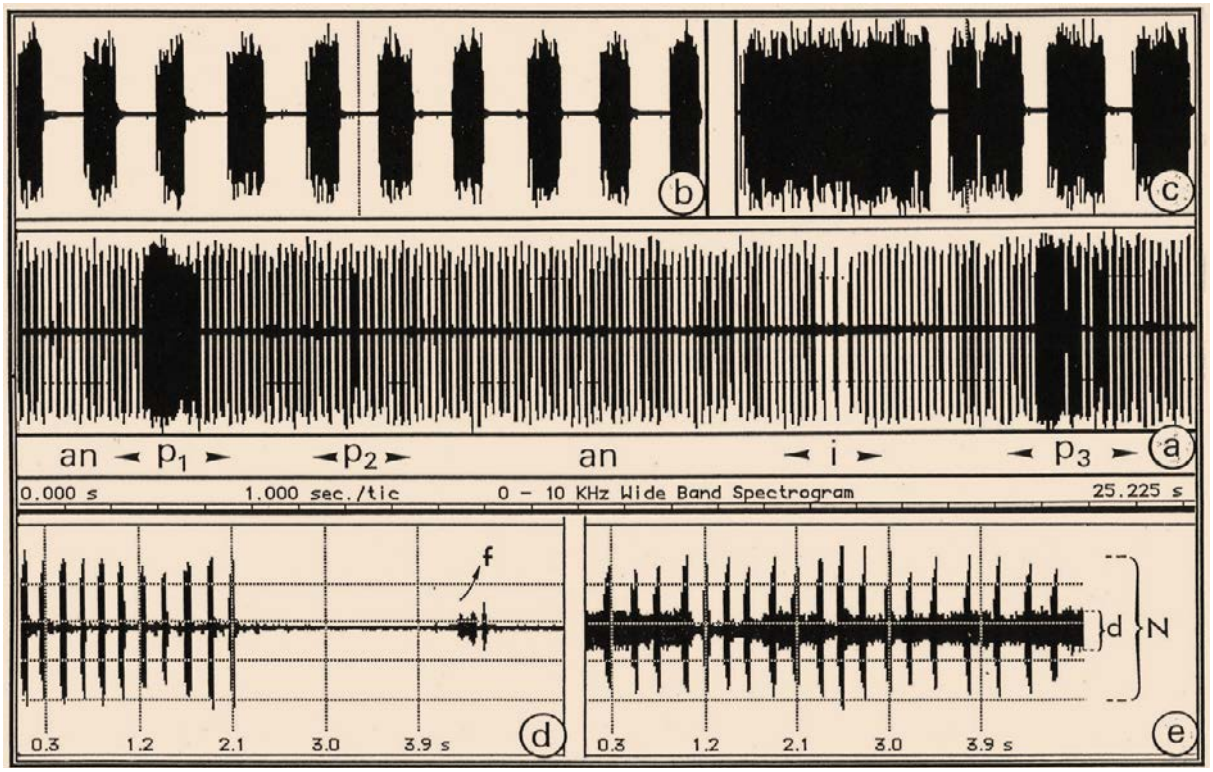
Nablites heterochroma Boulard, 1986. Indicative **IAC** transcribing, in an arbitrary space-time, the oscillogram and spectrogram of about 3 seconds of the extended time signal. **(*Signalyze 3, 0*. Blrd 2000h).**

A second example, equally clear once unmasked, was recorded in Thailand, revealing the concomitant sound imprints of two ethospecific and syntopic tymbalizers, previously distinguished by me, *Orientopsaltria fangrayae* in 2001 and *Dyticopycna** in 2005. Like the previous African ones, the two Thai Cicadas evolved in the same environment, during the same time segment, each one carrying out comparable ethological monitoring in parallel **(*cf.* Boulard, 2013a).**

e_7) Additional documents

->Acoustic Ethology Map (AEM) specific to *Cicada orni* Linné, 1758:

25-second visualization of tymbalizations of males recorded in natura, whose ecological vicissitudes (patterns) were selected, noted and transcribed recomposed, below, window (a). The various motifs were then isolated, windows (**b**) to (**e**) and briefly commented on:



This temporal signal, transcribed in real time, or extended, was commented at the Harmas, in company of my companions Jacques Coffin and Pierre Téocchi, then during the public presentations of my first book, *Vies et Mémoires de Cigales*, published in May 1995, re-edited in May 1996.

*) The genus '*Pycna*', Amyot & Serville, 1843, fundamentally polyphyletic, but represented in the Tropics in Africa and Asia, has just been redistributed into 2 new geographical taxa, ***Dyticopycna***, African and ***Eopycna***, Asian (*cf.* Sanborn, 2020).

Camaret-sur-Aygues, september 1995 (Photo Jacques Coffin)

The graph includes

(a) >Five tracks of the actual nuptial call (**an**), which is a kind of speech sequenced in a series of very close, regular, but amplified "sound modules".

>Two tracks reflecting vehement protests (**p1** and **p2**), caused by an Ant having chewed the wing, the rostrum, and then touched one of the legs of the Cicada.

>A manifestation of concern (**i**), due to the rapid passage of a Bird in the visual field of the Insect and resulting in a brief cymbal slowdown.

>An opposition reaction (**p3**), a protest triggered by the urgent approach of a second male. Opposition tymbalization, consisting of many sharp, closely spaced, telescoped cymbal clicks as shown in window **c**, which has the effect of stopping the homosexual attempt.

(b) Serene tymbalization, regular appearance of the modules, portion taken from (a) and x10.

(c) Protest tymbalization, irregular appearance, "telescoped modules", portion x 10.

(d) Distress, image of a temporal signal of approximately 4.30 seconds showing normal tymbalization abruptly interrupted by the sudden appearance of danger and quickly followed by a precipitous departure of the Cicada, accompanied by an escape "cry", **f** (in reality disordered tymbal strokes).

(e) Concomitant recordings, 4 seconds, of two males tymbalizing at a short distance from each other. The first having been captured, emits "distress cries" (small, irregular central range, i.e. "}d"), while the second tymbals regularly (large range occupied by normally modulated signals, i.e. }N). The latter clearly attests to the direct observation that has been repeatedly verified. The distress manifestations of the captured male do not affect the behaviour of the free male in any way. *The Cicadas do not integrate sound messages of fear, the external expression of fear having, in their case, no ethological alarm value.*

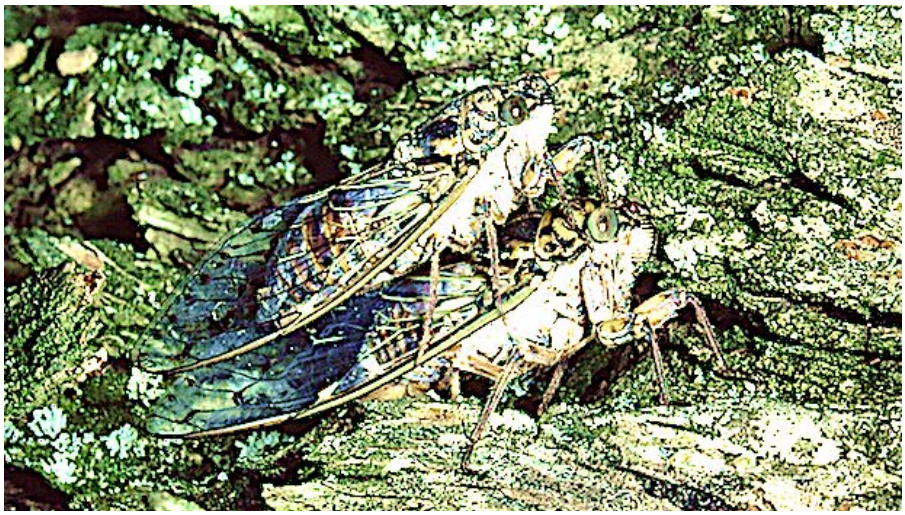
France, Provence, July (**MB on *MacSpeech Lab II*, 1995/96).**

-> Curious perceptual limits of male cicadas

Two sensory functions intervene in the behavioral course of the males that the mating concludes. Acoustics is the primary function and this one is not susceptible to error. A male of a given species will attract a specific female, not another, very generally. On the other hand, the **cicadid acuity** of vision, which plays an important role in the ultimate approach (courtship and contact), is limited and leads to misunderstandings. Males are unable to identify the sex of the individual in the vicinity, as shown by homosexual attempts, which are frequent in gregarious species, while intespecific copulation attempts have been noticed and filmed in natura (*cf.* Boulard, 1973h). Moreover, males are unable not only to appreciate whether the object of lust is a female or not, but also to integrate whether it is a cicada of their own species or not, or whether the target insect is alive or dead! This was the case in the following tests, using a simple "wire". In the two slides that follow.

On the left, a male *Cicada orni*, tymbalizing, comes to try to copulate with the corpse of the male *orni* which, hung on the end of a wire, is presented to him.

On the right, it is a vigorous *Lyristes plebejus* who "wants" to mate the corpse of an *orni* presented while it is tymbalizing **(MB Phots).**



-> What's more, they don't know how to "put things in perspective". In the snapshot above, a male is "courting" a laying female, its auger already embedded in the bark of the olive tree!

France, Vaucluse **(MB Phots).**

Finally, in the conclusive copulatory meeting, the male cicadas only react to the "**cicada image**", as they do not have the sensory equipment that can fully inform them about the object of their approach.

-> "Cicada rains". A strange behavior, unexplained

At dusk, under particular environmental conditions (calm weather, mild temperature), some cicadas - relatively large - at the height of their imaginary phase, start to climb towards the highest foliage ... Until they no longer find a stem, a leaf to hang on to ... So they fall to the ground "boom!", without even opening their wings. As this strange behaviour interests a whole population, it gives this event called "Cicada Rains".

Rarely reported, this phenomenon is however known in France, especially in the Drôme with our big red cicada, ***Tibicina haematodes***, in July. In Brazil, Pierre Pompanon and I had the chance to observe a similar event in the state of Rio de Janeiro, in the forest of Volta Redonda with the enormous ***Quesada gigas***, in January 1981.

More recently, the event was observed in northern Thailand, in late March-early April 2011 by the lepidopterist Robert Dodd, with ***Cryptotympana aquila*** (*cf.* p. 229) where, in two evenings *(pers. com. from my old friend John Moore)*, it was possible for him to collect a hundred of this strong Asian species.

-> To conclude this chapter and introduce the following

Framed' portraits of a rare languedocian morphe, ***Cicadatra atra, subflava***, then of an 'Invisible', the variegated cicada (***Cicada orni*** Linnaeus), the **"Cacan de Provence", that often we hear, but never see!** "*Popular saying*" (**MB Phots).**

2) Mimicry and camouflage, preliminary and didactic notions

A.- Mimicry and Mimetology

Many animals, especially Arthropods, have mimetic and mimic adaptations that allow them to have original strategies for saving or attacking, while others camouflage themselves. These

biological manifestations (barely perceived in the 18th century and to which the names of the first field naturalists are attached) were the subject of a significant surge of enlightening studies and research until it's a little bit longer nowadays (*cf. Georges Pasteur, 1972*). A very active field of investigation was thus created, so much so that it **became a precise discipline of natural history.** Curiously enough, this discipline remained without a generic name. In order to be in harmony with those designating the other disciplines of study of the living, it was called "**Mimetology**" (Boulard, 1991g).

After having retraced the early days of its history and given a substantial review of its characteristics, I have endeavoured to unveil and codify the functions and modalities of Mimetology, as well as to draw up the vocabulary associated with it (Boulard, 1978b, 1991g, 1998a, 2007b, 2012c). The Phenomenon covers the essential idea of appearance, accompanied by a false connotation (what "*appears true, without being true*", as Aristotle said), any event relating to mimicry is based on cunning (**la ruse**, Latreille, 1802) and implies the existence of a third party to be deceived. The effective strategy in a competitive ecology is to pretend to be what one is not, with the result of not being eaten, or to attack and eat better, or, in another strategic register, to perpetuate one's species by opting for a roundabout solution such as parasitism.

a) Composite definition

Mimetology turns out to compose the main tables of a "**system**", effectively a biological comedy presenting, under the same tent (a delimited geographical area, a determined ecological stage) three actors. The model, the mime and a third actor, the dupe at the heart of a staging giving the impression that the mime plagiarizes at least some of the model's identifying characteristics, so that it mystifies the dupe and takes advantage.

-> The mime is a being who has no other first line of defence (or attack) than the usurpation of an appearance, which may be ostentatious, conspicuous, or concealed.

-> The pattern is

-> either a conspicuous or very conspicuous subject (animal or vegetable), which can be
> or left in peace because reputedly dangerous, foul smelling, or uneatable,
> or attractive because displaying or emitting captivating signals.

-> or any part of the environment (biotic or abiotic) which usually surrounds the mime, but which has no remarkable features of interest to the mime's enemies.

-> The third actor, the keystone of the system, because "targeted" by the mime, it will be:

> an effective dupe, when the mime's livery catches its attention, but since the colors are apathetic (false), it is effectively deceived and reacts in the same way as in the presence of the model. The mime's livery, clairvoyant and fallacious, is a constant of sensual mimicry, sensu stricto or Batesian, which, when accomplished, reflects a rather rare reality

> an indifferent dupe, when it is unable to detect the camouflaged mime, which then totally abuses it... Extreme deception and primordial criterion of mime, the most frequent category of scenes in the comedy in question.

b) Rules, Classes and subclasses

Today, no less than seven mimetic rules have been defined and recognized. From **Bates**'s research in the Amazon, **Trimen**'s in South Africa and his own in Malaysia, **Wallace**, in 1871, first drew up five first rules concerning:

- the concordance of locality between the mime and the model;
- the special protection enjoyed by the model, who did not fear its enemies, the predators;
- the obligatory rarity of the mime in relation to the model.
- The imitator does not present the proper aspect of its group,
- the imitation affects the external characters without ever touching the internal characters.

In 1912, **Poulton** will create the sixth Rule ruling on:

- the optimal proportion which must exist between the number of mimes and the number of models, under penalty of regression of mimicry, a rule which reinforces Wallace's third rule.

Finally, **Sheppard**, in 1959, will involve the dynamics of the phenomenon by specifying:
- the determining role of the selective pressure on the allelicomorphs resulting from the populations with mimetic tendency, seventh rule or Sheppard's rule.

c) Classes and subclasses of mimicry

In the relational and first of all visual domain of an ecosystem, everything will depend on the effect obtained and projected by the livery of the species. Because in the end, the important thing for animals whose defence (or/and attack) strategy is based on the image they project towards the outside is: - either not to attract attention, disappear into the background, and protection is then provided by cryptic means (camouflage, disguise) with, as an immediate and necessary corollary, immobility;

- or appearing in "highly displayed" looks and colours, which may be sematic (truthful) or apathetic (deceptive), in all cases where protection requires a clear warning, whether justified or not. From then on, two fundamental mimetic classes will oppose each other.

1-> The Mimese, mimicry which encompasses cases of crypticism, whatever the efficient recovery function, and which leads to two sub-classes and two infra-classes:
- the defensive or protective mimicry (procryptism).
- the offensive mimicry, which can be subclass
- aggressive (anticryptism, camouflaged predator, disguised or transvestite) and the latter, when it exists, is superimposed on the former in the same individual.
- parasitic, the mime parasitizes its model at the expense of which it feeds and develops.

2-> The Mimetisme (true mimicry according to Wallace and Skertchly, whose criterion, opposite to the previous one, is to attract attention, by displaying usurped characters (optical, olfactory and others). There are then five main subclasses of true mimicry, depending on whether the display is

- constant and repulsive, as in the unprotected Piedrid Butterflies, totally mimicking (colors + shape + action) the protected Heliconiid Butterflies, observed by Bates and it is:
-> Batesian Mimicry
- constant and attractive, as observed with Entomophilous Orchids (Kullenberg, 1961), part of the flower mimics Hymenoptera Insects, attracting and constraining them in the roleof pollinators and it is: **->Reproductive Mimicry**
- temporary and attractive, as practiced by Pisces of the genus *Aspidontus* mimicking the Lambroid Cleaner Fish and feeding at the expense of Pisces seeking to be cleaned by the latter, or by its image (Wickler, 1963) and it is: **-> Wickerian Mimicry**
- temporary and repulsive, as the first unexpected, staggering or frightening response to a justly perceived threat (Brindley, 1925; Blest, 1957; Caillois, 1960; Boulard, 1978, 1996) and it is: **->Ostensible Mimicry**

Another phenomenon that resorts in some way to mimicry is the following observation: within a given territorial unit, several aposaemic (i.e. conspicuous and protected), endogenous or (and) exogenous species seem to copy each other, but there is no usurpation of characters: each having its own defence system, they all participate in the "learning costs" of predators that they may have in common. In this case, the third actor, perfectly aware, is not fooled; nevertheless, it is indeed to him that the similarities are addressed, it is to him that the signals revealing danger are sent; therefore it has been called a "*signal receiver*" (Wickler, 1963/1967) or "*operato*r" (Vane-Wright, 1976), while the distinction between models and mimes, by implication, is no longer obvious. The names Mimétisme mullérien (named after its first

designer, Fritz Müller, 1878) and Synapo-sematisme (Poulton, 1897) have been given to this phenomenon of reciprocity (Boulard, 2007).

c) Mimicry and Natural Selection

Three fundamental concepts:

- Variability: Organized beings have, in themselves, an inherent tendency to vary (chromosomal mutations, phenotypic adaptation).
- Heredity: genetic transmission of mutations.
- The Darwinian concept of the struggle for existence, which every living being must wage against all the obstacles in its natural environment.

Pragmatically, evolution is of interest to populations, first within the species (microevolution, with maintained inter-fertility), then from one species to another (macroevolution and speciation, with inter-fertility made impossible). Generally speaking, speciation results from two processes that are independent in nature and mechanism:

-> The hereditary, morphogenetic mutation, which tends, whatever its magnitude, to generate new types, carrying a minimal, marked or very marked genetic distance from a couple of ancestors (or an ancestral form);

-> Natural, ecological selection, which channels this mutation by eliminating types that are incompatible with the global environment of the moment. The success of an intrinsically viable original organism will therefore depend (at least to a very large extent) on natural selection.

Mimicry has proven to be one of the best proofs of Natural Selection in action. This has been particularly demonstrated, on a human scale, by the explanation of the development of industrial melanism (Kettlewell, 1955, 1957), confirmed by the discovery of ***Ustusian melanism*** in the great Central African savannas subject to bush fires (Boulard, 1974b, 1985g).

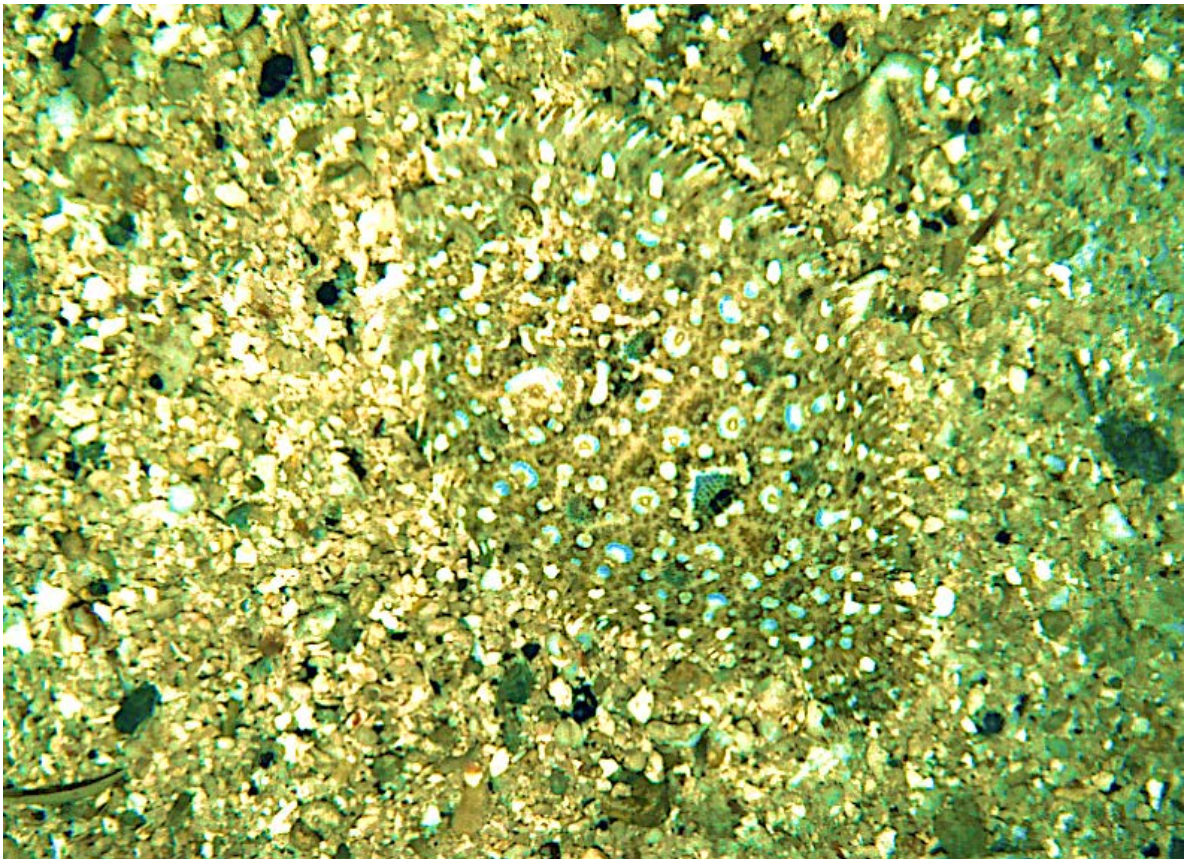
d) Examples

Couple of ***Barbitistes fischeri*** (Yersin; the female is on the right) showing a double homochromy, most probably nutricial: the bodies, more or less voluminous, have the color of the leaves, whereas the fine legs and antennas have that of the petioles. **France, garrigue provençale** (**MB Phot**)

Female of ***Phyllium bioculatum*** Gray, 1832, phaneromimetic marvel identifying itself with leaves, model of phyllomimesis (colour and body tricks!). **Thailand, Djamnong, June 2001 (MB Phot).**

From "**Être ou ne pas être, les facettes du Mimétisme, p. 143, fig. 165**".

EPHE, *Bio. Evol. Insectes*, 17, 2007, CD MB 4 (*First cover, p. 44.* See also p. 126)**.**



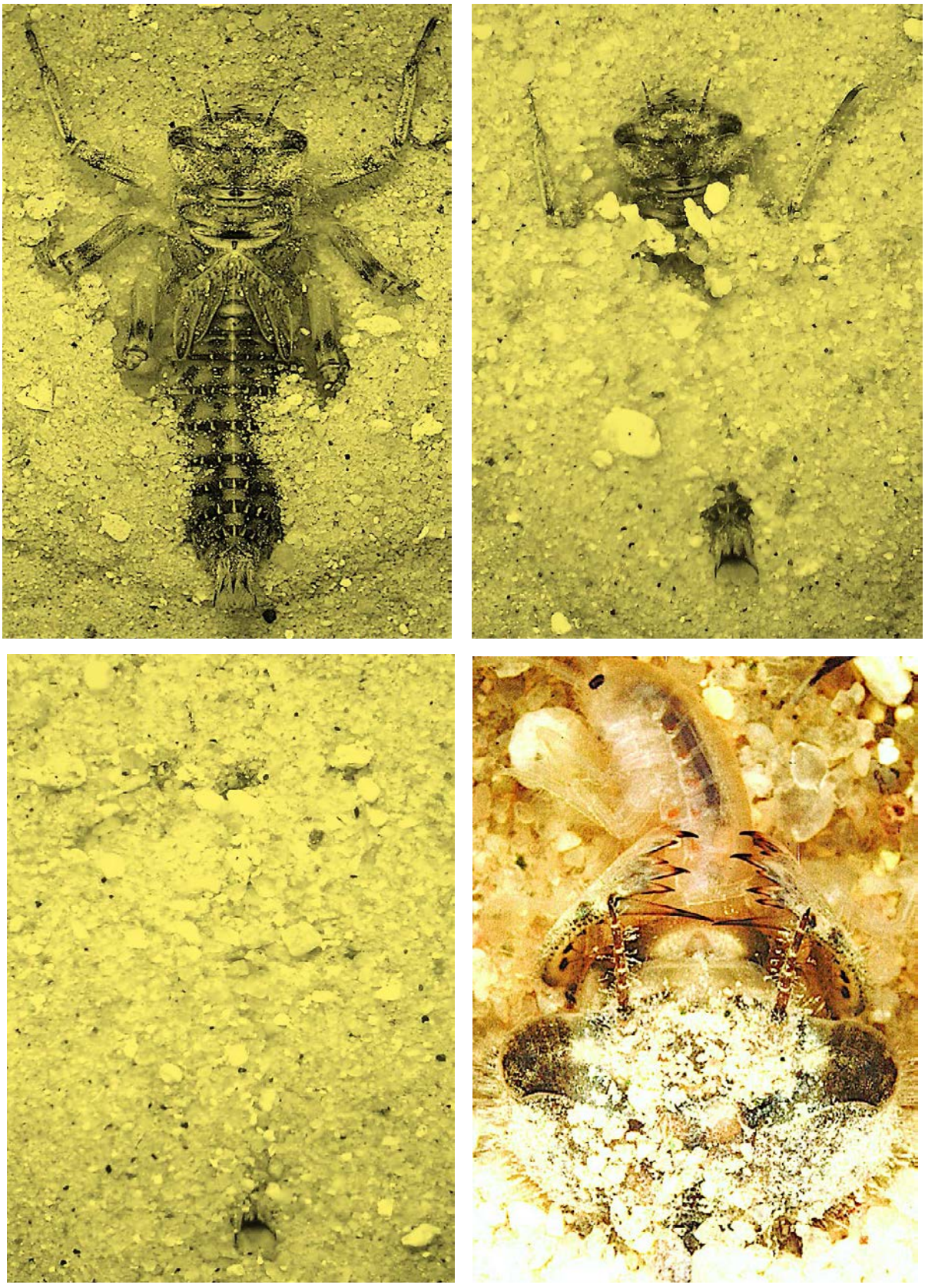
Mimicking Prodigy of a Sabulic Flatfish, young sole eco-photographed in the Lagoon of Moorea. **French Polynesia (MB Phot).**

***Leptacris hova* (K.),** a graminicole locust of the central grasslands of Madagascar, a striking example of body analomorphy in immediate relation to the animal's biotope (**MB Phot**).
(From ***Être ou ne pas être, les facettes du Mimétisme.* EPHE, *Bio. Evol. Insectes*, 17, 2007, CD MB 4.**

B.- Camouflage, definition. Some examples.

Camouflage, often confused with '***Mimese***' (sometimes with true Mimcry) is, strictly defined, the **possibility for an animal whose body morphology and general appearance cannot be modified,** to use "the means of the edge" to escape the sight of predators, or possible prey. A first, basic and well-known case is that of the Cicadelle, which is worried about its feeding stalk and which, in a few steps, will cling to the side opposite the threat and where, behind the stalk, it camouflages itself... Then jump and fly away if necessary.

A second case, the spectacular one practiced by the naiads, *juvenile aquatic dragonflies* camouflaging themselves in the first layer of a sandy-muddy ambient soil, deserves that here I come-back to it in pictures, detailing this innate behavior in one of great Provençal species, the ***Cordulegaster annulatus*** (Latreille):



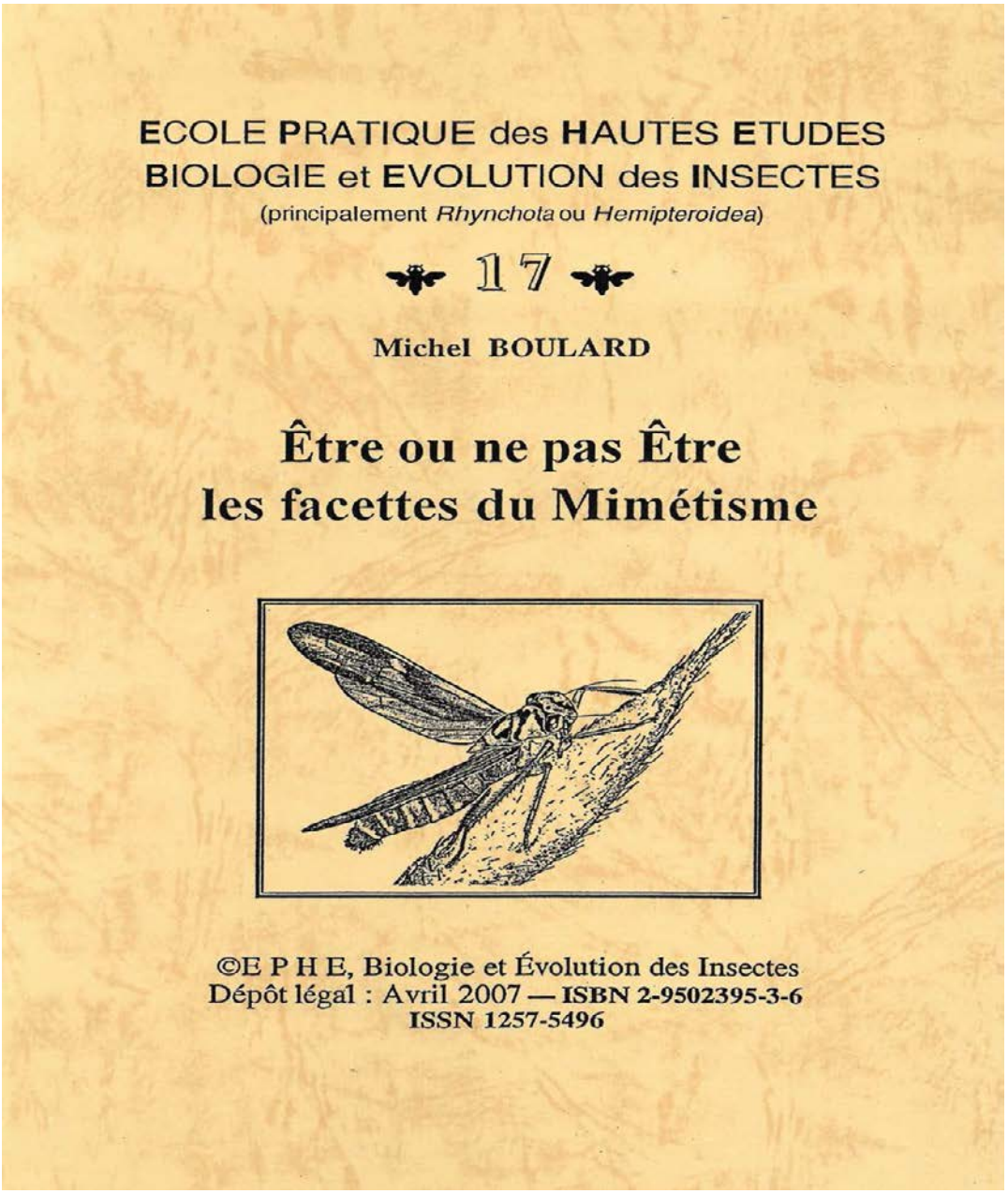
Selected phases of the juvenile aquatic bionomy of the *Cordulegaster annulatus* at the bottom of a pond. **-> 1, 2, 3 snapshots of the camouflaging naiad,** on the lookout... Finally, only the protractile front of the mandibles is suspect... While, on the other hand, **the apex of the respiratory tract remains clear and unrelated.** **-> 4, Winning the case:** Lightning capture of a small 'carefree' crustacean.

France, Sérignan-du-Comtat, July 1977 (MB Phots).

-> ***Cordulegaster annulatus***, the adulte

France, Sérignan-du-Comtat, july 1977 (MB Phot).

-> **Precis of Mimetology,** *my first book on this subject*



Contains my "MB4 CD" including the 264 slides quoted in the text. Book revisited with Patrick Tort and Marsha Schlee, under the title Mimétisme. *Usages biologiques du paraître* Boubée/MB, Paris, 2012. (with 40 color H-T and first French/English glossary). Printed in Thailand.

3) Eloquent contributions and pictorial markings

Biology, Eco-Ethology, Zoogeography and Mimetology

I.- Cicadidae, Cicadas

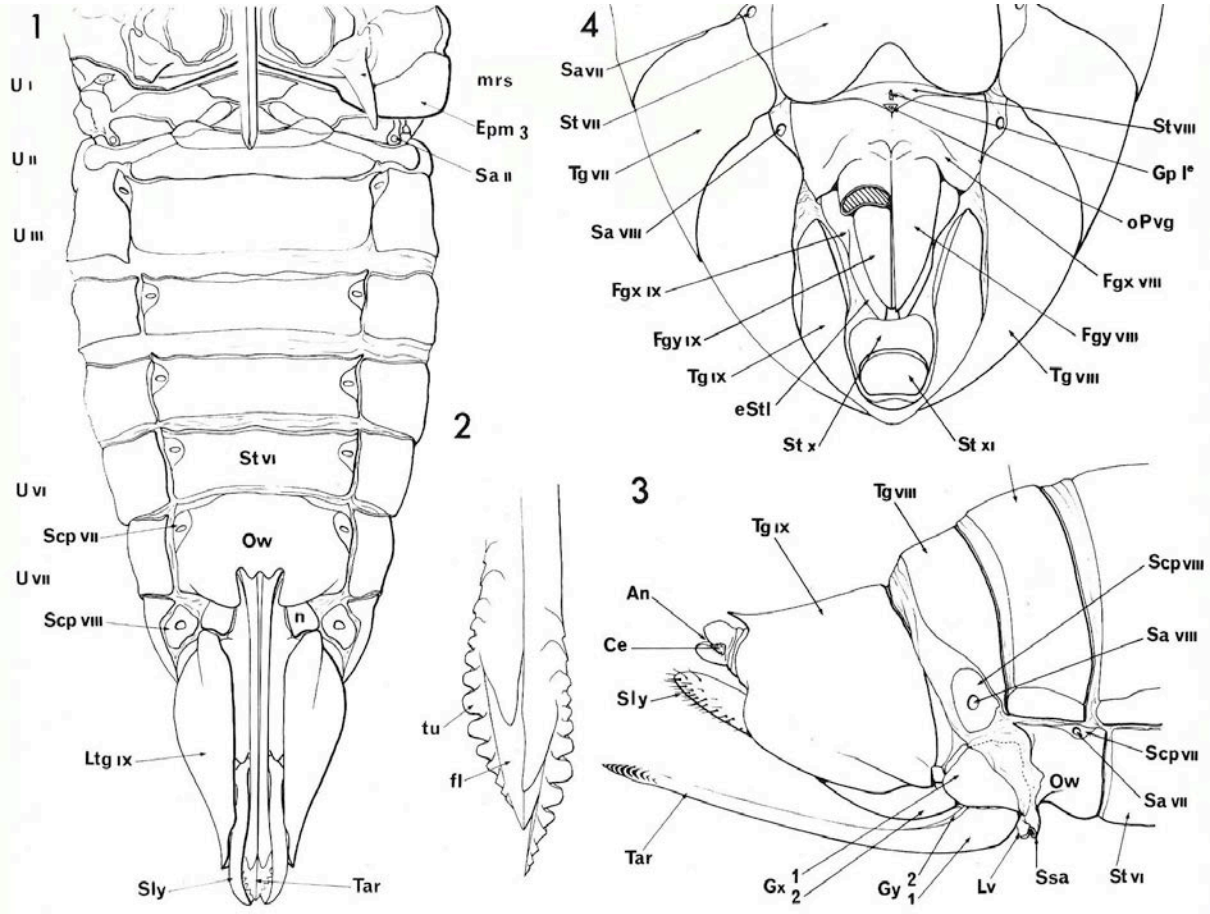
1.- In France

New ethological data collected on the subterranean phase (Boulard 1965b, 1990a), anatomy and functions of the female and male genitalia in *Cicada orni* Linné, a model species. Sound ethology and taxonomy of most of the Cicadas then known in France (1965c, 1966d, 1990a, 1995/96). Studies carried out mainly at the ***'Harmas de Jean-Henri Fabre' and in the Vaucluse area.***

a) Genitalia

1) Female cicadas. ***Structure. Intimate biology, insemination and fertilization.*** Entomology PhD thesis. June 28, 1966 [*Congratulations from the Jury Professors Possompes, Bergerard, Balashovsky and Carayon*].

>**Adult and juvenile morphologies** (*cf.* MB 1965b, 1966d, 1990a, 1995/96, replacing ~~larvae~~*) :



External parts of the genital tract of the female genitalia (MB pict., 1966)

1.- General morphology of the abdomen, ventral face, the ovipositor or auger, Tar, at rest in its sheath, sly.
2.- Apex of the ovipositor, the serratules, tu, shown moving on the fixed needle, fi.
3.- genital urites in right lateral view, the ovipositor, Tar = Gx+Gy, completely unsheathed.
4.- Prefiguration of the genitalia in the last juvenile stage in ventral view: the right anterior gonotheca, Fgy VIII, cut to expose the posterior counterpart, Fgy IX.

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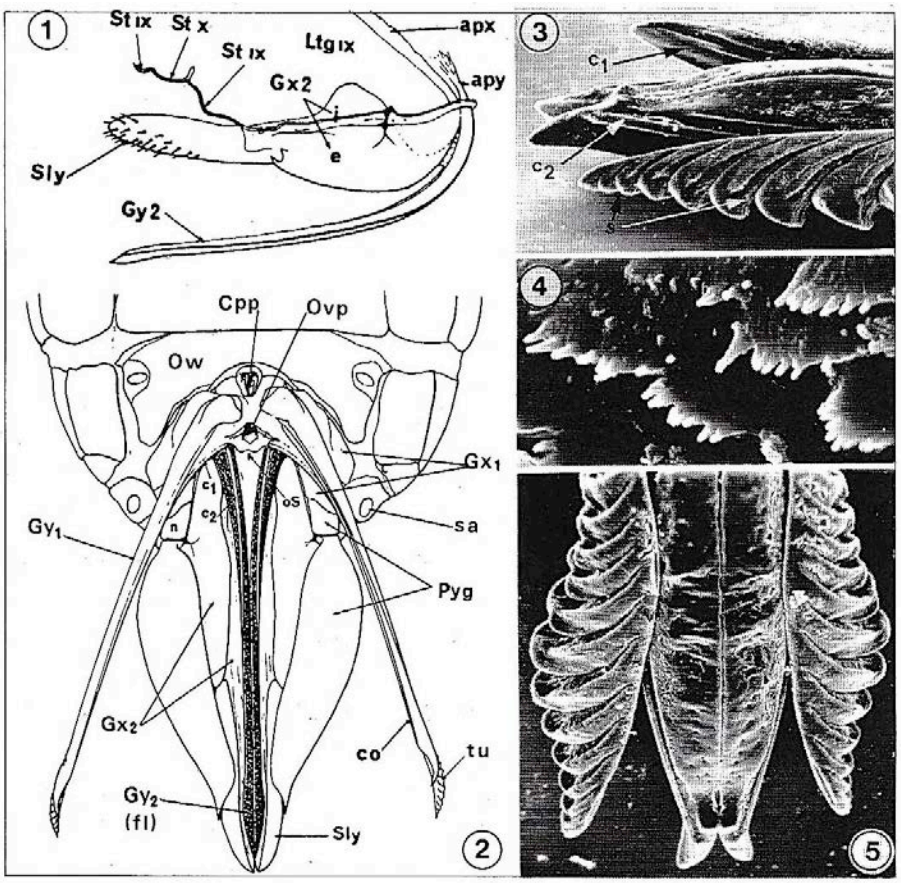
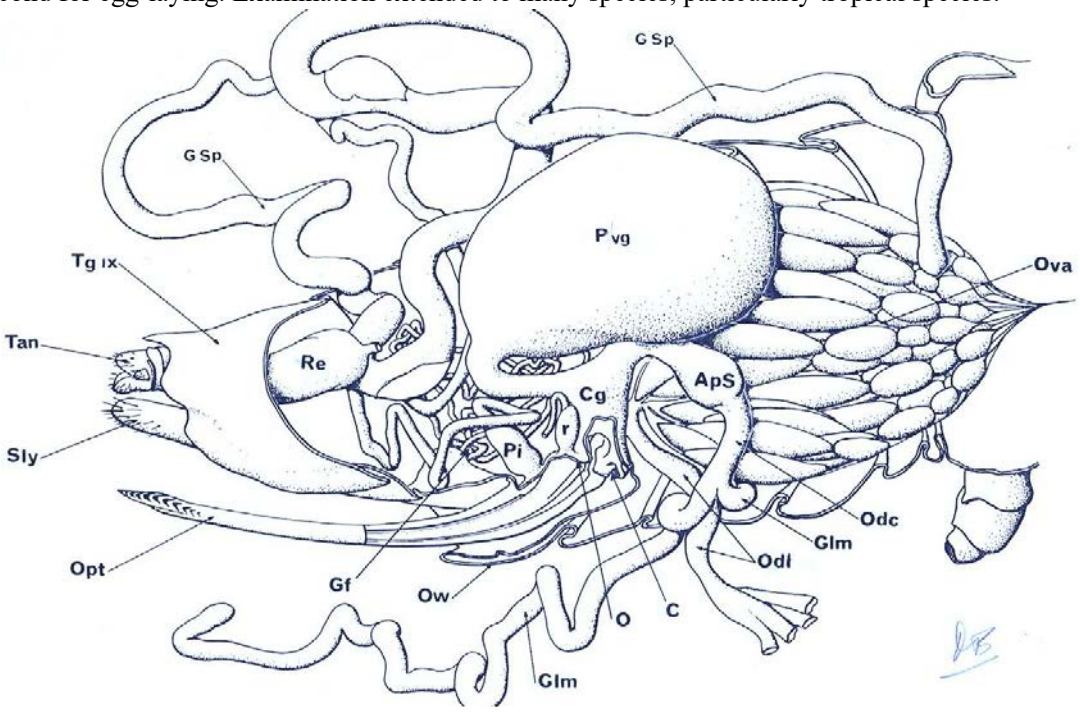
*) Today, in the case of Cicadidae *et al.*, the word **juvenile** replaces, biological veracity, the word ~~larva~~, as shown above, p. 20.



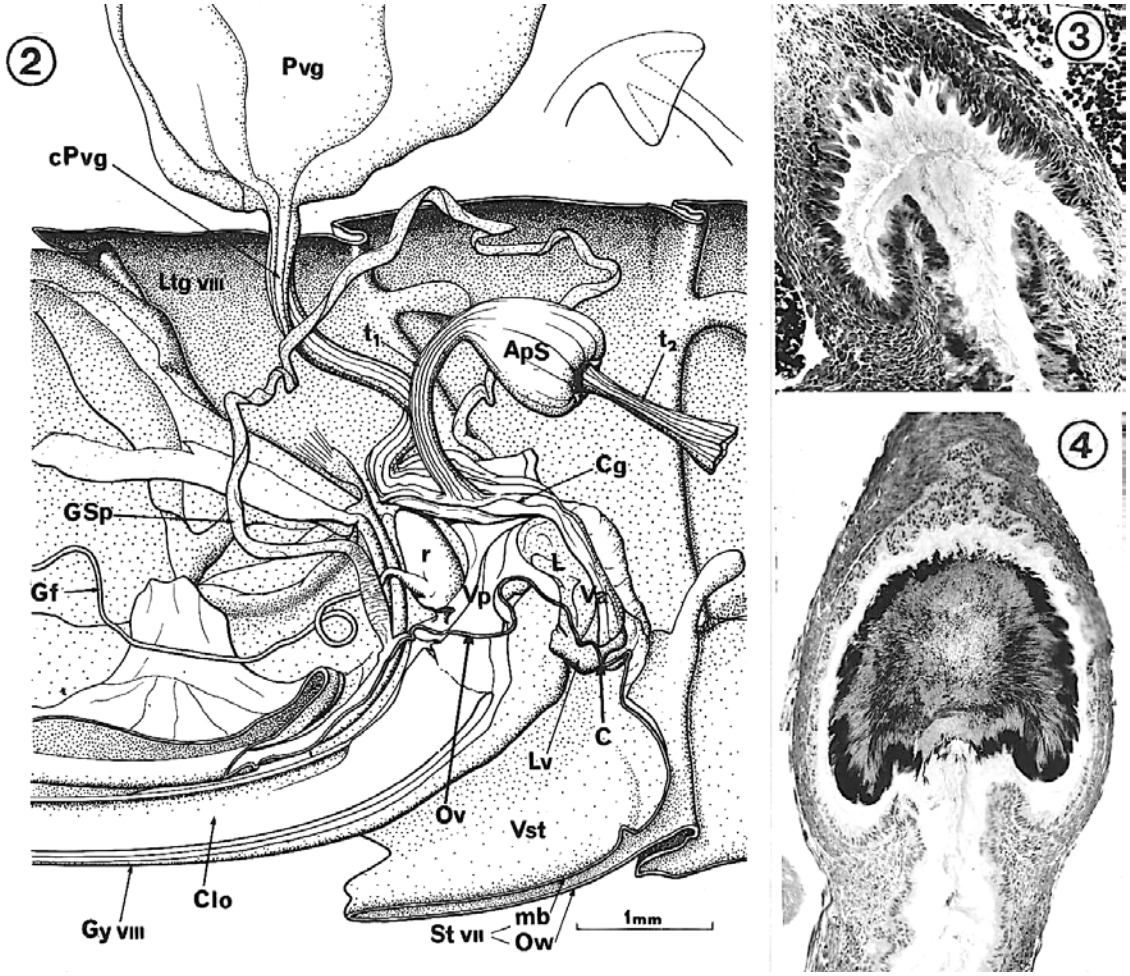
(1) Diagram of the second gonopod on the isolated right side; **(2)** Ventral view of the genital Urites, auger parts stripped and totally spaced apart (**MB pict**.); (**3**, **4** and **5**) Electromicrographs on the apex of the auger; (**c1**, **c2**) groove and coaptation rail. **Full excerpts from Boulard, 1995a.**

>**Dissections** and potassium treatments, then switch to "Black chlorazol", according to the "***Carayon technique***", revealing the ectodermal reinforcement of two post-ovarian genital tracts, one for copulation and the second for egg-laying. Examination extended to many species, particularly tropical species.

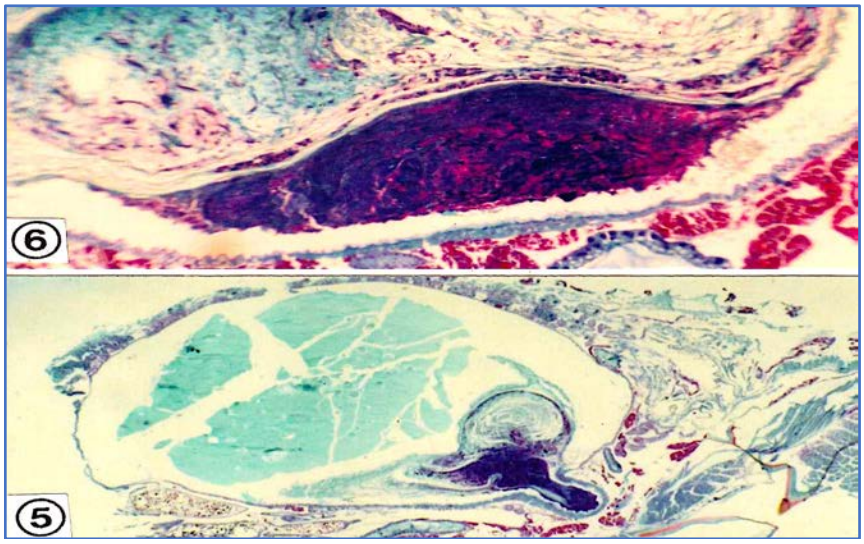


Dissection, in situ, of the genital tract of a female Cicada (MB pict. 1966d).
Aps, seminal ampulla; **Cg**, genital crossroads; **Ova**, ovary; **Pvg**, spermo-destructive sac.

>**Histology** establishing for the first time the relative importance of the different organelles involved. Remember, the organ previously seen as the functional spermatheca of the female genital tract turned out to be **spermo-destructive!** The spermatozoa intended for egg fertilization are kept in reserve by a previously unsuspected "**seminal ampulla**", differentiated from and around a short segment coated with the common oviduct, ***egg fertilization is therefore obligatory in Cicadas.***



(2) The ectodermal framework of the genital tract. (3 and 4) Histology of the virgin seminal ampulla (3), then (4) After mating, filled with spermatozoa correctly implanted in the inner wall of the seminal ampulla, operational spermatheca, (Original MB pict. & plate 1965c; 1966d):



(5 and 6) Histology of the spermodestructive pouch (Pvg), the organ which receives excess sperm during mating; in **5**, arrival of excess spz; in **6**, magma of degenerating spz **(MB Phots).** ***Please, see my Thesis.***

2) Male cicadas, copulator and ejaculator system

Two quite distinct sets, the organs of the generation, testicles and internal seminal tracts, and the genitalia, external copulatory parts making insemination possible.

>**Dissections** and potassium treatments have made it possible to demonstrate, for the first time, the fine conformation of the ectodermal constituents of the copulator and inseminator systems in ***Cicada orni*** L. Below, by fictitious transparency, left profile of the genital segments:

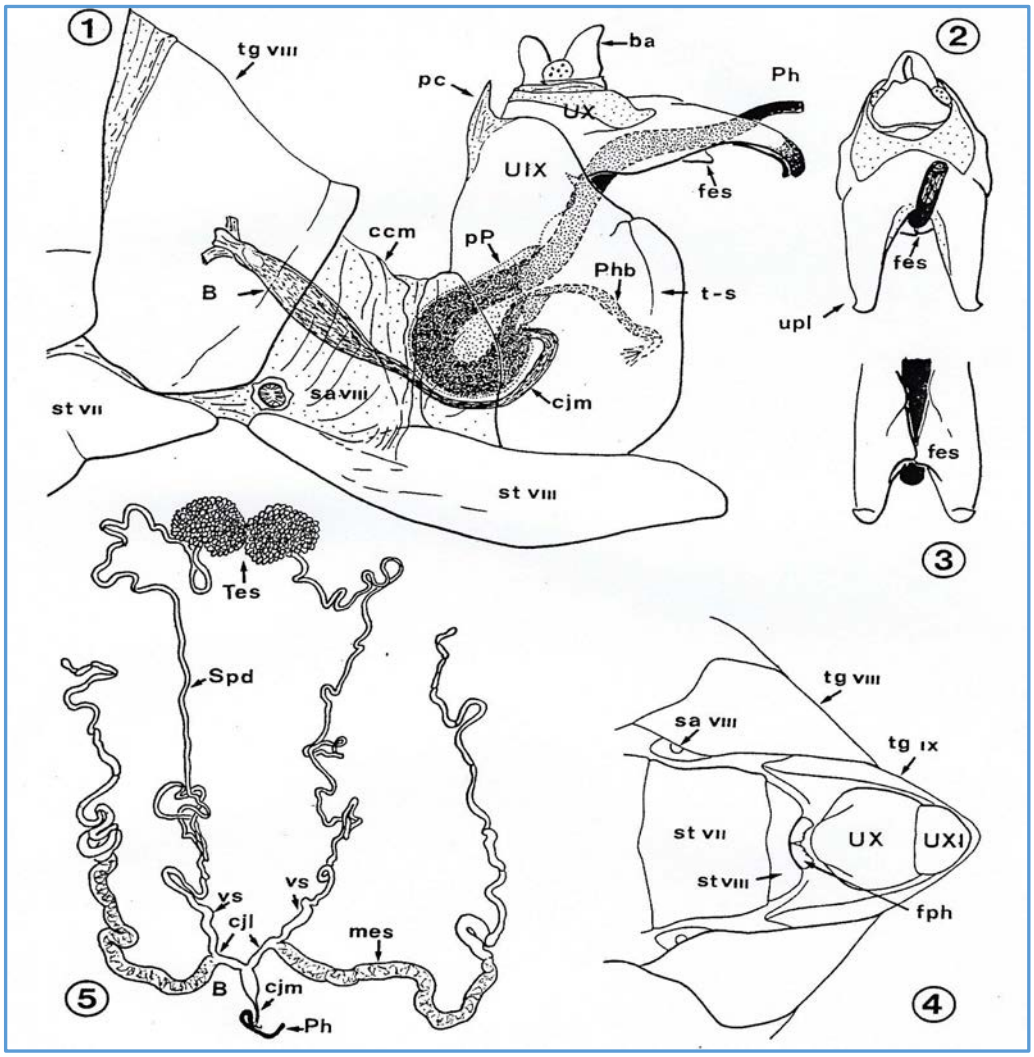
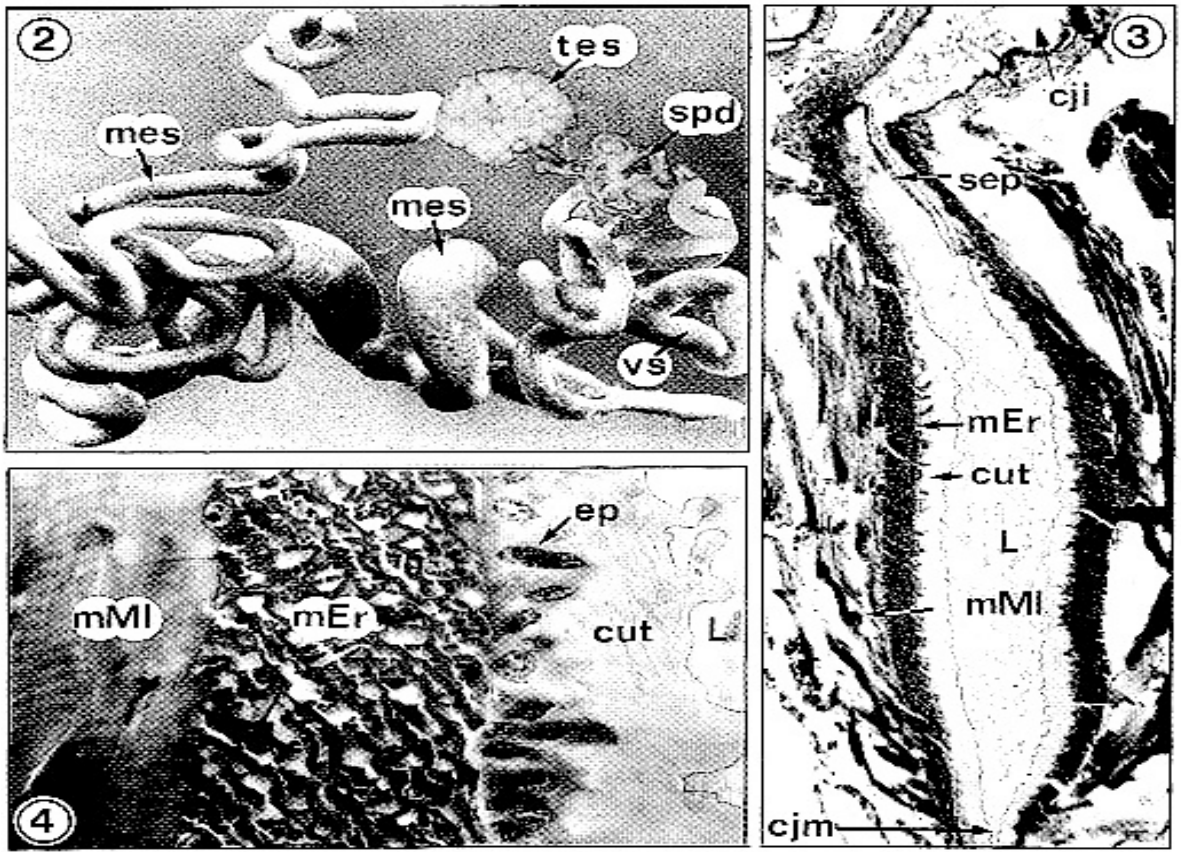


Fig. 1: The abdominal apex, in left lateral view, the genital segments, pygophore (urite IX) and phallicophore (urite X) protracted, with presentation by transparency of the copulator system and the ectodermal genital tract. **Figs. 2** and **3**: Phallicophore and anal block, in dorso-posterior and then inferior-anterior views.
Fig. 4: Abdominal apex at the last juvenile stage in ventral view to show the phallicophora (fph).
Fig. 5: Diagram of the "disentangled" reproductive system.

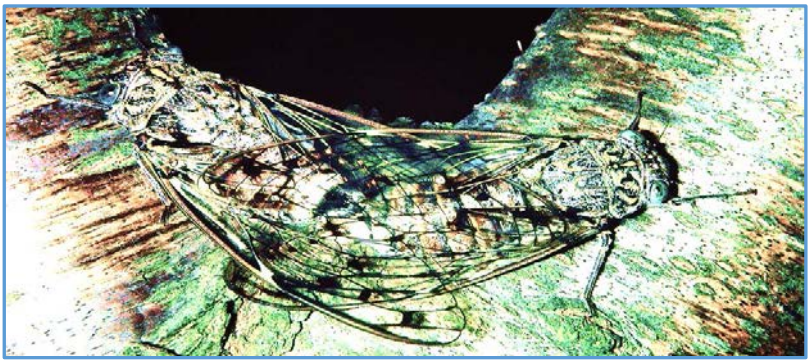
Explanation of the letters : B = ejaculatory bulb; ba = anal block; ccm = cylinder of membranous cuticle; **cjl** = lateral ejaculatory canal; **cjm** = medial ejaculatory canal; **fes** = phallus support festoons; **fph** = phallic sheaths; **mes** = mesadenia; **pc** = caudal process; **Ph** = phallus; **phb** = phallus basal plate or phallobase; **pP** = pygophoric pocket; **sa** = stigma; **spd** = spermiduct; **st** = sternite; **Tes** = testicles; **tg** = tergite; **t-s** = tergo-sternal suture of the pygophore; **UIX** = pygophore; **UX** = phallicophore; **upl** = unci post latere (hooks) of the phallicophore. **(Original document, MB pict., 1986d/1990a).**

> Histology establishing the relative functions of the different organelles involved concerning the detailed anatomy of the ejaculator system.



(2) Appearance of a testis and its adnexae, spermiductes (**spd**), mesadenias (**mes**) and seminal vesicle (**vs**). **(3** and **4)** Histological section of the ejaculator bulb, in **3**, overview; in **4** and very enlarged, a slice of the elastic muscular sleeve (**mEr**) between the internal epithelium (**ep-cut**) and the mass of longitudinal muscles (**mMl**). **(Boulard 1990a; 1995/96).**

> At the end of mating, the male often opens the copulation angle to 180°. Two examples.



-> in *Cicada orni*, a habit. France, Vaucluse, June 1995 (MB Phot) ;

-> in this *Purana chueatae*, likewise, with some temporary difficulties...
Thailand, Khun Pawor N.P. May 2006 (MB Phot).

b) Sound ethology of some European species

Conducted in most of the well-known species and some others approached, especially the **Cigalettes** (*Cicadetta, Tettigetta, Cicadivetta*) often not easy to record in the wild.

Ethologiquemet, the very first AIC (*Acoustic Identity Card*) and AEC (Acoustic Ethology Card) were established by me in 1992, using the software "**Signalyze**" created by **Eric Keller**, Professor of Computer Science at the University of Lausanne.

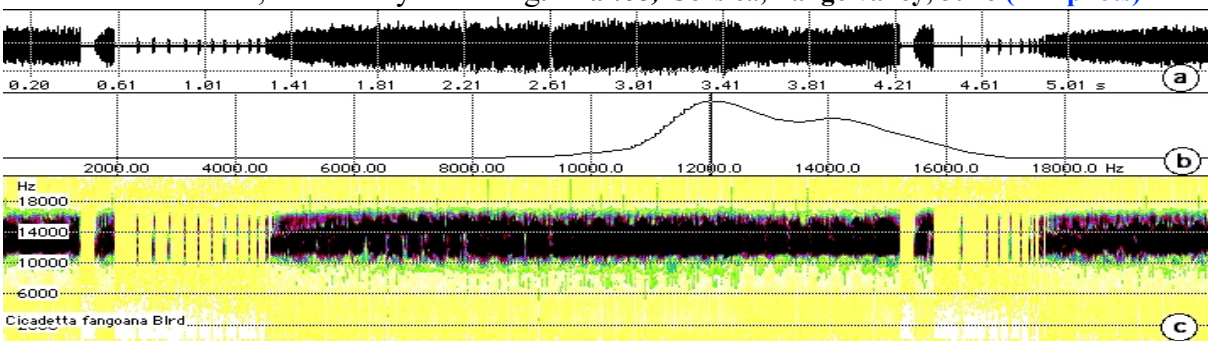
Subsequently, students and colleagues equipped with high-performance recorders made significant contributions. Some examples of these contributions are shown below

1-> French Cicadettes separated by the Mediterranean Sea and acoustics

> ***Cicadetta brevipennis*** Fieber, 1876, Languedoc species under the label "*Ctta montana*", a sub-mountain species.

> ***Cicadetta fangoana*** Boulard, 1976, morpho- and ecologically very close, but whose tymbalization of nuptial call proved to be of a largely different kinship **(Boulard, 1995/96):**

Cicadetta fangoana Boulard, 1976, Corsican sister of the previous one.
Female and male, this one cymbalizing. ***France,*** **Corsica, Fango valley, June (MB phots)**



First Acoustic Identity Card: (a) Visualization of about 6 seconds transcribing an entire sequence of the tymbalization, between the end of the previous one and the beginning of the next one. **(b)** Medium Spectrum Plot placing two unequal vertices at 12000 and 14100 Hz. **(c)** Spectrogram reflecting the wide useful frequency band between 10000 and 17000 Hz. **(From Boulard, 1995c sur *Signalyze*).**

2-> Discovery of an altitude species in South-Continental France

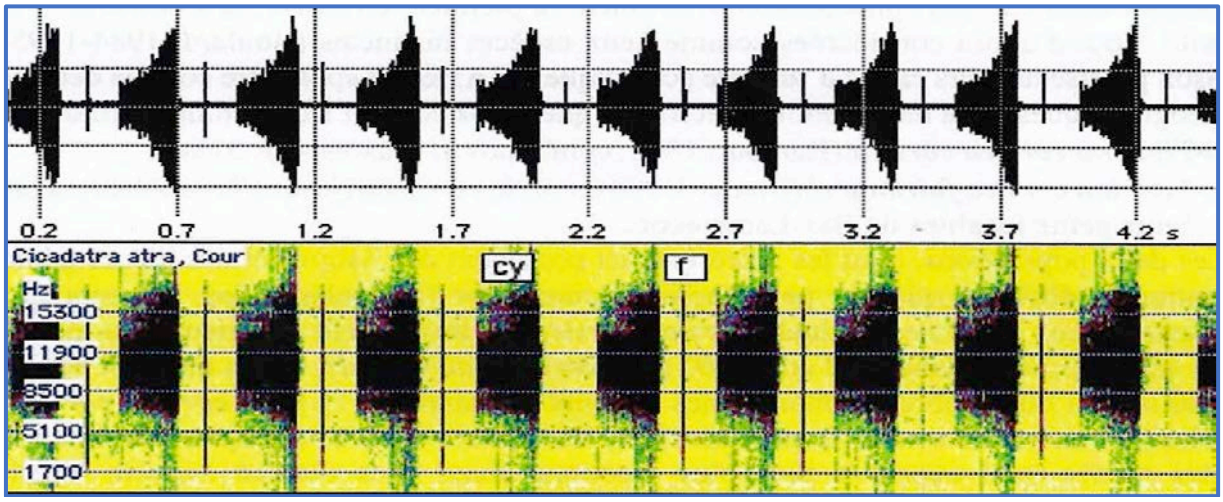
In 1999, Stéphane Puissant collected in Cerdanya (Fr. Pyrénées-Orientales) a new *Cicadetta* which was precisely distinguished from all the previous Cicadettes by its very characteristic call tymbalization. **(*cf.* Puissant et Boulard, 2000 ; Sueur et Puissant 2007a & b).**

3-> Acoustic revelation concernig the typical *Cicadetta*

Many thanks to my Slovenian colleagues and friends Matija Gogala and Tomi Trilar, who were the first to make known the call tymbalization of the typical species of this genus, recorded on its *locus typicus*, attesting to a sound capital different from the Mediterranean shores. (***cf.* Gogala et Trilar, 2004**).

4-> Acoustic Ethology of *Cicadatra atra* (Olivier, 1890).

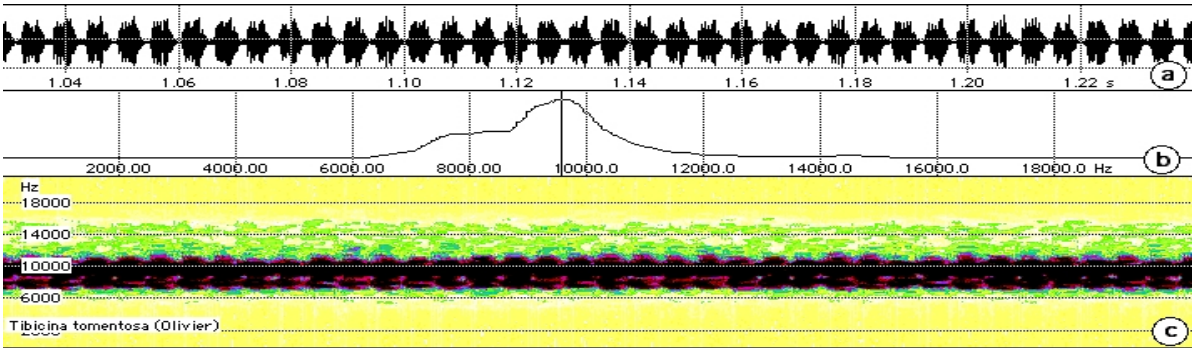
Production of one of my first **CEA,** *Carte d'Éthologie Acoustique* / **AEC** transcribing the sonic reaction of a male who had just perceived the arrival of a female, the tymbalization, then called **'Cour'**, was "persuasive" emitting rapid tymbal actions **(cy)** interspersed with slight strikes of the wings **(f)** on the abdomen:



(From Boulard, 1992e, *onr Signalyze*)

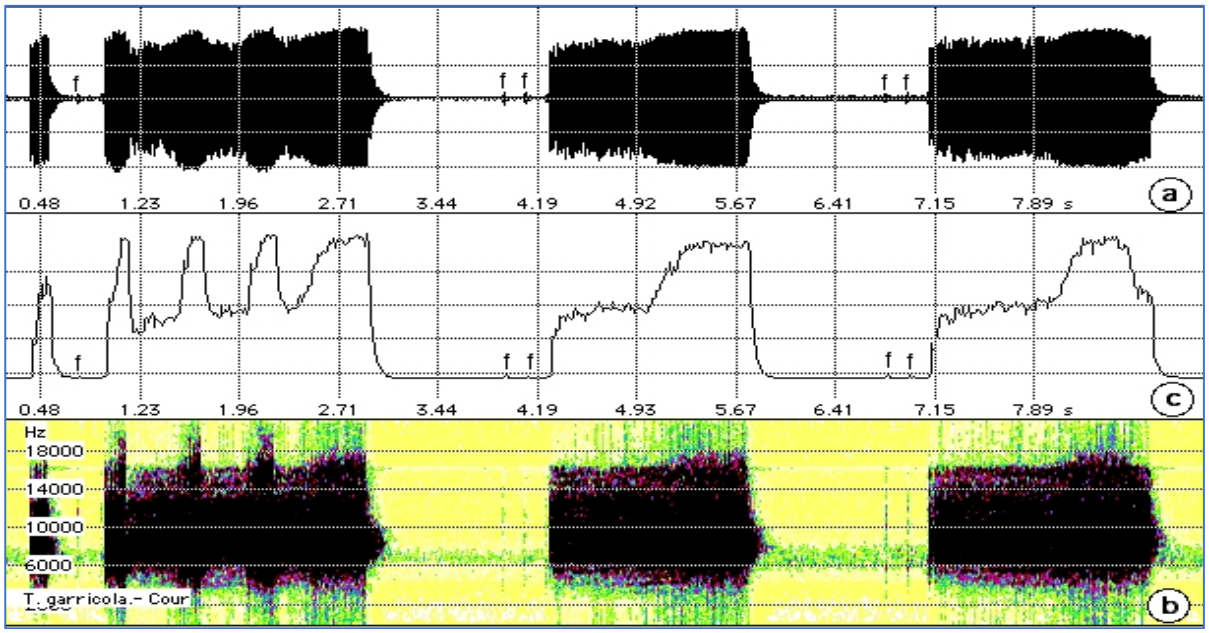
How many times have I passed by this fantastic aqueduct that the Romans had to build to the sounds of the music produced by many Gallic CIcadas!!! **France, Vers-Pont-du-Gard, juillet 1975 (MB Phot).**

5-> Acoustic and photographic identities (AIC) of *Tibicina tomentosa* (Olivier, 1790, male tymbalizing:



AIC, sonotype: (a) Approximately 1.23 seconds of the **Time Signal** very stretched to make appear, individualized, the repetitive modules of the tymbalization **(**which we perceive like a continuous whistling**). (b) Spectral trace** of the effective frequencies. **(c) Spectrogram** reflecting the frequency band of the modular sequence characterizing the tymbalization. **(Boulard, 1995c, *on Signalyze*).**

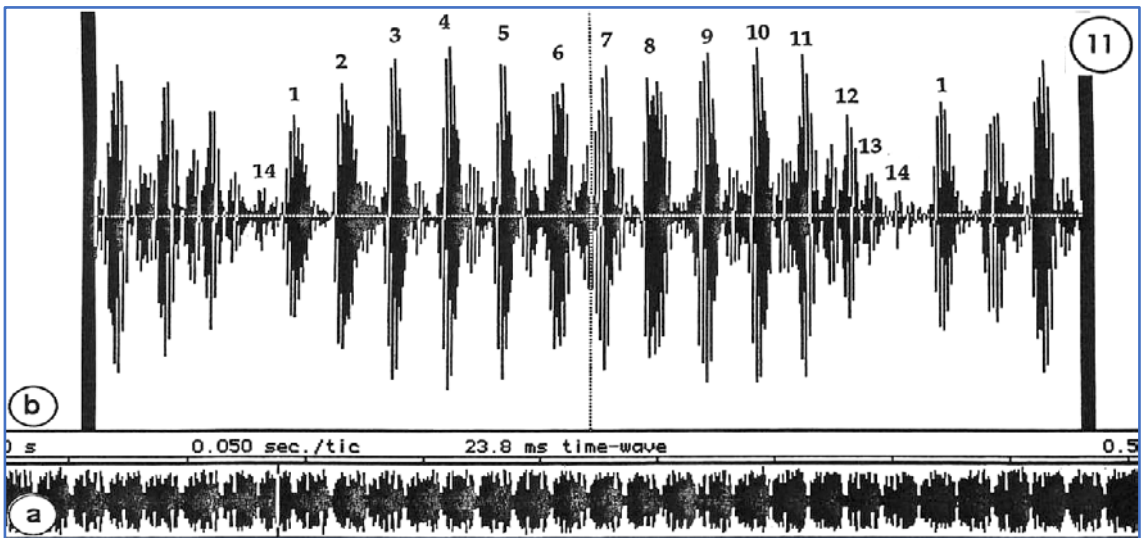
6-> Acoustic Ethology Card by *Tibicina garricola* Boulard, 1983, First AEC:



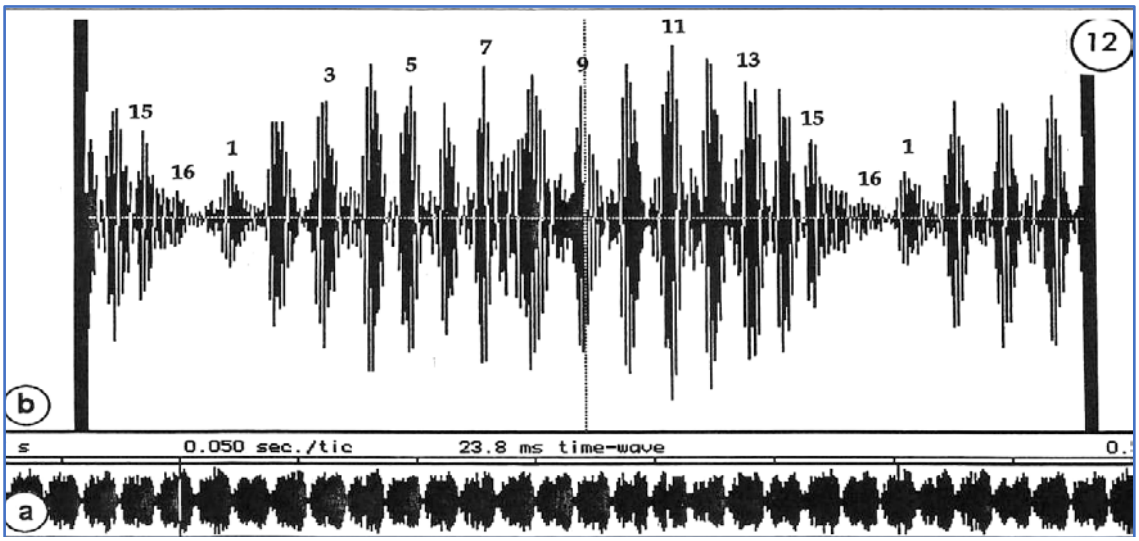
(a) Visualization of the first three sentences of the Court Tymbalization. (b) The amplitude envelope shows that they are all preceded by one or two strikes **(f) of the wings, of very much lower intensity than the cymbal actions. (c) The whole occupies one of the widest frequency ranges. Vaucluse, July (Excerpt from Blrd, 1995a**

7-> Tests of acoustic distinction between the Tibicine of Rambur and that of Faimaire, two related Cicadas which evolve the first in Corsica, the second on the Continent. At first considered as two distinct species (Boulard, 1984-1995), the precise comparison of their acoustic identity cards (**AIC**) made them appear as two subspecies, or geographical varieties of the same specific entity. The two populations, whose representatives possess almost identical habitus and genitalia, would differ somewhat in pre-breeding tymbalization.

Here are the identity sonograms that I was led to name, on the assumption that the rhythms of action, *in their full expression, have consequent repetitive values*



(11) ***Tibicina corsica corsica*** (Rambur,1840 comb. nov.), Corsican subspecies;



(12) ***Tibicina corsica fairmairei*** (Boulard, 1984, comb. nov.). Which, until then, has only been found in several small localities in the 'Bas-Languedoc'.

Letters **(a)** Transcription of about 0.5 seconds of the tymbalizations in a space-time (13.6mm/0.050s) allowing the individualization of the modules. **(b)** Elementary morphology of one of the component patterns, stretched in a larger arbitrary space-time. **(On *MacSpeech Lab II.* Excerpt from Boulard 2000e).**

In these tests, the rate of action in the nominal ***T. corsica corsica*** form is slightly higher in terms of the number of modules per second (62 versus 60 in ***corsica fairmairei***), while it is also lower in terms of the number of major phonatoms per module (14 to ***corcica corsica,*** 16 to ***corsica fairmairei***). Another noticeable difference is that the sound pickups (attacks) are not the same, the motives being expressed much more vigorously in ***corsica corsica***. In so far as these mini-differences can be argued…

Tibicina corsica faimairei Boulard, 1984, male and female in copula, on gorse.
Bouches-du-Rhône, Jonquière, July 1983 (MB phot)

c) Biological condensates in images

1) The example of ***Lyristes plebejus*** (Scopoli, 1763)

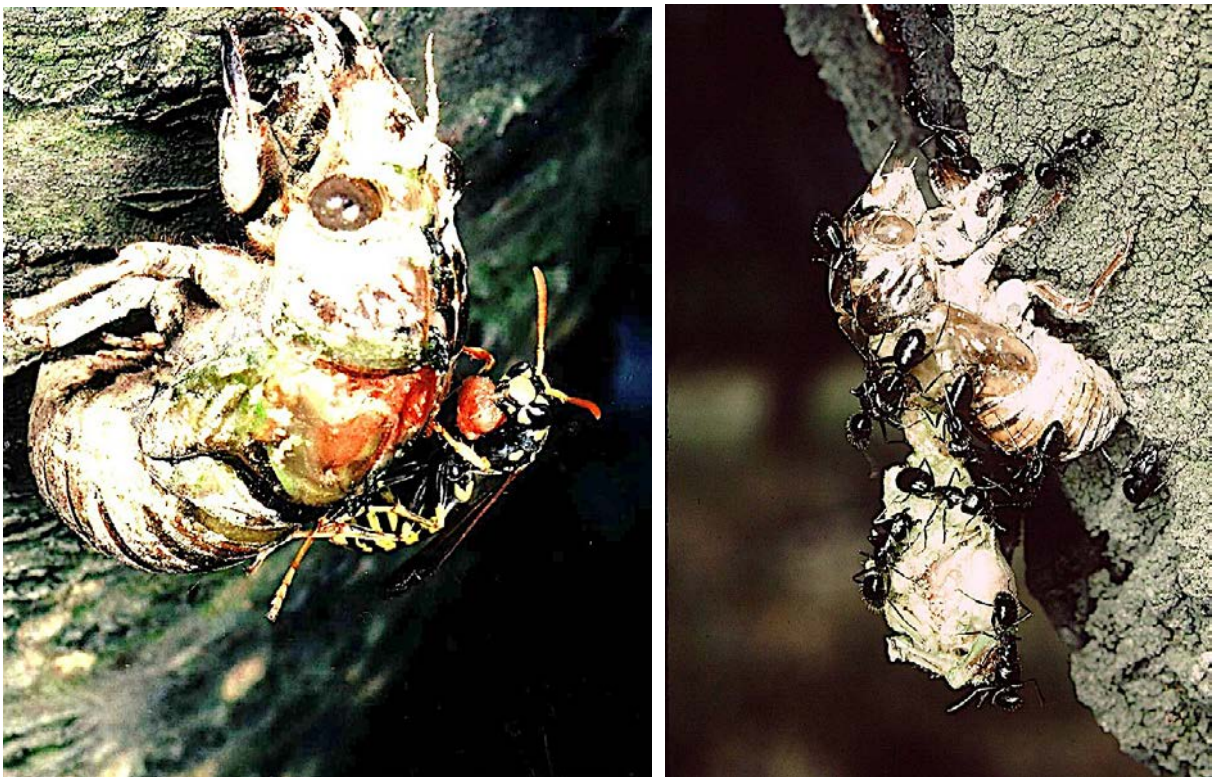
> From mating to atching of newborns, followed by juvenility expressed:

Explanations of the above slides reproduced

-> Mating -> Laying -> Eggs -> New-Born & Juveniles: **1 & 2)** having finished extracting themselves from the carrying branch by progressive oscillations and abandoned the ovigerous envelope. **3) juvenile I** having just fallen to the ground -> **juvenile III** brought to light in its burrow with nutritious root -> **juvenile V** whose belly is lined with a fine waxy prune. Waxy prussiness, which I will have to talk about a little later (*cf.* tomentum p. 76/77).

Irremediable accidents along the way

In the majority of cases, the exuviation starts at the end of the day and takes place at night. However, some species, "which do not respect this rule", or that one night is not enough to achieve the second cicada birth, have to pay a heavy price to predators hunting on sight. This is what often happens to our great Common Cicada:



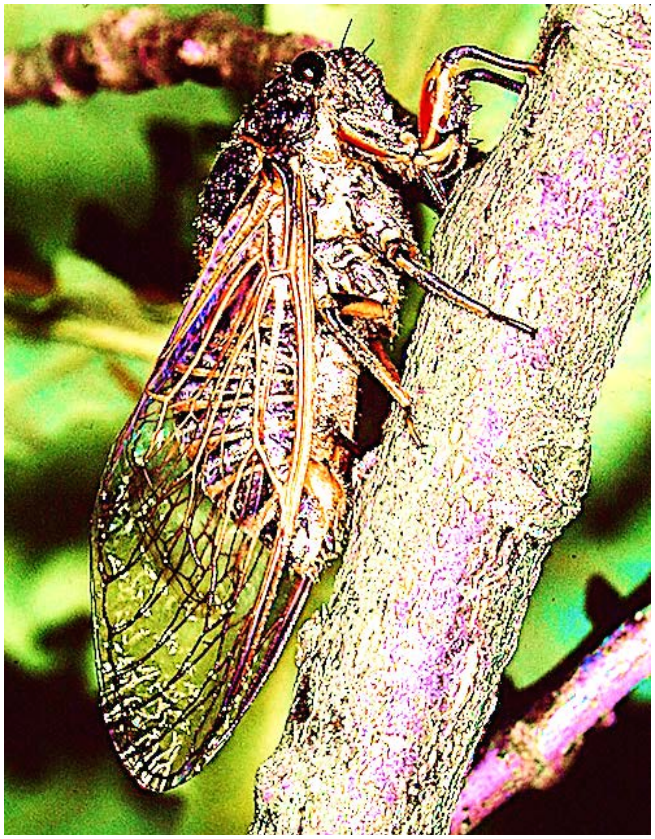
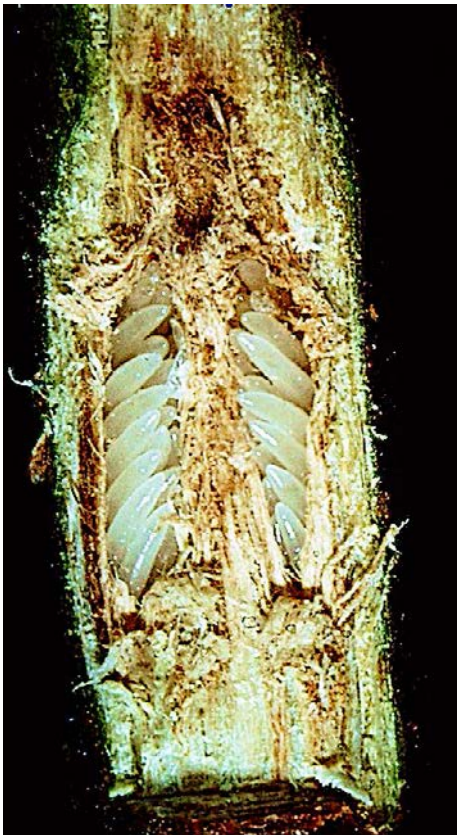
Lyristes plebejus*,** nymphoids attacked by ***Polistes gallicus and ***Camponotus cruentatus.*** Once fixed, the imagination in progress, the nymphoids can no longer move **(MB Phots).**

After *Lyristes*, the genus *Tibicina*, rich in several French species and varieties, then the lesser known *Tettigetta* and consorts. In relation, the following snapshots.

2) The Tibicines

Tibicina garricola Boulard, 1983, male and female.

Vaucluse, Saint Hippolyte du Graveyron, July 1987 (MB Phot)

Tibicina haematodes*, var. *flammea laying eggs on oak and the double cubicle systematically dug out, then loaded with eggs at each oviposition. **Vaucluse (MB Phots).**

3) *Tettigetta*, common in Provence:

a

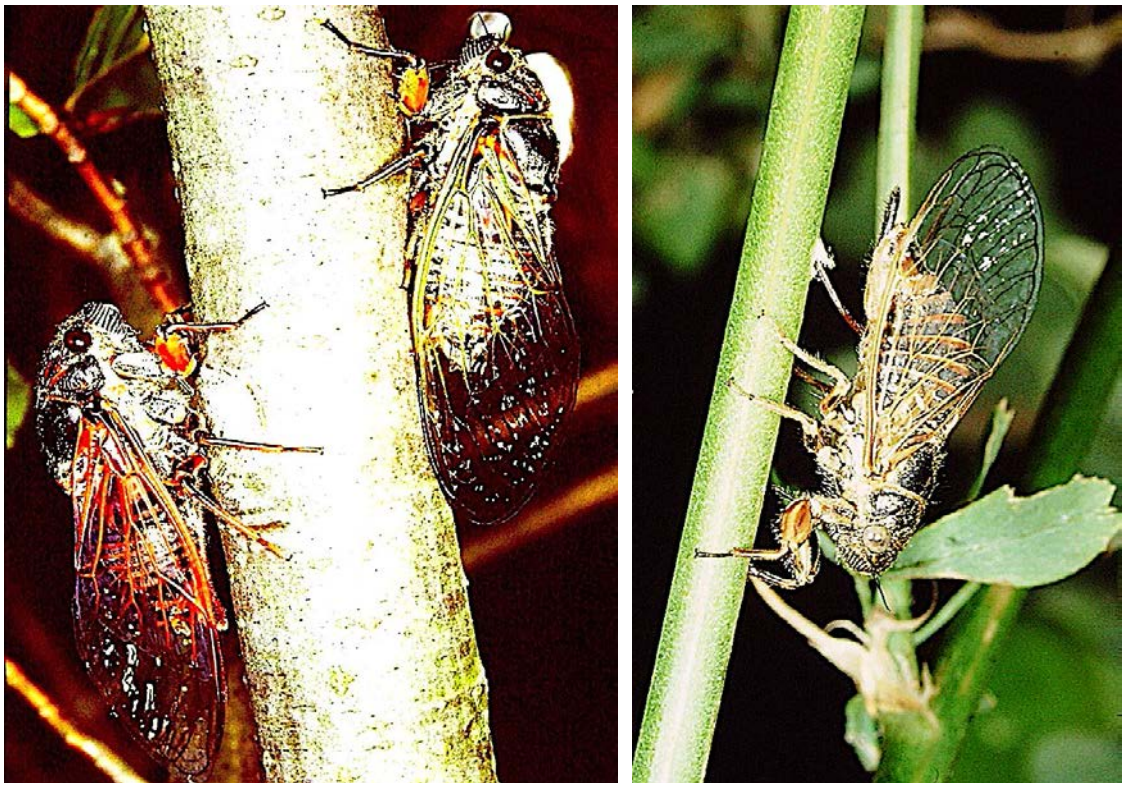
b

***Tettigetta argentata* (Olivier, 1790); (a) small with signed mesonotum; (b) night rest after a beautiful series of ovipositions on olive tree. Vaucluse (MB Phots)**

Tettigetta pygmea (Olivier, 1790). Main stages of the Life Cycle. Imago under a holm oak leaf; mating; laying; eggs... and new-born already on the ground. **France, Vaucluse (MB Phots).**

Tibicina corsica faimairei Boulard, 1984. Female and its long series of ovipositions on "*Ciste de Montpelier*". **Bas Languedoc, August 1983 (MB Phot).**

4) In selected complements, two Provençal rarities



Tibicina haematodes, a male and a female meeting under the two characteristic costumes of the species **bright red** (Scopoli, 1763) and ***viridinervis*** (Fieber, 1876). ***Cicadivetta tibialis*** (Panzer, 1798), the smallest species (L.t., 18 mm) of our cicadofauna, females lay their eggs either head up or down. **France, Alpes-Maritimes (MB Phots).**

My research brought to 16 the taxonomic number of Cicadas living in France, condensed in the **Audio CD MB1**, "Chants" (sic!) de Cigales méditerranéennes, in Boulard et Mondon 1995 /1996**, from the time when it was still said, according to our non-technical elders, that Cicadas sang...** (*cf.* also, Boulard, 1995c and 2000o). Number brought to 21 by **Jérôme Sueur** and **Stéphane Puissant**, former students[12] with their discoveries of new *Cicadetta*, *Tettigetta* and related, all acoustically spotted.

d) Fossil cicadas

Research on the Insects retained in the geological layers of the South of France, conducted separately by **Bernard RIOU**, a former student (EPHE) and **André NEL**[13]) (the latter whom I was able to help when he was a young member of the Entomological Society of France, the SEF), has made it possible to exhume unpublished ancient cicadidian forms. Notably species dating from the Oligocene and Miocene, two of which are particularly well preserved and are reproduced below

>The first, ***Paracicadetta oligocenica*** Boulard et Nel, 1990, found by André in the Oligocene layers of the Céreste region in Vaucluse.

>The second, as well as five others collected by Bernard in the strata of the Montagne d'Andance (Ardèche) were described, including ***Tibicina gigantea*** Boulard et Riou, 1989 (*cf.* p. 499) and ***Miocenoprasia grasseti*** Boulard et Riou, 1999.

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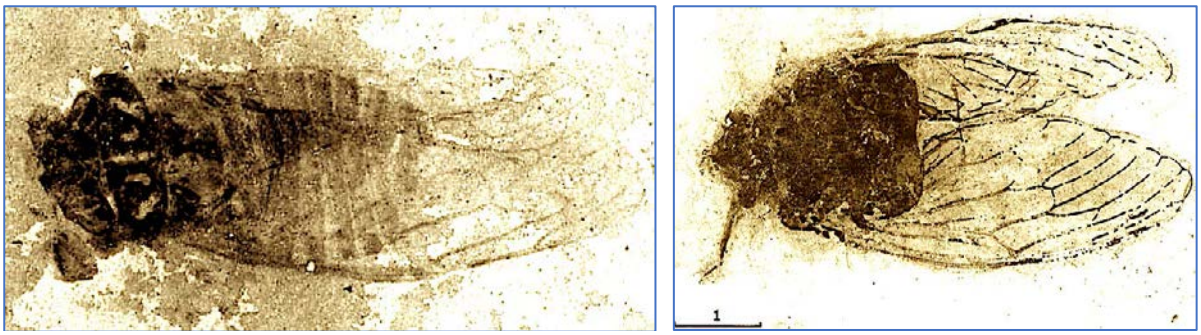
12) ->**Jérôme Sueur** is a Teacher-Researcher at the MNHN, as well as at the Centre National de la Recherche Scientifique (CNRS), Paris.

->**Stéphane Puissant** is Researcher, Collections Attaché, at the Dijon Museum and Head of the Scientific Department. He is also Correspondent of the Muséum national d'Histoire Naturelle (MNHN).

13) ->**Bernard Riou** is the Founder and Director of the Palaeontological Museum of La Voulte-sur-Rhône.

->**André Nel** is Professor and Head of Department at the MNHN, Paris.



Paracicadetta oligocenica Boulard and Nel, 1990. ***Miocenoprasia grasseti*** Boulard and Riou, 1999 **(MB Phots).**

> A Miocene Cicada from Czechoslovakia, presented by Dr. Jakub Prokop, a friend and colleague from Prague, was described: ***Tibicina sakalai*** Boulard & Prokop, 2000k.

e) Cicadas, Symbols and first book

In a completely different register, but just as fascinating, the Cicadas are among the few Insects to which many legends are attached, at least since antiquity, on various continents and in various latitudes. Two exhibitions entitled "**Cicadas, Lives and Symbols**", at the Musée des Alpilles and "**Cicadas from the Mediterranean and elsewhere**", travelling for a few years in Provence and Roussillon, both under the seal of my EPHE Laboratory, have borne witness to this.

In conclusion, a book, built with the mastery of **Mr. Bertrand Roullier**, Director of Equinoxe Publishing, and the contribution of **Mr. Bernard Mondon**, a specialist in Occitan Culture, brought together for the first time in a single volume "***Vies et Mémoires de Cigales",*** the fundamental cicadological and symbolic Provençal (Boulard & Mondon, 1995). Work quickly out of print. Revised (expanded scientific part), then reissued in 1996 (now also "out of print"). **[**Analysis of the work **Catherine and Philippe Magnien**, Members of the Entomological Society of France, *Bulletin de la S. E. F.,* **101 (5)**, 1996: 533-534**]**.

In June-July, some usual days, some long evenings of editorial work were embellished, some by our little Turtle, ***Testudo hermanni hermanni***, others by ***Alytes obstetricans***, a little Toad who took up residence in the vast enclosure of Jean-Henri Fabre:

> The Tortoise came to lay eggs under the windows of the Lab on a sunny day...

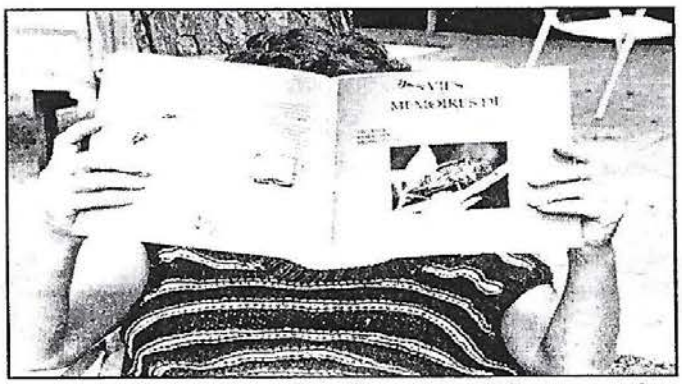
> The Alytes often regaled us with its short and clear, musical notes...

Sérignan-du-Comtat, l'Harmas, the first one in June 90, the second one, June-July (MB Phots).

UN SUPERBE LIVRE DE M. BOULARD ET B. MONDON

Travail de fourmi sur la... cigale !

Injustement calomniées par la fable de La Fontaine, les cigales prennent leur revanche grâce à un ouvrage qui dévoile tous leurs secrets et qui les fait même "chanter"



Un ouvrage à savourer confortablement installé sous un arbre, bercé par la cymballisation des cigales. (Photo C.B.)

A quelques encablures de l'automne, les cigales poussent leurs derniers chants. Il va donc falloir s'habituer à ne plus entendre ces métronomes infatigables, symboles de la Provence et de l'été.

Afin que la rupture avec ces étonnants insectes ne soit pas trop brutale, il suffit de se plonger dans un ouvrage aussi intelligent que superbe, paru aux éditions Equinoxe et baptisé *"Vies & Mémoires de Cigales"*.

Ecrit conjointement par Michel Boulard, directeur de laboratoire à l'Ecole pratique des hautes études, responsable de service au Museum national d'Histoire naturelle de Paris, et par Bernard Mondon, enquêteur-auteur, ce livre dévoile tous les secrets de cette surprenante petite bête sans laquelle notre région ne serait pas vraiment ce qu'elle est.

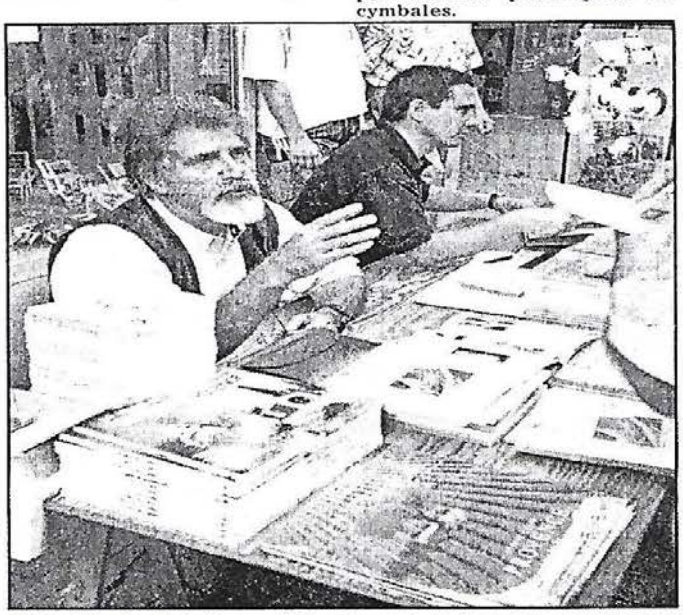
Le son aussi

Au fil des 159 pages, le lecteur se réjouit de mieux connaître cet animal, qui lui réserve d'incroyables surprises.

Plus il la connaît, plus il l'aime et plus il souhaite la protéger. Mieux même. Grâce à un CD inclus dans le bouquin, il peut écouter, les "cymbalisations" d'appel nuptial et de cour des seizes espèces de cigales vivant en France, auxquelles ont été jointes celles de quelques autres formes méditerranéennes inconnues chez nous.

Car les cigales ne chantent pas, ne "craquettent" pas, ne "cricrissent" pas... Elle cymbalisent !

Elles seules, parmi tous les insectes, possèdent un appareil voué uniquement à la production de son. Apanage exclusif des mâles, cet organe situé à la base de l'abdomen est composé de deux ensembles parfaitement symétriques : les cymbales.



Michel Boulard et Bernard Mondon ont dédicacé leur ouvrage à Carpentras. (Photo P.J.)

● "Vies et Mémoires de Cigales", collection L'Imagier aux éditions Equinoxe. 175 francs.

"Le" spécialiste mondial

En fait, toute la première partie de ce livre palpitant, aborde l'aspect scientifique. Rédigé par le spécialiste mondial des cigales, elle présente la morphologie et la biologie générales ou particulières.

Naissance et vie larvaire, sortie de terre et métamorphose en insecte aérien, réception et fonction éthologique de la cymbalisation, accouplement, appareil de ponte... Autant de chapitres plus passionnants les uns que les autres, illustrés par des croquis et des instantanés couleurs extrêmement rares, pris également par Michel Boulard après de longues heures de traque.

Taxonomie, cigales fossiles découvertes en France méditerranéenne... Rien n'a été oublié par ce chercheur qui consacre sa vie à l'étude de la Cigale.

Ecrits, images et traditions

C'est Bernard Mondon, "enquêteur-auteur", qui a élaboré la seconde partie du recueil.

L'origine de la Cigale depuis la Grèce antique ; ses relations avec la fourmi ; ses rapports étroits avec les Félibres ; son comportement à Paris ; sa place dans les chansons ou les proverbes provençaux ; les bandes dessinées qui lui ont été consacrées ; la cigale en poterie ; celle de Sicars ; la presse cigalienne ; des poèmes ; des croquis ; des dizaines de photos et de dessins, dont plusieurs de Van Gogh ; les hommages qui lui ont été rendus tout spécialement par des auteurs contemporains, Jacqueline de Romilly, Frédérique Hébrard, Jean Chalon, Jean Ferniot, Marcel Jullian, Françoise Sagan...

Grâce à un travail précis et minutieux, tous les aspects de la Cigale sont détaillés pour le plus grand bonheur du lecteur qui devient plus intelligent... tout en se régalant.

Christine BLANC

2.- In Turkey (Anatolia or Asia Minor)

Mission at the invitation of **Niyasi Lodos**, Professor and friend of the University of Smyrna.

a) News Cicadas

In Anatolia, the famous Euro-Mediterranean ***Cicada orni*** L. from west to centre is replaced by a sister species, ***Cicada mordoganensis*** Boulard, 1979. Both have an almost identical variegated habit, but they tymbalize differently. Their sound performances, recorded and transcribed on their respective **CIAs**, have demonstrated this excellently.

Winks offered by ***Cicada mordoganensis***; some of them mated in a singular head to tail (the females holding the males clinging to their internal genitals); the others, very busy layers...

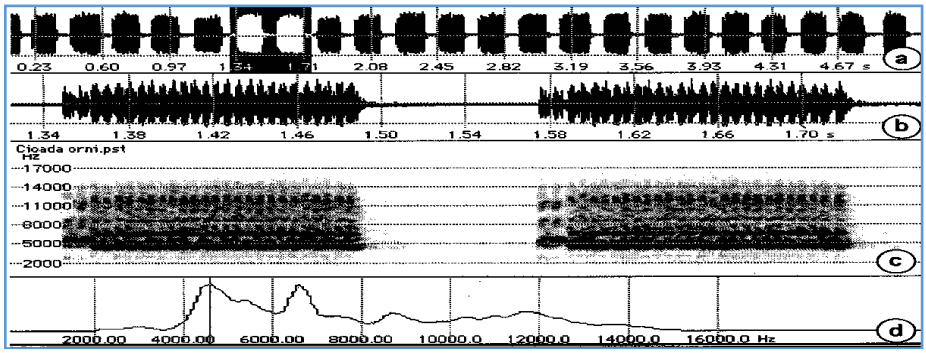
Turkey, Mordogan, Smyrna Peninsula, July 1986 (MB Phots).

A third Anatolian Cicada was also detected in natura and recorded. New, I had the satisfaction of dedicating it, during his lifetime, to my good old friend.

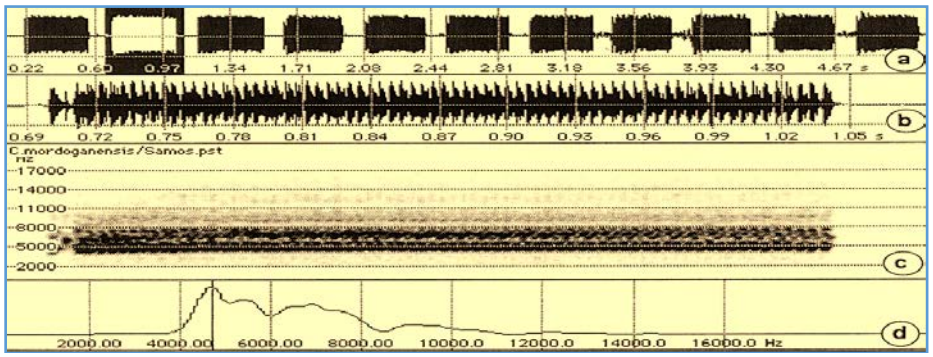
Cicada lodosi Boulard, 1979. A female (left) and a male on the bark of a pine tree.

Turkey, West-Central, Gördes, July 1986 (MB Phot).

Concerning the variegated cicadas, called **01** and **02**, here are their **AICs**, established according to the same parameters, whose procedure I have already indicated:



Variegated cicada 01, *Cicada orni* Linné, 1758 - **France, Provence, July;**

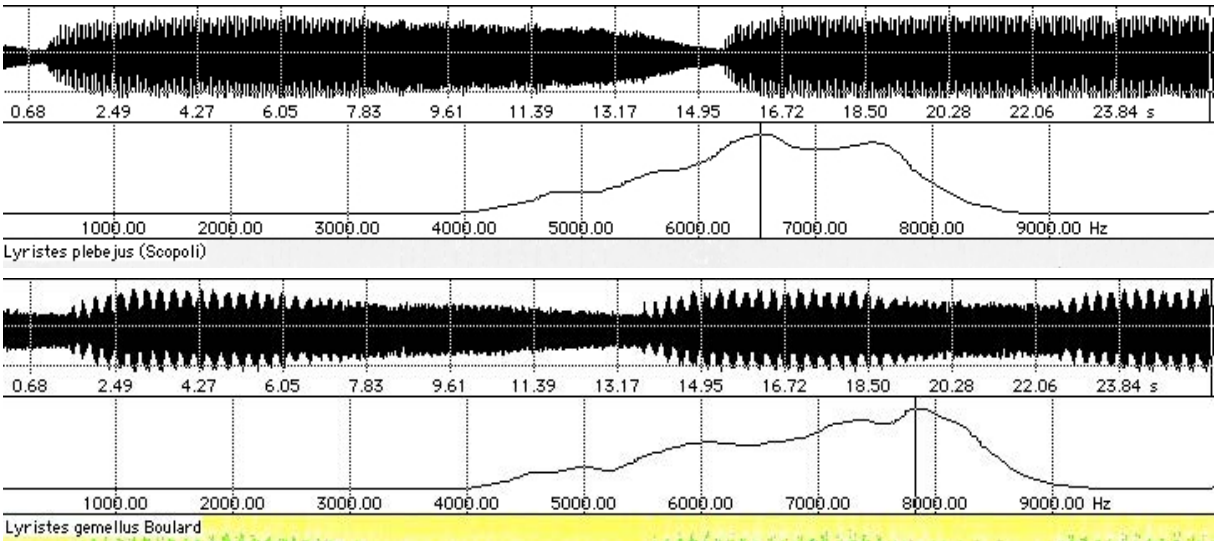


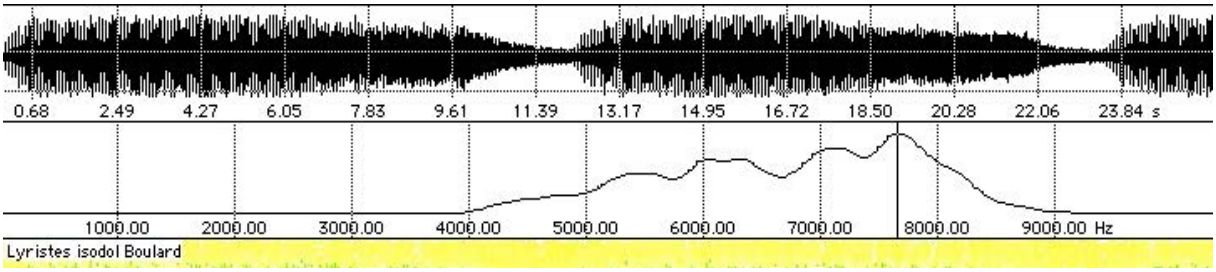
Variegated cicada 02, *Cicada mordoganensis* Boulard, 1979- **Anatolia, Gördes, July.**

(a) 5 seconds of the time signal; **(b)** Inverted ranges of the time signal stretched to the point of distinguishing the action of tymbals; **(c)** Spectrograms distinguishing frequency bands of very different pitches; **(d)** Plots of the Mean Spectra notifying the fundamental of *C. orni* over 2500 Hz, whereas it appears only around 4200 Hz for *C. mordoganensis*. Both have different top curves. **(MB cymbalisations on *Signalyze 3.5*).**

b) New Lyristes.

Detection of two ethospecific and syntopic, but acoustically separate forms, ***Lyrists plebejus*** (Scopoli, 1763) and ***L. gemellus*** Boulard, 1988, larger. The highlighting of this extremely rare fact called into question the notion of an "ecological niche" (Blrd, 1988e). A third species, ***Lyristes isodol*** Boulard, 1988, anatolian and not syntopic of the previous ones, was similarly detected acoustically, partly due to the greater vivacity of its tymbalizations. Here is the Comparison of the elementary **AICs** acoustically distinguishing the 3 species of ***Lyristes*** found in Anatolia





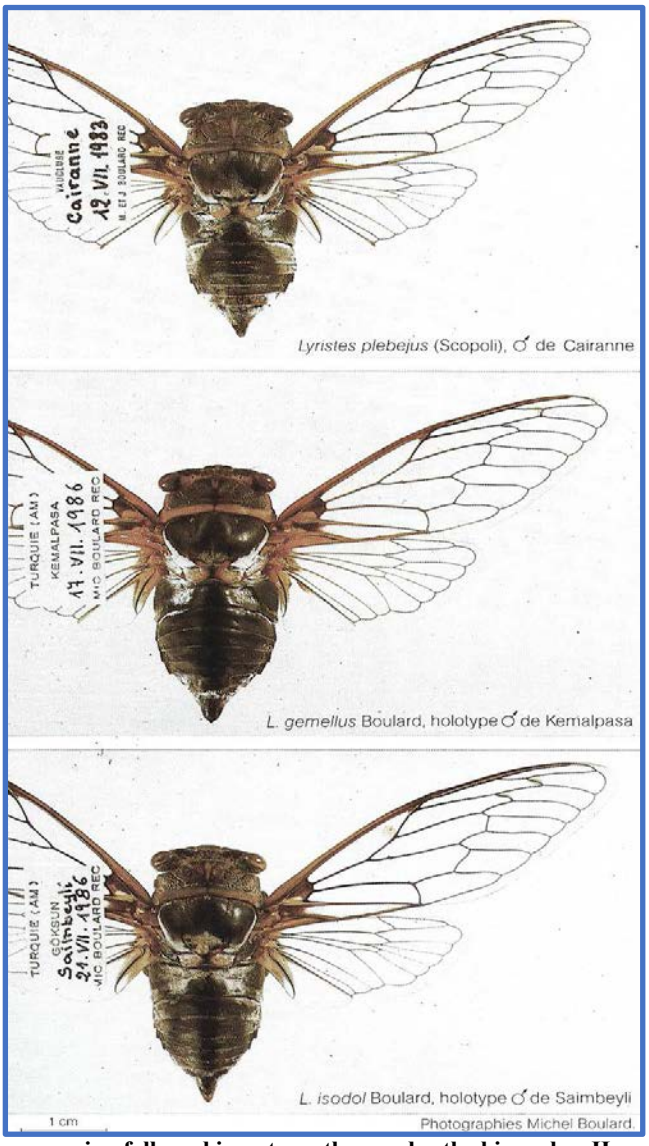
L. plebejus and *L. gemellus* **were spotted, often in company and in concert**, in the province of Izmir, in the west of the country, whereas *L. isodol* was only spotted, isolated, in the east, near Göksun **(Blrd 1988e, 2000e).**

Females of ***Lyristes gemellus*** have shown that, although they feed more readily on the green stems of grasses, they can lay eggs in dry or green twigs:

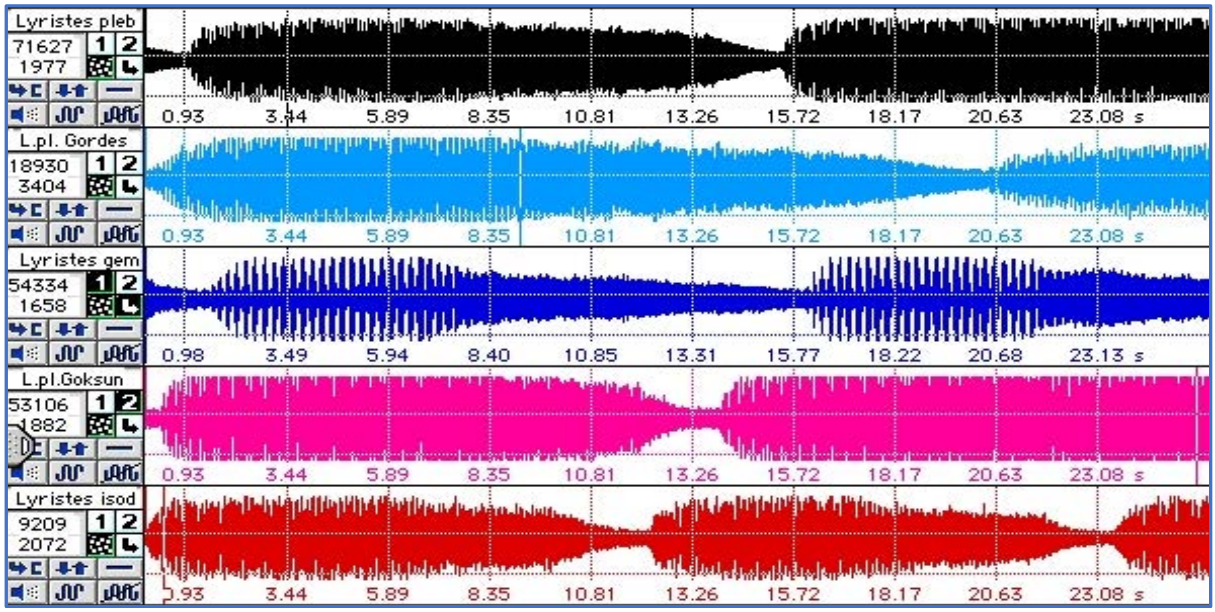
Lyristes gemellus Boulard, 1988, two females, one feeding, the second one is laying.
Turkey, Kemalpasa, near Smyrna, July 1986 (MB phots).

Unexpectedly, *gemellus* females often die, suspended by their auger which they could not remove, apparently too tired during the last oviposition, a case Niyasi had warned me about and which I was able to photograph several times in the Kemalpasa region:

Females of *Lyristes gemellus* often die this way, egg-laying accomplished (MB phot).



I can certify these three species, followed in natura, then under the binocular. However, it has happened to me, in different places and very far apart, to record only other Lyricists with rhythms somewhat different from the 3 above that I cannot do better to expose comparatively their performances taken, alas, without environmental notes. Here are, successively: *Lyristes plebejus, L.* from Gordes, *L. gemellus, L.* from Goksun and *L. isodol*. (MB rec. & *on Sygnalize 3*).

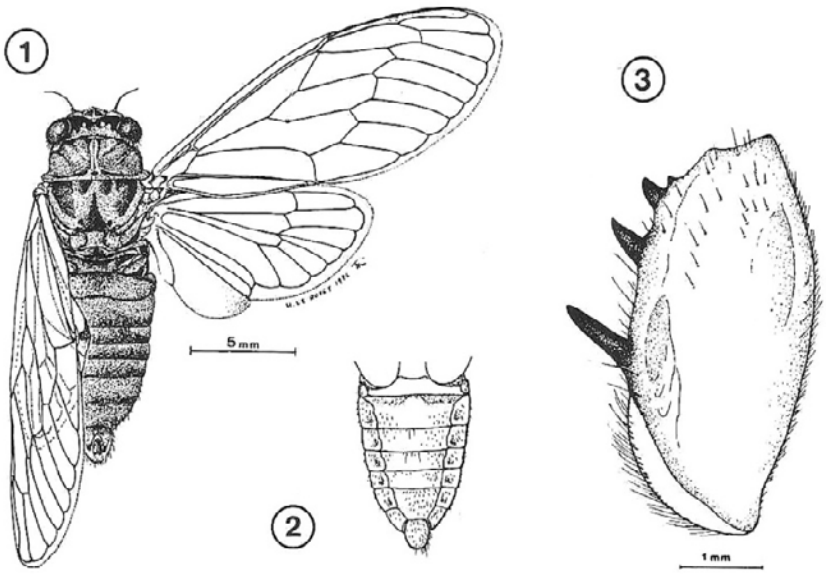


c) Further genera and species detected:

Many other genera and species of cicadas occur in Anatolia, a geographical hinge Euro-Asian area to which, alas, I could not return.

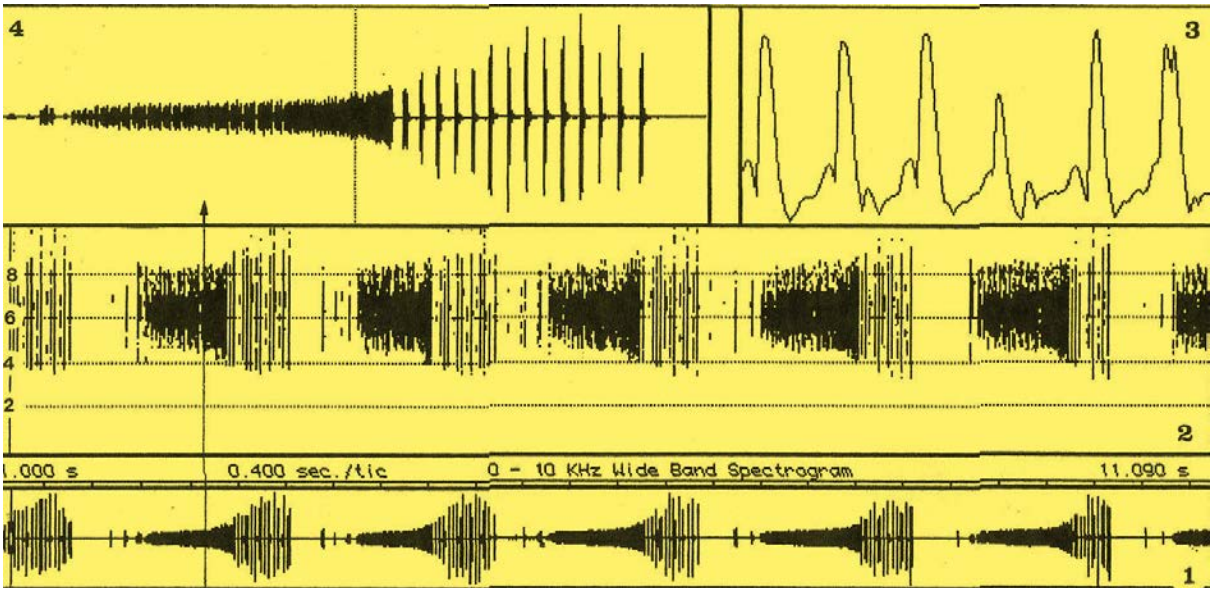
>Necessary, I place the neighbouring genus *Cicadatra*, because it is plurispecific in Anatolia. The omni-mediterranean ***C. atra*** (Olivier) is at the eastern limit of its vast expansion where, ***C. platyptera*** Fieber 1872, is largely confined, as well as ***Cicadatra glycyrrhizae*** (Kolenati, 1857) of which, hereafter shown, an eco-photographed and recorded male while he was tymbalizing, while continuing to feed, his rostrum fixed on the plant **(MB phot)**

>Happy to mention here a "souvenir pagiphore" met on mastic bushes in the Adana Region, while my daughter Christine was giving birth to my grandson Yann. Photographed and recorded, ***Pagiphora yanni*** was described and its **AIC** and **AEC** established in 1993. My excellent colleague and friend, Hélène Le Ruyet-Tan made perfect drawings of it for publication, reproduced below. **(1)** dorsal habitus, right wings spread out; **(2)** abdomen, ventral face; **(3)** left anterior femur (greatly enlarged):



Pagiphora yanni Boulard, 1992. Male Holotype.
(Original drawings Hélène Le Ruyet-Tan)

It's with the Anatolian species that Niyasi and I really started to translate sounds into Images, especially with the *Lyristes* and for good reasons. But too and precisely with *P. yanni*. The Bridal tymbalizations, then of court, recorded in 1986 on Uher 4200 tape recorder (1kg 200) were, in 1992, transposed with the invaluable software "*MacSpeech Lab II*", exemplary:



Pagiphora yanni Boulard. 'Carte d'Éthologie Acoustique' (**AEC**) visual transcription of the court tymbalization. **(1)** 11 seconds of the Time Signal, including 5 complete cymbal modules. *(2)* Visualization of the corresponding spectrogrammic ranges. **(3)** Plotting of relative energies. (4) Complete unit module amplified 3 times; this module, compared to the bridal call module, has the proximal half split into 15 equally equidistant signals.

Turkey, Adana, suffrutescent middle, July 20, 1986, late sunny morning.

(MB 1986, in Boulard, 1993a on *MacSpeech Lab II*).

Note: Among cicadas, acoustic taxonomy, initiated by myself in the study of provençale and Portuguese species, became internationally important with our research in Anatolia, presented at the "First Turkish national Congress of Entomology, Izmir, Oct. 1987" **(Boulard and Lodos, 1987d)**.

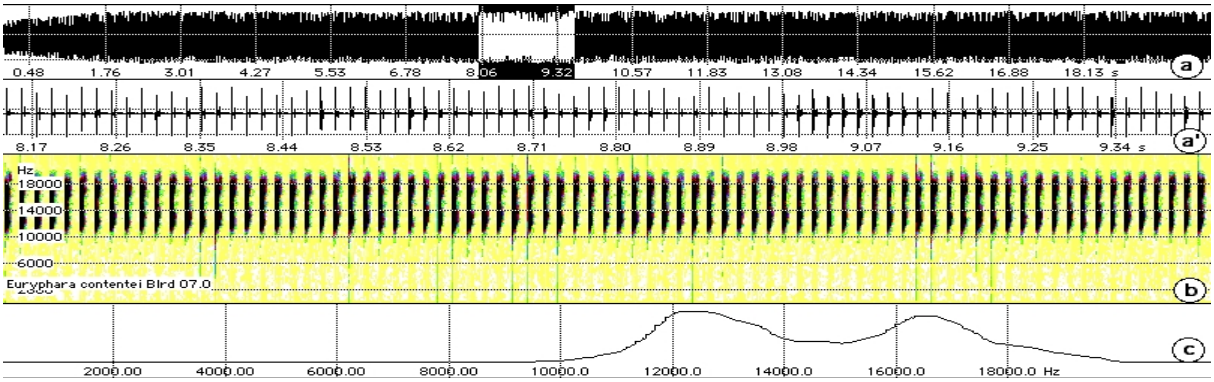
3.- In Portugal

Four missions at the invitation of my friends **José Passos de Carvalho** and **José Alberto Quartau** (Lisbon Faculty of Sciences) in the summers of 1980/81 and 1989/90. Programme: cicadidian faunistics, sound ethology and more if possible.

a) New species

Eight species collected then still without status. Recording of cymbalisations and **CIAs** drawn up for most of the Lusitano forms monitored in the field, known or new, including ***Tettigetta josei***, ***T. estrellae*** and ***Euryphara contentei*** Boulard, 1982, of pretty small species. The green-black contrast of the tegument of the third one makes it merge with the surrounding vegetation:

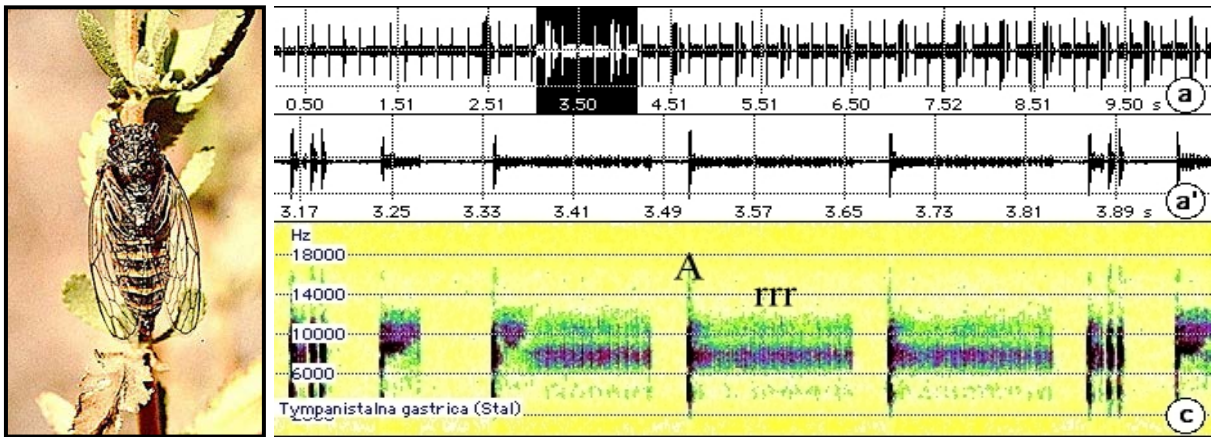
Its tymbalization, very fast, is made of an almost uniform sizzling. The following **Acoustic Identity Card** details. **(a)** 20 seconds of the Time Signal; **(a')** Inverted range of the Time Signal and stretched to distinguish the action of the tymbals; **(b)** Spectrogram showing the width of the frequency band required by this species and including two formantic zones culminating around 12500 and 1700 Hz; **(c)** Plot of the mean spectrum confirming, at two peaks, the previous data:



Euryphara contentei Boulard, 1982. **AIC**. **Portugal, Bas Alentejo, july 1981 (MB Phot; on *Signalyze 3,35*)**

b) Rediscovery of a "stateless" species

Cicada gastrica Stål, 1854, a small species with uncertain geographical bases (the author having omitted to give the locality of the specimen he had to describe), but also generic (just quoted "*Cicadetta* of Southern Europe" by Fieber in 1872), has since remained an enigma in the catalogue (Metcalf, 1963, Servadei 1967, in particular). In 1980, in the pending crops set aside by José P. de C., there was a male ***C. gastrica,*** captured in Extremadura, which I was able to associate precisely with the type of Stål, which in the meantime had been communicated to me by the Museum of Stockholm. We found the species, indeed in the Serra de Arrábida in July/August, and were able to photograph and to record males. Examination of the captured specimens led me to create the genus ***Tympanistalna***, drummer, as evoked by the amusing timbalization performed by a male *gastrica* in sexual call **(Boulard, 1982i)**:



Tympanistalna gastrica (Stål, 1854). Male tymbalizing, wings slightly raised. **AIC**, due to the sticks of a "Small Drum" so much, with each attack (**A**) follows a small sound roll (rrr).

Arrábida, Fonte dos veados, July 1980 (MB Phot; on *Signalyze 3.5*)

c) Detection of a geographical subspecies

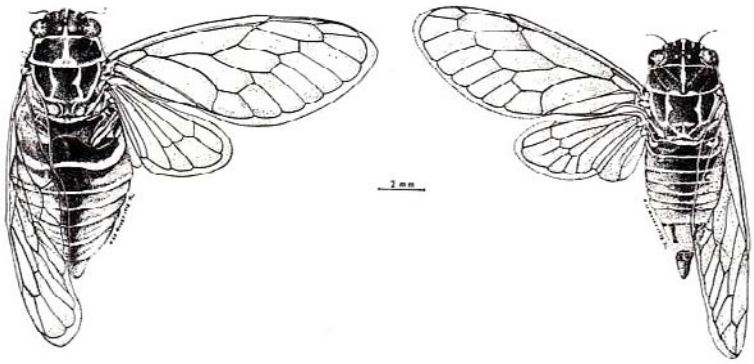
Important form mentioned here is the subspecies ***Cicada barbara lusitanica*** Boulard, 1982; it shows an unmistakable link with the Maghreb stock of *Cicada barbara* (1982i, 1985a, 1995d, 2004).

4.- In North Africa

Thanks to the collections of the MNHN, those of the Musée de Lausane and the hunts of the friend Jean-Michel Maldes, new faunistic data were established (MB, 1980e, 1981a, 1987b; 1994d). Apart from *Cicada barbara barbara* (Stål, 1866) reviewed and its **AIC** drawn up thanks to the captures and recordings of **Miss Amel Bendid**, former EPHE student, four genera and their new species must first be recalled here, these only known by their presence in collections.

a) New genera and new species

-> ***Xossarella*** Boulard, 1980, then a new genus with three species of mini-cicadas with sexual dimorphism: ***X. marmottani*** Boulard, ***X. soussensis*** Boulard, 1980, as well as:

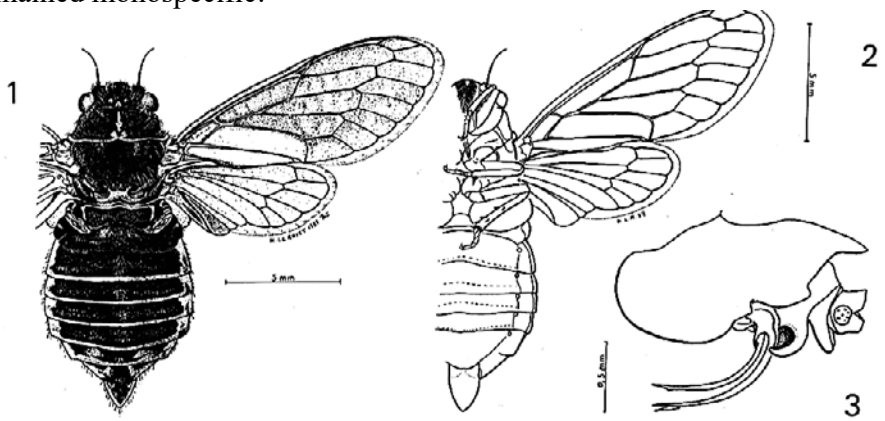


Xossarella giovanninae Boulard, 1980, didactic example; the male is on the left (Hélène Le Ruyet-Tan).

Note: In the same article, 4 Maghrebian ***Tettigetta*** are described.

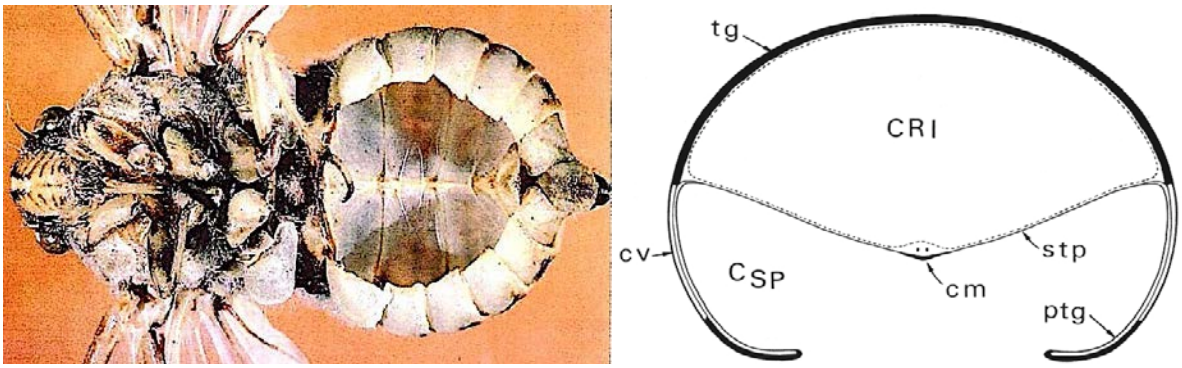
b) Old genera and new species

-> ***Saticula vayssieri*** Boulard, 1988d, second species of a genus known since 1866 and which, until then, remained monospecific:



Figures 1 and 2: Male holotype in dorsal, then ventral views; fig.3: genital segments and anal tube. (Drawings Hélène Le Ruyet-Tan).

-> ***Zouga beaumonti*** Boulard, 1994. Thanks to my colleagues at the Museum of Lausane, I was able to examine, describe and name a Moroccan Atlas Cicada, which presents a rare abdominal morphology. The male has the extraordinary characteristic, the ventral face of the membranous abdomen is hypertensive, pellucid, while the tergites and paratergites delimit a vast sub-ventral cavity… Which may have an acoustic role :



Ventral view completed by the diagram of a virtual cross-section in the middle of the abdomen. Letters **cm**, mid-sternal carina; **CRI**, internal resonance chamber (common to all males); **CSP**, subpellucidal neoformed enclosure; **cv**, vitrified cuticle of laterotergites; **ptg**, paratergites; **stp**, pellucid sternite; **tg**, tergites. **(From Boulard, 1994d).**

This is an extreme conformation, exceeding the excavated belly already noted in *Neomuda fornicata* (Linné, 1758), South African species (*cf.* Blrd, 1990a, fig. 3).

-> ***Aestuansella estuans*** (Fabricius, 1794) and ***A. dogueti*** Boulard, 1981a: 43-44.

-> To quote, Jean-Michel's hunts, I owe it to him to have been able to describe several North African ***Tettigetta*** and a larger species of a genus already provided with beautiful units, adding ***Tibicina maldesi*** Boulard, 1981a: 37-49. Renewed thanks.

5.- In West and Central Africa

Numerous new data, both in Cicadology and Mimetology. Significant results and main zoogeographic signals reported below.

5_1) Côte d'Ivoire, first visit

Ivory Coast. My first steps in tropical Africa (and some others), I owe them to the "Teachers" who trained me, MMr Alfred Serge Balachowsky, Jacques Carayon and Maxime Lamotte. It was three full months (March - May 1964) of enlightening stays: Abidjan and its lagoon, Lamto and the Bandama, the chain of the Nimba Mountains, tacit border with Guinea.

From the capital, Abidjan, thanks to **Yves** and **Dominique Gillon**, fellow orthopterists then working at the Orstom of Adiopodoumé, some "outings" were possible to "open" myself to the great Ivorian rainforest. And to continue, somewhat 'enlightened'.

a) Lamto and Le Nimba

At Lamto, **Mr. Lamotte** had set up a bio-ecological research branch, an annex of the École Normale Parisienne, located near the banks of the Bandama River, just where the forest is gradually giving way to the savannah, a logistical station for natural science explorations. With little knowledge and no experience, I have made a real debut as an eco-ethologist there. And of man.

MB, tent set up halfway up the mountain, towards Pic Richard-Mollard[14]), in April 1964

On "Le Nimba", my mission was to sample the "animal biomass" specific to mountain lawns. With the help and advice of *Roger Vuattoux*, a normalist who was then Lamto's manager, I had to organize and manage a month-long expedition to and on the Nimba Mountain Range: 4x4 vehicle from Lamto to Yalé (a forest village at the base of the mountain, on the Ivorian side), recruit a team of eight porters to go up to the summit meadows, with canteens on their heads (!). Nearly 2 days of "crapahutage" before being able to work, base camp established.

The task consisted, on n (5x5 meters) of high grassland, to capture or remove any "4, 6, 8, 100 and 1000 legs" that might be on and between the grasses, and then scrape the soil for 5/6 centimeters.

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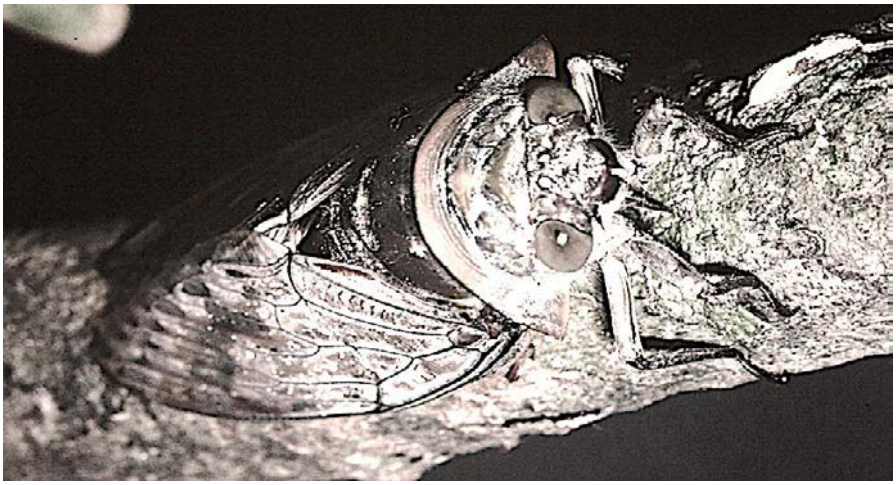
14) Jacques Richard-Mollard, an exploratory geographer, was involved in mapping the Nimba range when he fell to his death. It was July 30, 1951, when he was thirty-eight years old. The mountain carries his memory.

With the help of "my" carriers, then transformed into eco-observers, about 200 pill boxes and as many small jars were filled, labelled and brought back to Lamto, then to the E.N.S., Paris.

At work, my Porters-Observers... To the far left, Mr. Degaule, the foreman!
Prairie at the top of a Nimba slope, April 1964 (MB Phot)

On the Chain, no Cicada. Hopeless. Back in Yale, a few days of exploitation in the forest, and two or three nights of light trapping, with the good wishes of a Petromax (*pressurized oil gas lamp*), allowed the capture of some large Cicadas ... All similar, arriving towards the lamp, some of them tymbalizing, which delighted the villagers intrigued by my actions... Quite unusual!

The next day, I took pictures of specimens locked the day before in a makeshift cage. Good pickaxe, these Cicadas were Ugada still unknown, as I was able to realize a few years later. I was then able to concretize thanks by creating the scientific status of the species. Here is the first 'slide' of a feeding male, the apex of its mouth rostrum on the branc:



Ugada lamottei Boulard, 1977a. Rainforest near Yalé, Côte d'Ivoire, early May 1964 **(MB phot).**

Some specimens of a second species, ***Cicada tigrina*** Palisot de Beauvois, 1813, were taken on the way back to the beautiful wooded savannah preceding Lamto. A few years later, it fell to me to rename this "tiger cicada", ***Attenuella tigrina*** (Palisot de Beauvois, 1813), a typical species of a genus hitherto unpublished (Boulard, 1972a). Species found in 1986 on the edge of the Taï forest, south of the Nimba Mountains Range (*cf.* p. 106).

For the record

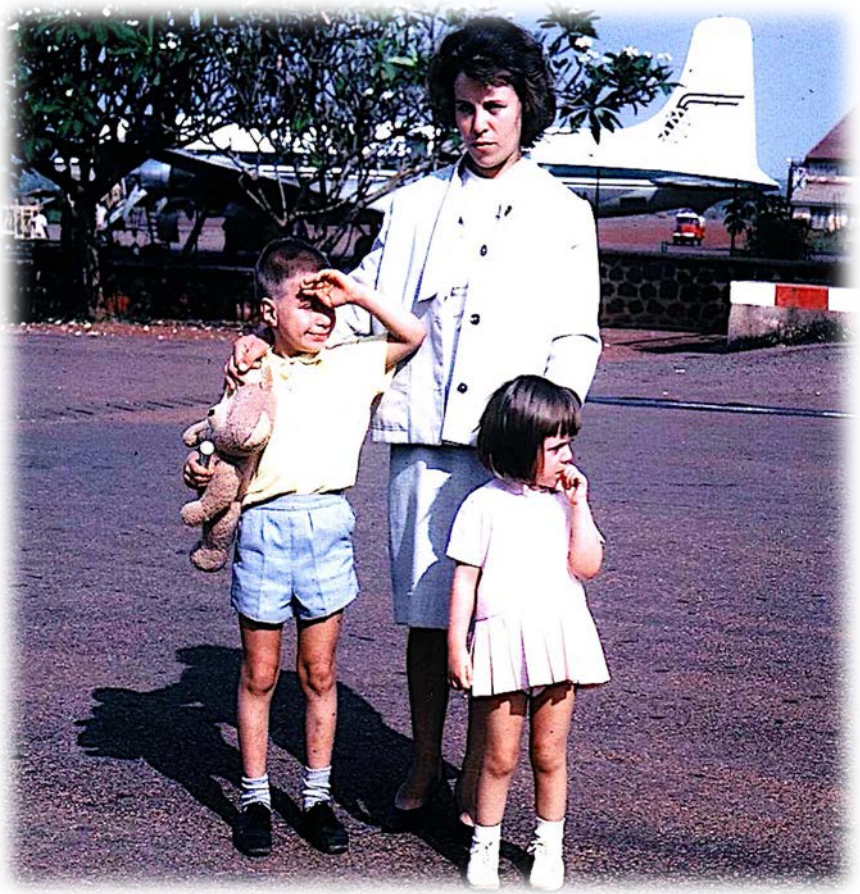
On the trail from Danané to Yalé... First puncture! March 1964.

Night on the beautiful savannah at Rhoniers in Lamto area. End of May 1964 (MB phot).

5$_2$) Central African Republic (CAR)

As soon as I had just completed, as an assistant trainee at the MNHN, the basics of professional training at Nimba, my teachers and **Mr René Coste**, an agricultural engineer and Director of the French Coffee and Cocoa Institute (IFCC), offered me a long stay in the Central African Republic, "CAR". Perfectly influenced by the spirit of our Laboratory of General and Applied Entomology, I had perceived, during my first stay in tropical Africa, all the importance of Agricultural Entomology in the economic development of Overseas Countries. With a certain

enthusiasm, in agreement with my wife Jeanine and although we had two young children at the time, I agreed to direct a large part of my activities towards the study of Insects harmful to stimulating plants cultivated in the CAR.



Just arrived in Bangui. Jeanine, the children, somewhat worried... (May 1965 MB phot)

For five years (03/1965-04/1970), I was in charge of the Entomology Service of the IFCC Agronomic Research Centre in CAR, located in **Boukoko**, 120 km south-west of Bangui and close, 5 km, to the MNHN Scientific Research Station, magnificently located in **La Maboké**. This Station, created and directed by **Professor Roger Heim**, was then managed by **Raymond Pujol**, Head of Practical Work at the MNHN, an astonishing connoisseur of Afro-tropical fauna and flora. He was appointed Professor of Ethnozoology at the MNHN.

Raymond helped me a lot in my early days as an agricultural entomologist; he became and remains one of my old friends.

My career as a cicadologist, an eco-ethologist and an animal photographer was established in the Central African Republic (*cf.* Boulard, 1969f, 1986d), having had from **Mr. Coste**, any possibility of carrying out, in parallel to the agronomic problems posed, my investigations on cicadas and other sap-suckers, some of them attacking stimulating plants.

It then developed profoundly upon my return to Paris in 1970, at the Museum, then at the École Pratique des Hautes Études (EPHE). Appointed Deputy Director of the Agricultural Entomology Laboratory of the School, I had to take over at the same time, on an honorary but proud basis, the charge of the Auchenorhynchus Homoptera Section of the MNHN where I was reserved, during my entire official career, a suitable laboratory on the third floor of the new Entomology building, near the Collections. The following year, 1971, the Entomological Photographic Laboratory was also entrusted to me.

In what follows, the confirmation of the orientation of my research, amply accomplished on the Cicadas, the Membracids and some other Auchenorhynchus, the one also concerning the facts associated with mimicry, or others, will be more widely commented, clarified, illustrated.

A) Great rain forest (Congolese forest block)

First Report to the Academy of Sciences, Paris.

The possibility of staying for a long time in the same Region, Afro-tropical therefore, was for the cicadologist an unsuspected chance. The subterranean eco-phases required by the great cicadas can be long, usually several years, hence the bio-taxonomic difficulties in linking the post-mbryonic cycle and the imaginary phase, except for the exuvia collected during the imaginary phase, or hoped for as a sample of a species to the adults found on the spot.

a) Unimaginable, the endogenous life of *Muansa clypealis*

A few months after my arrival, in the great forest surrounding the Stations of Boukoko and La Maboké, my attention was drawn to small earthen towers raised here and there, more or less high above the litter, even installed on the old termite mounds... They were **Cicadian buildings!**

With my Central African technical helpers called "*Observers*", we quickly had to highlight several galleries that the towers had topped... In fact, vertical burrows, about one meter long! **Splendid as well as strange, a big 'whitish beast' occupied the bottom of each one, but where... What was it?**

Unexpected (!), **it was juveniles Cicadas in stage V, bathing in a liquid!!** The burrow-galleries were then quickly seen like wells... The immediate breeding allowed to obtain several imagos, perfectly associated with the exuviae that they abandoned on the spot. Thus was discovered the unusual underwater phase during the edaphic biology of ***Muansa clypealis***, a magnificent African (see the specimen, spread wings, p. 471) described by Ferdinand Karsch in 1890, on a dry specimen.

Surprisingly, the "liquid" in question had nothing to do with the water table - the water table is much deeper. In fact, it was the result of the accumulation of urine excreted by each juvenile IV/V. Unexpectedly again, this ‘cicadidian’ urine proved to be a masonry material, as it was rich in mucin, a sticky protein. During the making and maintenance of the burrow, the excavated soil copiously spoiled with the help of the forelegs, the insect proceeds to a mucinous smoothing of the inner wall, which becomes almost impermeable. Urine no longer used, resulting from the repeated urination of this large consumer of root sap, accumulates at the bottom of the burrow... Its level rises until it covers the inhabitant to a large extent!

Revelation, the "underwater" behaviour of this Cicada in the making is made possible by the strong development of a thick carpet of **aerial wax** under the abdominal and supterothescal, that I have named "**tomentum**" which, covering the stigmas (entomic respiratory orifices), includes a reserve of circulating air that, from time to time, the juvenile insect renews upside down, the abdominal apex piercing the aqueous surface of its lodging, almost in call of air.

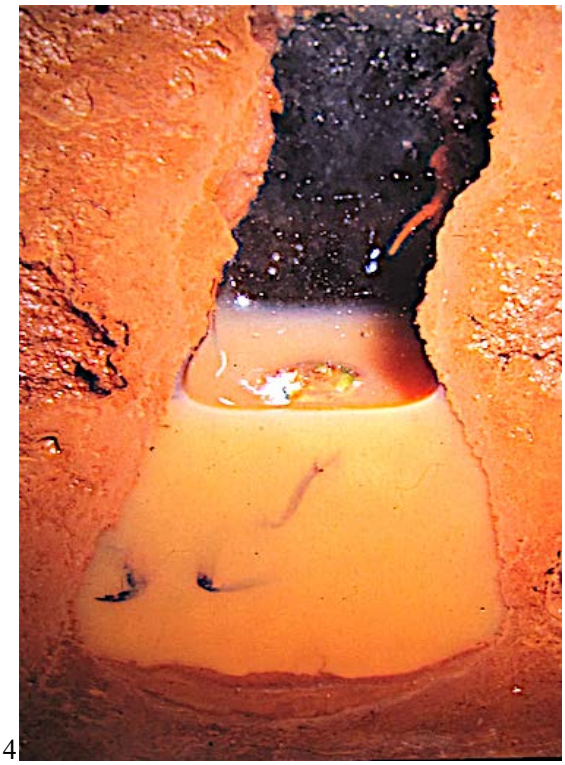
Curiosity: an enigmatic but attractive disclosure, the last juvenile 'concern' of this Central African species was to extend the burrow of a vertical gallery of emergence, until exceeding the surface of the litter by a tower that could reach a dozen centimetres... Tower elaborated nightly, muddy pellet after muddy pellet, overhanging the forest litter by a dozen centimetres.

(***cf.* Boulard, 1969a, C. R. Acad., and 1990a**).

The first exploits are shown in images from (1) to (4), followed by topographic photographs of the tomentum, explanatory microscopies and, in (5) and (6), the accomplishment of this unprecedented activity:

1 2

Muansa clypealis (Karsch, 1890). **(1)** Highlighting, on the scale of a machete, of the Tower surmounting the burrow, axially cut, then the wet* bottom. **(2)** Glass cage and juvenile in breeding,

3  4

Juveniles V: (3) female in situ in the aerial exchange phase and (4) male, also in its breeding cage, with the abdominal apex of the abdomen exposed (see also p. 79);

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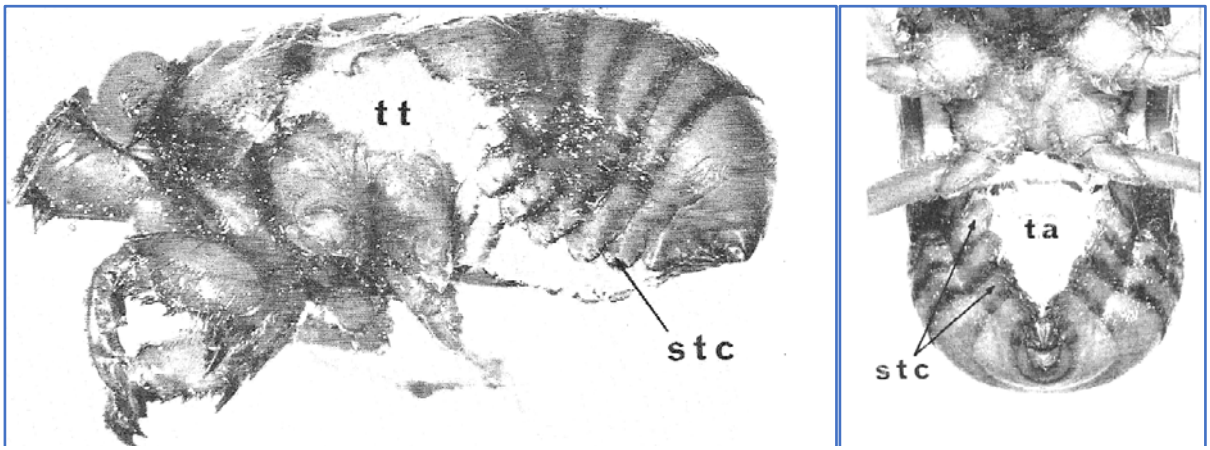
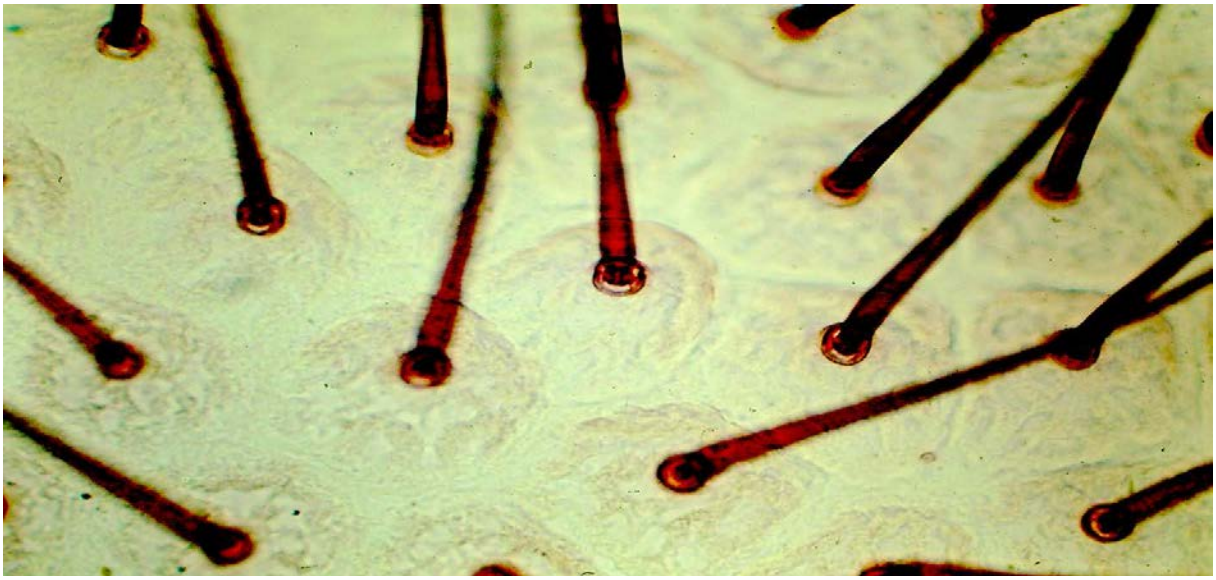
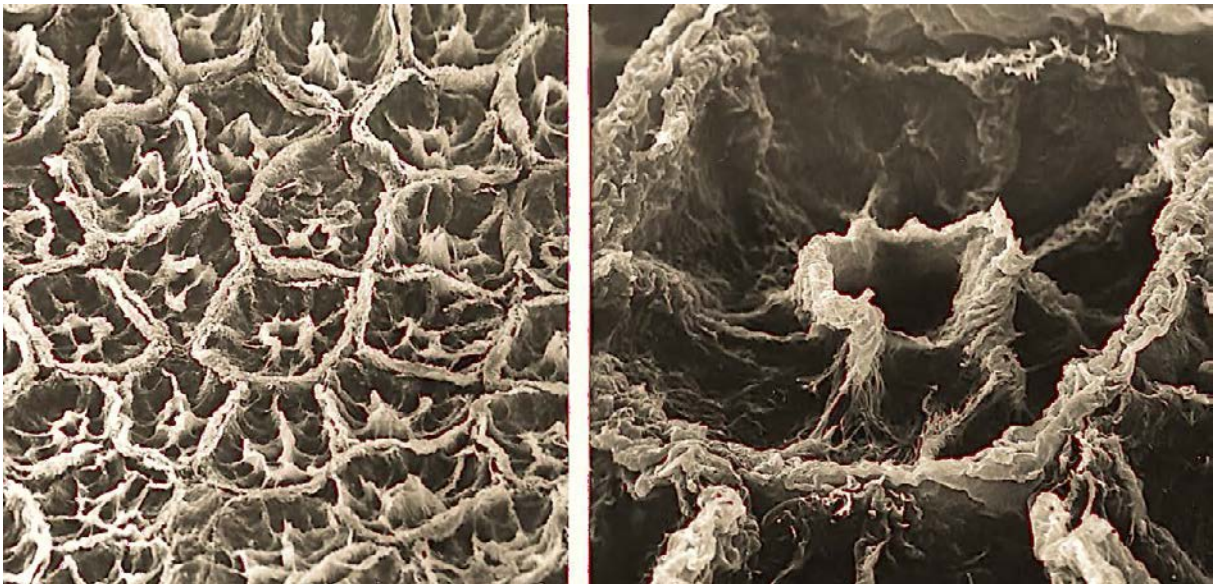
*) On the back of the book, there is a para-axial section of the burrow of a **mature J V**, from the watery bottom to the top of the tower.



Juvenile V *(ectomized left pterothic),* **body areas producing immaculate and hydrophobic aerial wax protecting the stigmata, entomic respiratory pores. Stigmacalyptes (stc), lateral-tergal expansions enclosing the abdominal tomentum (t a); (t t) thoracic tomentum.** **(*Cf.* Boulard, 1969a);**



Optical microscopy of the ciriferous epithelium, each unit of which secretes tight filaments, nested around its axial axis, which together form a tomentum framework (**MB phots**).



Electron microscopy (SEM) revealing the exoskeletal structure of the subabdominal epithelium of the waxy tomentum (Photo & micrographies Michel Boulard, 1990a, Laboratoire d'Entomologie du MNHN).

5

6

(5) Mature Juvenile V, colored, black eyes, 3/4 out of the watery bottom of its burrow (opened by the observer); **(6) Imagination completed,** birth of an **adult** and its last juvenile remains, **exuviate it! [**Reminder The first birth was the hatching of the egg (endophytic oviposition) giving a newborn cicadidaean which fell to the ground, then penetrated it for several years of endogenous life. The number of years required for growth remains unknown for almost all tropical species described]. **Boukoko-La Maboké, May 1968 (MB Phots).**

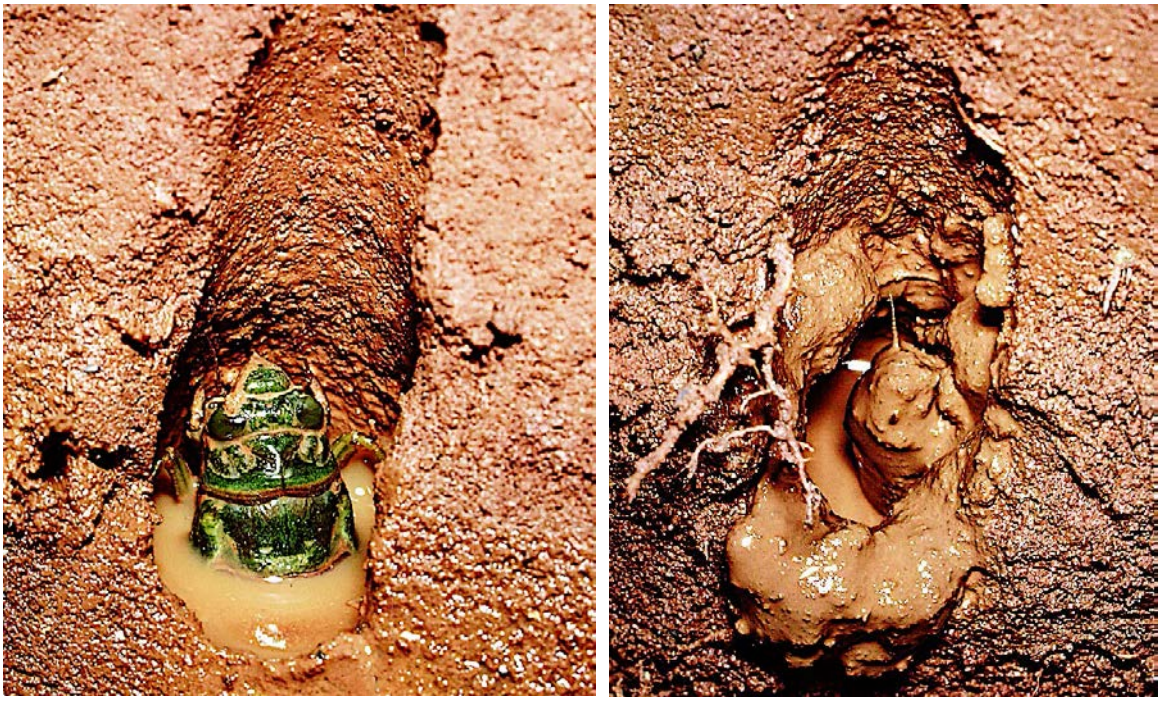
Thus, the post-embryonic, **endogenous and subaquatic stage** of the great cicada ***Muansa clypealis*** has made known an exceptional bionomic phenomenon, highlighted as **a cicadological discovery of the 20th century.** Quickly compared with the development of **Dragonflies**, other good-sized hemimetabolites, whose post-embryonic stage is totally aquatic, with anal gills, and predatory like the adult, but thanks to a protractile jaw (*cf.* p. 43).

b) Juvenile ethology of the *Ugada*

Also unsuspected facts. In Central African Republic, then in Malawi, the juveniles of some other Cicadas, evolving in identical or comparable soils, follow the same "endogenous and underwater" eco-ethology: ***Ugada***, some ***Ioba*** and ***Orapa*** provided me with examples, tomentum provided and of identical function. Apparently, however, the juveniles of the ***Ugada*** and others do not build a tower before the imagination (*cf.* next page, slides **1** and **2**).

(1) Juvenile V and mature *(nymphoid appearance!)* in the last few centimetres of its emergence gallery that has been uncovered, digging almost blindly into the recognized emergence zones of these species.

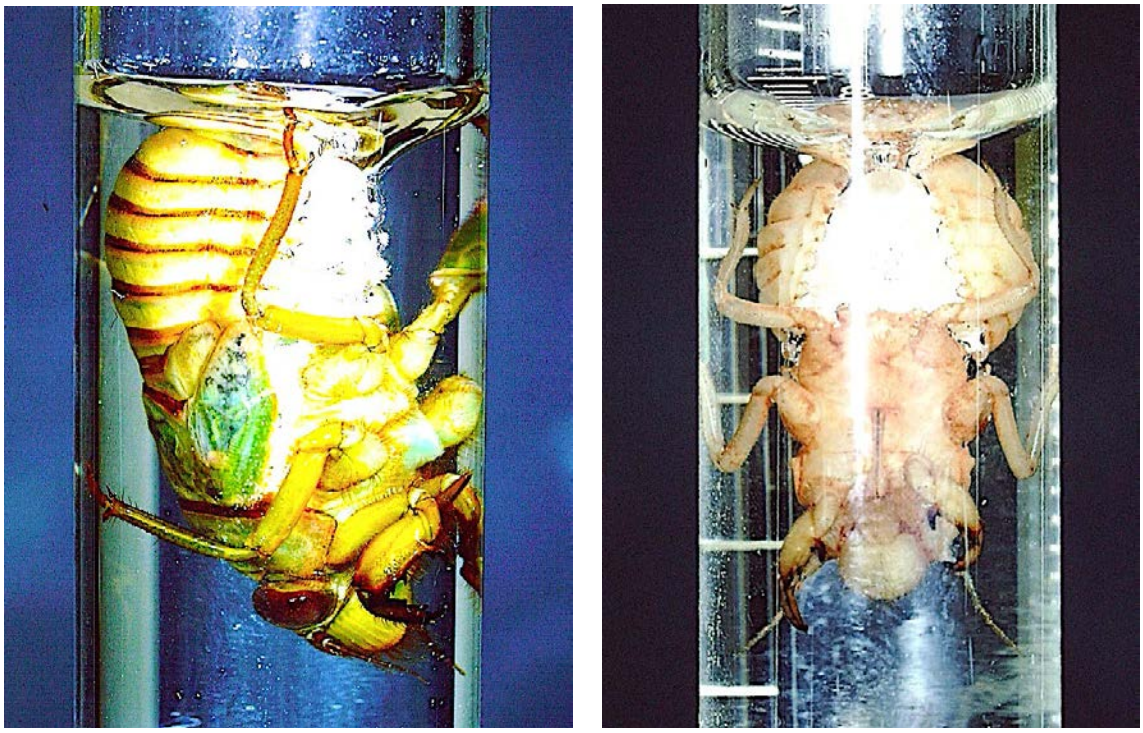
(2) The individuals thus found were quickly at work to repair the damage, muddy charge after muddy charge until they closed again, each in its own edaphic home in not even two hours. The location of their land dwelling was scrupulously located, noted... A way of hoping to "harvest" the exuviae, or even the imagos.



(1 and 2) *Ugada limbalis* (Karch, 1890), mature juvenile V. Boukoko, September 1968 (MB phots).

(2) Development of the waxy tomentum protecting the respiratory stigmas

Additional data were acquired on the hypogeal evolution of the juveniles of these Central African species. From the third stage, the juveniles are provided with a thin waxy felting which already allows them to stay in an aqueous environment. Already, in order to breathe, they have the reflex to point the abdominal apex above the surface of the liquid, evidenced in test tubes, like the *Muansa* previously followed in the same way:



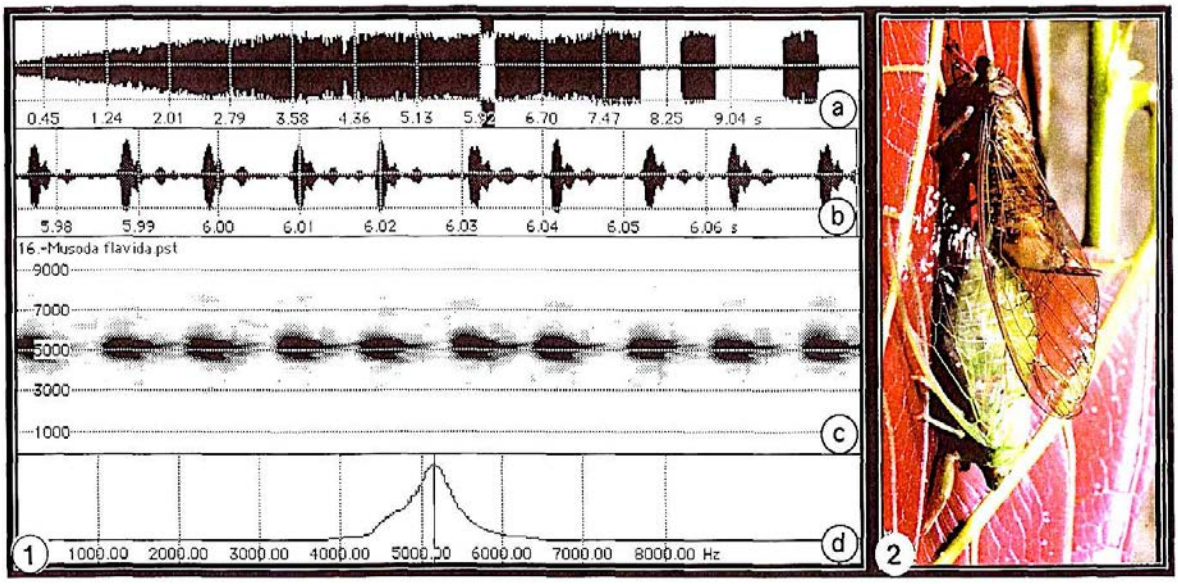
Ugada limbalis (Karsch, 1890). juveniles V (almost mature) and III (late stage) introduced, head upwards, into tubes of selected diameters and filled with clear water. After a few minutes, they turned upside down and, from the abdominal apex, pierced the surface of the water, thus maintaining the characteristic attitude that these insects take during the necessary air exchanges. The J. III showed the same reflex: as soon as the tomentum is provided, it quickly proves to be effective. **(MB phots, September 1968. *Cf.* Blrd, 1973a)**

Juveniles of ***Ugada limbimacula*** (Karsch, 1893) have shown that they proceeded in the same way (*cf.* **Blrd, 1973a**). In fact, in this group of species, the abdominal-thoracic ciriparous system is already established and ready for use. Interestingly, it is present in many Cicadines, notably Cryptotympanini; the first control is the mature juvenile *Lyristes plebejus*, mentioned above, which has only a very thin film of white wax (*cf.* page 55). A species of another genus has juvenile V with tomentum, notably ***Orapa numa*** (Distant, 1904), the exuviae collected are provided with it. These juvenile cicadidae are therefore likely to adapt to the texture of the soil being used.

On the other hand, sympatric *Ugada* evolving in the same forest as the previous ones do not seem to follow the same bionomy. The black juvenile ***Ugada giovanninae***, whose open burrow bottoms were dry, appeared to have a less dense tomentum. In addition, imaginary beginnings, a simple halo of dried mud, slightly surmounting the ground surface, may mask the imminent opening of the emergence gallery (fig. 3, next page) (*cf.* Boulard, 1973a, Plate VI).

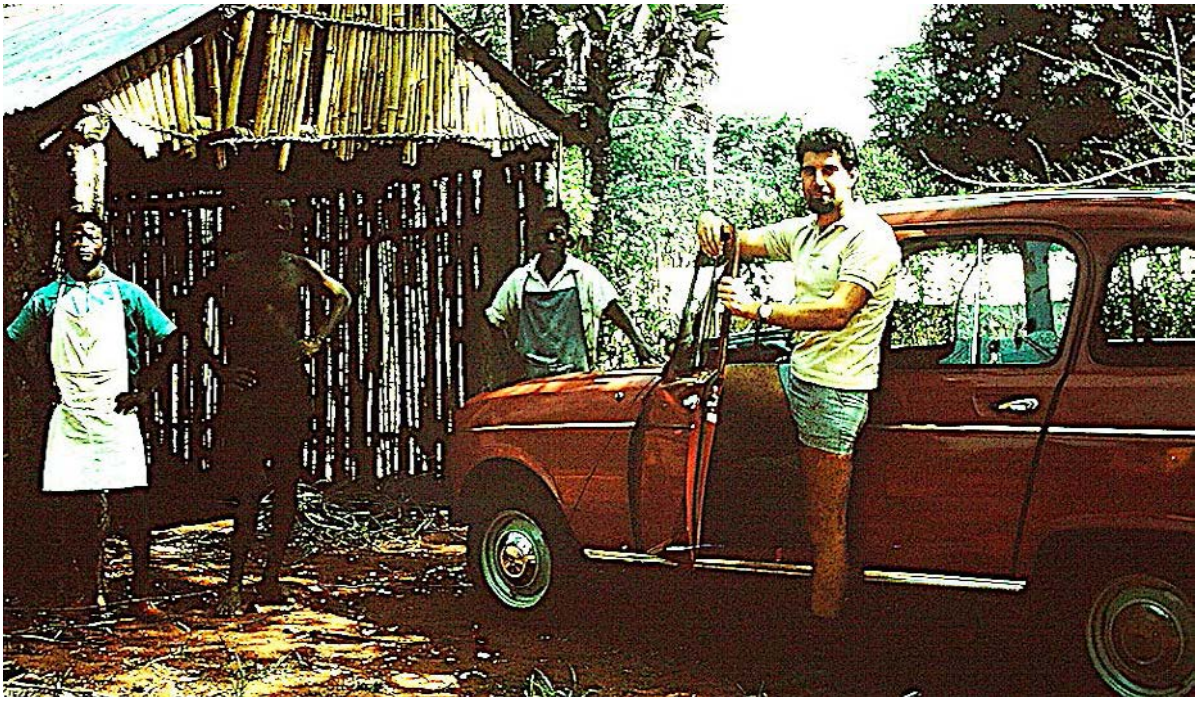
(c) *Musoda flavida*, a heterochrome species

The first species thus qualified was only qualified after the fact. It was a Cameroonian forester, a male of which was entrusted to a museum across the Rhine and which had scientific status: ***Musoda flavida*** Karsch, 1890. *M. "flavida",* as described on a dry and yellowish specimen. I found the species in the RCA, photographed and recorded it. The species is heterochromic in natura, the ***flavida*** males are leaf green (the aging green, then dried out, turns to yellow ochre), while the females are brown, or dark green (see p. 84), like those of the twigs on which they stand to feed and lay their eggs (Boulard, 1973a; 1998a). Below is an eco-photo of a pair in copula, preceded by the AIC (*Acoustic Ethology Card*) of the species,



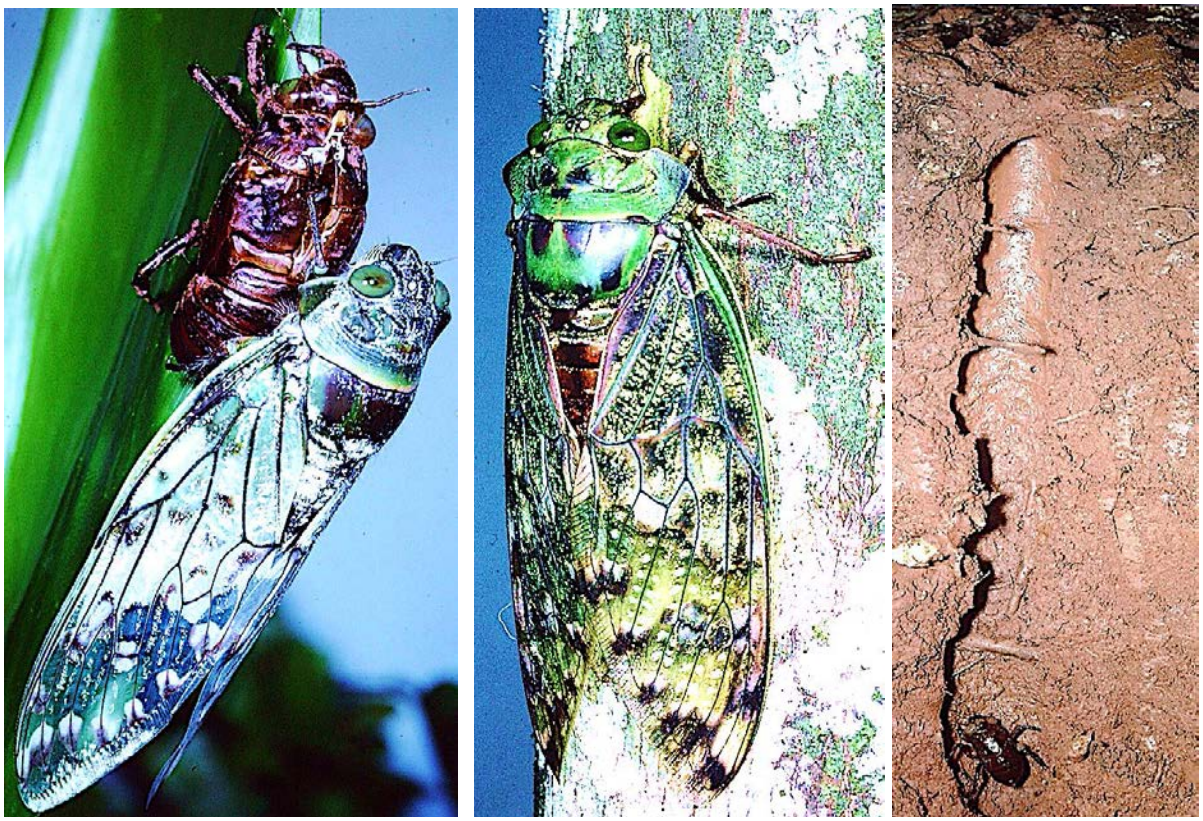
Bionomy of *Musoda flavida* Karsch 1890: (1) Acoustic Ethology Card. (2) Conclusion!
(a) Real-time transcription of an entire sequence of the premarital tymbalization. **(b)** Highly stretched oscillogram of 1/10s of the signal (short range inverted in a); **(c)** and **(d)** Spectrogram and responders Spectrum, with tymbalization having all efficiency centered on 5100 hertz.
(**Boulard, 2000h, Boukoko-La Maboké, on *Signalyze 3.5* and MB Phot**).

Also counted the two captures of an obviously rare species, ***Musoda gigantea*** (Distant, 1914), in a constant light trap in a clearing in La Maboké. Since its description, this Musoda, the largest of the genus, was not seen again until April and June 1968. I stayed close to this forest until May 1970, without having been able to recover this species. Its subterranean ecophase must be long...



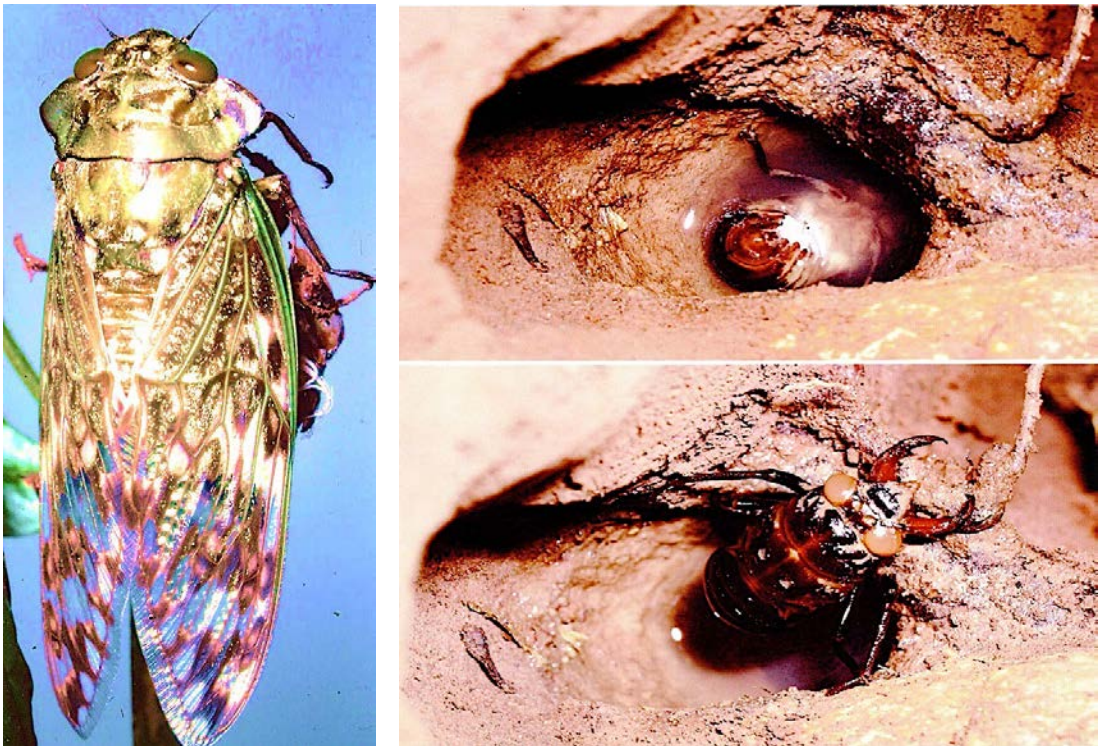
The entry of the garage of the "Boulardière boukokoise"… In February 1966, I was still using my R4 (Renault 4) coming from France with me. (**JB phot**)

d) The Cicadas of the Central Africa, some forest species

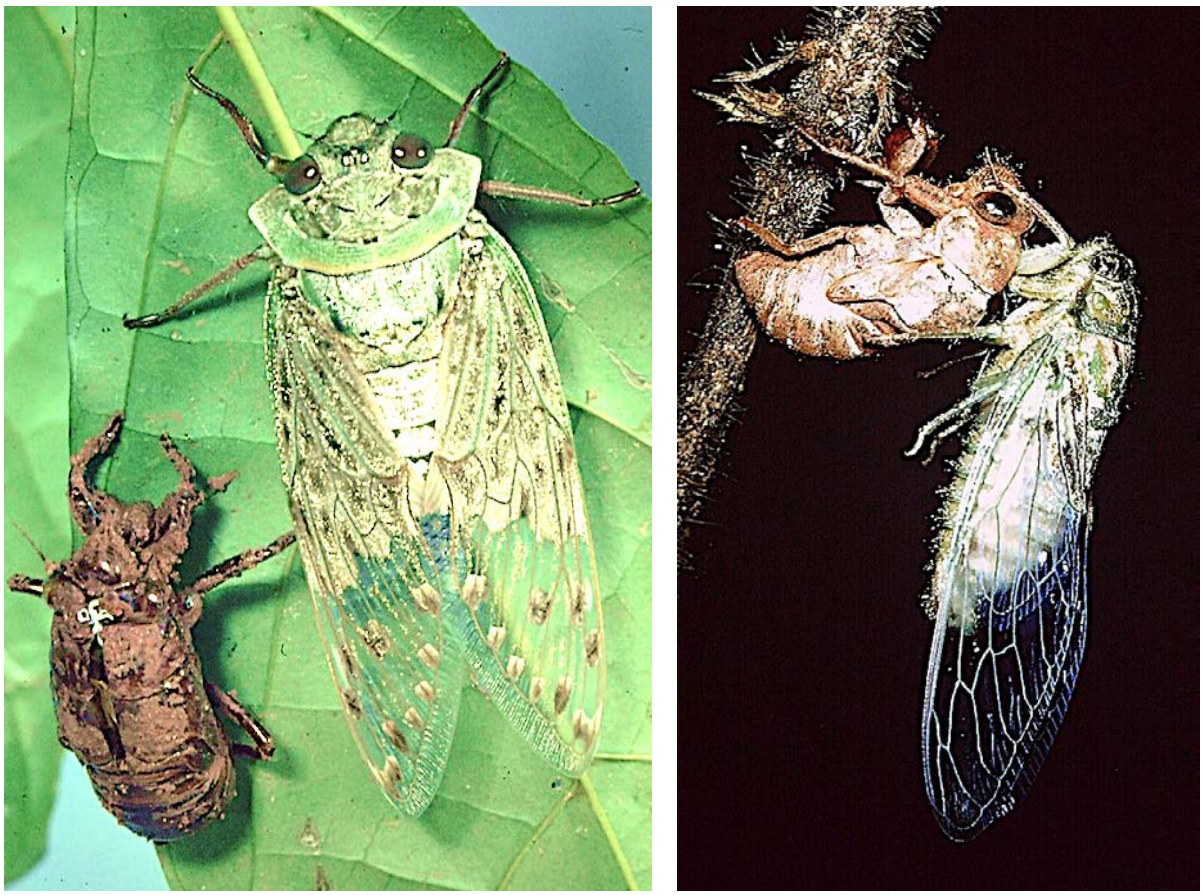


1) ***Ugada limbata*** (Fabricius), imago almost completed, the pictorial density of the habitus is still light. **2** and **3**) ***U. giovanninae Boulard***, beautiful **imago**, then **juvenile V**, black in its burrow with, in litter, the dried mud aureole which temporarily closes the opening.

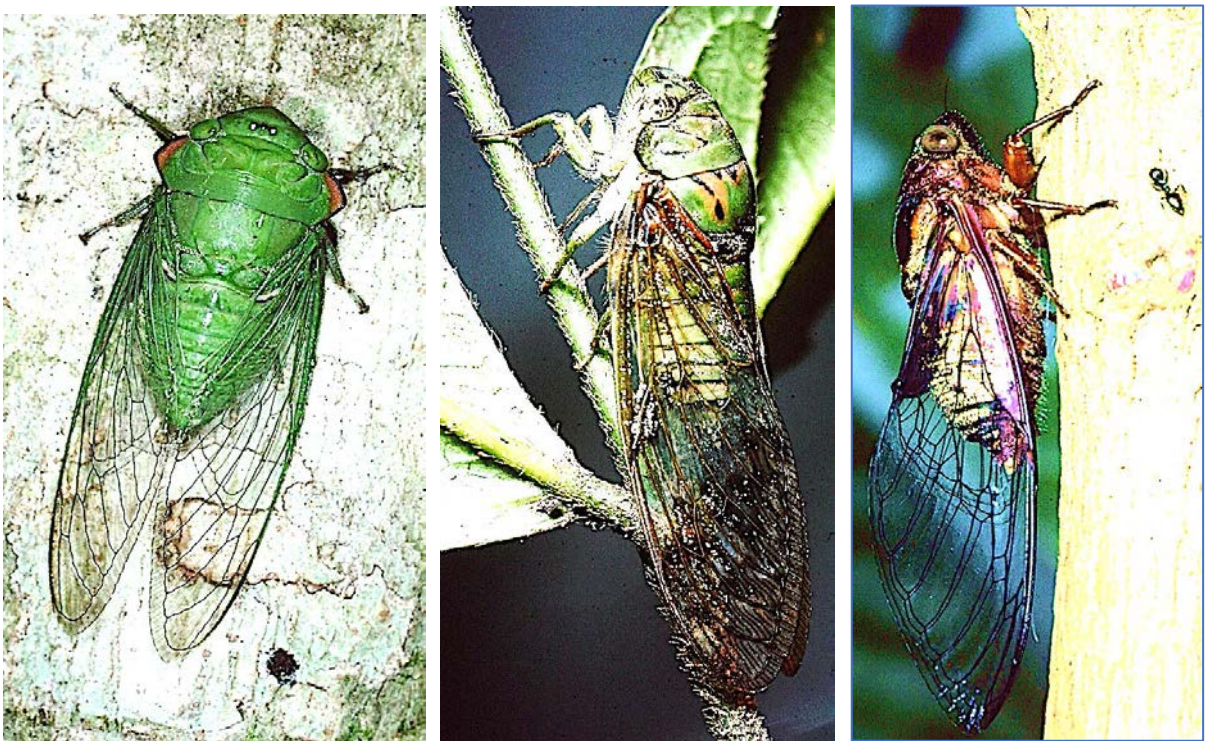
Boukoko-La Maboké, 1966-1967 (**MB Phot**)



(4) ***Ugada limbimacula*** Karsch, young imago; **(5** and **6)** Open burrow: **juvenile V** emerging from the watery bottom, then re-entering it, tomentum exposed, functional. **Boukoko-La Maboké (MB phots)**



(7) ***Ugada grandicollis*** Germar and **(8)** ***Afzeliada christinetta*** Boulard, 1973, imagos in the process of completing their imaginations by acquiring their specific pictorial outfits. No tomentum in exuviae of species of this genus. **Boukoko-La Maboké, 1966-1969 (MB phots)**



(9) ***Sadaka virescens*** et **(10)** ***S. radiata*** Karsch, 1890. **(11)** ***Trismarcha umbrosa*** Karsch, 1891.
Boukoko-La Maboké (MB phots ; Boulard, 1973a).

The genus ***Afzeliada*** is represented by eight common species, including ***A. erici, A. christinetta*** Boulard, 1973 and ***A. balachowskyi*** Boulard, 1975.One will find in facicule 16 of the Revue de l'EPHE, about twenty cymbalisations relating to Central African Cicadas.

e) Forest mimetology, four examples

1) Association of untraceable

The association brings together sympathic species with relatively similar liveries for which the common protection lies in the difficulty of capture due to their cryptic nature and their near invisibility. All of them emit cymbalisations following specific sound registers evoking whistling. The efficient predators are then learned through frustration: they hear them, but cannot locate them.

Gathered here (in spite of the lost living colours) were four bark-coloured dendrophilous Cicadas, which live together with a few others similarly protected, in the great Central African Sylva, namely: above, *U. giovanninae* Boulard and *U. limbata* (Fabricius); below, *U. nigrofasciata sylvicola* Boulard and *U. limbimacula* (Karsch) **(*cf.* Blrd, 1991g; 2007b and 2012c).**

2) Analochromia

Musoda flavida Karsch, 1890, a female in situ, feeding. **La Maboké** (MB phot)

Small Rainettes, ***Hyperoclinus sp***., quiet but alert on Aframomum leaves, whose essential colour they mimic. **CAR, Bébé-La Maboké small humid valley, in July** (MB phot).

3) Analoschemia, analogous manner

Heterochaeta bernardii Roy, Bacilliform mantis resembling Phasms, but capable, when needed, of... **Mimic the frightening, yet rustling wings suddenly open,**

Boukoko-La Maboké Forest (MB Phots).

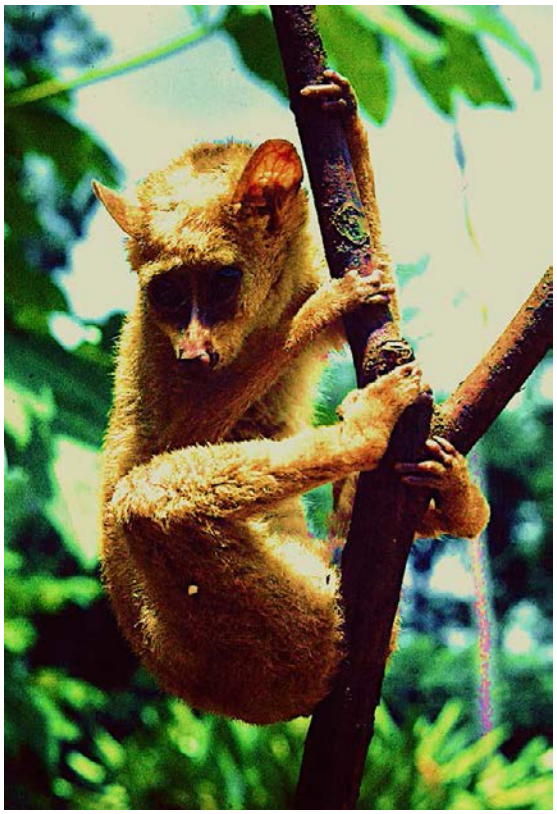
4) Phyllomimesis and hypertelia

Brycoptera lobata Ragge, 1981, a large phaneropterine grasshopper "transformed" not only into an ageing false leaf, but also as if it had been cut by phytophages and bears traces of scarring... As well as more or less whitish, brownish patches... Relating to false fungal attacks. **Beautiful example of a protective Phyllomimesis, enriched with confusing hypertelism. (*Cf.* MB 2007b, consult the CD, or see *in* MB 2012, plate 31). African dense forest (MB phot).**

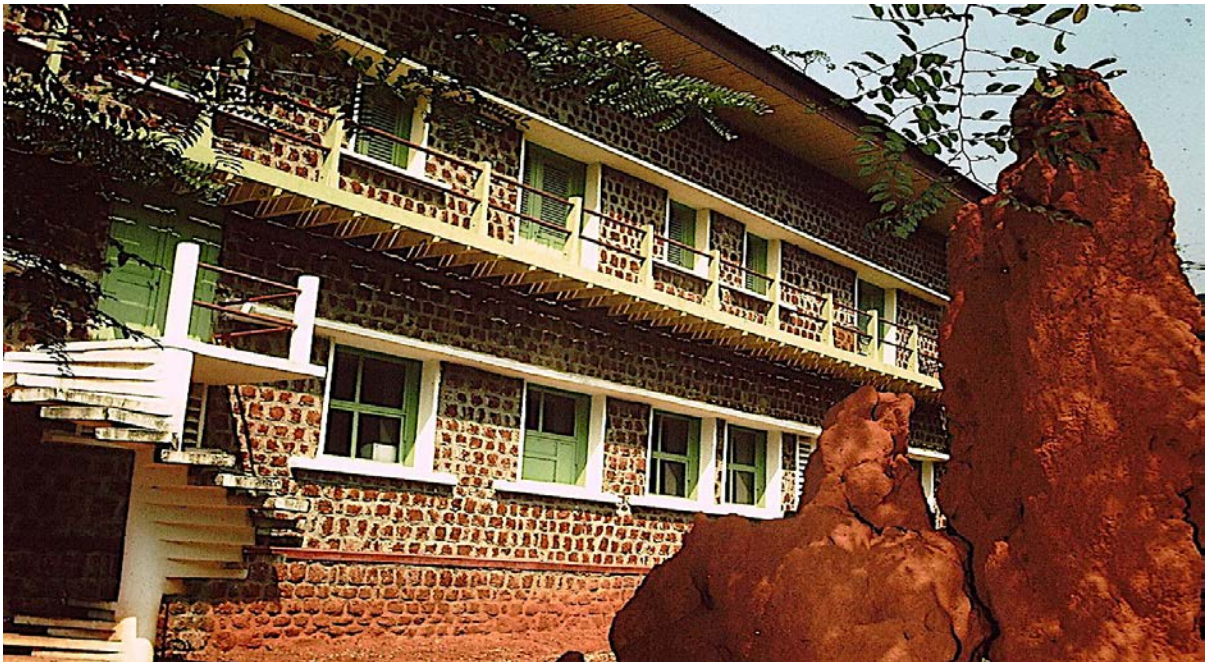
f) Encounter on the Boukoko - Bangui trail

Every fortnight, we had to go to Bangui, renew our supplies, make various purchases. Sometimes, the track... Impracticable... Jeanine and Eric were devastated... Back to La Case faster than expected (!). This event can allow us to collect small arboreal animals from the inhabitants of a giant that has just collapsed. In this way, I was able, among others, to photograph:

The Tree Daman, ***Dendrohyrax arboreus*** and the very rare ***Arctocebus calabarensis***:



End-February 1966 and mid-February 1970. *See another one* p. 481 (**MB Phot**s).



The sumptuous laboratory of La Maboké, the former Central African Forest Antenna of the MNHN, created by **Pr Roger Heim**. The rear entrance guarded by the "Termitière de Service" in 1965/70 (**MB Phot**).

B) Great Central African Savannah and National Parks

In order to develop fruitful prospecting in the great savannah areas, I needed a solid all-terrain vehicle. In Boukoko, I had a Citroën 3CV sheet metal van, perfect for the IFCC Centre and the plantation roads, but not suitable for expeditions equipped for several days or weeks of investigations in the Savannah. A Land Rover, a large 4x4 vehicle, was lent to me several times by **Pr Heim**, also Director of La Maboké.

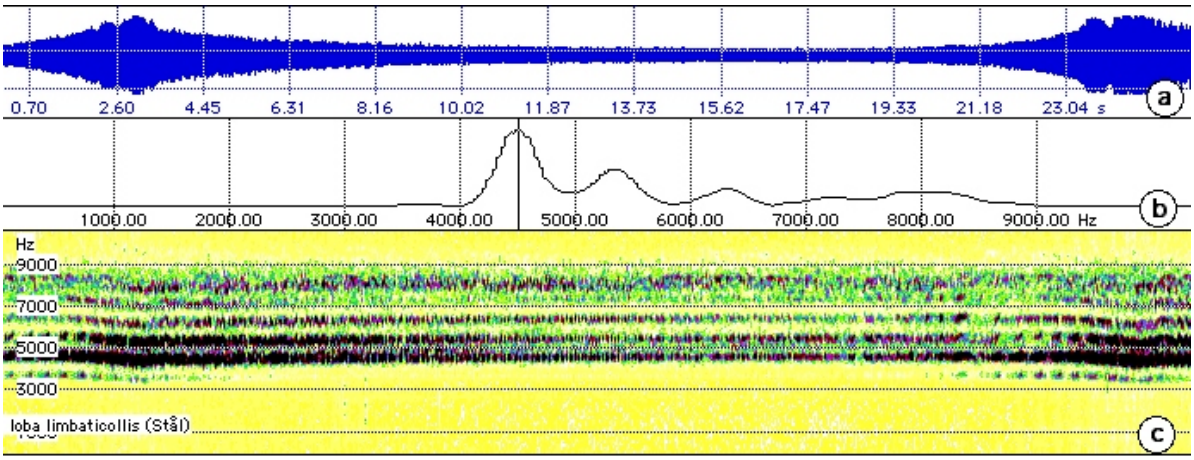
April 2, '68. Preparations OK! We took the N'Délé trail... (JB and MB Phots)

a) The Main Savannah Cicadas of the Central African Republic

-> *Ioba limbaticollis* (Stål, 1863)

Less rich in species than the large rainforests, the savannas, especially the tree-covered ones, however, have representatives demonstrating similar adaptations to this environment. Even in the savannah, some great cicadas have juveniles with a waxy tomentum and can accumulate their excremental liquid at the bottom of their burrows. Such was the demonstrative case of ***Ioba limbaticollis*** (*cf.* Boulard, 1975h). The males in this marvel savannah cymbalise, throughout the sunny days, **long 'whistling' sequences with very largely sinusoidal tones.** Impossible for any wanderer, even cicadologically novice, to miss it.

Ioba limbaticollis (Stål, 1863), **male in the typical attitude taken to tymbalize.**

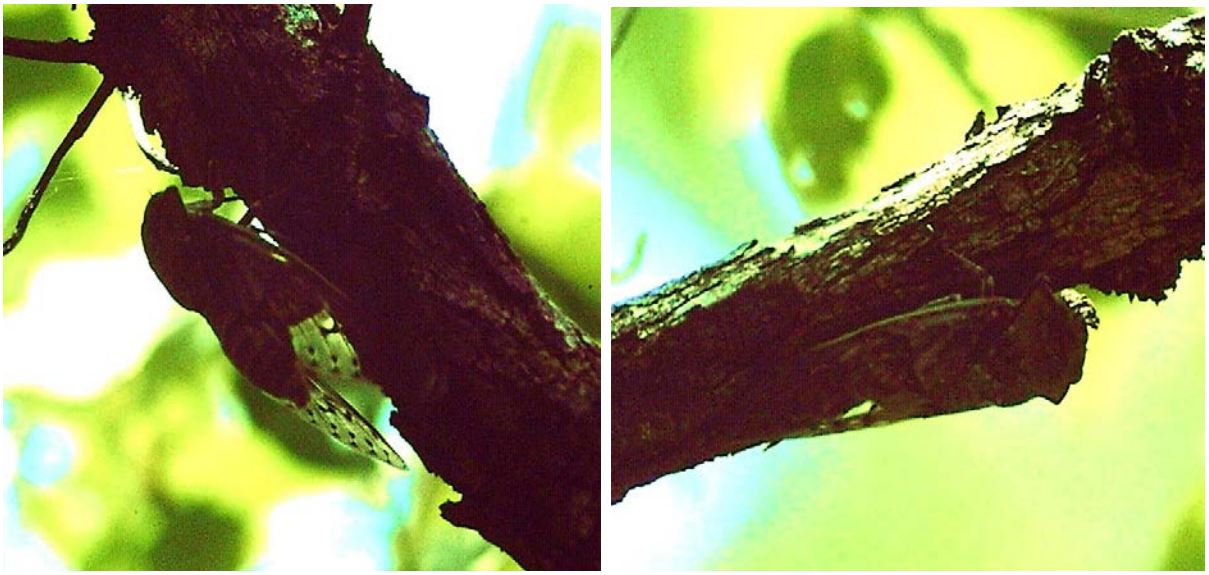


Ioba limbaticollis, elementary **AIC (a)** Waveform, 25 seconds of time signal; **(b)** Mean spectrum; **(c)** Spectrogram, multi-frequency graph, formants more powerful than the fundamental.
RCA, Saint-Floris National Park, large wooded savannah, April 1968 (MB phot, on *Signalyze 3.5*).

Ioba limbaticollis, a dish appreciated in the savannah.

The Boffis, a small ethnic group living in the savannah of Central-Eastern of the CAR, consume these great cicadas. They capture them with fat balls attached to the top of long poles. Touched and engulfed by the fat, the Cicadas (the males cymbalizing in fear) fall to the ground and are quickly picked up, their wings torn off and eaten instantly, or cooked (**Boulard, 1975h**). A technique found 30 years later in Thailand (*cf.* p. 297).

Aspect of the vast, unburnt, wooded savannah between Bambari and the Gounda (CAR), with *Lophira, Burkea, Terminalia* and *Erytrina* predominate. On the latter, we have sometimes seen, on the high branches, ***Ioba limbaticollis*** on the opposite side to the sun, cymbalizing or not:



By too strong sun, these large Cicadas are arranged in the shade of the branches and twigs. the one on the left tymbalize, the one on the right, no. April 1969 (MB phots).

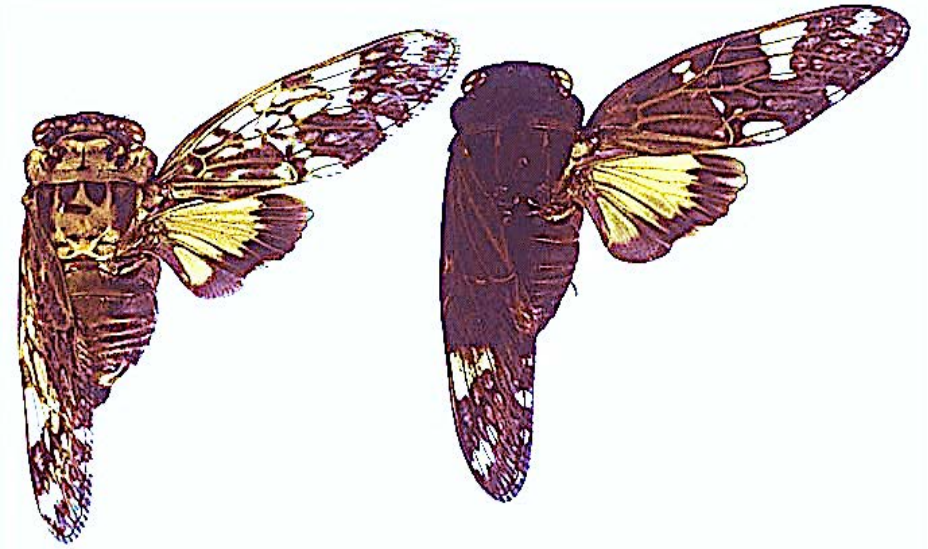
b) Mimetology, two cicadidaean examples

> Ustusian melanism

Encounter, announced by its cymbalization, of an almost invisible and unpublished corticultural species, which became ***Soudaniella cortustusa*** Boulard, 1974. It also became the leading example of Ustusian melanism, a subclass of mimicry created the same year. Species in the "small medium size, 25 mm long" with a habitus normally corticiform in analochromic concordance with its usual supports in authentic savannah, but which can present a strong melanization of all its dorsal face, linked to bush fires licking in black the bark of trees.

Nocturnal bush fire in the savannah north of Boda in CAR (MB phot)

The following document shows, on the left, the nominative form of the species **cortustusa** (originally phloeomorphic livery, in pictorial harmony with the natural bark) and, on the right, the melanic form, black livery (unchanged hind wings) developed by populations of the same species living in savannah areas subject to bush fires, obliterating the appearance of the bark in black,



Controlled adaptation, but raises the problem that juveniles are hypoaged. However, the imaginaison, **Juvenile V -> J. V mature**, takes place in soils mixed with soot, so that at the end of such environments, the new *Sudaniella cortustusa* hatch melanized:

I could pass ‘n’ times close to fragments of ‘*silent bar*k’... Finally immortalized easily on my slides... So much the small Cicadas showed themselves "confident" in their "burnt copies"...

Close-up of two ***Soudaniella*** melanics on the burnt bark of a Combretacea.
Wooded savannah of Mbouma (CAR), March 1968 (MB phots).

> Phyllomimesis of *Lacetas annulicornis* Karsh, 1890

Same in the savannah of Boda, interviews in natura with a strange little Cicada, entirely green and foliar-looking. Conical head and thorax, with long, broad, polynervurous and tegminized (hardened) forewings. Perfect mimesians, the ***Lacetas***, are *leaf-cicadas* of the orthogonal type (***cf.*** **Boulard, 1985**).

Lacetas annulicornis ecophotographed in the Boda savannah in Central Africa (**MB phots**).

A fundamentally fixed state, their lineage not having evolved with the appearance of antropic fires, like that of the previous species, both of which, however, share the same original biotope, subsoil and aerial sylvae (***cf.*** **Boulard, 1975h**).

Mockers, my Central African "observers" ... What good and fruitful moments I spent with them... Always in a good mood and rarely tired. **Boda Savannah, RCA, 1967, with Ambroise Mondziaou, Paul Kombo** and **Oscar Ngouma**, who takes the picture.

c) Snapshots in the Pygmies

With Ambroise and Paul, I got to know a **Babingas** family, pygmies living in the thick Central African forest adjoining South Cameroon. From La Maboké, after about 36 hours of interesting walking, we arrived, early dawn, at a village of huts, deserted! We waited, taking pictures of the 'atmosphere'...

Then the locals took a bold step. Thanks to my two companions, they accepted the "clicks" of the strange thing I often wore on my face... (Info: MB, 1.75 m)

Central African Republic, Babingas Village, January 1966 (MB phots)

d) National Parks

A small Savannah Cicada, belonging to the genus ***Trismarcha***, which is not susceptible to mimicry, was detected in an apparently intact part of the Saint Floris Park in northeastern CAR. A new species, with hind wings pointed with bistre at the base, it was dedicated to Professor Roger Heim: ***Trismarcha heimi*** Boulard, 1975.

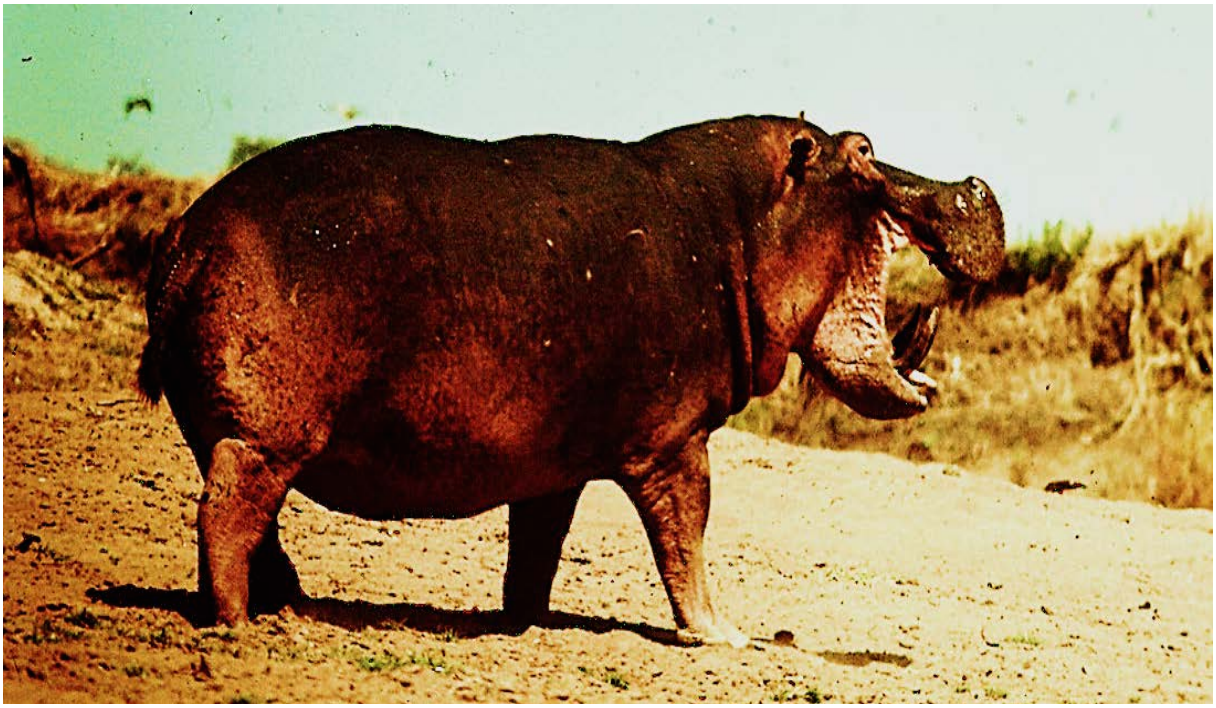
The parks of Gounda and Saint-Floris, prestigious in CAR, particularly seduced me by the great fauna which remained there at that time (since then, alas, we know the ravages of poaching, irresponsible hunters and the impotence of animal rights). Seeing and photographing Lions, Elephants, Giraffes, Buffalos, Antelopes... Have anchored in us, wife and children, excellent and definitive memories. Consequently, **some Images of Happy Times** offered below for sharing:

A quiet happiness...

One elephant can hide another... (MB Phots)

Great savannah of La Gounda, about 17 hours ... The earth trembles ... Passage of a long herd of Buffalos in gallop but without bawling! **(MB Phot** *on unstable Agfacolor***)**

Often the most peaceful, but a little restless at your approach... La Gounda, April 1969 **(MB Phots)**



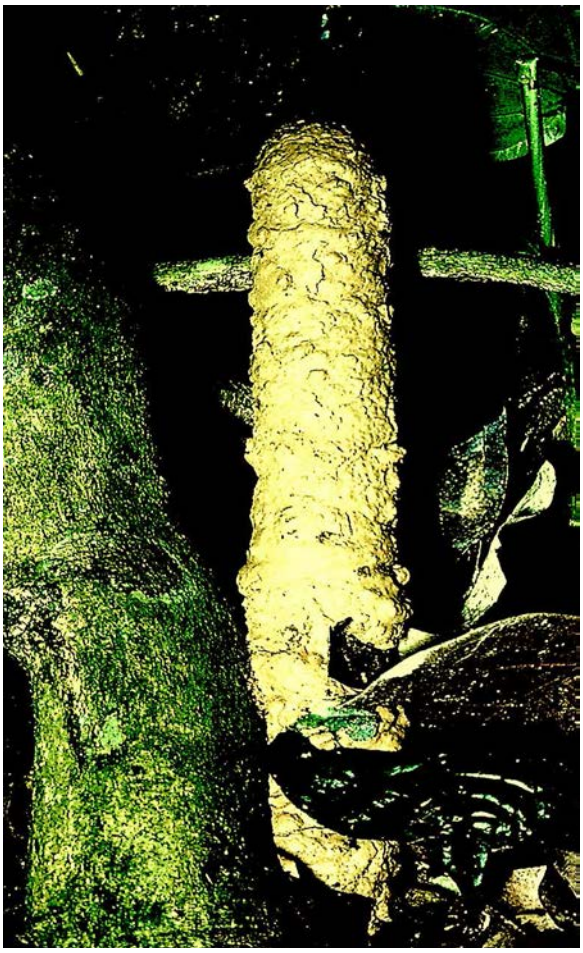
A certain aesthetic... A mass on short legs... A funny, huge face, with inverted "fangs"?! With no other adaptation expressed than "ears, eyes, nostrils" on the same waterline.
La Gounda, April 1969 **(MB Phot)**

And the Nesting Birds of the Sandy Shores:

Scarlet bee-eaters, *Merops nubicus*. RCA, La Gounda Park, April 1969 **(MB phot)**

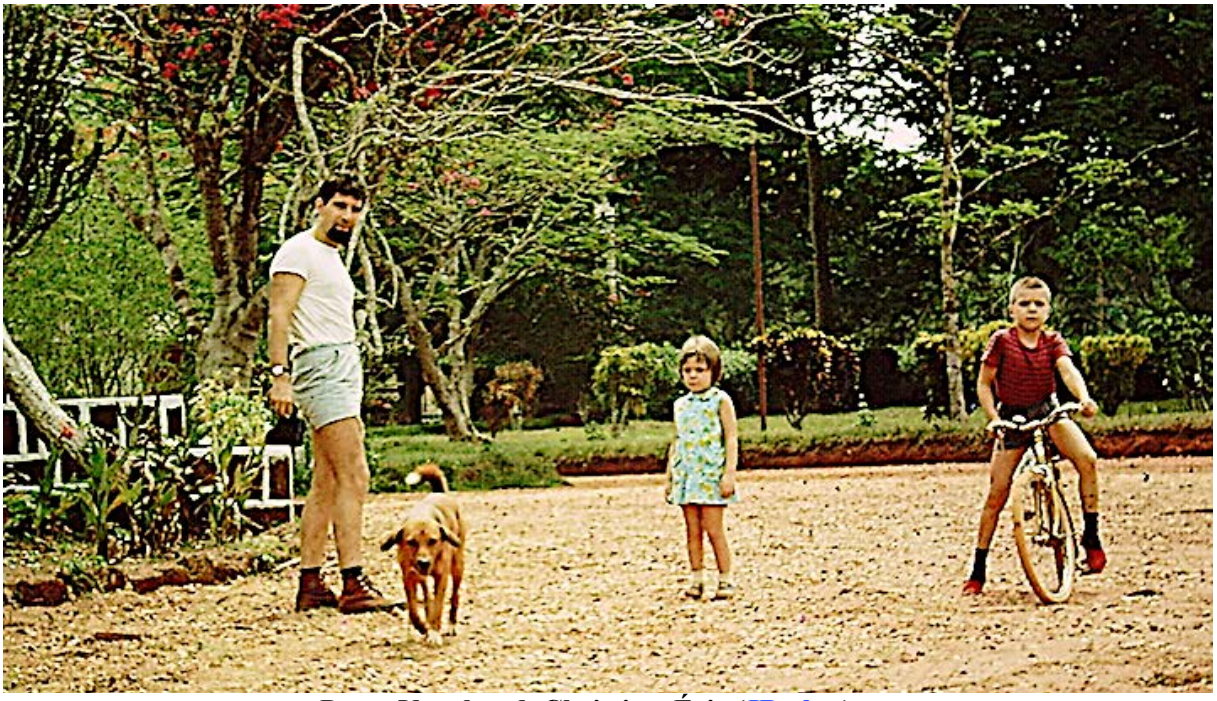
e) For the Record

Near the commemorative stele to honour of **Pierre Savorgnan de Brazza**, explorer of Central Africa.
Haute-Sangha, juillet 1965, MB with, from right to left, Oscar,Mondziaou et M'Balé.



The extraordinary ***Muansa clypealis*** in its works **(MB Phots)**

The Boukokoise "Boulardière" 1965-70, its wide varangue and, upstairs, the classroom. In Lobaye, RCA forestière (MB Phot)



Papa, Vagabond, Christine, Éric (JB phot)

We had a dwarf goat farm, as well as some laying hens in the vast field which was allotted to us;

We built a small swimming pool (3 x 5 m) in the patio of the 'Boukokoise'.
Mom and Christine (MB Phots)

Christine and Cégo, a young chimpanzee we adopted as a baby...
"*The last one*", strangely successful!
RCA, Boukoko, 1965-70 **(MB Phots)**

Boukoko, the territory of the entomologists, "Boss and observers". The 'lab' preceded by a small 'Exhibition Hall' very much appreciated by the visitors, one of my large cages and the Insectarium. Formidable "pied-à-terre" to which a 3 CV Citroën, a sheet metal van, was assigned**.**
(Photo Oscar Ngouma).

Powerful bush fire, far away... Not enough to panic some bush dwellers.
RCA, on the Bamingui runway in April 1978 **(MB Phot)**

Christmas '67 and its local "tree", a spurge... Boukoko **(MB Phot).**

5$_3$) Côte d'Ivoire, second stay

Ten years passed before I could return to Côte d'Ivoire. A mission, EPHE and Museum, was motivated by the number and quality of the species collected in 1985 by **Guy Couturier**, another 'Ostomian' friend, in the Taï Forest Reserve in lower Côte d'Ivoire, not far from the Nimba, a little further north. 23 cicadidae entities including 5 species and 3 new subspecies. Excellent material processed immediately with the precious help of **Jeanine**, *then a laboratory assistant at EPHE*, for the preparation of specimens, wings spread out and the talent of **Hélène Le Ruyet-Tan** for the drawings devoted to new species (**Boulard, 1986b**).

-> ***Sadaka radiata radiata*** (Karsch, 1890 : Boulard, 1986); -> ***Ugada limbta occidentalis*** (Fabricius, 1775: Boulard, 1986); -> ***Ugada grandicollis taiensis*** Boulard, 1986 -> ***Ugada taiensis*** (Boulard, 1986);

-> ***Trismarcha guillaumeti*** (Boulard, 1986); -> ***Lamotialna couturieri*** Boulard, 1986; -> ***Nablistes heterochroma*** Boulard, 1986; -> ***Maroboduus maxicapsulifera*** (Boulard, 1986).

In the meantime, **Yves and Dominique Gillon** had sent a few homopterans lost in their ecological tests, including a Cicada very curiously deprived of tymbals, but equipped with a stridulatory system, this one became by my care ***Ydiella gilloni*** in 1973. On this species, I will have to come back a little further.

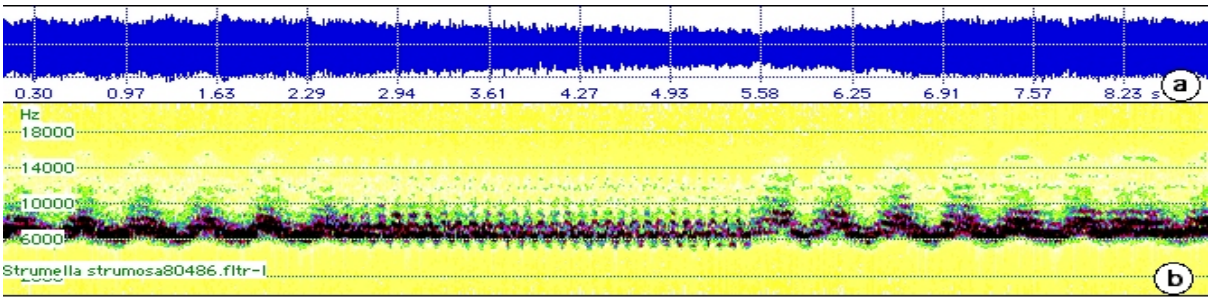
a) The Boundiali savannah

From March to May '86, I returned to the country, obviously more able to appreciate the great coastal forest and the immense savannah. Luckily, I also found **Jean-François and Josianne Mamecier,** known friends in the CAR, who often offered me table and lodging. I was able to widely test the savannah, especially in the vicinity of **Boundiali**, a village adjacent to a forest remnant.

Several Cicadas of the genera ***Afzeliada, Ioba, Soudaniella*** and ***Strumosella*** were objects of my attentions, notably ***Soudaniella seraphina***, here on the left and ***Strumosella strumosa,*** on the right

(MB Phots)

Strumosella strumosa (Fabricius, 1803), a common species in unburnt savannah, emits an astonishing tymbalization in long "zip" waves, interspersed with short sequences emitted 10 times faster, worthy of being transcribed into images. Here is an overview of its AIC



(MB record, 1999b, *on Signalyze 3,5*).

b) The Taï and Divo forests

In the Taï forest, the species brought back by Guy were taken up again and a few others, newly collected, were added. Most of them, for the first time, were recorded in situ, as they informed me of their relative interventions regarding the concomitant or successive occupation of the cicadidae sound space of this forest (*cf.* above, p. 33). I found and photographed two specimens, below left, female & male of ***Attenuella tigrina*** (Palisot de Beauvois), a species captured at the foot of the Nimba in 1964.

In this same beautiful forest, one evening I was able to flash a splendid multi-capped termite mound that could only be attributed to a *"Cubitermes sp.?"*

Côte d'Ivoire, Taï Forest, April 1986 (MB Phots)

Specimens were bred, especially small canopic species obtained from light traps. It was the case, in particular for one of them, which I could not supply adequately... Clumsiness which led to an astonishing drama for the insect, but accusing and significant for the operator. The caging of a female of ***Lamotialna couturieri*** Boulard, collected the day before in the light with the desire to photograph it, then the hope of seeing it lay, turned out to be a failure…

(MB Phot)

Just enough time to take 2 or 3 shots of the little Cicada drinking from one of the plants offered... When it was knocked over, it fell to the bottom of the cage, dead! The proposed plant, recognizable by its stems and branches with a quadrangular section, was *Dioscorea preussii* Pax determined by *Lucile Allorge*, a fellow botanist. The sap absorbed, a violent poison, very demonstrative. The little Cicada, apparently thirsty, solicited the first possible plant, in accordance with the largely non-selective Cicada polyphagia.

Still in Ivory Coast, but in the forest of Divo, I witnessed again one of the first natural dramas, called elsewhere "**Encounter of the 4th Type**", fatal meeting since involving belligerents bionomically obliged, prey and predator. While I was trying to line up a series of small Cicadas, a long and strong ***Mantis*** was devouring a big Cicada. Taken pictures, which, with an eloquent look, the ogress, surprised and disturbed, did not seem to appreciate.

The Mantis, a *Plistospilota guineensis* Roy, 1965.
The Cicada, an *Ugada taiensis* (Boulard, 1986) (MB phot).

A few steps away, indifferent, another male ***Ugada taiensis*** tymbalized. As for the tiny Cicada (dimensions of the male and female types: 14/16 mm total length, 23.4/28 mm wingspan), it was described ***Panka parvulina*** Boulard, 1995.

To conclude my Ivorian chapter, I will have to remember the "Dantesque" memory of a theatrical game where a poor Cicada did not have the best role. In the same Taï forest, I witnessed one of those endless eco-ethological dramas, but where I was also a bit of an actor and which ended with a superb unexpected.

(See p. **415/416**: **H > Surprising arachnophilic midges).**

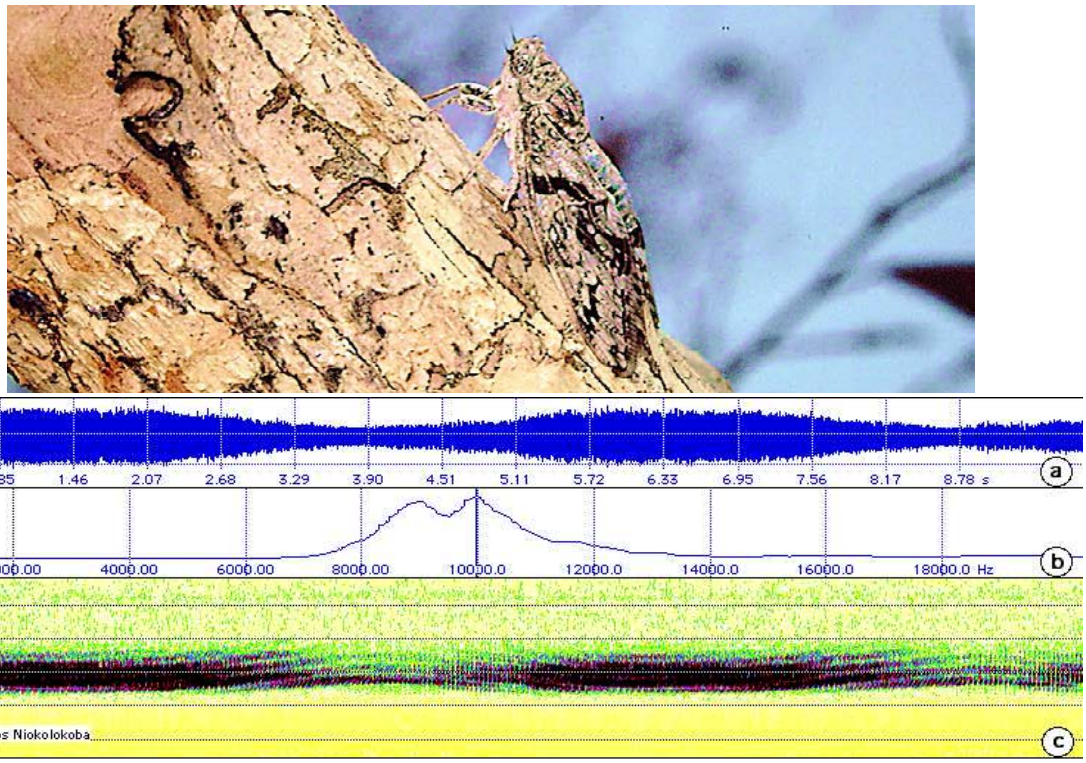
5₄) Senegal. Personal mission to the Niokolo Koba Park, May 1986.

a) Dwarf buffaloes. It's a forest subspecies of the great Buffalo,

Amazingly, foresters described as *nanus* (MB phot)

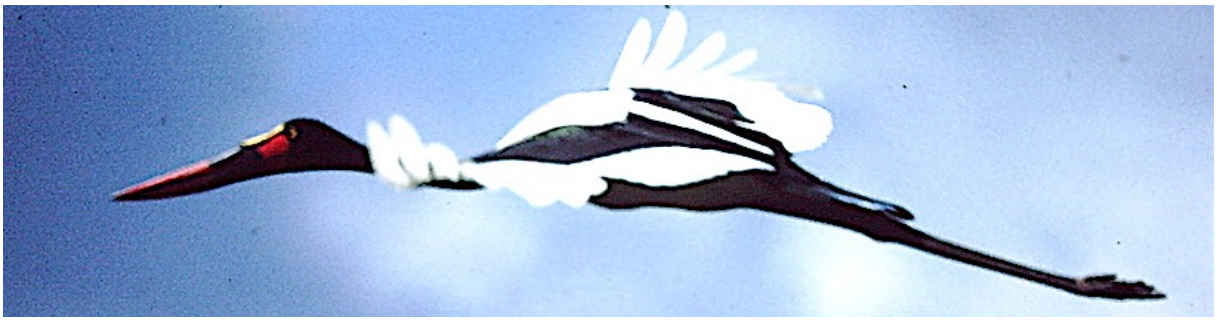
b) A small Cicada: *Soudaniella latipes*, one of the most western African species

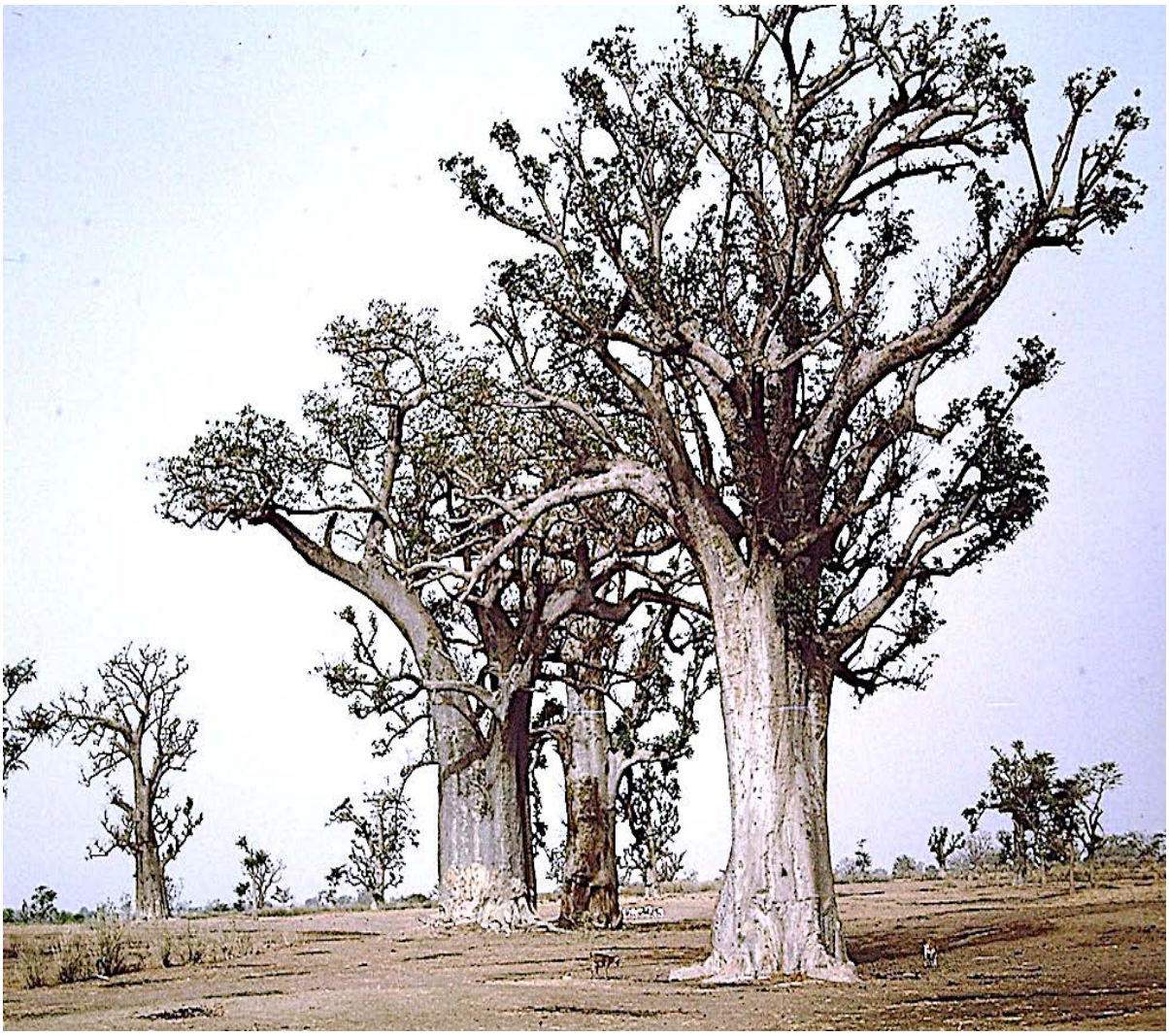
In this beautiful savannah with medium trees, after having photographed the Buffalo and a young *harnessed Guib* (*cf.* p. 482), I meet small **mimesian** Cicadas, perfectly adapted to the dry forest. First recordings and first eco-photographs... Determination at the Museum, *Platypleura latipes* Karsch, 1890, which I had to reclassify in a new genre: ***Soudaniella*** in 1972. Image of a male in the typical attitude taken to tymbalize (wings lowered, abdomen slightly arched), followed by a *closely undulating* **AIC**



Sudaniella latipes (Karsch, 1890). Indicative **ACI (a)** 10-second pictorial transcription of the Time Signal; **(b)** Mean spectrum; **(c)** Spectrogram according to (a), centred on 10000 Hz (**MB Phot. & *Signalaze 3.5***).

Further north, sub-desert, no Cicadas, but Baobabs, to ecstatic a Parisian ... "Flying over by the mirage of an *Ephippiorhynchus senegalensis*, Jabiru apparently back home, having had the good fortune to be photographed in Malawi! (*cf.* MB Phot, p. 125).





(MB Phot).

5₅) Sâo Tomé Island (On collection material)

On this island located in extension of the Cameroonian ridge, Cicadas were collected and conserved, not classified in the Museum, like many others. Recognizing them and incorporating them with those brought back from Boukoko-La Maboké was one of my concerns.

a) Genus ***Afzeliada*** Boulard, 1972. On this island, most of the species belong to this genus; one, long known, had to be reclassified as ***A. afzelii*** (Stål, 1854); the others, new, were named and described: ***A. lusingana, A. caluangana*** and ***A. donskoffi***, Boulard (1979f).

b) There would exist, on this island, only one species, ***Canualna schmitzi*** (Boulard, 1979f: Sanborn, 2020). Cigale so far unreported elsewhere.

5$_6$) Annobón Island (Equatorial Guinea), statutory Rectification

The species originally named "*Platypleura liberiana*" Distant, 1912 was reclassified in the new genus "***Canualna*** Boulard, 1985: 184". Here is the first colored picture of the type

Canualna liberiana (Distant, 1912), homotype, 77/28mm.

This species originates from Annobón (or Pagalu), an extreme island in the Gulf of Biafra, not from Liberia, as stated in the original description (*cf.* Boulard, 1985c).

5$_7$) Angola (On collector's material)

On material provided by my colleagues **A. de Barros Machado** (Dundo Museum), **José and Umbellina Passos de Carvalho** and **F. Romero Monteiro** (Nova Lisboa Institute of Agronomic Research) and **José A. Quartau** (University of Luanda).

Faunistic study with biogeographic approach of this vast western part of south-central Africa. 12 genera and 35 species, including 8 new ones, ***Afzeliada helenae, A. passosi, Brevisiana quartaui, Panka duartei, Platypleura machadoi, Soudaniella dlabolai*** **(Boulard, 1972b, 1975e)** and ***Dyticopycna umbelinae & Dyticopycna passos decarvalhoi*** (Boulard 1972: Sanborn, 2020),

6.- In Eastern Africa and the Indian Ocean

6$_1$) In Kenya

Mission Museum and C.N.R.S. October-December 1972. During this mission, I was able to discover the country thanks to the help of **Dr Anne Spoerry** and her colleagues of the "Flying Doctors Services" of Nairobi, as well as to that of **Mr and Mrs LLewelyn**, "gentlefolk farmers" who, at the foot of Mount Kenya, kindly offered lodging to a young stutterer barely speaking English.

Mount Kenya in October around 8:00 a.m., before the clouds make it disappear for the rest of the morning. At the foot, the lawns still under dew (early November 1972, **MB phot**, from **Timau**).

a) The sub-top prairies and eco-ethological shock

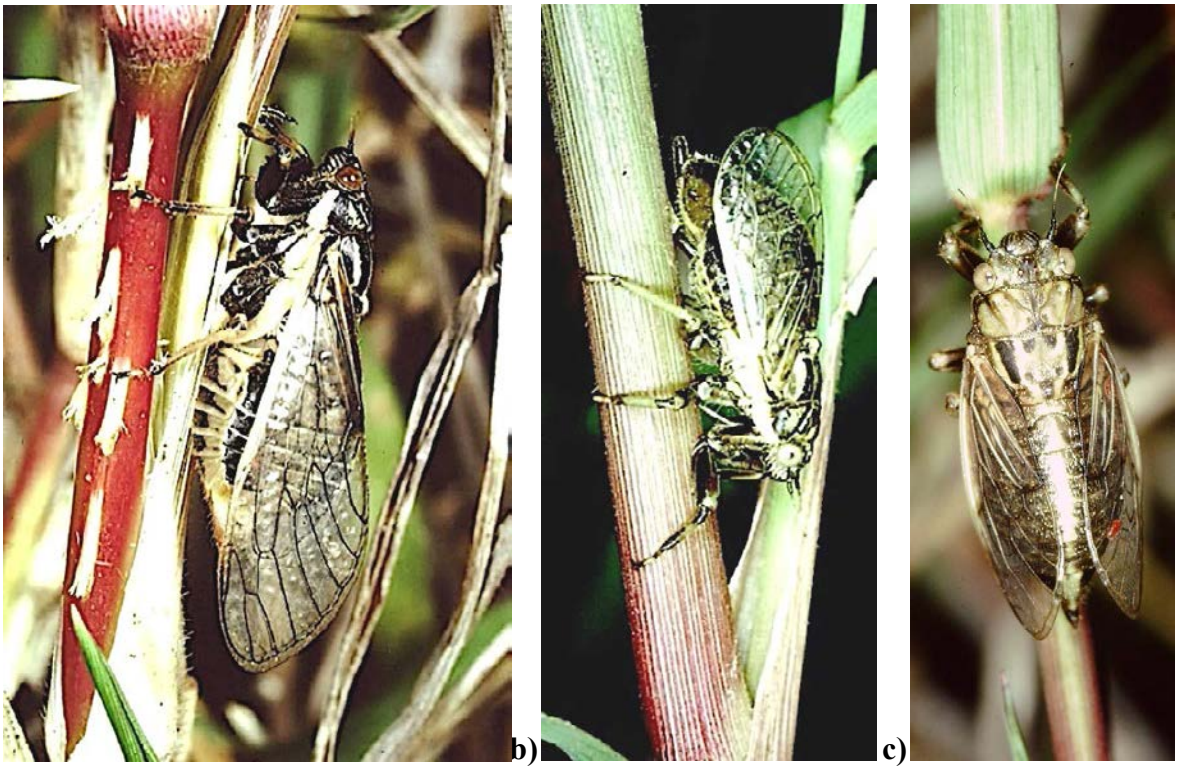
Leaving by car the property of my hosts to return to an environment considered more favourable to the Cicadas, I travelled several kilometres of the grassy expanses characterizing the base of the Kenyan Mountain. Several kilometres, accompanied from time to time by "croaking jumps". I finally stop and see what this frog was...

In fact of batrachian, **a small Cicada**! My blood was just a trick! A Cicada fluttering croaking, never heard before… Such tymbalizations! One week on the spot, this croaking species, with normally winged males, taught me a lot about its bionomy and a little bit about its biology. Back in Paris, this discovery caused a "sensation" during a session given at the SEF, *Entomological Society of France*, especially as it was learned that it was a new Cicada belonging to a new genus.

In my publication informing about this discovery, I named this species ***Spoerryana llewelyni*****,** happy to thank **Anne Spoerry**, French pioneer [much regretted] of the "Flying Doctors Services", as well as **Mr and Mrs Llewelyn** (also extinct), but to whom I owed a week without household worries.

1) Singular biology of *Spoerryana llewelyni* Boulard, 1974.

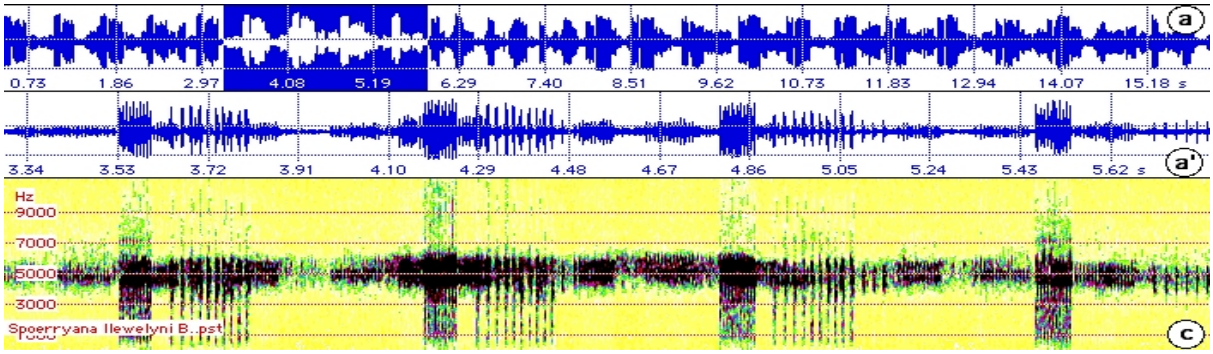
Mini cicada that has invaded the grasslands at the foot of Mount Kenya. Surprisingly, the females, smaller than the males, are **brachypterous and unable to fly...**



a) **b)** **c)**

Spoerryana llewelyni Boulard, 1974. **(a)** Male clinging to a grass stem, where white chips indicate laid eggs, upside down as seen in **(b)** by a female in action **(c)** An other female, brachypterous as above.
Mount Kenya, basal grasslands, November 1972 (MB Phots)

> **A croaking tymbalization**: a captivating fact and so far, not even imagined, males with normally developed wings fly in search of females, from clump to clump of grass, while cymbalizing in a coarse manner, evoking not a Cicada, but some frog, or a little crow! A mature female will climb briskly to join the jolly male who has fallen on its clump of grass (Boulard, 1974n):



Spoerryana llewelyni, **AIC (a)** Waveform temporal; **(a')** Expanding "croakings"; **(c)** Spectrogram placing most of the tymbalization centered on 5000 Hz.

Basal grasslands of Mount Kenya, November 1972 (Boulard, 1977m & *S. 3.5*)

> Ethology of mature juveniles emerging *(peudo-nymphs)* **from the ground (dry ground)**

***Spoerryana llewelyni*, Sobueguia Prairie, near Timau, November 1972 (MB Phots)**

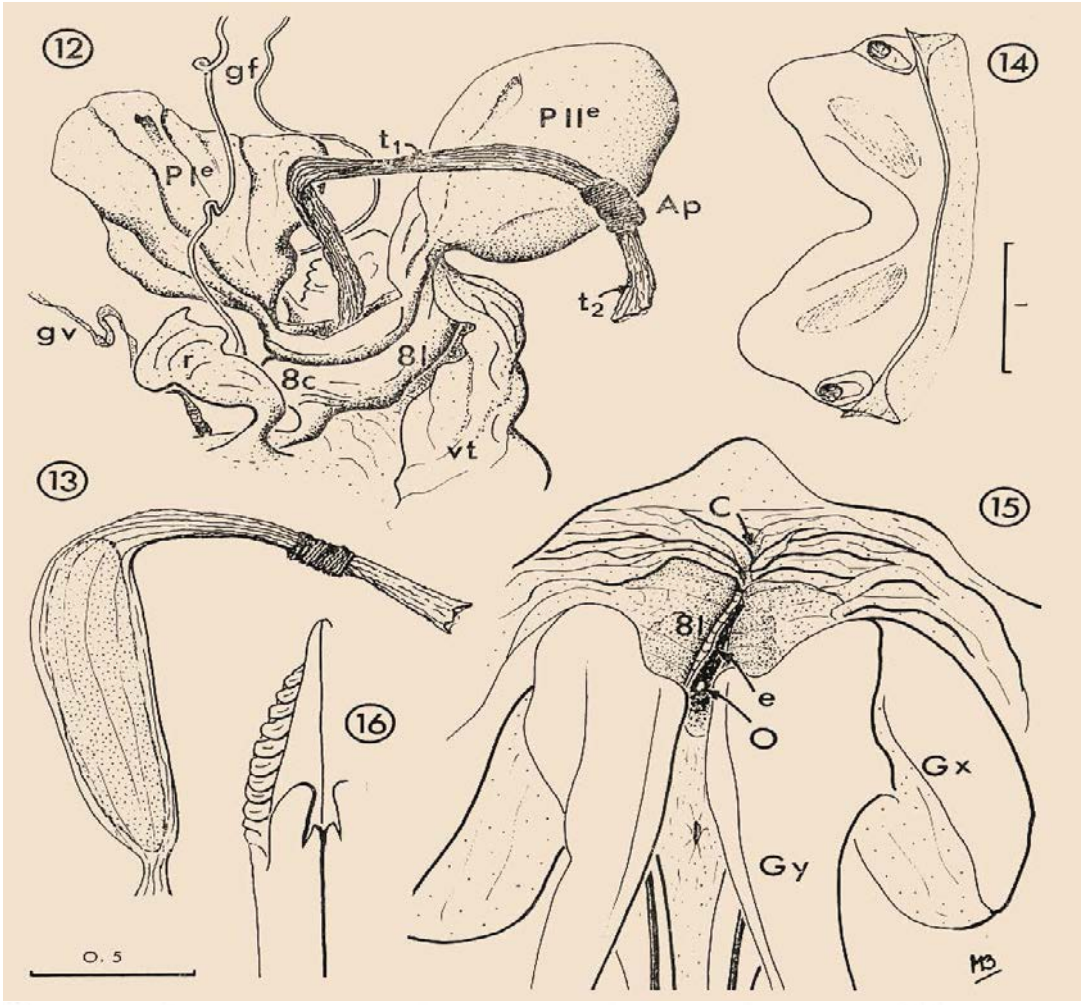
->Anatomy of the female genital tract

It was a good opportunity to fix a few specimens of this small species to be dissected, submitted to the microtome and to try to bring new structural and biological elements that could support my Thesis. I was very pleased, having then been able to note:

> the complete isolation of the mating and egg-laying tracks,

> the existence of a second purse supposed to have an excess of sperm,
> the uniquely "tubular" shape of the seminal ampulla, whether filled or not...

This is explained in the following plate, taken from my article published in 1974, which also contains the associated histological data, not reproduced here.



12 à 16, *Spoerryana llewelyni*, n. g., n. sp., ♀. — 12, voies génitales ectodermiques vues de profil droit (Ap : ampoule séminale; gf : glandes filamenteuses; gv : glande spermathécale ou vermiforme; P I^e : pera spermadelens postérieure, primaire; P II^e : poche secondaire antérieure; r : réservoirs des glandes filamenteuses; t_1 et t_2 : portions tubulaires proximale et distale de l'oviducte commun; vt : vestibulum; 8c et 8l : parties centrale et latérale du huitième sternite. — 13, ampoule séminale et oviducte d'une ♀ fécondée fixée au moment de la ponte. — 14, ovivalvula. — 15, base de l'ovipositeur et St. *VIII* extraits du vestibulum, vue ventrale montrant les bords latéraux du sternite découpés (8 l) et laissant voir la paroi (e) de l'entonnoir oviductal et l'oviporus 0 (comparer avec fig. 22 et 23). — 16, tarière en vue ventrale, serratule et apex bilobé de la gonapophyse droite. (Echelles en millimètres).

Male captured by a ground spider (MB Phot).

2) Crapahut in the Ngare Ndare forest

-> **Rediscovery of a historical Cicada** on a forested section of the Mountain, meeting with a splendid species, specimens of which were collected by our great elders **Charles Alluaud** and **René Jeannel** during the first MNHN East African Mission. Here is one of mine (!) feeding on a strong branch

Platypleura argus Melichar, 1911. First eco-photo of a male trying to place the apex of his rostrum properly for feeding. **Ngare Ndare forest, November 1972 (MB Phot).**

-> **Impromptu untimely!** Two hornbills took fright, at the same time that me!

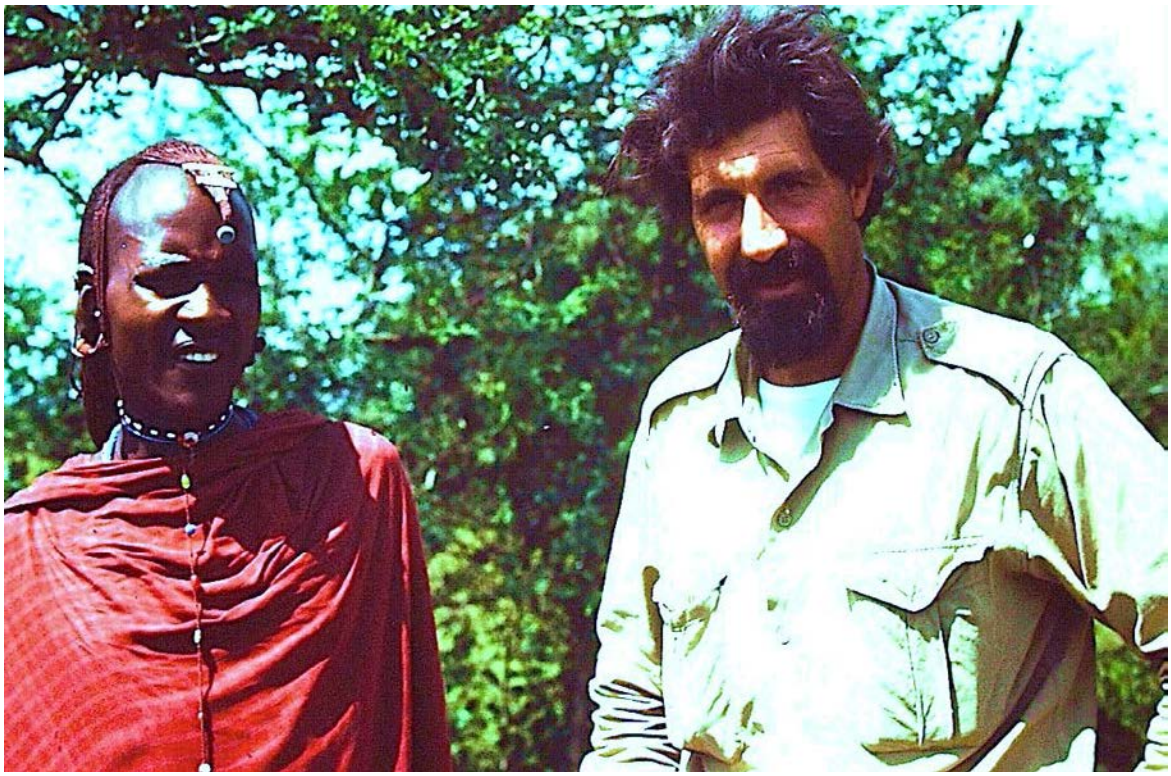
Both of them, ***Ceratogymna atrata,*** left me this 'business card'. **Ngare Ndare forest, XI 1972** (**MB Phot**).

b) East African Savannas

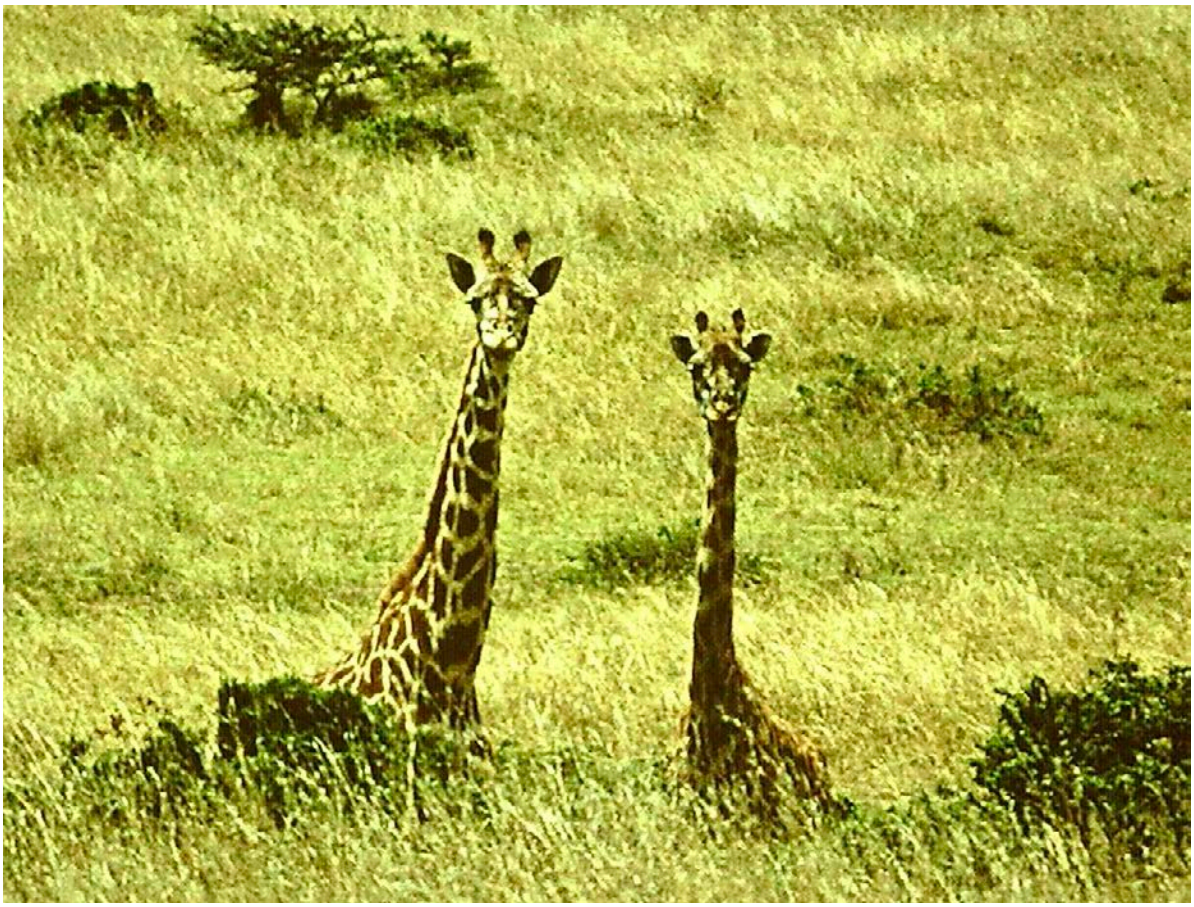
1) The great expanses

I have travelled extensively through the Flying Doctors' drop-off points, i.e. the bush dispensaries, explored the surroundings and shared excellent moments with the medical teams

and the Maasai, who were surprised to see me often with my head up in the air, sometimes on all fours, always 'camera' or net in my fist...



As well as the great fauna...



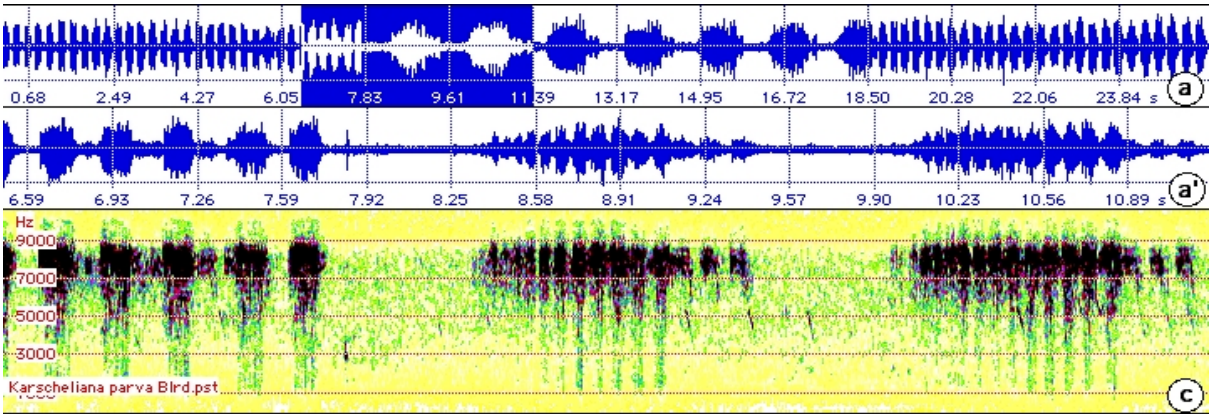
Even bothered a Sagittarius, who offered me this shot

And admired the flamingo crown from Lake Nakuru (MB phots. November 1972).

2) Herbaceous savannah, sometimes with trees, celebrated by many tymbalizations.

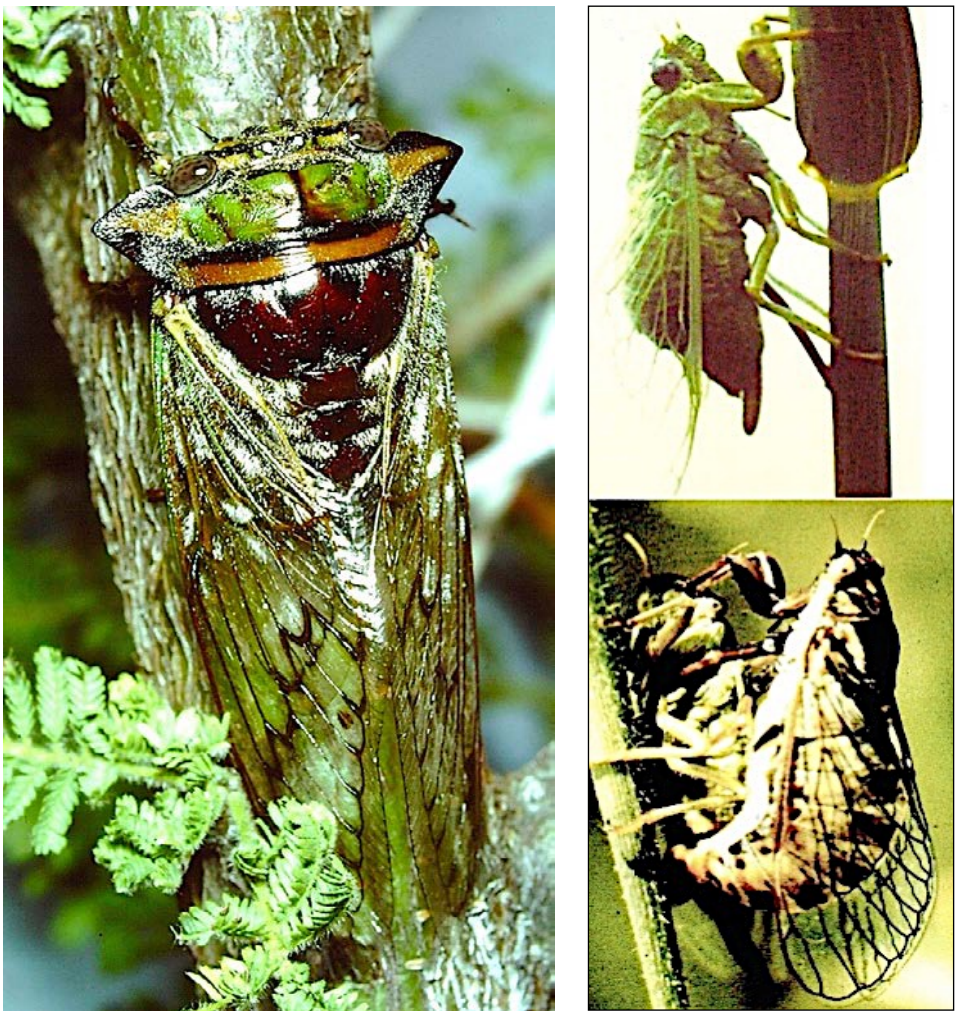
> ***Dyticopycna baxteri*** (Distant, 1914: Sanborn, 2020) and ***Karscheliana parva*** Boulard, 1990a. In the bush of the wooded hills of Isiolo, during a dazzling full day, I had great difficulty to locate the Cicadas which surrounded me... They were under the branches or clinging to the trunks, opposite side to the sun, their color merging with the bark thus shaded,

Dyticopycna baxteri (above, left), therefore seemed not to appreciate the warm rays of the sun (**MB phot**). This confirmed the first observations noted in CAF, with *Ioba limbaticollis* (*cf.* p. 91). Further on, a small, frankly heliophilic Cicada appeared. An approached male tymbalized, lowered wings, abdomen vibrating up and down, thus modulating its nuptial call. Species that required the creation of a new genus and the description of the specific type immortalized in full action, ***Karscheliana parva*** (above, right). Here is the AIC, worthy sonotype of this small tymbalizing species:



Karscheliana parva Boulard, 1990, AIC **(a)** and **(a')** Temporal oscillograms, then expanding the two types of tymbalized modules; **(c)** Spectrogram placing the bulk of the tymbalization between 7000 and 9000 Hz. **Isiolo bush, December 1972** (**MB phot & *on Signalyze 3.5.* Blrd, 1999b**).

> Encounter of a powerful, brilliantly coloured Cicada, with a *mimesian* head, having vast triangular paranota that I was later able to determine thanks to the BM (British Museum) Collections as ***Ioba veligera*** (Jacobi, 1904) reproduced below, left:



On the right, photographed in the Isiolo plain, a female laying eggs and a couple of a small heterochrome species (brown male, green female) infested with thorny bushes. Unknown until then, it was named ***Paectira feminavirens*** Boulard, 1977. **November 1972** (**MB Phots**)

Close to the previous small species was added, in the same publication, ***Paectira jeanuaudi*** Boulard, whose type slept, incognito, in the Collections of the MNHN, together with four other

specimens. A new historical species, also collected by **Charles Alluaud** and **René Jeannel**, during their East African Mission, mentioned above. ***Paectira jeanuaudi*** is the largest known representative of the genus, with a wingspan of 39.5 mm (**Boulard, 1977h**).

3) Steep savannah with large Acacias and the 'Lichen Cicada'

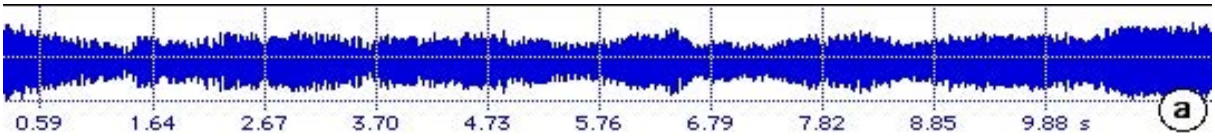
Encounter, in situ with great difficulty to apprehend it, of a male of ***'Pycna'*** magnificent species of the wooded savannahs of East Africa, in full cymbal exercise... Although relatively familiar with the Cicadas, it took me nearly a quarter of an hour, the ears imperatively, desperately solicited... To spot this male who was nevertheless standing at man's height, almost in front of me, "confident" in its mimicry and, therefore, not disturbed by my presence. For me, the species has become a very descriptive example of a subclass of accomplished mimicry, the ***lichenomimesis***. Moreover, its generic membership has just been redefined in ***Dyticopycna*** (*cf.* Sanborn, 2020).

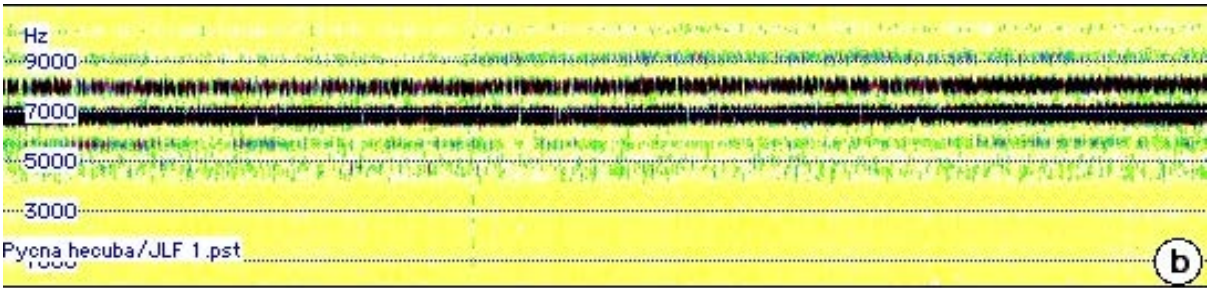
Once the Cicada was spotted, the photographic approach was quite easy. Somewhat enlarged, slightly flattened body, with inlaid colours and irregularly hairy, it takes on the slightly bluish appearance of the lichen thallus of the trunks of Acacia, its main host plant **(Boulard, 2007b/2012c)**. A magnificent mimésienne, it adorns the cover of the previous volume of may 2017,

Enlarged 'framed' portaits of ***Dyticopycna hecuba***, a perfectly mimetic species (**MB phots**)

Honour and memory. The tymbalization below transcribed, **sonotype** of the species and which I owe to **Jean-Louis Florenz**, is the one he recorded in September 1984. I am happy to contribute in this way to the Memory of this valiant friend who was taken away by a relentless illness. **Jean-Louis** was a great musician and, among us, more than amicably regretted. He wanted to use the sounds of the Cicadidae as the original medium for his creations, hence the contacts, which were too rare, and the few exchanges that we were able to have, as long as the sonic exploits of the Kenyan cicadas were able to bring us together.

At the EPHE, he was a pupil of **Yveline Leroy**, a great friend, who sadly passed away with the same disease.





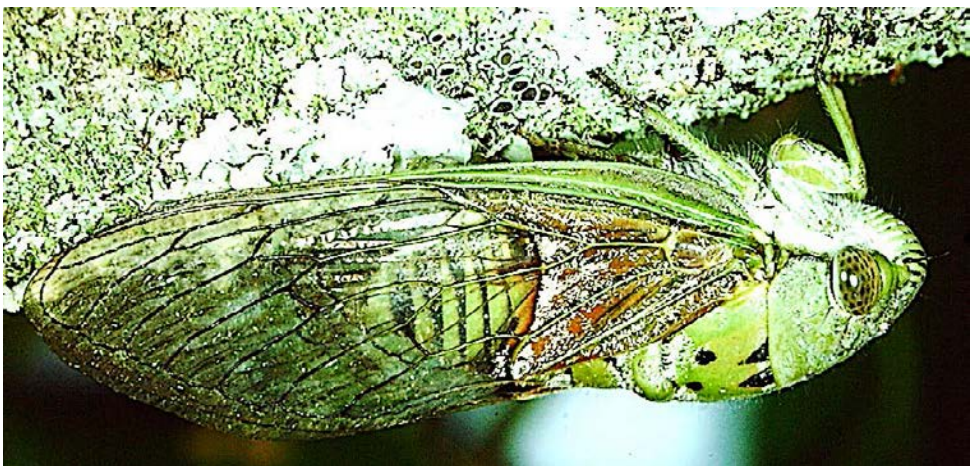
Dyticopycna hecuba, **AIC (a)** Waveform, 12 seconds of time signal; **(b)** Spectrogram, frequency graph with several parallel lines of force, tending to fade and disappear above 10,000 Hz.
Kenya, Submountain Acacias, September 84, JLF rec. (**MB *on Signalyze 3.12*).**

c) Gedi Coastal Forest

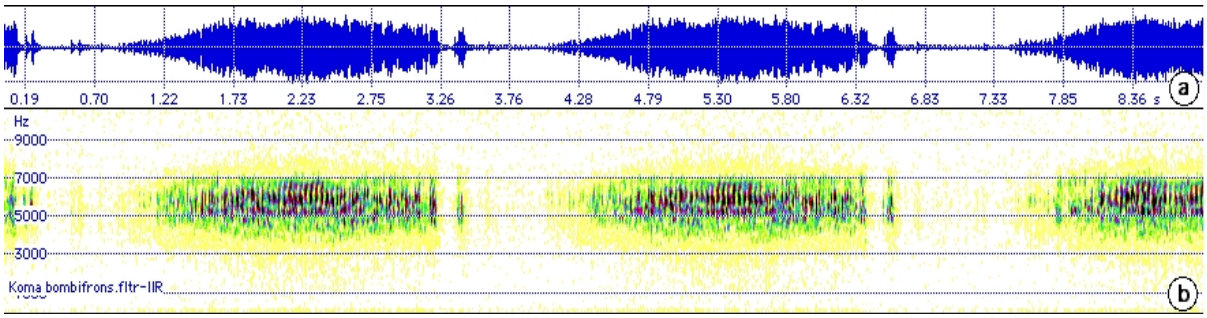
I first got acquainted with a nice little animal, long hind legs and a pronounced snout, interested in the surroundings of my tent where insects lay caught in the light and not relevant to me, but apparently good opportunities for him... "I drew its portrait". I knew later that it was a Macroscelididae curiously named "Elephant shrew" or, ungainly and wrongly, "Rat with trunk". Its scientific status, ***Petrodomus tetradactylus*** corresponds well to a large shrew with a long snout and high on legs,

Petrodomus tetradactylus (**MB phot. November 1972**)

In the following days, pictures and recordings were taken of ***Koma bombifrons***, the beautiful Cicada also described by Karsch in 1890.



The sound accents of this Cicada are very different from those of the previous species. This is shown by the pictorial transcriptions. The tymbalized stanzas are long and similarly repeated after short irregular silences, each one encloses a small projection,



Koma bombifrons Karsch, 1890. First elements of the AIC (*cf.* Blrd, 1996j; *on Signalyze 3,5*).

d) In the relatively humid forest of Meru National Park

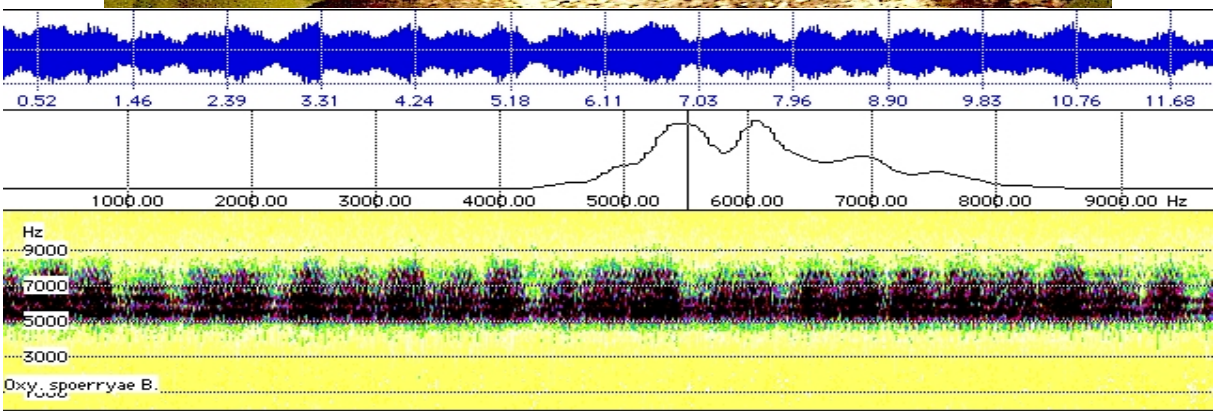
Camping and capture of a twilight-night ***Iruana*** in the evening. New, I later described it with the epithet ***meruana*** n. sp. Its tymbalization, emitted in low frequencies, has a curiously rolling tone (**Blrd, 1990a**). The next day, at the opening of my tent, my 135mm received an intriguing invitation from a beautiful company of reticulated Giraffes:

Meru N.P. December 1972 (MB Phot)

e) Tana and Marsabit volcano forest galleries

Eco-photographs, captures (December 1972) of tow species and descriptions (Blrd, 1980f)

> ***Oxypleura spoerryae*** Boulard, 1980, Cicada with light green back, white underside of forebody; white waxy patches on the veins of the hyaline forewings. Common in the gallery forest of the Tana River where males tymbalize, wings lowered, abdomen arched.



Its tymbalization is a long, tightly modulated whistle, with two peaks of effective frequency between 5000 and 6300 Hz **(MB Phot near Garrissa & AIC sonotype *on Signalyze 3.5*).**

>***Platypleura marsabitensis*** Boulard, 1980, twinned with *P. argus* from Mount Kenya and isolated in the **altitudinal gallery forest (1400m) surrounding Lake Paradise** at the top of the old volcano.

December 1972 (MB Phot, from Anne Spoerry's plane)

With **Anne Spoerry** and a cousin in Subukia, Kenya (December 1972)

Working on the forest flank of the volcano, catching some ***P. marsabitensis***...

6₂) In Malawi, where I only stayed a fortnight, in April 1988, a personal exploration trip, associated with that of ***G. Vindevogel***, a friend and organizer of "Touring Tour".

a) Suffrutescent vegetation near Lilongwe airport… Eco-photos and capture of a small heliophilic ***Dyticopycna***. Species already noticed in the Angolan material sent by my dear Portuguese colleague, **José Passos de Carvalho** and described under his name.

> ***Dyticopycna passosdecarvalhoi*** (Boulard, 1975: Sanborn, 2020). Male tymbalizing.
>***Mantis*** finishing devouring another male (**MB Phots**)

b) Kuchawe inn, dense forest near Zomba. Recordings and capture of ***Orapa numa*** (Distant, 1904). Mimesian species, of twilight-night ethology difficult to detect in daylight. With the help of a "boy" curious about activities never seen before, the captured specimen could be placed in an impromptu cage and photographed the following morning.

Orapa numa (Distant, 1904), male at rest, flattening more or less on the offered piece of branch and very photogenic! Excellent subject of *rhytidian mimicry* or *phloeomimicry*.
(MB Phot, April 1988).

c) A new species " aphone " of a new genus

In the meantime, epistolary relations were established with **Raymond Murphy**, an entomogist living in Mzuzu, to whom I owe a fruitful sample of the Malawian Cicadofauna, of which I have barely begun to work on the taxonomy. In honour of this providential friend, a few lines and a document relating to a very singular species of his captures are reported here.

In one of the consignments that Raymond sent to me were four males of a small Cicada remarkable by the extent of its four *almost diaphanous wings*, the astonishingly polynervous forewings. More singular still, the strong reduction and the *silicification of the tymbals*, these proving to translate outside the total absence of the phonogenic system yet so characteristic of the family of Cicadidae. In fact, here we had a *new voiceless species* belonging to a **new genus**, the fifth for the group of the *Acymbalic Cicadidae* and which with a friendly pleasure I dedicated to Murphy. **Alive**, this little species is **green**.

Murphyalna mughessensis Boulard, 2012, Male Holotype and Close-up view of one of the vestal tymbals (**Cv**). The genus joins that of the Cameroonian ***Bafutalna*** (Boulard, 1993) in the heterogeneous group of African Prasiini (***cf.* Boulard, 2012d**).

In a second consignment was a male of an unknown variety of *Ugada nutti* Distant. I give below the basic description.

-> Ugada nutti, mzamba n.var. **Holotype** ♂**,** Malawi, N. Khorongo, Mzamba District, 1370m, 11 23^{S} 33 59^{E}, **Raymond Murphy** réc., 24 mars 2005, MNHN, Paris.

Main dimensions in millimetres. Wingspan = 104; total length including wings = 69; length of forebody = 10; length of abdomen = 27; width between paranotal tips = 21.5; width of abdomen at cymbaclytes = 14; length of body = 29; length Lh of homelytra = 42; greatest width Lh of homelytra = 15; width of head including eyes = 12.

Photographic and genital identities of the Holotype

This new Cicada is a Distant *Ugada nutti*, 1904, both by the general size, by that of its pararanotas in strong sharp triangles, as well as by the conformation of the parts composing the genital block... But all different by the pictorial clarity of the wings, front and rear.

d) For the record

>Lost? Two Jabiruses from Senegal, ***Ephippiorhynchus senegalensis***, seem want go back home! " Like the one seen in mid-air, page **109**. **Malawi, Chinteche, April 1988** (**MB phots**).

6$_3$) From Tanzania (On collection material)

I was able to publish a substantial paper on the cicadofauna of this large part of East Africa. This is thanks to the kindness of **Dr Philippe Darge**, a specialist in Tanzanian lepidoptera, who brought back the Cicadas attracted by its light traps, and to the kindness of **Mrs Monique Prost**, entomologist of the Dijon Museum, who prepared and then directed the Cicadas in question to me.

Among the collections examined, a new genus, ***Kageralna*** Boulard, 2012 and seven new species could be noticed and described, including ***K. dargei, Dyticopycna moniquae*** and ***Ugada dargei***, one of the largest African Cicadas known today (**Boulard 2012a**).

A few years earlier, I had given descriptions of two small Tanzanian species**,** ***Paectira hyndi*** and ***P. forchhammeri*** in **Boulard, 1992f**).

6$_4$) Seychelles Archipelago

Personal trip, December 1995-January 1996, undertaken with Jeanine and our grandson Yann, 9 years old. A trip of course very oriented "Natural History" and which was fruitful.

a) Mimetology. Two cases of hypertelic phylomimesis

To the extreme diversity of the leaves corresponds a no less great adapted phyllo-mimesian, giving in the sumptuous hyper-mimicry. Two Seychelles examples.

1) ***Phyllium siccifolium***. The tangential facies is particularly developed in this large phyllomimicry already known from Linnaeus, where sexual dimorphism has retained the mimicry prerogatives; hereafter the male, rarer than the female, the latter "lush", also found in Mahé.

Phyllium siccifolium, male in a convincing phyllomimetic attitude. **Mahé, January 1996** (**MB Phot**)
(*cf.* the eco-photo of a female in Boulard 2012c, *Usage biologique du paraître,* fig. 164).

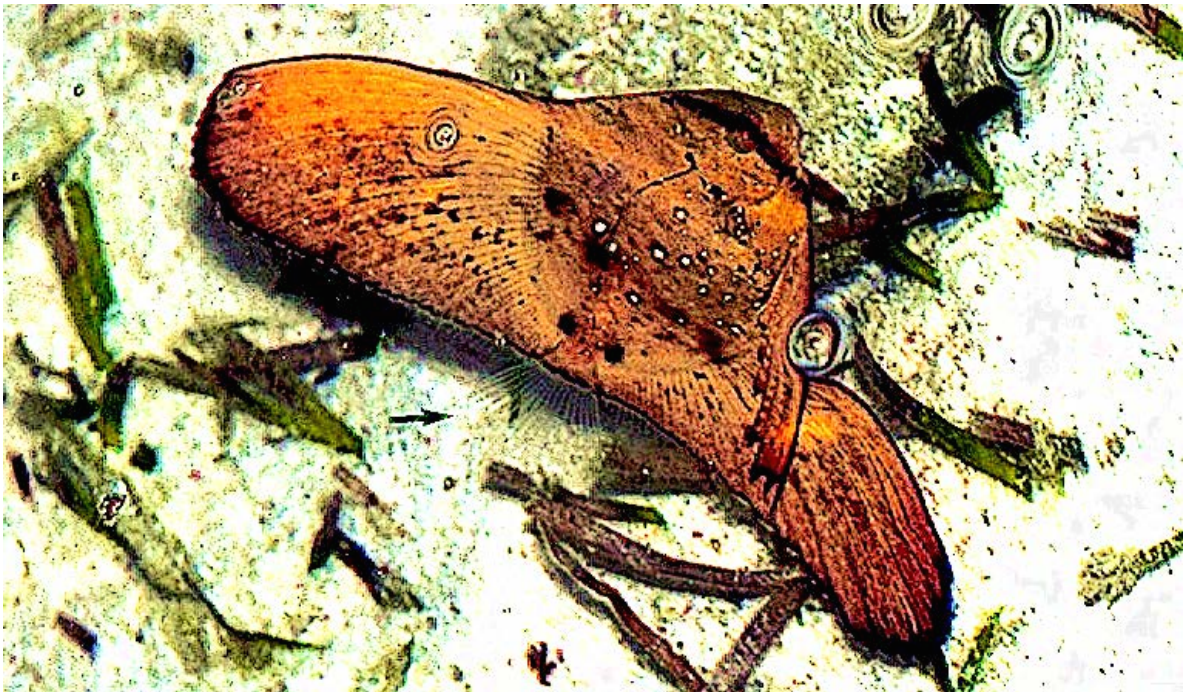
2) ***Platax orbicularis***

Shots of something like an old leaf animated, like many others, by the waves of the shoreline of the hotel where we had stayed...

Actually, a dead leaf mime fish... Who totally "bluffed" Yann and me. It was a young specimen of ***Platax orbicularis***, a fish from the Chaetodontidae family. In its juvenile state, this fish has amazing mimicry attributes

-> Brownish-brownish hue, a black disruptive **bar on the head** masking the eyes.

-> The body, a shallow but bouncy wafer, thick, oversized pectoral and dorsal fins, while the **caudal fin, totally transparent** (*arrow*), breaks up the original pisciform appearance:



-> In addition, this flatfish swims softly on one side, allowing itself to be tossed around by the weak surf, which similarly affects the dead leaves that have fallen from the few trees on the shore (**MB Phot**).

Mahé, January 1996 (**Boulard, 1998a, 2007b, 2012c**)

b) Cicadology

> Description of subspecies ***Chemistica pulverulenta seychellensis*** Boulard, 2001h.

> Creation of the genus ***Sechellalna*** Boulard, 2010: 334, for the species ***seychellensis*** (Distant, 1913), this one particularly interesting. Its morphology corresponds, quite closely, to that of the Malagasy ***Yanga***, the genus where the original descriptor had installed it, without being able to know the phonogenic incapacity of the male.

In these islands, the absence of tymbalizations, other than those produced by ***Chemistica***, was noted by myself (in Mahé, alone) and affirmed several times by **Pat Matiot**, a sechellian entomologist friend, who was an adventurer on his islands. Two observations made since then, one anatomical, the second ethological, allow us to understand and explain why ***Sechellalna seychellensis*** is silent:

- The autopsy of a male led me to observe and publish this extremely rare fact, as underlined above: the tymbalic anatomy, organ and associated musculature, is totally lacking in this species, which is therefore **acymbalic** (**Boulard, 2010b**).

- At Silhouette, one of the islands of the Archipelago**, Pat Matiot** was able to follow an intriguing behaviour developed in natura by a specimen, which he told me about and allowed me to transcribe directly here from "his savoury French": « Une fois, non loin du sommet du « Mont Pot à Eau », j'ai entendu une sorte de crépitement provenant d'un grand *Dillenia ferruginea*… Puis vu, à une hauteur d'environ 20 mètres, une *Yanga* (mâle ?) qui frappait ses ailes très rapidement contre le tronc de l'arbre. Une autre cigale (femelle ?) se trouvait non loin de la première, mais sans agiter ses ailes ». A drumming behaviour therefore, known, elsewhere, in a few other cicadas (*cf.* p. 178), but which in the Seychelles, it will be necessary to hear again and especially to camcorder in its acoustic and visual reality. Anyway, **Pat**, species to follow and thank you very much… Hoping to see you later, *"à Dieu vat!"*

6$_5$) Archipelago of the Mascarene Islands

On materials collected by **Raymond Mamet, Pierre Viette** and **Jean Vinson**, much missed veterans.

a) Mauritius and its 3+1 genera of Cicadas

Revision (MB, 1979d) making known nine Mauritian species, three of which motivated the creation of a new genus, all of which belong to the subfamily Tibicininae:
> **Abricta** Stål, 1866 with the species *A. brunnea* (Fabricius, 1798) and *A. ferruginosa* Stål, 1866.
> **Abroma** Stål, 1866 with the species *A. mameti* Boulard, 1979 and *A. vinsoni* Boulard, 1979.
> **Fractuosella** Boulard, 1979: 35, genus based on fracture (f) of the midrib M and overlap of sections on each other: **f' break on TRONC^1 -> TRONC$_2$ + (r-m),** ***Cf.* Blrd, 1979, p. 38).** Together with the species ***F. darwini, F. virginiae*** and ***F. vinsoni*** Boulard, 1979, the genus ***Fractuosella*** belongs to the tribe ***Gymnotympanini*** (as opposed to ***Chlorocystini*** with multiribbed wings, like in *Dinarobia claudeae*, known as *'the Mauritian'*.
> **Dinarobia** Mamet, 1957 with the species ***D. claudea*** (Orian, 1954) with multiribbed wings, well-known '*forestière*' (♂&♀) of **Macabé** and **Mare-Longue,** light traps our elders R. Mamet and J. Vinson, not far from the 189 meters of the Pic **Brise Fer Mountain**, from where I received an photo thus worded **"Cigale_Maurice_Brise_Fer.jpg"** no more, but that here is! *Thanks to the artist (***D. Martiré***?).*

Beautiful ***Dinarobia* claudeae***

b) Reunion Island and *Fractuosella breoni*

Fractuosella breoni Boulard, 1989 is the only endemic Cicada to Reunion Island, and the fourth of its kind, which I was able to affirm thanks to the help of **Pierre Viette, Dominique Martiré** and **Sylvain Hugel**, colleagues on the spot. The information deserves to be underlined, which is also a good opportunity to explain the nominative epithet of the species.

Pierre Viette was able to bring me back two Cicadas taken from a camphor plantation in December 1982 and, at first sight, unknown. I was very interested, but an increase in work and the preparation of a new mission forced me to postpone the study...

A few years later, opening box-shops of old collections, I had the surprise to find, in mixture with other insects, three specimens of the Reunionese Cicada which remained in question! Specimens faded, but bearing a tiny circular label with, on the back: 112/33. Such a label leads to the use of the venerable " Catalogue des Animaux articulés " in which scrupulous predecessors recorded the origin of the Arthropods bequeathed to the Museum by naturalist travellers. To the above reference corresponds, in the 1833 register, the following mention: *"Voyage de Monsieur Bréon à l'Ile Bourbon"* (Mr Bréon's journey to Bourbon Island). In other words, this Cicada, collected in the middle of the 19th century, remained unpublished and apparently not taken up again until 1982. The species thus also belongs to the genus ***Fractuosella*** and it was dedicated to the memory of its inventor, **Mr. Nicolas Bréon**, botanist, gardener of the MNHN and the French Navy, long-time resident in Bourbon

Fractuosella breoni is clearly larger than the Mauritian females of the same taxon and the species, which is phenomenal, occurs in two phenotypes, one predominantly brown, the other predominantly green, regardless of sex. According to my resident colleagues, **Dominique Martiré** and **Sylvain Hugel**, it appears to be restricted to mid-altitude rainforests, preferably standing close to the ground. In the face of danger, it lets itself fall and plays dead. The males appear at night, discreetly emitting short phrases repeated every 20 to 30 seconds with a tymbalization peak at 22 KHz (!), culminating above lower frequencies, which are also inaudible. These first ethological data explain why this strange small Cicada went unnoticed for so long. Here are the excellent documents that Dominique shared with me and that, as a friendly duty, I present here, my renewed thanks.

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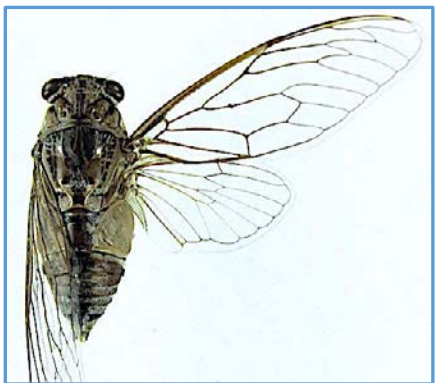
*) ***Dinarobia,*** of which my recent ***Murphyalna***, a new genus from Malawi, seems very close.

Fractuosella breoni Boulard, 1989, under its two phenotypic varieties (**Dominique Martiré Phots**).

c) Rodriguez Island and *Distantada thomaseti*

>***Distantada thomaseti*** (China, 1924), an astonishing and only Cicada on this tiny island, where it seems endemic. Relatively large, with a wingspan of up to 85 mm, vast cymbacalypts and opercules masking its acoustic chambers, characterize it (**Blrd, 1979e**). Surprisingly, the species is fundamentally different from the morphological basis of the occupiers of the other islands. It alone represents the tribe of *Distantadini* Orian 1954, in the subfamily Platypleurinae. Subfamily only found in the distant Madagascar and India.

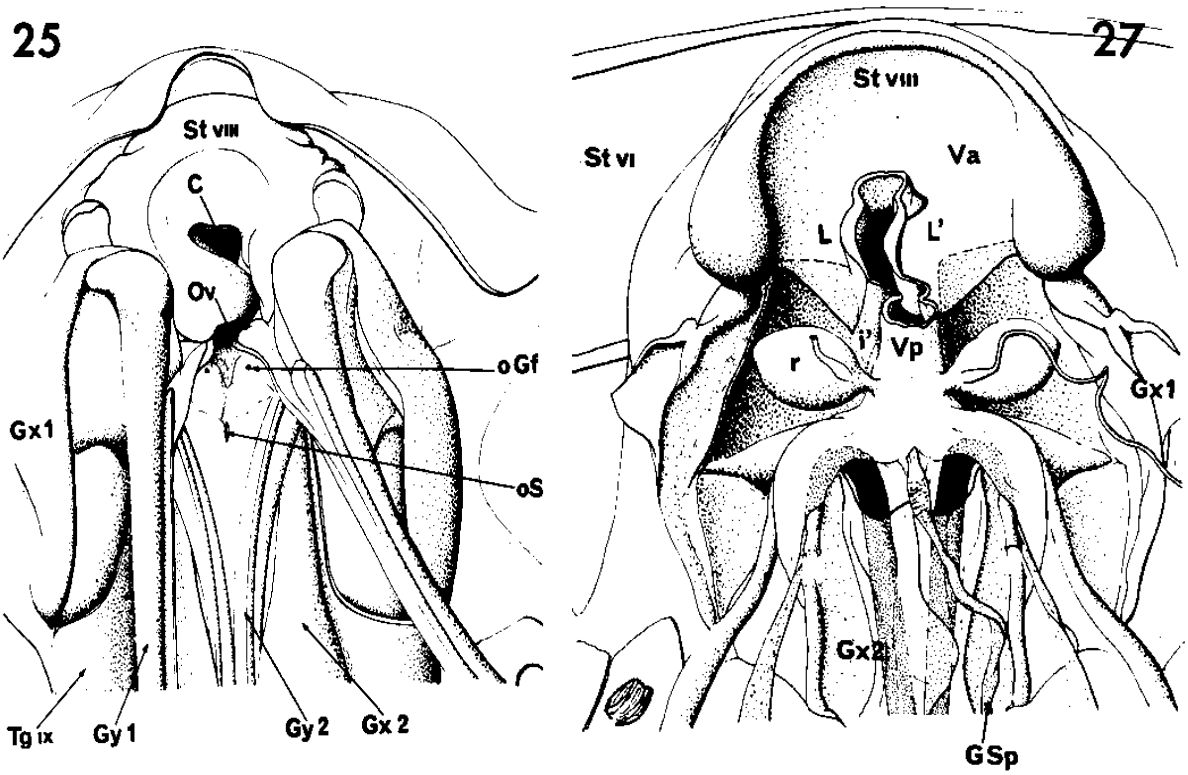


Distantada thomaseti (China, 1924), première photographie (**MB Phot**) d'un mâle homotype.

6_6) Madagascar

a) Thesis fragments

Initial studies conducted on 'Cigales de la Grande Île', dry specimens kept at the museum, have allowed me to provide some information, if not to clarify the establishment of the female genital tract, which led to the isolation of an egg-laying route functionally different from the one used for copulation (*cf.* p. 46/47). In some species, especially Malagasy species, such as ***Pycna madagascariensis*** and, separation has only just begun, as some of my drawings at the time show:



Dissection of the female ectodermal genital tract of *Pycna madagascariensis* Distant.

Highlighting of a first step in the evolutionary conformation, within the Cicadidae family, of the conformation of a different laying route from that of mating. In **25**, external view of the genital bases. In **27**, internal view, the vaginal complex cut at the level of the pre-insulating **L** and **L'**blades (MB Pict).

The process in question thus seems to have stopped at an early stage in this lineage of Malagasy cicadas, which in this respect can be considered archaic (***cf.* MB Thèse, 1966d**).

b) Faunistics. Two 3-month missions, allowed to improve somewhat the knowledge on the Big Island's cicadofauna, to highlight or discover original aspects, especially as regards the characteristics of the main groups and, as far as possible, to capture specific tymbalisations. Upon arrival, males of several species were recorded and captured, as well as the females in "**La Mandraka**", at the time a vast property owned by the entomologist **André Peyriéras**[15], whom I would like to thank once again for all his help.

The biogeographical isolation of Madagascar took place at the end of the Jurassic period, a few lustres after the initial development of the African cicadofauna, the filiation of its Malagasy counterpart being obvious. Nevertheless, no common species are known, while many genera had to be created for the vast majority of species specific to the Big Island.

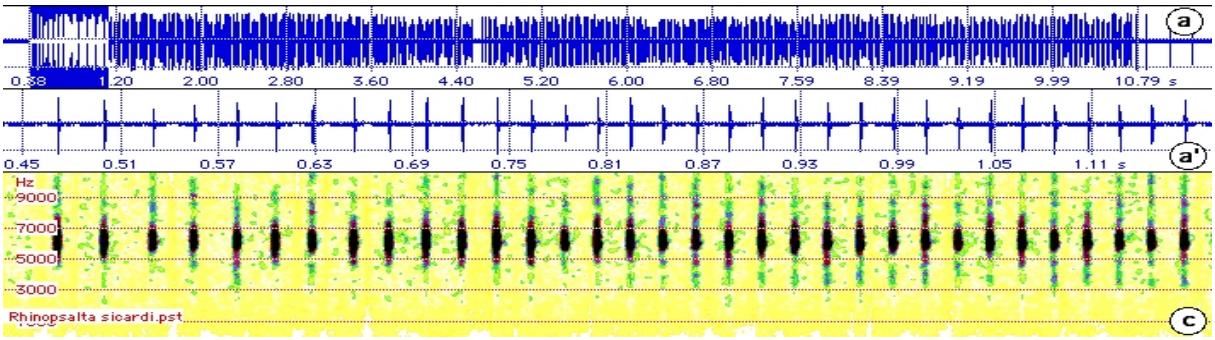
1) Madecass endemic genera

Pycna Amiot et Serville, 1843. ***Malagasia*** Distant, 1882. ***Ligymolpa*** Karsch, 1890. ***Yanga*** Distant, 1904. ***Umjaba*** Distant, 1904. ***Antankaria*** Distant, 1904. ***Rhinopsalta*** Melichar 1908. ***Jafuna*** Distant 1912. ***Malgachialna*** Boulard, 1980. ***Malgotilia*** Boulard, 1980. ***Viettealna*** Boulard, 1980. ***Crassisternalna*** Boulard, 1980. ***Cephalalna*** Boulard, 2006. ***Anopercalna*** Boulard, 2008... Giving the Big Island an authentic cicadofauna.

Of all the preceding taxa, one contains a single species and the most unexpected, because very astonishing by the conformation of its head as a sharp cone, a peculiarity that the taxonomist **Léopold Melichar** included in the name of the new genus he then had to create.

15) André Peyriéras. Scientific Correspondent of the MNHN, eminent specialist of Malagasy Beetles, Reptiles and Amphibians, he was a formidable "elder", having always ensured the reception, at his home, of naturalists and other visitors on mission on the Big Island. **André** left in 2005, retiring to Montpellier, France.

Rhinopsalta sicardi Melichar, 1908, eco-photographed male at Nossy Bé, December 1997 (**MB Phot**)
Its tymbalization evokes a quick and discreet drum roll:



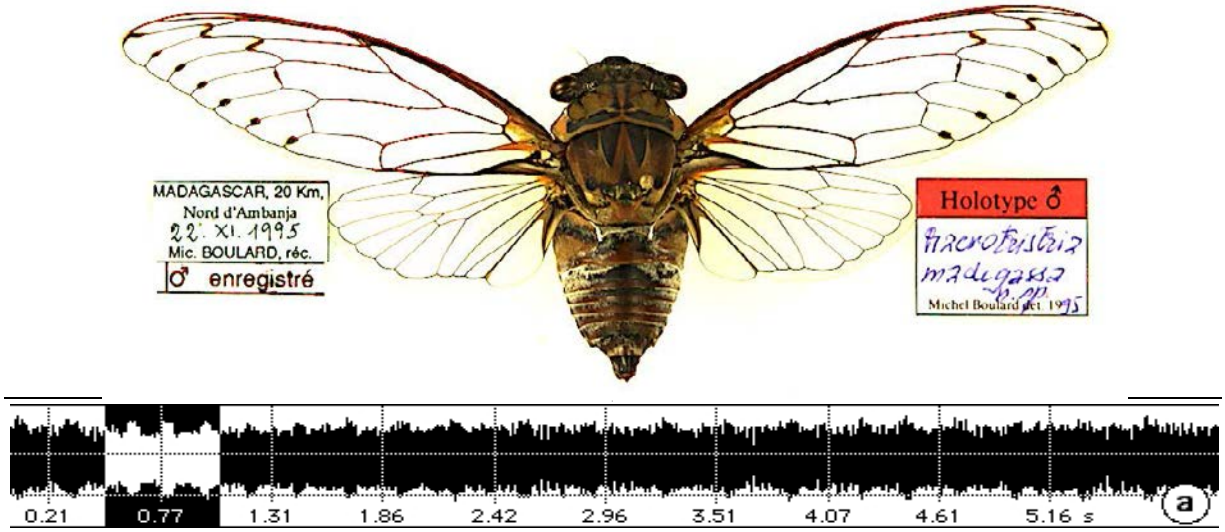
Rhinopsalta sicardi Melichar, **AIC**: **(a)** Time signal, complete sequence recorded; **(a')** Revealing "unit cymbal strokes" by widening the inverted beginning in a; **(c)** Spectrogram conforming to the oscillogram a'. (**MB phot & *on Signalyze 3.0***).

2) Other genera represented in Madagascar; some of them quite surprising:

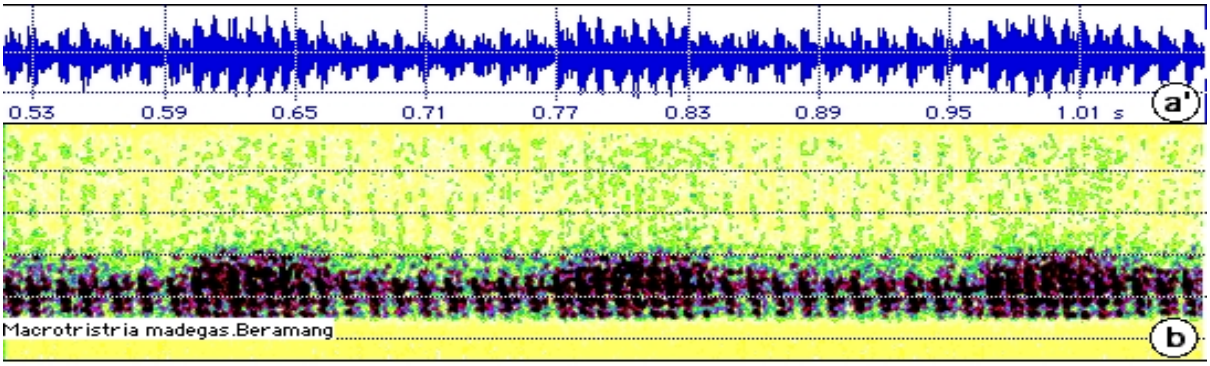
-> Oxypleura Amyot and Serville 1843: 469, with the species ***spicata*** (Distant, 1905),
-> Chremistica Stål, 1870, counting about ten Malagasy entities to be listed or described.

In 1996, I gave the descriptions, including acoustic identities, of two Malagasy Cicadas belonging to two genera, which were not known to be represented on the Big Island:

-> First ***Macrotristria*** Stål, 1870 with the species ***madegassa*** Boulard, 1996, whose discovery triggered a zoo-geographical astonishment*... Which surprised my friend Max Moulds: until then this taxon, specific to large species, was only known in Australia! The Malagasy species, which has a wingspan of 121 mm (*cf.* Blrd, 1996h), is heliophilous, its call tymbalization is strong, but hoarse and nasal:

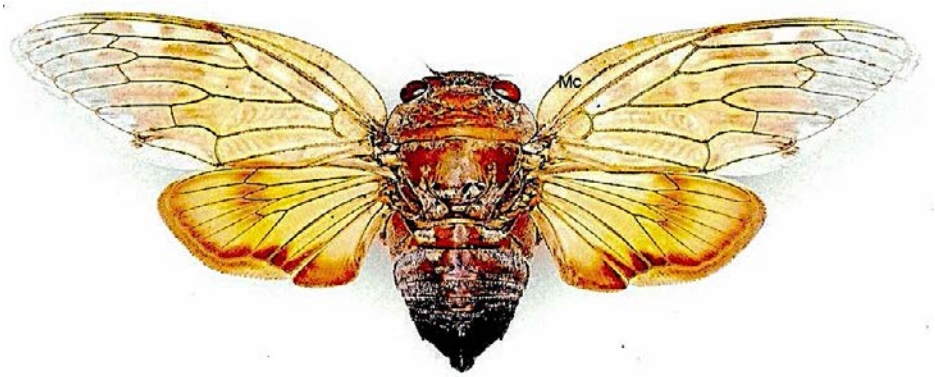


*) Prodigious in its biogeography and its facies, the genus ***Macrotristria*** poses the thorny question of its nativity: Malagasy or Australian? Leaving to think that it could have proliferated more easily on the second.

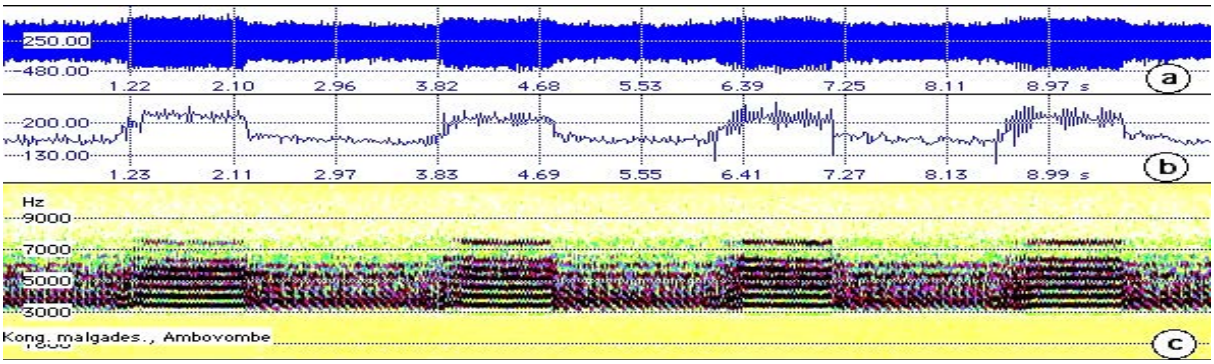


Macrotristria madegassa, Acoustic Identity Card (sonotype): (**a**) Naturally saccadic part of the calling tymbal; (**a'**) oscillographic morphology of a selected fragment of the signal spread not over 5.40s, but over 0.65s here allowed; (**b**) Spectrogram conforming to Oscillogram a'. **Dry forest, Beramsango, XI, 1995** (MB *on Signalyze 3.5*).

-> Then it was a taxon which until then had been typically South African, ***Kongota*** Distant, 1904, characterized by the strong development of the pre-costal membrane (Mc) of the homelytra, which is much larger than the costal cell, an arrangement rarely seen under other skies:



I have detected, recorded, named and described *Kongota malgadessica* n. sp., this large cicada with this morphological singularity, combined with that of the non-protruding, or camus head. It was in the xeric forest reigning in the very South of Madagascar where I was able to record a tymbalizing male, the homelytra lowered on the sides (slide of the Cover). Squeamish and curiously plaintive, often emitted at dusk, its tymbalization completes the characterization of this beautiful species, just as unexpected as the previous one.

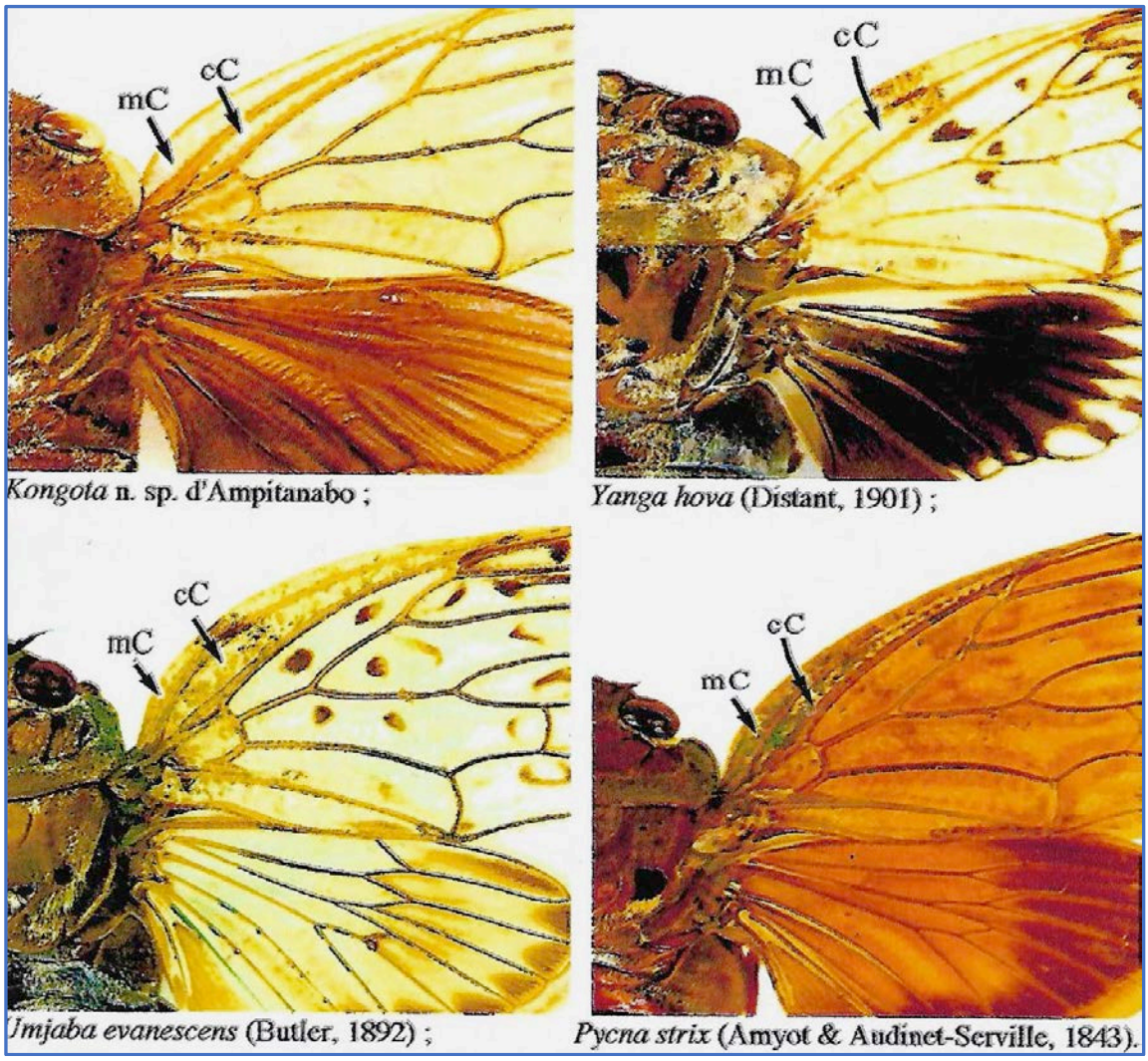


Kongota malgadessica, **AIC (a)** Visualization of the tymbalization in real time; **(b)** Plotting of the sound amplitudes; **(c)** Spectrogram showing the regular staggering of the harmonics specific to the higher sequential alternatives. **Ambovombé Nord, 7/XII/1995 (MB phot. & on Signalyze 3.5).**

The examination of this Cicada with camel head, made me appreciate more the strangeness, not or little seen elsewhere, of the basal topography of the costo-radial veins in the majority of the large Malagasy species of the tribe of the Platypleurini.

16) Later, in the laboratory I was somewhat disappointed, *malgadessica* turned out to correspond to the species *handlirshi* described without figure in 1897 by Distant in the genus *Poecilopsaltria*, then that he transferred to the *Yanga* in 1906; what Jacobi confirmed in 1907! Nowadays, this maligned species has the status, rectified by myself in 2008b: *Kongota handlirshi* (Distant, 1897j = *K. malgadessica* Boulard, 1996, syn. nov.).

Here is the reproduction of the costal frameworks of four species explicit on this subject, the basis of a taxonomic reorganization at the generic level envisaged, in short, then remained in suspense, in connection with my long period and Thai stays in the study of the asian cicadofauna.



Kongota n. sp. d'Ampitanabo ; *Yanga hova* (Distant, 1901) ; *Imjaba evanescens* (Butler, 1892) ; *Pycna strix* (Amyot & Audinet-Serville, 1843).

Several entities, all equally astonishing by the double-cell costal venation of the homelytra, relatively narrow or more or less distant between them, with also the width of these wings a little more important, the whole well in the line of the ***Pycna strix*** of Amiot and Serville, typical species of the genus, the mesonotal flanks bearing black round macules (like "owl eyes", according to our old authors), the latter in exact copies in some species, while they are reduced to more or less fine points in others. Below are described two other ***Pycna*** with a massive body, which slept in my boxes, *in late Homage* to **Pierre Soga**, entomologist and zealous Malagasy collector. Then is assured the place of *Pycna madagascariensis* (Distant, 1879: Distant,1906).

Basic description of the Platypleurini cited here, (Some of them benefiting from their CIA)

1) *Pycna strix* Amiot et Serville, 1843.

Homeotype mâle. Madagascar Est, environs forestiers de Maroantsetra, janvier 1965, Jean Vadon réc. MNHN, Paris.

Main dimensions in millimetres. Wingspan = 116, total length including wings = 150, length of forebody = 20, length of abdomen = 18, width of abdomen at cymbaclyptes = 19, length of body = 38, length of homelytra = 50, greatest width Lh of homely = 24, width of head including eyes = 12.5, width of mesonotum = 16.8.

Photographic and genital (Sex block open) identities of the species

On the right, very enlarged, the pygophore, its copulating appendages and the edeagus (MB Phots).

2) *Pycna madagascariensis* (Distant, 1879 in *Platypleura*), classified as the second species of the genus by Distant in 1906, but for which a homotype had to be designated by me at MNHN in 1996.

Homotype ♂ (conforming to the drawing provided by the inventor of the species in 1879, Trans. Ent. Soc. Pl. V.), Madagascar, Arkaratra massif, Manjakatompo forest, 1700m, December 1995, MB rec, Phot & Son, MNHN, Paris.

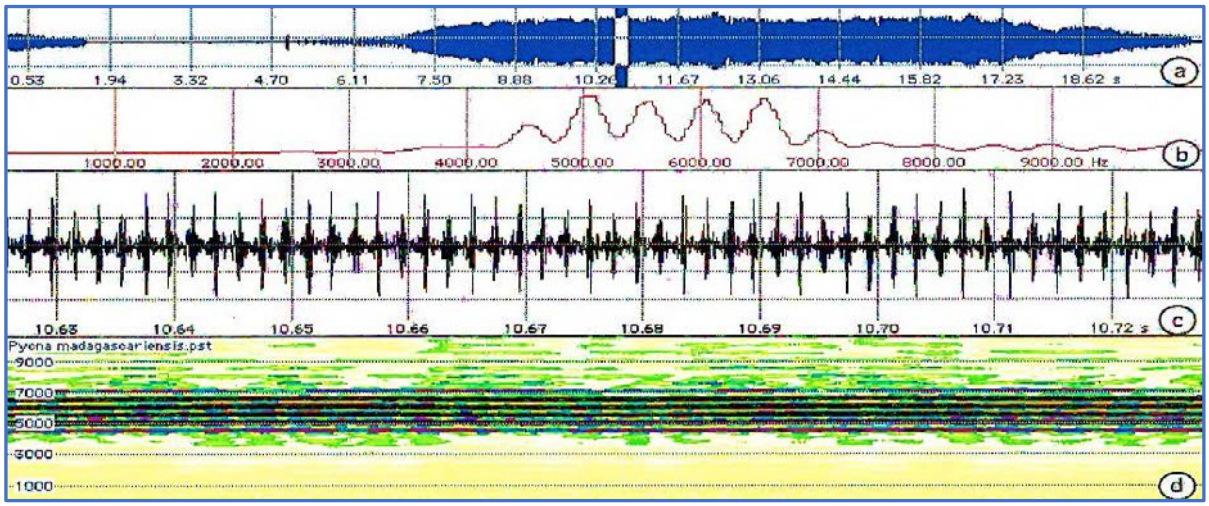
Main dimensions in millimeters: Wingspan = 98; total length including wings = 49; length of forebody = 17; length of abdomen = 15; width of abdomen at level of cymbaclyptes = 15; length of body = 30; length Lh of homelytra = 41; greatest width lh of homelytra = 16; width of head including eyes = 11; width of mesonotum = 15.

The photographic, genital (open sexual block, its copulatory hooks) and acoustic identities of the species

Hunting notes. On the 11th of XII 95, arrival at the end of apm at the forest station of Manjakatompo, where we could have a lodging. The next morning, silence in the mountain forest (± 1700 m) until 10.45 am when a Cicada-Sirene appears...

Which we finally spotted at about 4 m high. Recorded and captured thanks to my double circle net. It is a *Pycna madagascariensis*! Others, awake, were recorded, photographed and layered.

Here is the Acoustic Identity Card somewhat detailed



Pycna madagascariensis (Distant,1879)**. AIC (MB sonotype),** ***on Signalyze 3.1***

Following the collection of my captures realized *in situ* in 1995 and precisely the new '*madagascariensis*', it appeared that their 'photographic identity', as revealed on the previous page, was too different from that exposed by the *Pycna strix*, also exposed. Due to the lack of time in '96/97++' and the extent of my research in Thailand, the problem remained unsolved.

It happens that it has just been amplified in a very recent publication due to our old taxonomist friend A.L. Sanborn, in Zootaxa 4722, 2020,158-159, fig.1. The specimen he called "*Pycna madagascarensis*" ***(sic)*** and from which we do not know where it comes from, does not correspond to the Cicada described by Distant in 1879 and even less to the drawing at the same time communicated (fig. 9) in an adjacent plate. In fact, it corresponds to one of my 'new species' named *roussettalna* n. sp., in my registers '96/'98 and that I find transcribed below. In addition, the main characteristics of a ***Pycna*** **n° 4**, also new in my notes, will conclude opportunely this adjustment.

3) *Pycna roussettalna* n. sp.

Holotype ♂, Madagascar Nord, Montagne d'Ambre, plantation des Quinquinas, 'Les Roussettes', ± 1100 m, **Pierre Soga** réc., février 1959, MNHN, Paris.

Main dimensions in millimetres. Wingspan = 63, total length including wings = 48, length of forebody = 13, length of abdomen = 16, width of abdomen at cymbaclytes = 16.5, length of body = 29, length Lh of homelytra = 40, greatest width Lh of homelytra = 13.5, width of head including eyes = 11, width of mesonotum = 14.

Photographic and genital identities (open sexual block) **of the Holotype**

Finally, except for the strength of the mesonotal points, this species resembles very much the "*Pycna madagascarensis* Sanborn, 2020, fig 1", which is not a *madagascariensis* as described by Distant in 1879 and even less so in view of the drawing (fig. 9) that, as a cicadologist before the hour, our old referent author took care to provide, thus guaranteeing his description... This one perhaps forgotten in 1906.

4) *Pycna ambrensis* n. sp.

Holotype ♂**,** Madagascar Nord, Montagne d'Ambre, 'Les Roussettes' ± 1100 mètres, février 1959, **Pierre Soga** réc., MNHN, Paris.

Main dimensions in millimetres. Wingspan = 112, total length including wings = 59, length of forebody = 16.5, length of abdomen = 15, width of abdomen between the cymbaclytes = 18, length of body = 31.5; length Lh of homelytra = 49; greatest width Lh of homelytra = 19; width of head including eyes = 11.4; width of mesonotum = 15.

Photographic and genital identities of the Holotype

5) *Yanga guttulata* (Signoret, 1860), another species whose original type was not found.

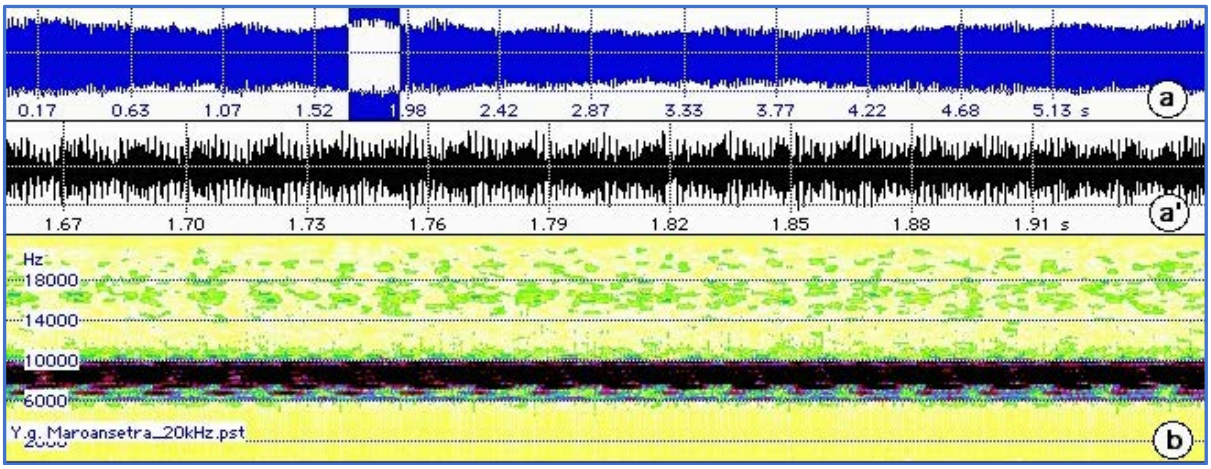
Homotype ♂ (in accordance with the drawing provided by the inventor of the species in 1860). (*Annales de la Société Entomologique de France)* ; Bétioky, 11 décembre 1948, **Pierre Clément réc.** MNHN, Paris.

Main dimensions in millimetres. Wingspan = 84, total length including wings = 49, length of forebody = 14, length of abdomen = 13, length of body = 27, width of abdomen at cymbaclytes = 13.5, length of homelytra = 36, greatest width of homelytra = 13, width of head including eyes = 11, width of mesonotum = 14.5.

Photographic, genital (open sex block) **and acoustic identities of the species**

***Yanga guttulata*, male witness, La Mandraka, December 1992. Pygophore and copulating hooks.**

Here is the first Acoustic Identity Card, sonotype of this species



Yanga guttulata*, AIC, sonotype: (a)** Temporal image of the extremely fast tymbalization; **(a')** Perceptible, modular structure by widening the range of the signal inverted in 'a'; **(b)** Spectrogram exposing the still tumultuous staging at this stage, but sufficiently precise to image the repetitive ultrastructure of the signal, between 6000 and 10000 Hz. ***(MB on Signalyse 3.2).

6) *Yanga johanae* n. sp.,

Holotype ♂, Madagascar, centre sud, environ d'Ihosy, plateau herbeux 'prairie à Zébus' quelque peu boisée, 1100m ; 18 janvier 1997, *MB réc., Phot & Son*, MNHN, Paris.

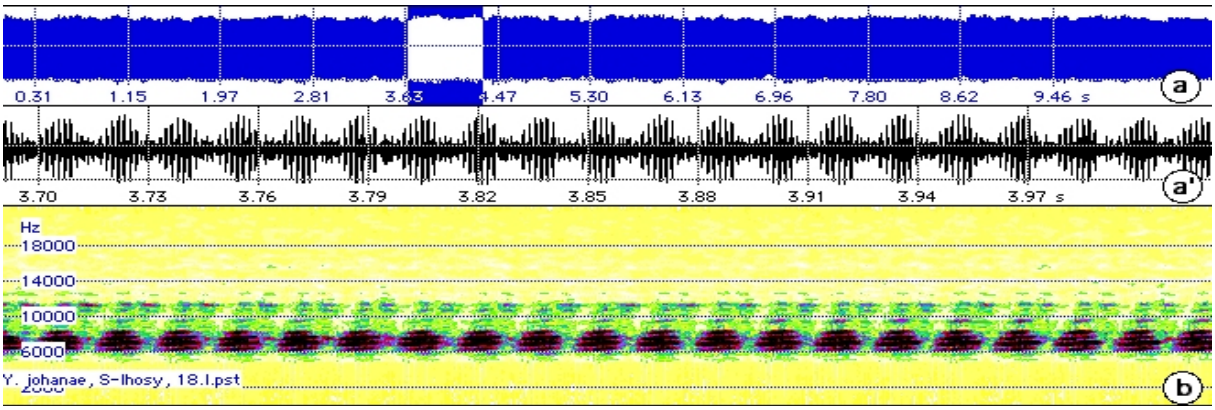
Main dimensions in millimetres. *Wingspan = 74, total length including wings = 38.5, length of forebody = 11.5, length of abdomen = 13, length of body = 24.5, width of abdomen at cymbaclytes = 12, length of homelytra = 31, greatest width of homelytra = 11.5, width of head including eyes = 9.2, width of mesonotum = 10.5.*

Photographic, genital (open sex block**) and acoustic identities of the species**

Hunting notes. "On the 18th of January, 97, around 10.30 am, let's go into a wood of Eualyptus located about ten km from Ihoshy, under a sound manifestation evoking that of the *Yanga guttulata*! In fact it is a question of "mini-guttulata" (perhaps representing another smaller species?), this one in full copulatory effervescence. Recording, photographs, then capture of a good number of specimens and harvest of about ten exuviae. Usual exit holes.

On the way back, dissections on the lab bench of the genital block in two males. The suspicion of a novelty takes some strength. Which the imaging of the call tymbalization nicely confirmed.

Here is the Acoustic Identity Card, sonotype of the species



Yanga johanae n.sp., **AIC (a)** Temporal image of the extremely fast tymbalization; **(a')** Perceptible, modular structure by widening the range of the signal inverted in 'a'; **(b)** Spectrogram exposing the still tumultuous staging at this stage, but sufficiently accurate to image the repetitive ultrastructure of the signal, in a frequency space between 6000 & 12000 Hz.

7) '*Yanga' heathi* (Distant, 1899)

Homotype ♂**,** triangular head (conforming to the design provided by the inventor of the species in 1899, *Trans. Ent. Soc. Lond. p.458, t.XVI. f.1*). Madagascar, environs d'Ampitanabo, décembre 1995, ***MB réc., Phot & Son***, MNHN, Paris.

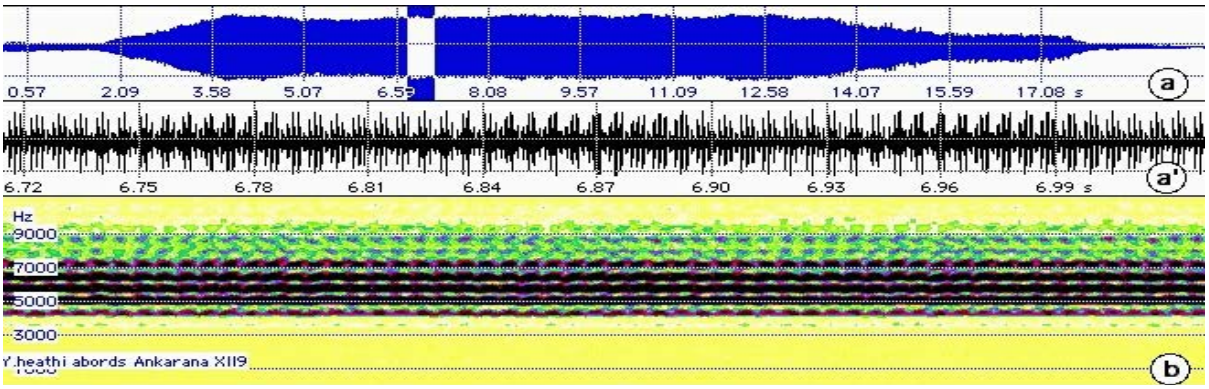
Main dimensions in millimetres. Wingspan = 116, total length including wings = 57, length of forebody = 19, length of abdomen = 15, length of body = 34, width of abdomen at cymbaclytes = 17.5, length of homelytra = 47, greatest width of homelytra = 18.5, width of head including eyes = 14.5, width of mesonotum = 19.

Photographic, genital (open sex block**) and acoustic identities of the species**

Hunting and taxonomic notes: *"*From the outskirts of Antankarana to Ambandja. Wednesday 18. XII. 96, clear weather, some clouds... 4h50: **Tintamare** of *Y. heathi* mixed with the more discreet one of some cespiticolous *Antankaria.* Decidedly, in Madagascar the Cicadas are alarm clocks functioning at dawn, even before the sun shows up.

Now, observing the collected *heathi* specimens with triangular head (not camus), a question became insidious as for the surface developed by the 'mC', the costal membrane of the tegmina, whose width shows itself more or less broad, according to the specimens.

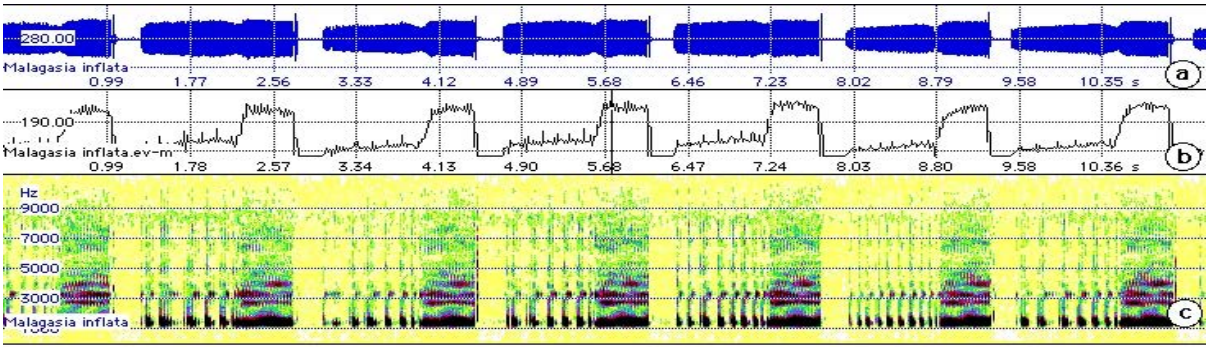
Here is the Acoustic Identity Card, the sonotype of the species:



The Malagasy Cicadofauna includes many other species, each more remarkable than the other. Three last examples, among those whose CIAs were established, or otherwise worthy of attention.

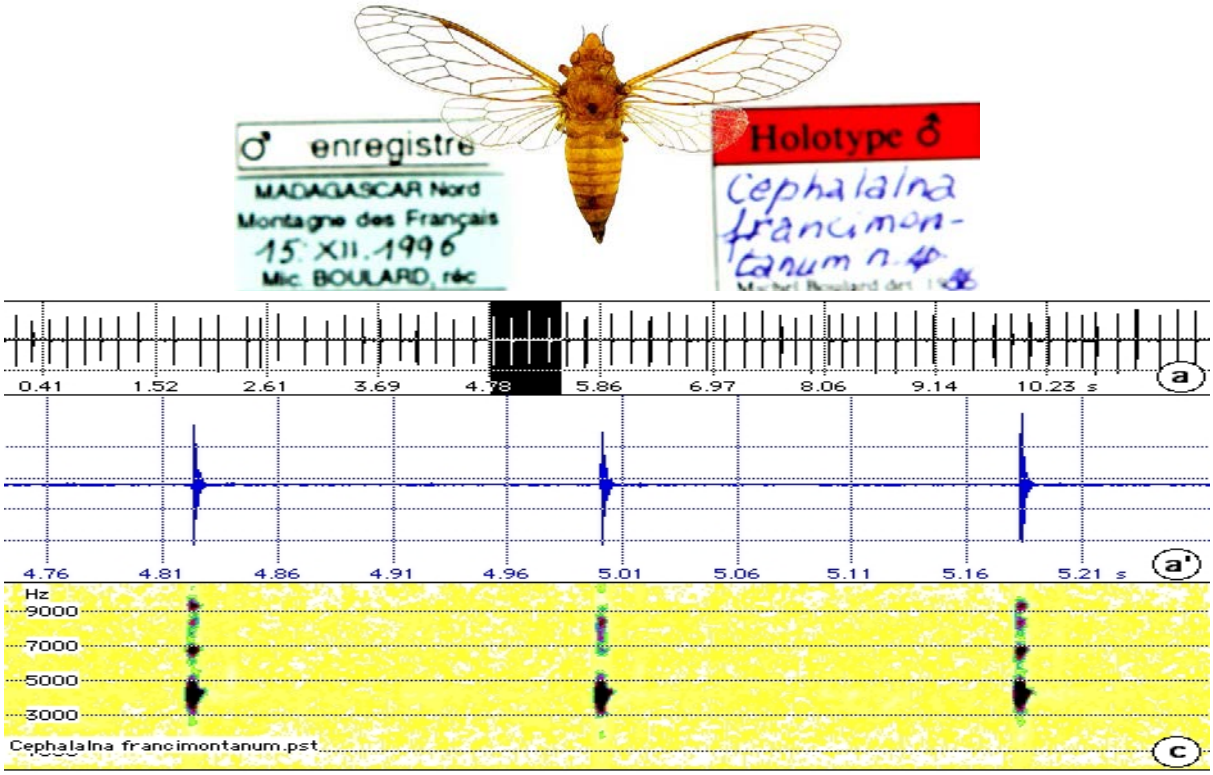
8) ***Magalasia inflata*** Distant, 1882. Species, quite different from the previous ones, with its large cymbals totally exposed, its abdomen swollen by a voluminous resonance bag. At the same time, the males express themselves in very low and low frequencies. The one below was recorded in uncertain hot weather, tymbalizing under a fine rain …

Is one of the few large species (98 mm wingspan) to express itself according to a fundamental expressed in very low frequencies. Nevertheless, it gives a sequence of formants somewhat above 9000 Hz.



(a) Time oscilogrm immediately unmasking a sequence of bicomponent modules that are almost identical to each other and separated by complete silences of equivalent duration. **(b)** Trace of the sound envelope, revealing the strong difference in sound capacities existing between the two parts structuring the modules. (c) Spectrogram and columns of formants expiring above 9000 Hz. **At the foot of the Andrigistra, January 1997 (MB Phot. AIC *on Signaly. 3.5*).**

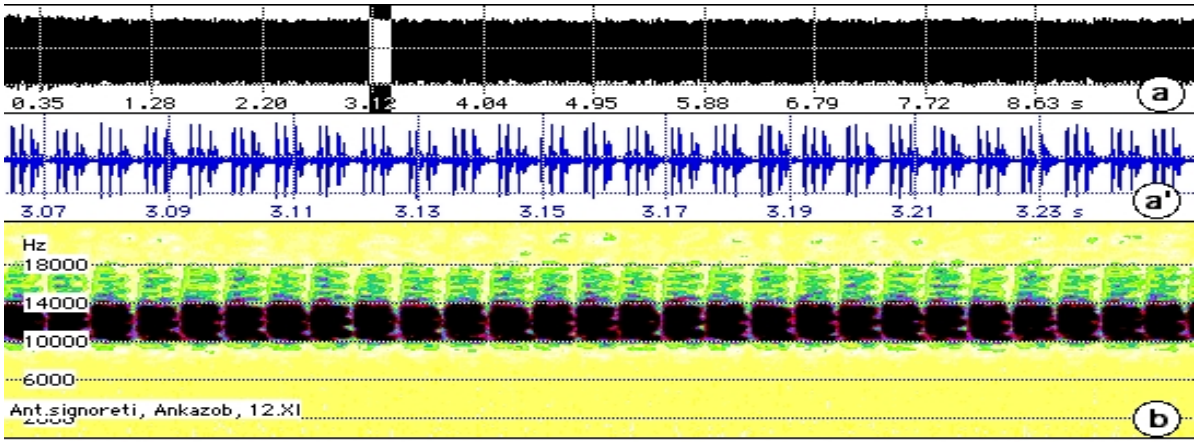
9) ***Cephalalna francimontanum*** Boulard, 2006. Tiny species that is also very different, since it is entirely green in the living state with completely transparent wings. With a wingspan of 33 mm and a length of 20 mm, its labels, both geographical and statutory, give a scale with the image somewhat enlarged below:



Cephalalna francimontanum Boulard, 2006. Tymbalization and AIC **(a)** Its sound ethology has proven to be particular. The nuptial call is a fractional suite of short, equidistantly tymbalized motives, evoking a splash. **(a')** Stretched in a suitable space-time (inverted segment in a, developed in a'), each abruptly lapped stroke ends in a very short decrescendo, followed by an immense silence). In **(c)** the spectrogram is based between 3000 and 5000 Hz, amplified by harmonics below 7000, then below and just above 9000 Hz. **(MB *sur Signalyze 3.5).***

10) ***Antankaria signoreti*** Metcalf, 1955. Pretty little species with very lateral eyes, rather abundant in the meadows of the central plateau, that in the 'last-first' months of the year, it animates with its acute sizzling sounds, emit in a strangely arched abdomen *(See snapshot profile p. 427).*

Male at rest, then tymbalizing. Below, the ACI (sonotype)



Antankaria signoreti Metcalf, 1955. **(a)** Time waveform of barely ten seconds demonstrating the speed of tymbalization melting an unreadable graph. **(a')** Portion of the inverted signal in (a) stretched over a distance identical to the original captured and thus offering a nice structural regularity of the emission. **(b)** The efferent spectrogram shows maximum sound efficiency between 10000 and 140000 Hz.

Ankazobe, November 1995 (**MB Phots**, sonotype *on Signalyze 3.5*).

c) Mimetology

In Madagascar, my mimetological observations have largely progressed, increasing the number of my interesting eco-photographs on this subject.

1) Pseudo-thallophytic stains

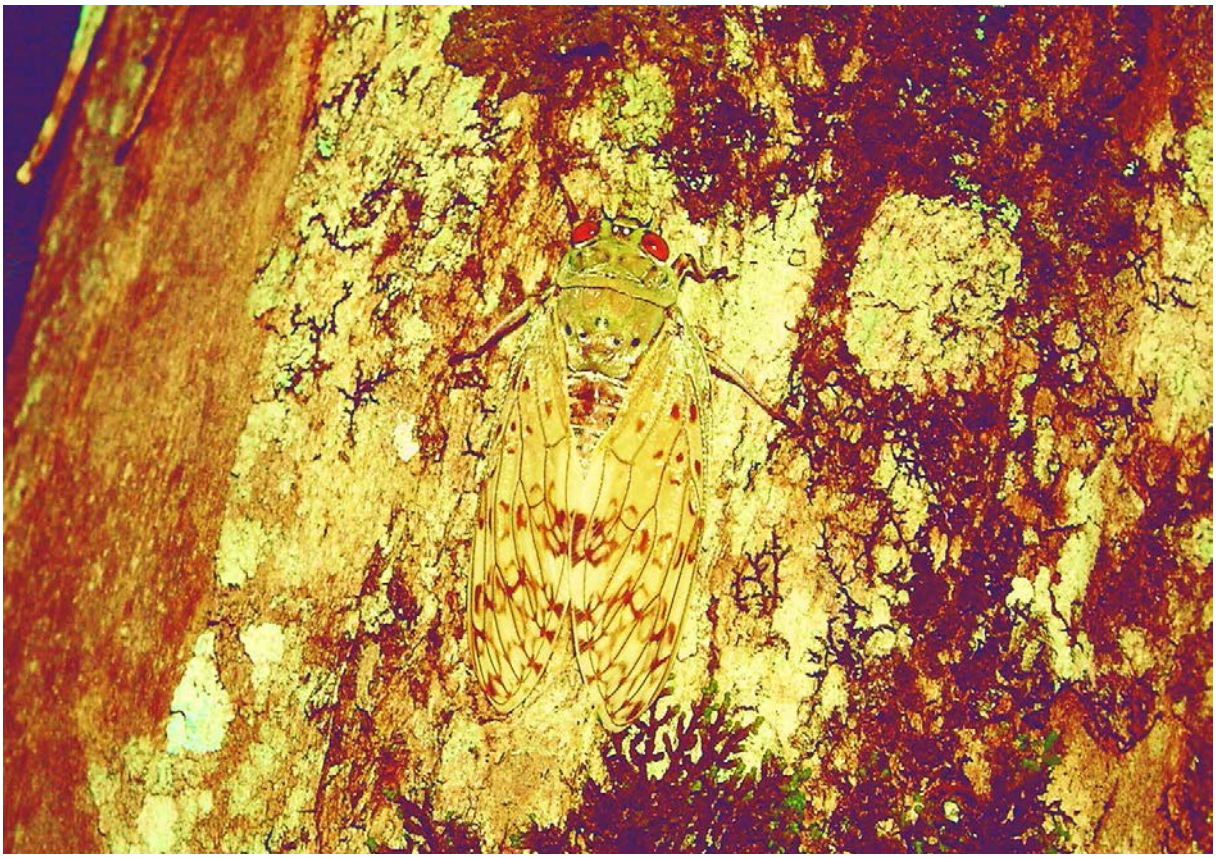
Body ambiguity demonstrated, on a sunny morning, by the ***Yanga pulverea*** leaving, slowly, as if on the sly (!), the hidden base of a trunk stained with whitish lichens and reaching the places favourable to sap taking...

A supposedly 'inexperienced' predator is not attracted by these 'lichenoid tracks', even if they are somewhat animated by small, windy puffs... Assuring this behaviour, the partially

annihilated cicada habitus in this species, the forebody is coloured whitish, while the rest is visually broken by the transparent, almost invisible rear half of the whitish-pointed homelytra. See, on the left, the effect produced, *in situ*, by the insect's costume… On the right, female *Yanga pulverea* (Distant, 1882), having completed it imagination, final colours acquired, offers a close view of the mimetic texture of the dorsal tegument, including the eyes, the transparency of the wings with greyish veins here and there dotted here and there finishing by 'cutting' the body transversely. **Madagascar, Marozevo, January 1996 (MB phots)**.

2) 'Fake loss of identity'.

Many insects, many Saurians have this beautiful ability to identify themselves with their environment... Until they are no longer perceived, "disappear". Certain large corticultural Malagasy Cicadas, feeding and resting on the bark of large trees are customary in this respect; the choice made for the well named ***Umjaba evanescens*** (Butler, 1892), that we hear perfectly without ever seeing it, is relevant here:



Umjaba evanescens (Butler, 1892), corticicolous and mimesian species par excellence (**MB Phot**). Its sound faculties with extremely fast, whistling, piercing cymbal blows, panic our faculties of perception, making it very difficult to locate the necessary markings for the shot (!)

> Other specialists announced:

The ***Uroplatus***, prodigious lizards of respectable size and with a broad tail, are virtuosos of the "**Perte factice d'identité** " according to the famous expression of the Academician Roger Caillois (1963) mentioned above. Examples with four of these 'famous flat-tailed geckos'

Two ***Uroplatus henkeli*** **basking,** lying in wait, one on a branch that looks more or less like lichen, the other underneath, hoping for prey to pass close to their invisible mouths

The Mandraka, breeding farm, December 1995 (MB Phots).

> Elsewhere, chance encounters,

***Uroplatus fimbriatus*, each one, upside down, with the branch that supports it (EB phots).**
Wink to my son Eric, passionate about « Nouvelle Lémurie » (as he says), author of these documents taken on the East Coast and extracts from his rich photo library dedicated to Chameleons and Lemurs.

Personally, I was able to see "small fragments of wood" in movement…

With a few dance steps it was, in fact, party time at the home of two **mini-chameleons**, living on the forest litter, named ***Brookesia bonsi*** Ramanantsoa, 1980. **Namoroka (NW), December 1995 (MB phot).**

> Getting a glimpse... Then admired, this immobile chameleon, almost 'invisible', but vigilant!

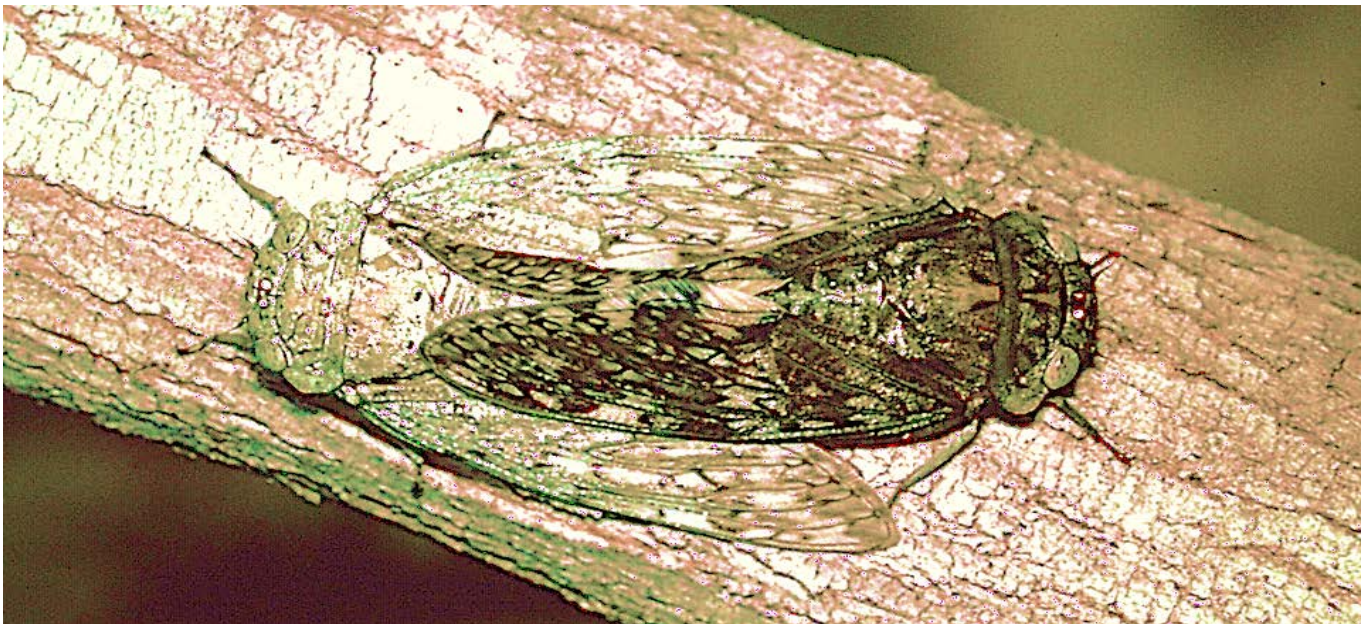
> The large and powerful chameleon that follows, is an ace at prey-predator ratios very often in its favour. But here, doubtful in front of my lens, both eyes fixedly darting in parallel (!!), one leg under the chin... It tries to evaluate the reality of its position....

Calumma parsonii (Cuvier, 1824), the largest chameleon in Madagascar and the world **(MB phots);**

While this other one was trying to swallow a big Cicada of the genus *Yanga!*

La Mandraka Forest, January 1997 (MB Phot)

3) Upset Faculty. Thus, the following very interesting eco-photo was entitled



Yanga guttulata (Signoret, 1860). **Copulation practised by two cicadas of the same species, although they have opposite dyeing habits. Surroundings of Ambositra, forest hill with burnt enclaves and *Eucalyptus* plantations, December 1996 (MB phot).**

In this spectacular and didactic document, the meeting of the sexes in the *Yanga guttulata* cicada, a mimesian species, is brought into play. A female, predominantly black, which joined a light-coloured tymbalizing male on its light-coloured support – a branch of *Eucalyptus* – was not stopped by a constraint of body harmonization at the visual starting point.

The chromato-mimetic harmonization, acquired in a medium that had been set ablaze during the imagining of the female, proved in this case to be unalterable. It is simply a definitive fact of selection and can be used as such, fortuitously and therefore with more or less certain deferred benefit. In short, the image suggests that procreation takes precedence over all in natura **(Boulard 2007b, 2012c).**

4) Digressive roundabout with the Nightjar of Madagascar

A whippoorwill mother, falsely wounded, thus distancing the enemy from its young huddled in the nest, immobile. Typical example of aristotelic automimetism. Model and mime are the same individual. A modality revealed, well before the letter, by Aristotle [History of Animals, IX (8)], about

the European Partridge which pretends to be wounded to attract the hunter and divert her from its nest or from its young. It is a behavior often manifested by the birds nesting on the ground, of which the Nightjar ***Caprimulgus madagascariensis*** Sganzin, 1840 (**MB Phots); (*Cf.* Boulard 2007b, 2012c**).

5) Relative effectiveness of lures

Some predators are totally insensitive to mimetic lures. Another ***Yanga guttulata*** was snaped, a large Malagasy Centipede, ***Scolopendra morsitans*** Linnéus, (*Demange det.*), devouring her belly while she was still alive (**MB phot**):

6) The Leafy Cicada par excellence, *Hovana distanti* (Brancsick, 1893)

Mimesian cicada of the type "leaf-orthogonal", exceptional habitus in the Cicadas, already approached with ***Lacetas annulicornis*** Karsch, *Afro-tropical species of small size* (*cf.* p. 94). Here we are talking about a much larger species, with enlarged leaf-like wings. In 1986, I was able to draw attention to the strangeness of this species… More astonishing is the structural composition of the male genitalia recently revealed by my ex-student and friend **Stéphane Puissant** in a magnificent board in press, while the sending of a leg fragment of our unique specimen allowed our molecularist colleagues (**Marshall & *al.*,** 2018) to definitively elucidate the systematic rank of this extraordinary animal.

Hovana distanti (Brancsick, 1893) **is the largest known Leaf Cicada (5 cm long with very wide and long costal membranes!).** Extremely rare and endangered entity of the residual sylves of Madagascar, of which I could only reconstitute two images according to the evocation that the blessed friend having captured and having offered it to me in the most perfect state.

Vallée de l'Ifasy, près d'Ambanja, décembre 1965, Annie[16] Monsarrat rec. & lég. **(MB Phots)**.

d) For the Record

Fantastic little path (**MB Phot**).

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16) Annie was, in 1962/63, a fellow student of the Certificate of Advanced Entomology (Fac. Sc. Paris). In 1965, when I entered the Harmas, she was able to follow her husband, **Pierre Monsarrat**, a researcher at the ORSTOM of Tananarive, and work on a Cicada that was inflicting damage to the sugar crop on Nosy Be and in the Ambilobé region. **Annie** defended, in 1971, an excellent Thesis on the "Bionomy of the Cicada *Yanga guttulata* Sign. in a sugar cane field in Madagascar", with the congratulations of the Jury. (A copy in my library).

In the Massif de l'Itrème... sunny "breakfast". April 1997;

Morning toilet on the outskirts of Andrigistra, January 20, 1997;

Parawintreberti gigantea, a large, apterous grasshopper and ***Mantella baroni***, a small tree frog, both seem to be preparing to leave the stage... **January 1997 (MB phots)**;

Very surprised! Little Apilemur coming out of his tree stall... ?

Ampitanabo, December 1995 (MB phot).

Gateway seems to keep its promises...

While an 'escape from the Nile' was at his expense... A bit cheeky, all the same! (MB phots)

Typical of the east coast, ***Nepenthes madagascariensis***, entomophagous plant and his trapping floral urns. **Foulepointe, February 1997 (MB phot)**

Sun at zenit on the Ihsoy Plateau, 26 January 1997 (MB phot)

Classify. Exploring the cicadofaunes, from one tropic to another with the various worries involved... I have sometimes heavily forgotten some of my own decisive dispositions. I must rectify here the generic position of the species ***itremensis*** quickly arranged with the *Pycna*, **error!** The costal membrane of the homelytra being, at its own, largely dilated, to the detriment of the costal cell, it is in fact a ***Kongota***… Let's put the Photographic Identity of this malagasy species back in the right place.

Kongota itremensis (Boulard, 2008) *new combination.*

67) Comoros Archipelago (On submitted collection)

On material collected by **Dr Pierre Viette**, former Assistant Director at the Museum and great friend. Descriptions of ***Yanga viettei*** Boulard, 1981, of ***Yanga mayottensis*** and the subspecies ***Yanga viettei anjouaniensis*** and ***Yanga viettei moheliensis*** in **Boulard, 1990a.**

6₈) Ethiopia

Little research has been done on the Ethiopian cicadidae fauna. However, I have been able to publish 2 taxonomic notes thanks to specimens brought back by my colleagues **P.C. Rougeot** (MNHN, Paris) and **P. Brignoli** of the Accademia Nazionale dei Lincei (Rome). These two lepidopterists had the opportunity to carry out some entomological hunting in 1973-1975 in a country which was then unstable, the Eritrean province being in secession. Both of them communicated to me the cicadas that had fallen into their nets, or into light traps, most of them belonging to the old taxon '*Pycna*' now geographically fragmented (*cf.* ***Sanborn****, janvier et avril 2020*). In the collection of **P.C. Rougeot,** there were 13 specimens, all females of the magnificent *P. antinorii*, 2 females of *P. viticollis*; 1 other female of the same genus; 1 male and 2 females of an undetermined *Iruana*. **P. Brignoli** reported 23 females of *P. antinorii;* 2 males and 1 female of another *Iruana* also undetermined. I attached these materials to the Ethiopian elements provided by my colleague **U. Gollner-Scheiding** of the Berlin Museum and by my confrere **E. Tortonese** of the Museum of Genoa. The opportunity to study these elements of an extremely rare material, was going to make known an astonishing figurative painter.

a) A prodigious "animal copyist"...

In 1975, I began to work on the material I had collected... And it was at this time that an illustrator of Provençal insects in search of exotic models, **Mr Bernard Durin**, came to the Museum. After having seen the Coleopterists and Orthopterists, he stopped in my laboratory... Very quickly he saw the *Pycna* on the bench... And left with a beautiful specimen of '*Pycna' antinorii* [today in *Dyticopycna* genus, Sanborn, 2020] the wings spread out, offering a wingspan of 80 mm. Barely 15 days later, he returned with an ordeal that surprised us all, fascinated by its magnificence.

Bernard* became a friend, 45 (rue de Buffon) supplied him with subjects from the most beautiful boxes of the National Collections, with the approval of **Professor Jean Dorst**, our very regretted Director of the time, who was full of praise, particularly concerning two other Auchenorhynchous that I had also entrusted to him, the great Central African Cicada *Ugada giovanninae* and the superb Fulgore of *Phrictus* genus. Taking again the sublime *antinorii*, I am happy to reproduce in these pages, the image of this Cicada as beautiful as alive. Especially since our talented friend was struck down by an indomitable disease in the first days of January 1988, he was not yet 50 years old.

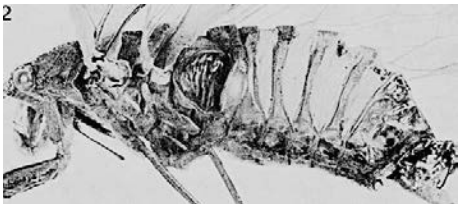
Dyticopycna antinorii (Lethierry, 1880). Reduced copy of the pure Watercolour, due to **Bernard Durin**, his wire counter and double-zero brush, **November 1975.**

b) New Ethiopian species, bioethological note

> ***Oxypleura ethiopiensis*** Boulard, 1975 e: 255, fig. 11; ***Dyticopycna dolosa*** (Boulard, 1975 e: Sanborn, 2020): 256, fig. 12; ***Munza popovi*** Boulard, 1975 e: 253, figs. 7, 9 and 10; ***Iruana rougeauti*** Boulard, 1975i: 176, figs. 1 and 2; ***Iruana brignolii*** Boulard, 1981: 58, figs. 1-3.

Male Iruanes have the very particular ability to greatly increase their abdominal resonance chamber during call tymbalisations. This faculty is exacerbated by the wide membranized and crumpled (at rest) areas that occupy laterotergites III to VI:

*) **Bernard** published **"DURIN'S KÄFER, Schirmer/Mosel publisher, 1986",** a sumptuous 28x33 cm cardboard brochure gathering 48 of his watercolors dedicated to the most extraordinary and colorful tropical insects. In my Library, dedicated.



Iruana brignolii Boulard, 1981. Male, abdomen somewhat stretched, showing the beaches crumpleable and extensible integumentaries to increase the internal resonance chamber during call tymbalization in these Cicadas **(MB Phot)**.

69) Some important 'highlights' of Ethiopian zoogeography

a) Fauna

>Creation of the genus ***Hylora***, with descriptions by ***H. centralensis*** Boulard, 1971, from Gabon and the Central African Republic, and by ***H. villiersi*** Boulard, 1984, from Ivory Coast.

>Descriptions of ***Musoda occidentalis*** and ***M. orientalis*** Boulard, 1974c, species related to ***M. flavida*** Karsch, 1890, from Central Africa.

>Description by ***Paectira capeneri*** Boulard, 1992f, from South Africa.

b) Cicadas biologically disabled

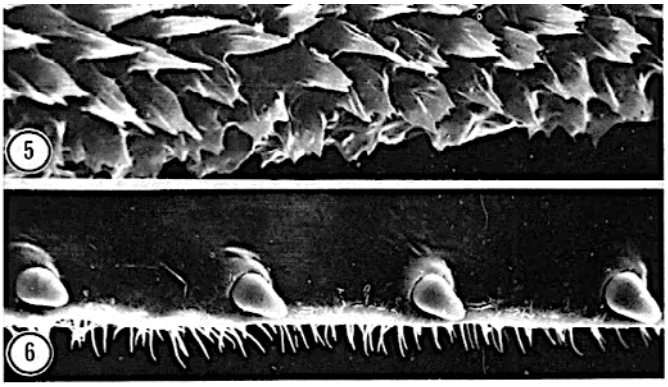
> Seven acymbalic species are known to occur in Africa, most of which are "MB detected", two of which are potentially stridulent. "**Acymbalic**" means cicadas whose males, like the females, lack functional tymbals. They are all African,

-> ***Lamotialna condamini*** Boulard, 1976, in Central African Republic.
-> ***Lamotialna couturieri*** Boulard, 1986, in Ivory Coast.
-> ***Bafutalna mirei*** Boulard, 1993, in Cameroon.
-> ***Sechellalna seychellensis*** (Distant, 1913 : Boulard 2010), subgenus *Yanga*.
-> ***Murphyalna mughessensis*** Boulard, 2012, from Malawi, reported a few pages ago.

A surprising private reality that raises the problem of the means used, in these cicadas with males thus genetically diminished, to ensure the meeting of the sexes and the sustainability of their species. New question: phylogenetic scanning has shown that these acymbalic Cicadids come from various strains, more or less distant from each other (Boulard 1973e, 1993e and 2012d).

> More exceptional and disturbing, there are two other species that are also acymbalic, but with a phonatory system equivalent to those of some Orthopterans. Both were discovered in the Lower Forest Ivory Coast, ***Maroboduus fractus*** Distant, 1920 (= *Ydiella gilloni* Boulard, 1973) and ***Maroboduus maxicapsulifera*** (Boulard, 1986). Otherwise remarkable, these species have a potentially stridulating homelytro-alaric system, a singular fact that evokes some genetic reminiscence of an ancestral sharing with Grasshoppers.

Below, **partial micrographs** of the main elements of the chirping mechanism: in **(5)** stridens pars made up of multiple spikes carried by the 3rd anal rib of the homelytra; in **(6)** surprising plectrum composed of identical teeth regularly implanted on the costal edge of the hind wings **(*Cf.* Boulard, 1973g; 2006f):**



7- In South America

Several long missions entitled "**Entomological exploration of Guyano-Amazonian natural environments**". The first one, "**Mission Pompanon**" of seven months sponsored and financed by **Mr Louis Pompanon**, Director of the Gévéor establishments. It was sponsored by the Museum and **Professor A.S. Balashovsky**, Member of the Institute (Academy of Sciences) and Director of the Entomology Laboratory of the Museum, entrusted me with its scientific direction and was carried out from the beginning of July 1975 to the end of January 1976.

Conceived "**Systematic prospecting of the entomic fauna of the Amazonian banks, from the mouth to Peru**" with **"Acquisition of new knowledge on the ethology of Homoptera Cicadoidea and Membracoidea"** and **"Realization of visual documents on Amazonian Insects",** it was thus presented to the Brazilian Embassy in Paris, which encouraged it, providing advice and addresses.

The great river could be navigated thanks to the *"Taniaco"*, a sailing boat owned by **Mr. Pierre Pompanon** (Navigator, Company Director). With him, **Mr. Pierre Jauffret** (teacher, entomologist and forest agronomist, member of the Alliance française de Belèm) and myself made up the permanent staff of the boat and the **Mission Pompanon**.

Pierre Pompanon at the controls of the "Taniaco" sound, sailing towards Belèm (MB photo).

7_1) French Guiana

a) Kourou-Mana-Kourou. Initially based in Kourou, we spent about ten days of acclimatization. Preparatory hikes were organized, including the one following the gold panners' rail to Saül, the geographical center of the department. By the coastal road, we reached the surroundings of **Mana**, where we had the great chance to witness the hatching of very lively small **leatherback turtles**, as well as the arrival of psammophilic layers. Photographic happiness. Four eco-photographs witnesses,

-> Newborn baby crawling on the wet sand, in full sunny daylight but towards the Ocean

-> **Nightly,** female (*its left fin crippled*, Shark? Helix?) having dug a hole with its hind legs and depositing its eggs by three or four. (**Early August 1975, MB phots**).

b) Kourou - Belèm - Kourou.

Anchoring (September 19, 1975) barely completed the Amazonian Mission's project ran short, due to political problems tinged with French journalistic influences concerning Amerindian peoples… In spite of the assurances given in Paris, then the forced contacts in Brasilia with the help of the French Consul... It seemed that the Brasilian authorities wouldn't admit that with a ship like the *Taniaco*, we were only interested in the Insects. The *Taniaco* moored in Belèm and our passports were confiscated by the harbour master's office... The welcoming harbour administration offered us to go on a touristic trip for about fifteen days before leaving for French Guiana.

With bad luck, big heart! We set up several impromptu salvage expeditions, relying on regions that were little or not entomologically explored. In Brazil, as far as it would be possible, and then in French Guiana, where we would not have to suffer any discrimination. Our Mission, thus redefined, was saved in acceptable proportions.

So, In the Brazilian Amazon where, thanks to **Denis Vandame**, director of the Alliance française de Belèm, and his relations **with the Para Air Force**, we were able to reach the region of Gorotire, in the South of the Province and paddle near the banks of the Xingu (*cf.* pp. 179 and 333). Despite a bumpy landing, the plane, a DC 3, was thrown off the runway, following the bursting of a tire when it hit the ground.

After yawing, install the jack to change the wheel. Sao Felix, October 1975. The runway was laid out on the typical savannah at ***Bulbostylis paradoxa***, Cyperaceae "not very suitable for landings"!
Gorotire region (MB phot)

Back in French Guiana, we went up the Maroni, as well as a large part of Itany, finally basing ourselves in Touenké, superbly welcomed by the Wayanas and where **Pierre Jauffret** found dear friends (*cf.* Boulard, 1979h).

Additional missions of long duration took shape afterwards, motivated by the desire to deepen and increase the "acceptable" results. These were: in September 1979-January 1980, in Brazil (without a boat, but discovering the North-South Trans-Amazonian by bus), then in February-March 1981 in Amapa, and finally, once again in French Guiana. Most of them were made with one or the other of the two companions, dear friends known during the first Mission. In addition to new species and homopterological data collected and catalogued, many mimetological facts have also been discovered and photographed, partially exposed in this collection.

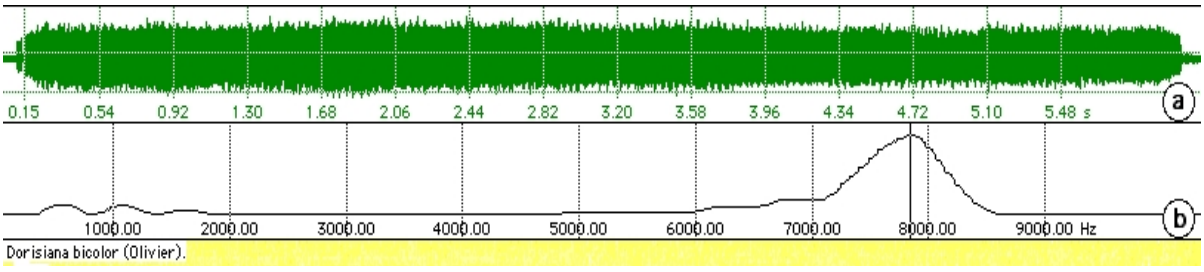
It is my friendly and fervent duty to thank again **Pierre Pompanon**, who has since settled in Rio-Ipanema, but also in Buzios, where I am still awaited. Great friendship also assured with **Pierre Jauffret** who, alas, left us recently and very tragically. **Pierre Jauffret** had settled with his wife and children in Amapà, at the mouth of the Amazon River, near Santo Antônio do Tauá, where he created a **Nature Reserve**, **administratively recognized and legalized on August 22, 2005.** The protection of this Reserve, which I was able to visit in March 1981, cost him his life: he was murdered, during an "umpteenth" dispute with some miscreants deploring the coveted existence of 25 hectares put in Forest Reserve. Several assassins were condemned. As for the Reserve, assistance has yet to be set up.

To conclude this preamble, it is important to mention the cordial welcome found in French Guyana at the Foreign Legion, which allowed us to acquire anti-rain hammocks (*cf.* p. 163) and several times daily rations packages. Thanks also to the Gendarmerie for all the help given during our expeditions by pirogue on the Mana, then on the Maroni and the Itany.

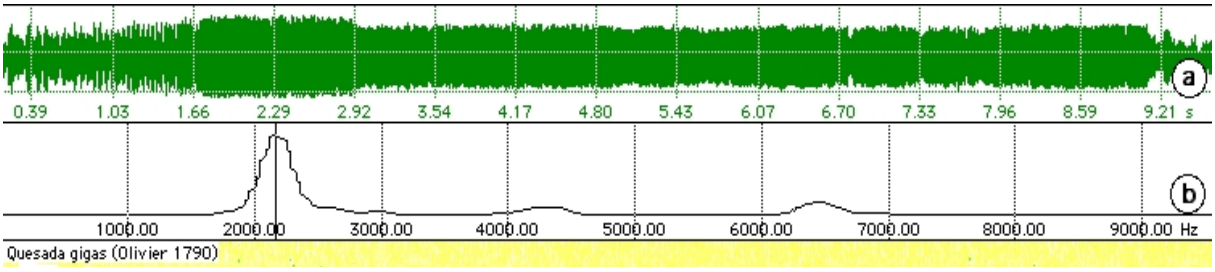
Pedestrian transfer of luggage; lighten the dugout canoe and pass the Maroni rapids
Case on the head: Pierre Jauffret **(PP Phot)**.

c) The Maroni and first Cicadas

Concerning Cicadas that have been known and described for a very long time: ***Quesada gigas*** (Olivier, 1790), ***Dorisiana bicolor*** (Olivier, 1790) and ***Fidicina mannifera*** (Fabricius, 1803), Acoustic Identity Cards (CIA) were established for the first time (Blrd 2001b). These are species that are omnipresent in the great Guyano-Amazonian sylva and can be easily identified in situ, thanks to their tymbalizations with specific accessible sounds. The first two are 'solitary' species, whose sonic outbursts may have attracted the attention of the first travellers who collected the few specimens that the entomologist **Guillaume Antoine Olivier** described in volume 5 (**Paris, 1790**) of the 'Histoire naturelle des Insectes' in the ***Encyclopédie méthodique*** de **Diderot et d'Alembert**. Here are the first **AICs** relating to these two historical species:



Kourou en août 1975 (MB Sign);



Maripasoula en novembre 1975 (MB Sign):

For each of the two species: In **(a)** oscillogram of a real-time tymbalization sequence, short for the first (6 s), longer for the second (10 s). In **(b)** Medium Spectrum Plot. There is a large difference between the pitches of the frequency registers used: relatively low for the 'giant' (just over 2000 Hz), relatively high (nearly 8000 Hz) for the 'bicolour' (*on Signalyze 3.0*).

Pause during an 'umpteenth' pedestrian transfer to lighten the canoe and cross the rapids (PP Phot).

d) Itany and Touenké

Turning on the Itany, we arrived in Touenké, where **Pierre Jauffret** received a warm welcome. He was for 3 years the 'Teacher' and the village secretary.

Pierre went back to his school and the Mission was a real 'Welcome'. We took a month's stay, settled in a comfortable carbet, a stability that allowed us to explore the banks of the river between Touenké and Antécumpata (**MB phots**).

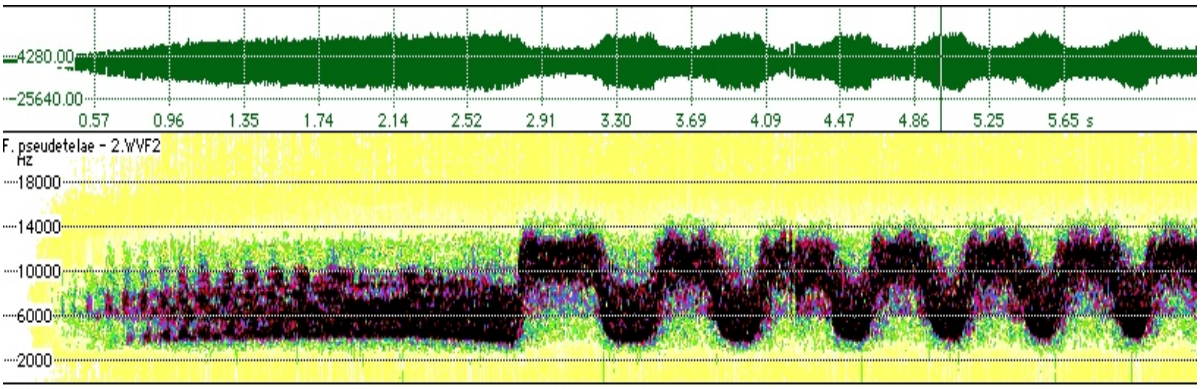
> Where we found the species "*mannifera*":

We lived in Wayanas (above, **PP Phot**), fishing and hunting. Often with the help of villagers and children, we collected a lot, photographed, made some beautiful discoveries, including the 'frightening' behaviour of the Leafhopper (*cf.* p. 314/5), and collected many documents, some concerning more precisely the third Guyano-Amazonian Cicada (*cf.* p. 314/5). It is *Fidicina mannifera*, a green and brown species, of which the eco-photo of a couple, female above **(MB phot),** is shown below:

The species was immortalized in 1705 in a watercolour by the first entomological artist, **Maria Sibylla Merian**, in a sumptuous work on the insects of Suriname. The copy, drawn and painted, is in the collections of the *Linnean Society of London* (**Boulard, 1988c**).

It was only in 1803 that J**. C. Fabricius** created the first scientific status of the species: *Tettigonia mannifera*. Later it became the type species of the genus ***Fidicina*** Amyot et Serville, 1843. Subsequently, many new Fidicines were described. Notably when I had the opportunity to obtain a long internship in my laboratory for a young Brazilian colleague **Nilza Maria Martinelli**[18].

Nilza wished to specialize on these great Guyano-Amazonian Cicadas, of which she had many undetermined specimens (*cf.* Boulard & Martinelli, 1996 and Boulard, 2001b; 2011c). I will retain here the eco-portrait and the ramage of a large unknown solitary species, admired and recorded on a sunny Guyanese day at the end of 1975. It was described under the binom ***Fidicinoides pseudethellae*** representative of a genus that we created for this Cicada and a dozen of its sisters. Later, I was able to treat its 'ramage'. It is a powerful and melodious tymbalization, which turned out to be astonishing in the temporal and even more frequent transcriptions of the emitted sounds, which, imaged, revealed themselves in a long series of large V's just connected between them:



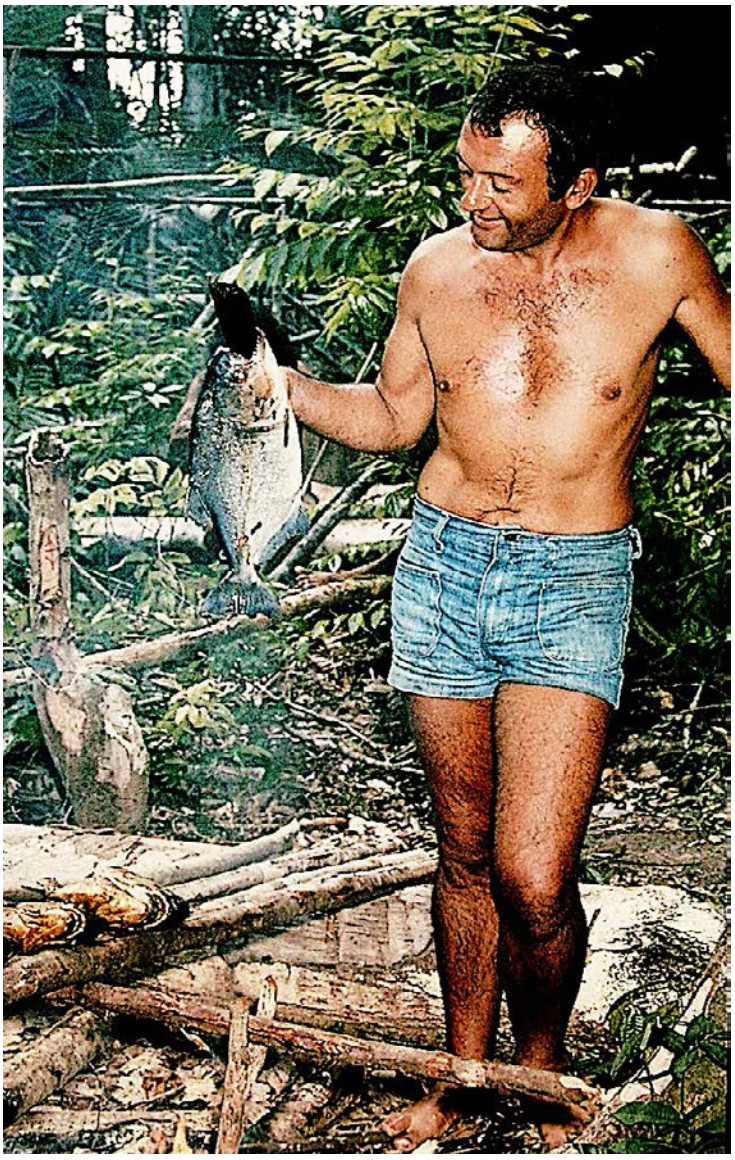
Fidicinoides pseudethelae Boulard and Martinelli, 1996 - First elements of the AIC, *on Signalyze 3.0*: **Waveform**: An eight-second transcription of the time signal at the very beginning of the broadcast. **Spectrogram**: Frequencies transcribed into a multiple "V" sound chain.

French Guiana, Haut Itany, dense forest, December 1975 (Boulard, 2001b).

18) Became Professor of Agricultural Entomology and Phytosanitary, UNESP, Jaboticabal Campus, Sao Paulo.

e) For the Record

> In the meantime, Pierre Pompanon respecting the deserved rest that I took, following the highlighting of the burrow of an unknown mature Fidicine juvenile, immortalized the scene **(PP Phot)** and left for fishing.



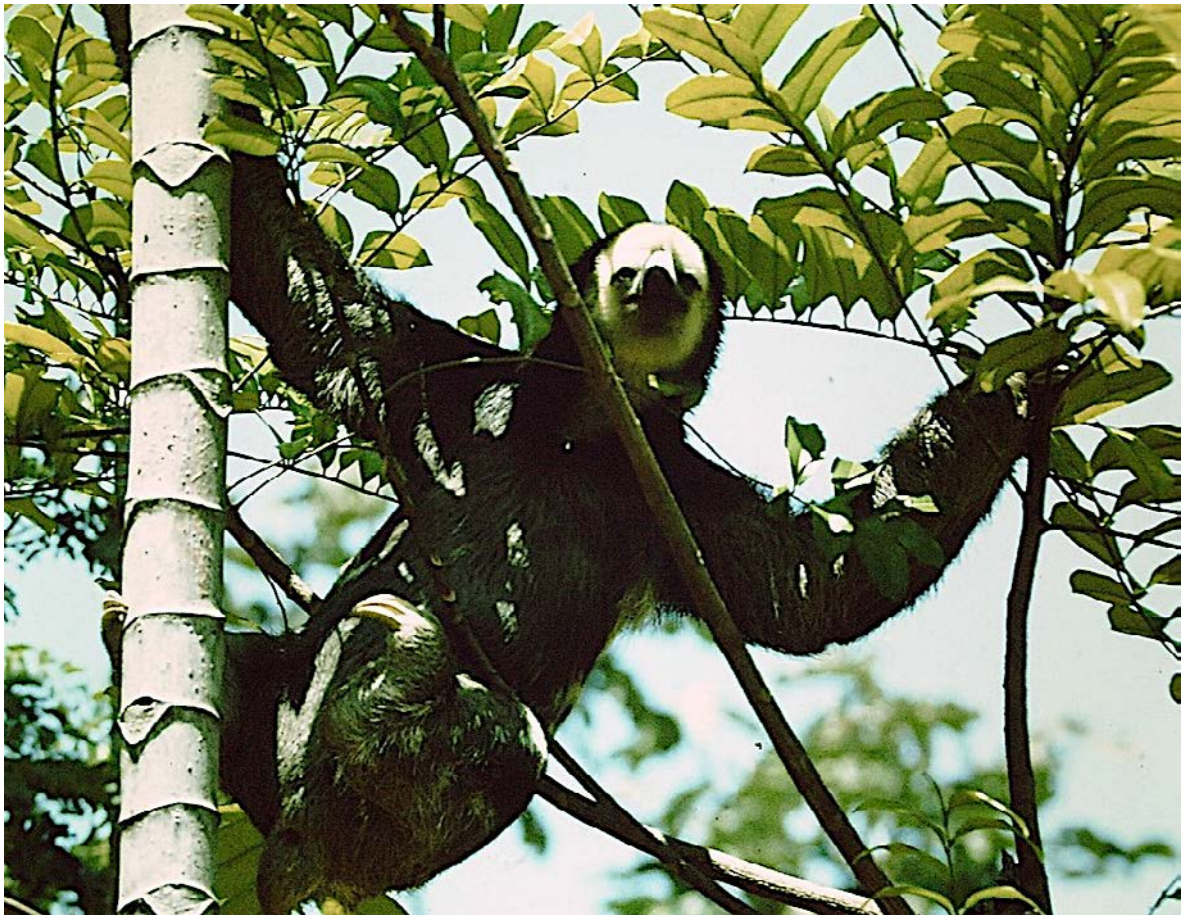
>Tower and dry burrow of a Fidicine may be of the kind *Guyalna* Boulard & Martinelli 1996 **(MB Phot)**

> And three to smoke, *dixit* **PP**! **(November 1975 (MB phot)**.

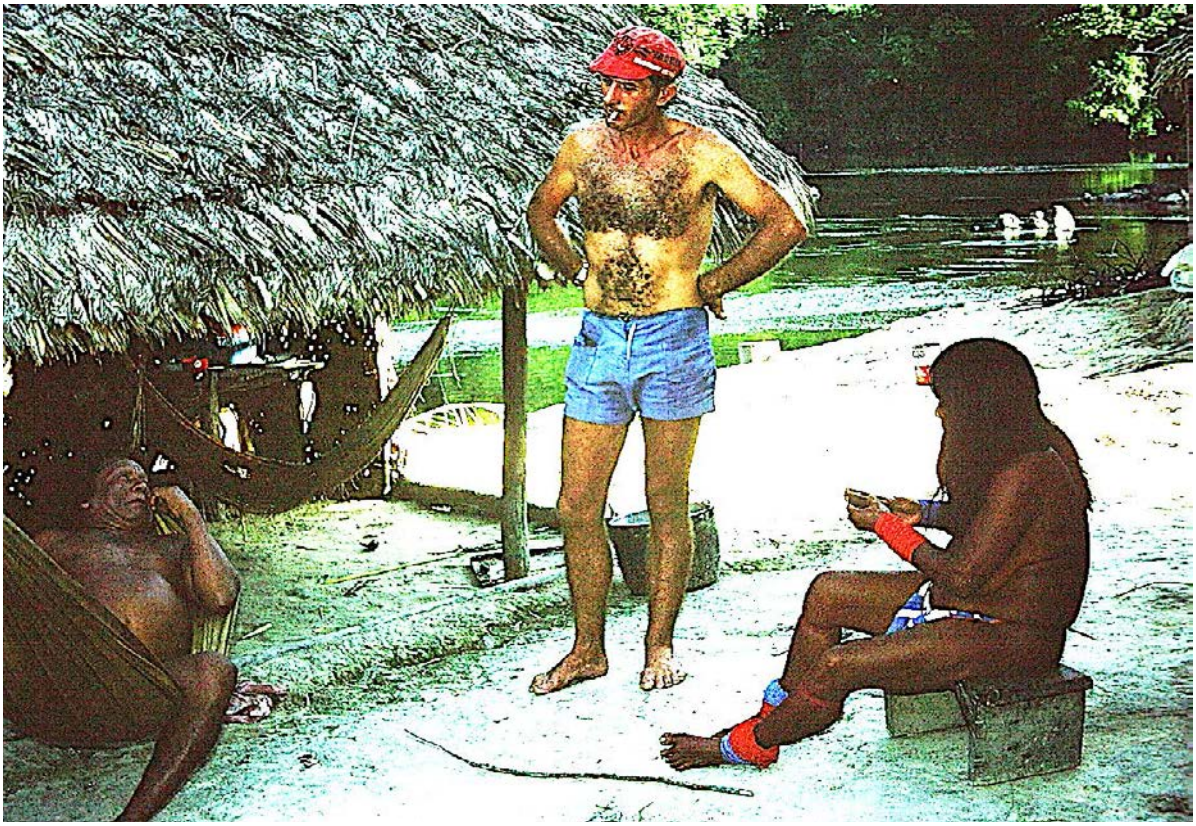
> Common cicadas at Touenké

Fidicinoides pseudethelae Boulard and Martinelli, 1996. Caged female, feeding, and two males of ***Dorisiana bicolor*** (Olivier, 1790). **Haut Itany, December 1975** (**MB phots**).

> **An Aï, a three-toed sloth, was brought back to the village**,



As well as a Cohendou, an arboreal porcupine with a prehensile tail (MB phots).



> Pierre Jauffray talks with an old friend, whose young daughter seems to be busy today (!)... By some 21st Century "trendy" object! (**MB phot**).

>Tasting of larvae from an Arbor Hymenoptera nest, just brought back by a daddy,

Which was photographed while he was finishing fixing the tail of an arrow.
Touenké, November 1975 (**MB phots**)

> The Lesson of the Peccary Hunters

At the beginning of our stay in Touenké, I was invited to hunt big game in the forest along the river. We arrived in sight of a troop of Peccary. As a young European, I thought "they are going to make a massacre". That they won't! These assistants in animal ecology only bent three of them! Immediately picked up and placed in the dugout. One for each of the families and assimilated composing the village.

Then, we took a break for a snack... Of course, I took pictures.

On the banks of the Itany. November 1975 (MB phot).

In the forest, some surprising encounters, from the moment they are frightening, can become seductive... Witness this disturbed Green Python of a peaceful digestion... Apparently not too angry for all that... Perhaps a little too curious:

Green white-spotted python, ***Morelia viridis*** (Schlegel, 1872). **November 1975 (MB phots)**

On the way back, entertainment offered by the "rapids" of Itany...
Pierre Jauffret and two wayana friends (PP phot).

The dugout had to keep going! (MB phot)

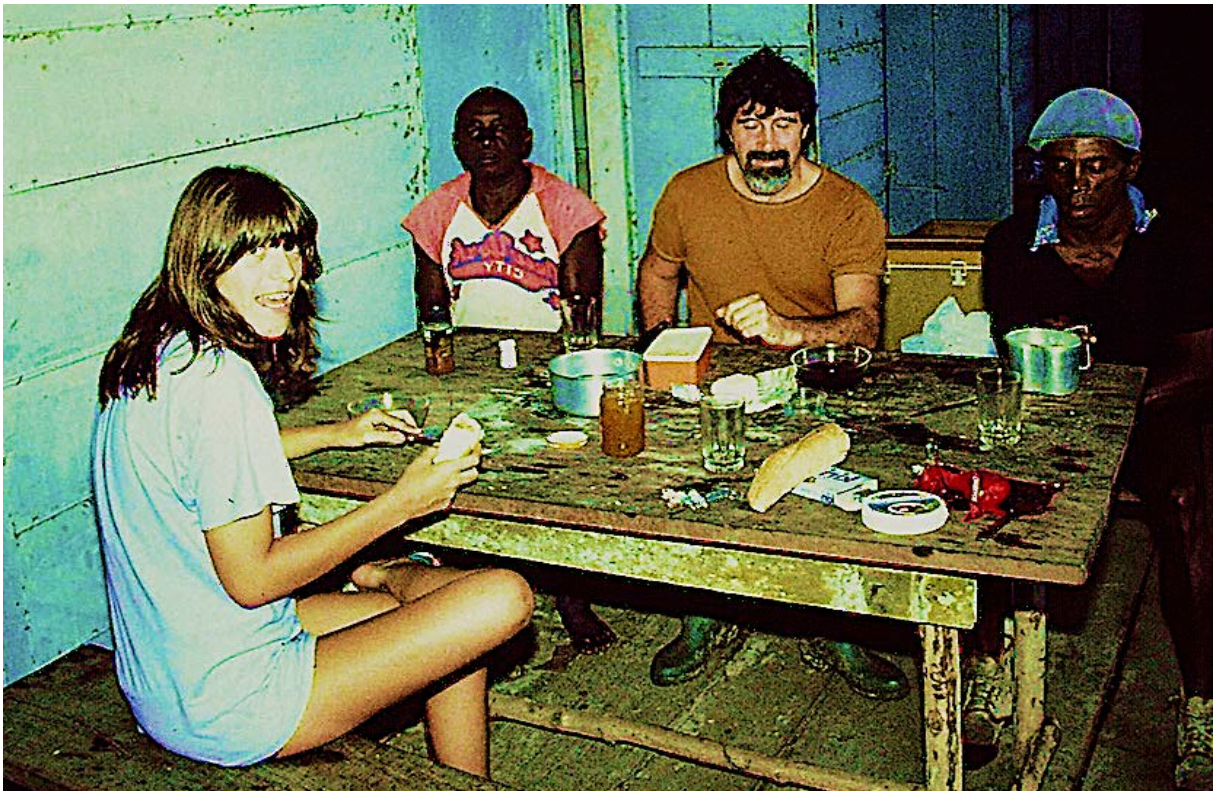
Tribute to Chief Anapaïké

Who offered us a warm hospitality in his village of Touenké on the Itany (PJ phot, December 1975).

I write here my sadness in his memory, this valiant friend left us, eight years ago.

f) The Arataye. In February-March 1981, I returned to French Guyana, accompanied by my daughter Christine, who had just completed her secondary education. It was expressly to visit the banks of the Arataye, that from Regina we went up, like Spartans, from time to time supplied by our friends from the gendarmerie.

Going up the river in the gendarmes' pirogue...



Frugal meal" stage; always friendly welcome

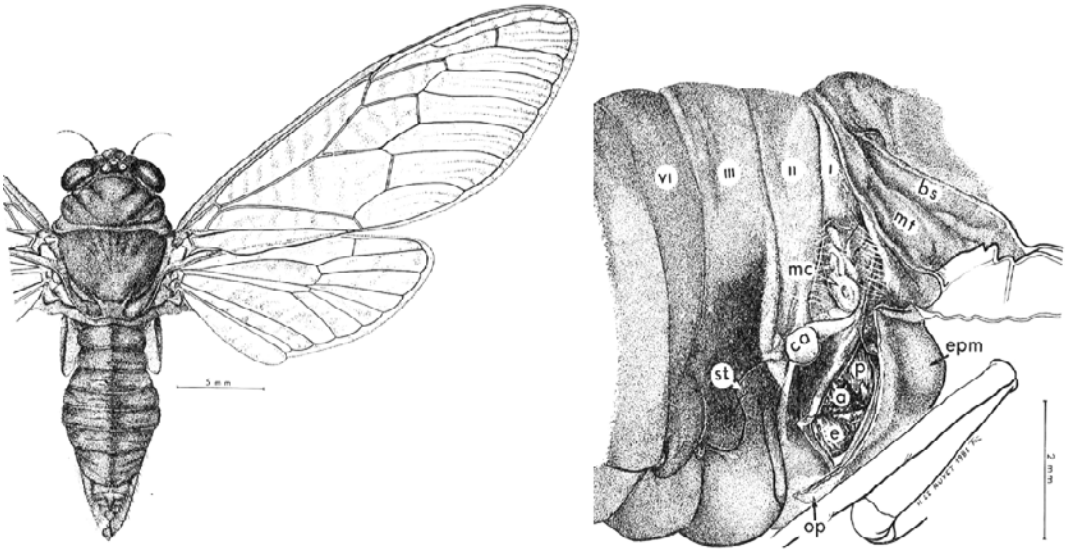
-> Our main camp at Saut Pararé, end of February 1981:

Then various eco-photographs, including those of a rarity: *Atelopus pulcher hoogmoedi*, very nice little frog *(Jean Lescure det.).*
And Christine with a little Atèle, spider monkey, with its tail on her wrist. **(MB Phots)**

g) Winess

This is a transitional page to pay tribute to excellent friends and colleagues who, in the course of their own research, have been able to collect species of Guyano-Amazonian Cicadas other than those that fell into my nets. Two have caught my attention. New to Science, they were described by me and therefore reported here, with the names of Hervé de Toulgoët, Gérard Tavakilian and Olivier Bénichou.

>Guyanese species of a new kind, collected in Saül, in the center of French Guyana. The male, curiously tight at the "waist", has large lids and tiny but functional cymbals. Two pairs of oversized wings, in relation to the relative smallness of the body (wingspan = 56 mm, body length = 20 mm) complete the distinction between the species, whose status I forged on the surnames of the collectors, **Hervé De Toulgoët** and **Gérard Tavakilian**

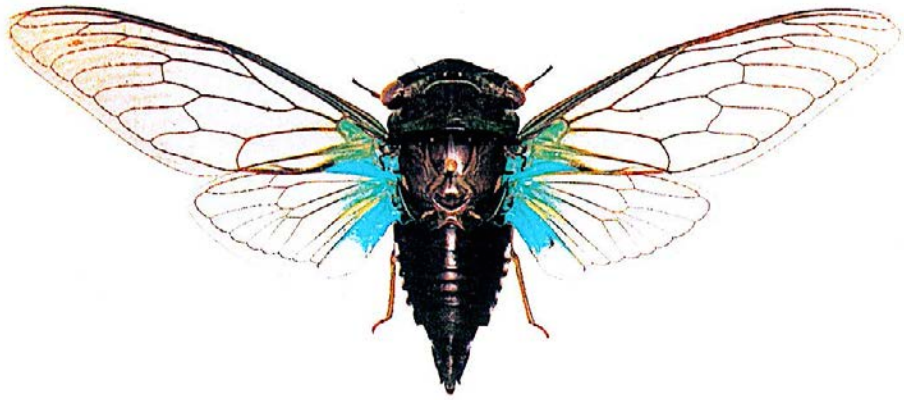


Toulgoëtalna tavakiliani Boulard, 1982, French Guiana.

Dorsal view allowing to appreciate the strong pinch of the abdominal base, quite unusual in the Cicadas. Partial and augmented view of the right profile of the abdomen allowing to locate the tiny cymbal (**mc**). **(I-IV),** the first 4 urites; bc, skull flange; ca, ear capsule; mt, metathorax.

(**Drawings Hélène Le Ruyet-Tan**).

> Large and magnificent species trapped in the light and independently by Gérard and Olivier in the Kaw Region, in August 1984 and September 1986. It is characterized by its homelytral and wing bases of a bright turquoise blue, an extremely rare color in the family Cicadidae. Possible subspecies, or Guyanese variety, of *Orialella boliviana* (Distant, 1904).



Oriallela aerizuelae Boulard, 1986, female allotype, wingspan 119 mm.

(**Buirette Phot**).

7_2) Brazil

a) Brasilia, impromptu visit

During our discussions about the few days we spent in Brasilia to obtain the authorization to go up the Amazon with the Taniaco... In vain, as explained above, the long free time obligingly allowed by the authorities, allowed us to see the spectacular site. The shots were captivating, the New Capital having given a certain free architectural course in its construction, this one largely accomplished in **October 1975**, I can assure it, incidentally (!)

The 'Twin Towers' flanked, on both sides, by the 'Houses of Congress', under a stormy sky

The top of the Cathedral, under an otherwise uncertain sky (MB Phots).

b) Wildlife contributions

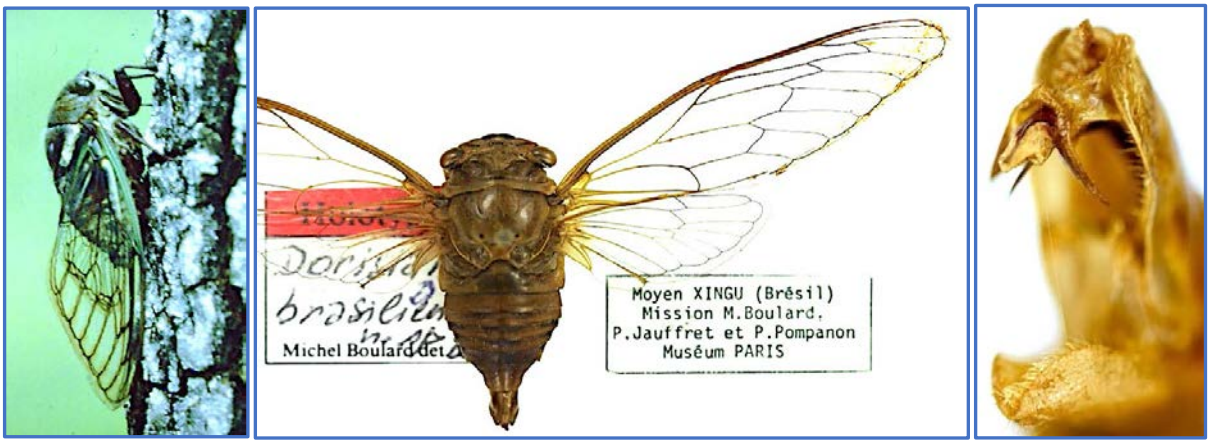
Many are still without determination, the Cicadas collected during the main Mission and the few others that I have been able to realize, on meagre Museum credits or, more often, on my personal fund. As mentioned above, I have undertaken, with the help of Nilza Martinelli, **the Taxonomic Revision of the Fidicinini tribe**, a tribe widely represented in the Guyano-Amazonian Forest, but also largely unknown. Two articles were published, including a fundamental 71-page article (1996g; 2011c). The genera ***Fidicina*** Amyot and Serville, 1843 and ***Dorisiana*** Metcaf, 1952 are redefined and three unpublished genera distinguished: ***Fidicinoides, Bergalna*** and ***Guyalna*** Boulard and Martinelli, 1996. Nine species were reviewed or confirmed, to which 26 new species were added, including 10 collected by me during my Guyano-Amazonian missions.

> On the genera Dorisiana and Guyalna. New faunistic data are in preparation, but can be cited here, as they have already been named and are being described. First of all detection, photo and capture, in the wooded areas surrounding the city, of a feeding male of a small species. Just medium in size, green, with transparent wings, this specimen examined with the binocular, became the type of a new species of *Dorisiana*. As such, it seemed appropriate to fix the species and describe it in fascicle **21** (EPHE, March 2017: *Dorisiana brasilianensis* nsp, p. 93-94).

> Rappel. **Holotype ♂,** *Brazil, Middle Xingu, wooded savannah around Brasilia.* MB réc., 22. X. 1975. *Mission M. Boulard, P. Jauffret et P. Pompanon*, MNHN, Paris.

Main dimensions in millimetres. Wingspan = 63, total length including wings = 48, length of forebody = 13, length of abdomen = 16, width of abdomen at cymbaclytes = 16.5, length of body = 29, length Lh of homelytra = 40, greatest width Lh of homelytra = 13.5, width of head including eyes = 11, width of mesonotum = 14.

Photographic identities of the Holotype



***Dorisiana brasilianensis*, eco-photo, dorsal and genital taxonomic views** (MB Phots).

> ***Dorisiana saofelicensis*** Boulard in litt., ***D. draluobi*** Boulard in litt. and ***D. xingusidensis*** Boulard in litt. all collected in September and October 1975.

> ***Guyalna*** Boulard & Martinelli, including ***G. jauffreti*** Boulard in litt. and ***G. pompanoni*** Boulard in litt. also collected in November-December 1975.

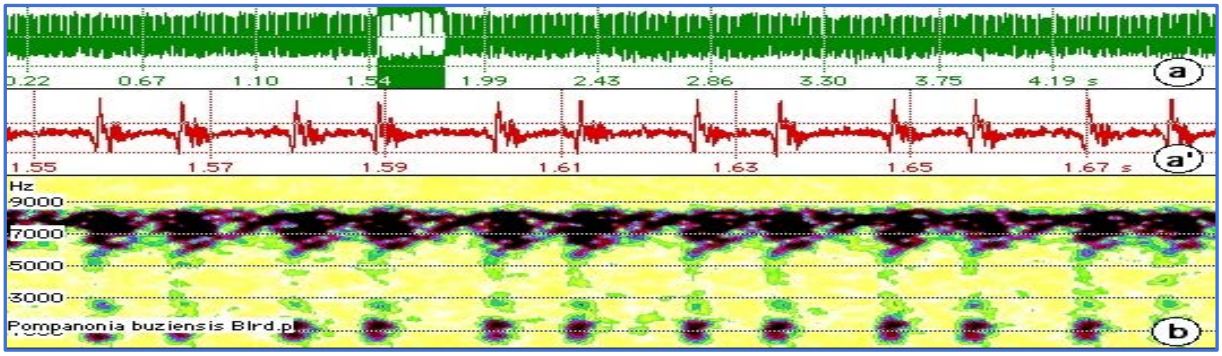
c) Bionomic contributions. A few observations should be noted here:

1) A halophilic and dusk-night Cicada

First detection, description, ethology followed and elementary **CIA** of ***Pompanonia buziensis*** new genus, new species met on a narrow coastal edge of the **peninsula of Buzios, state of Rio de Janeiro.** This cicada, **twilight-night**, has revealed a hitherto unpublished and then hardly believable ethology, then an ethology difficult to believe, by seeking first a mode of "*echolocation*" unsuspected in diurnal species first. Here it is: established twilight, or passing into the night, males *Pompanonia buziensis* tymbalize... The females become feverish and fly away... In the half-light, each one joins a

tymbalizer and mates! **Action which can take place at night largely established**, as it was the case when I had the chance to follow and several times "flash" this behavior:

Pompanonia buziensis Boulard, 1982. **Male tymbalizing at night...** Shortly after having flashed it and followed it, then tymbalizing, a female came to join it and mate! (*cf*. **Boulard, 1982j**).



Pompanonia buziensis Boulard, 1982**. AIC (a)** Very fast 'tymbal roll'; **(a')** Stretched segment, to be readable; **(b)** Spectrogram revealing a very low, relatively powerful, fragmented fundamental and a formantic zone overlapping 8000 Hz. **State of Rio de Janeiro, Presqu'île de Buzios, December 1979 (MB, *Signalyze 3.0*).**

2) Imaginaison of Quesada gigas (Olivier, 1790). We have been able to follow and photograph the complete unfolding, performed **at night** and in concert by several specimens in the **humid forest of Volta Redonda**, on the night of November 20-21, 1979. Below, a male just "hatched"

***Quesada gigas*, imaginaison in progress**.

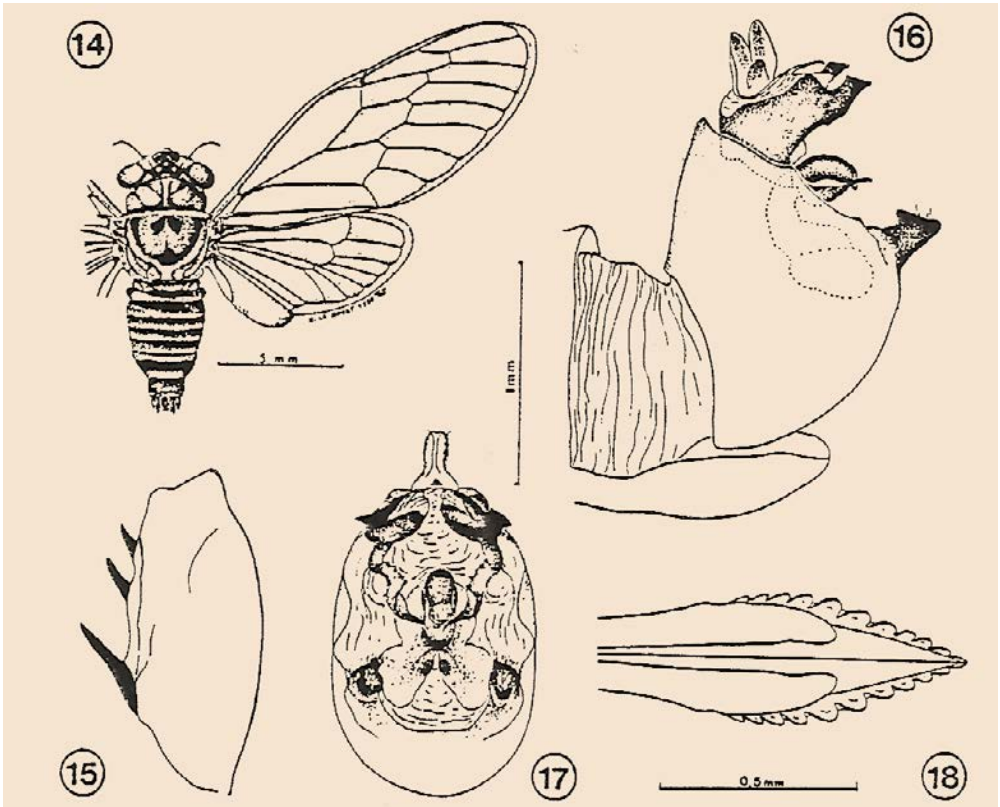
Here on the left, phase of the total reversal inciting the imago to straighten up and take out its abdominal apex from its old exoskeleton, the last juvenile remains. At the top, the insect straightens up and will cling to finally take out its abdomen completely.

Here on the right, **a Juvenile V mature** still walks on the trunk, while **a female, almost completed imaginary birth,** dries its large wings, sending back in blue the flash of my flash.

Brazil, R.J., Volta Redonda, November 1979 (MB Phots).

3) A small Cicada drumming on leaf

Taphura debruni Boulard, 1990, a small species with poorly developed cymbals, but whose homelytra, with just reinforced costales, are used for drumming:



Txt-Fig. 14 à 18 : ***Taphura debruni*** **n. sp.** ; **14** = Holotype ♂ (dessin de Hélène Le Ruyet-Tan). **15** = fémur antérieur; **16** et **17** = genitalia mâles, en vue de profil puis inféro-postérieure; **18** = apex de la tarière en vue ventrale. (Echelle en millimètres).

Brazil, State of Maranhao, Acailandia, October 1979 (**MB rec., HLRT drawings**).

d) For the Record

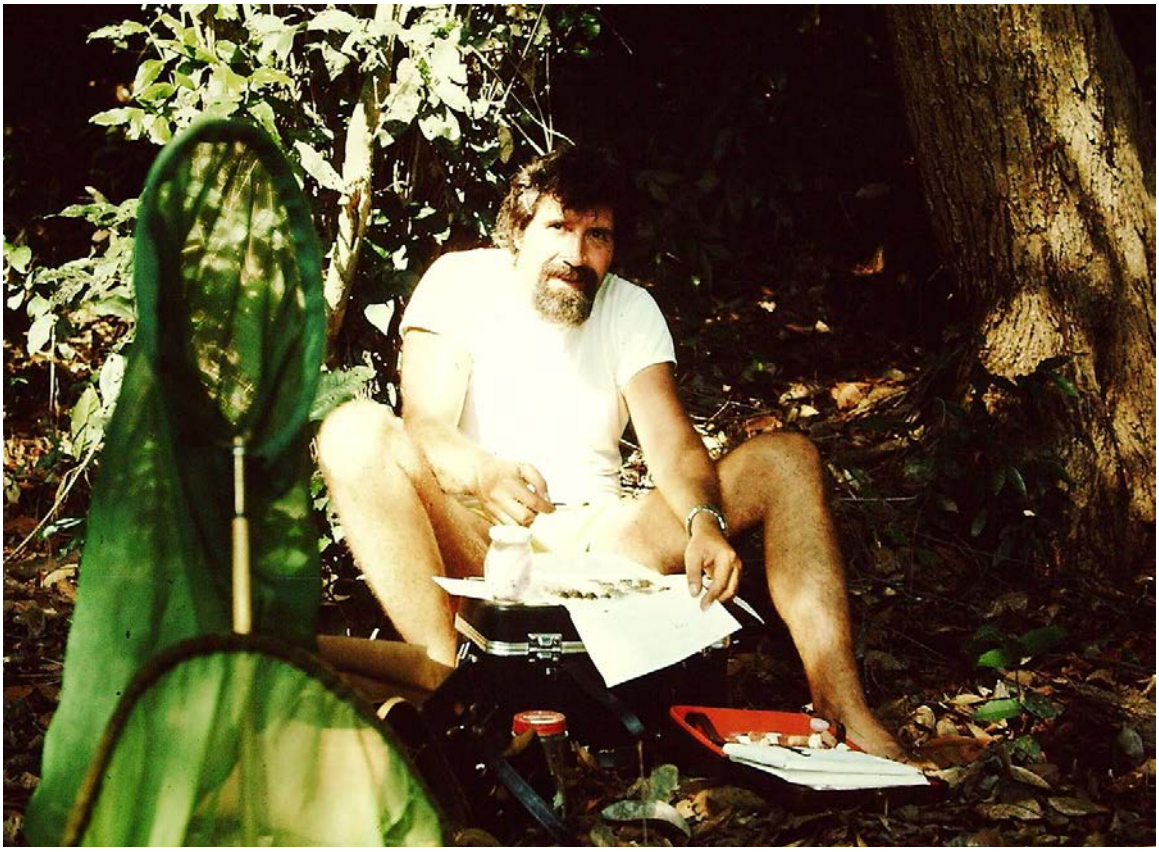
>A green Mimésian Cicada captured in a light trap: it's a ***Hemisciera maculipennis*** Laporte, 1832. Known for a long time, this beautiful species seems to be common in the Amazonian sylva because of its beautiful "chlorophyll colour" which disguises its entire body, down to the veins of its transparent wings, in a pseudo-vegetal element. Large and heavy, it should only stand in the high branchy foliage ... It sometimes falls in the light of the traps.

Santo Antônio do Tauá, September 1979 (**MB Phot**)

Exploring the banks of the Rio Xingu, **not far from São Felix,** in a paradisiacal site (**PP Phot**)
While taking care of the harvested insects

-> Fragments of entomological life

Regardless of the origin of the medium... Pierre Jauffret, at ease, aligns his harvests (MB phot)



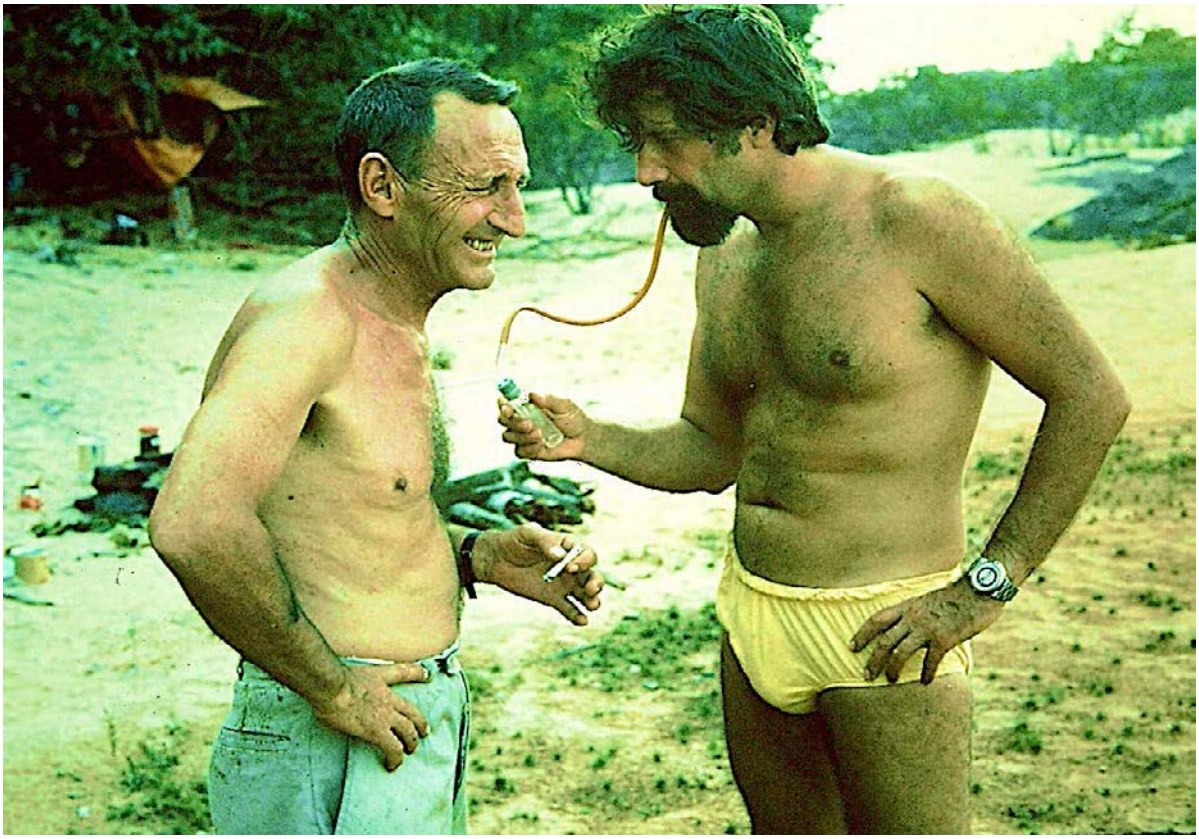
Mine seemed more appropriate and the rest, relatively comfortable... (**PP Phot**)

Saco da Ferradura (Buzios) and its rich forest shores for the photographer entomologist:

The *tymbalizing* ***Pompanonia buziensis*** Blrd and the magnificent Membracid ***Heteronotus pompanoni*** Blrd;

Two males of the Cerambycid *Oncideres saga* Dalman fighting each other (see p. 398**) (MB phots).**

-> **Elsewhere, there were hateful Insects**. Sometimes, we had to pay certain entomic tributes, painful, inflicted by "pious", execrable Ceratopogonid Diptera... Below, part of a poor martyred back:



So we paid, but with the raging pleasure of wiping out many of them by means of a small mouth vacuum cleaner. **Gorotire-São Felix region, second half of September 1975 (MB, PP, phots)**

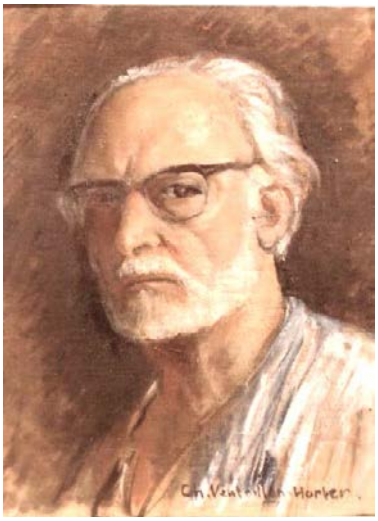
Exciting relaxation in Buzios, Saco de la Ferra dura. **End of December 1975 (PP phot).**

7₃) In Venezuela. Meeting with **Charles Ventrillon**

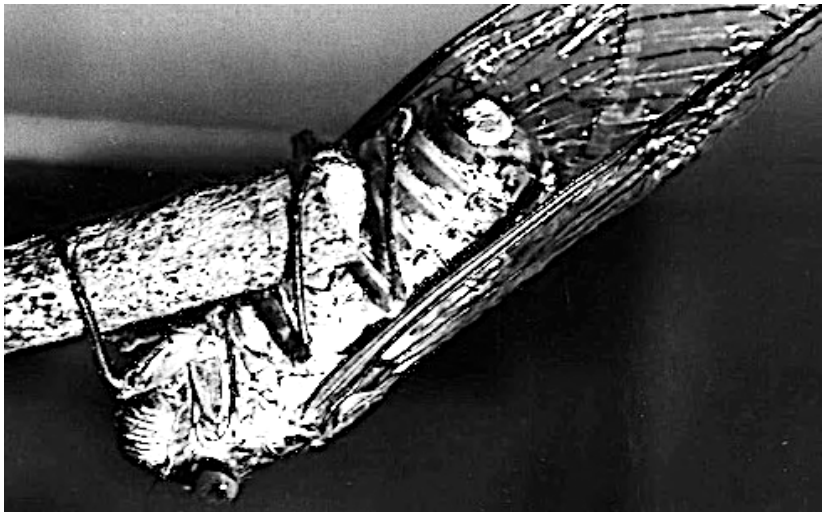
In February 1976, in Caracas, I seized the opportunity to meet an old friend, until then an epistolary relationship, **Charles Ventrillon-Horber**. Teacher and cartoonist, he was passionate about the great Amazonian cicadas and was the pioneer who recorded some of them with the difficult means of the time. In 1969, he personally published most of his results – which I have described as historical concerning ***Quesada gigas*** – with the very first sonograms, demonstrating in particular the alternating contraction of the tymbal muscles during the nuptial call. He sent me a copy of his brochure while I was in the Central African Republic. Brochure now in my Library.

During our interview in Caracas, he entrusted me with an eight-centimeter audio reel with cymbalizations of ***Q. gigas*** and various ***Dorisiana*** (including *D. semilata* Metcalf, type of the genre), which I gave to the archives of the MNHN sound library.

Incidentally, at the end of 1976, sending me his self-portrait, he informed me of his discovery of a **fungus castrating the males of *Q. gigas***, evoking *Massospora cicadina* parasite of the North American Periodic Cicadas. He attached two pictures of the parasite, which I included in his 1969 book. I did not know then that I would have to find such a fungus elsewhere, to describe and photograph its misdeeds (*cf.* p. 200).



Charles Ventrion-Horber



Quesada gigas, male castrated by a *Massospora* **(CVH Phot)**

Now, as far as my taxonomic work in this country is concerned:

> Description of four new ***Carineta*** from Venezuela (Boulard, 1986c).

> Creation of the genus ***Zammaralna*** Boulard & Sueur, 1996 with description of ***Zammaralna bleuzeni*** Boulard & Sueur, 1996i.

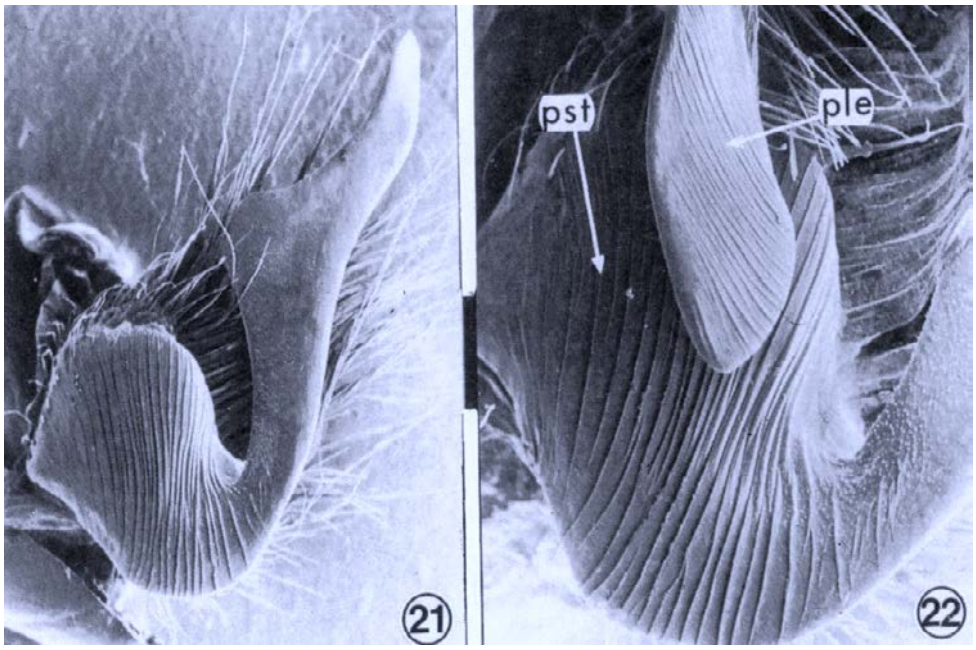
> Creation of the genus *Aragualna* Boulard, 2000f and description of ***Aragualna plenalinea*** Boulard, Champanet and Gaiani.

7₄) In Ecuador

Benefiting from the hunts of **Mr Hervé de Toulgoët**, **Madame Vénédictoff** and **Brother Onoré**, I was able to describe new species. Among the most interesting,

> **Among the males of certain *Carineta*, I was able to reveal a surprising genitalstridulatory system.** The external genitals have opposite microstriated structures, which appear to be shaped in such a way as to be able to chirp (Blrd, 1986f, 2006f). Simple anato-morphological deduction from collection specimens and not ethologically confirmed.

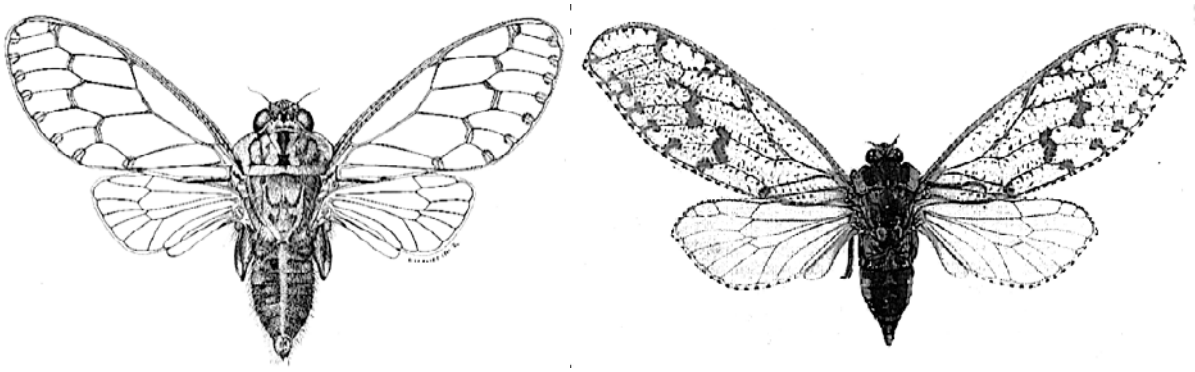
Hereafter, **Scanning micrographs on the external genitalia of *Carineta genitalostridulens*** Boulard, 1986. In (**21**), tribogonous on the right side isolated, its inner base striated, described as pars stridens. In (**22**), apex of the right plectrogon, plectre (**ple**) and the preceding stridens pars (**pst**) in their respective positions.



Michel Boulard 1986, with the technical assistance of Jacques Boudinot, Muséum, Paris.

> In the ***Plautilla*** Stål, confirmed strangeness of the thoracic accessory parts, striated mesonotals (pars stridens), x wide and flattened skullcap extended by **pseudo-tymbacalytes** (from the *metathorax!*), oversized and strongly laterally offset lids (Blrd, 1975g):

Plautilla hammondi Distant, 1914. Close-up view of the left profile of the thorax highlighting the morphological features of the genus: ace, striated angle of the mesonotum and ct, metanotal pseudo-tymbacalypte.



Plautilla stalagmoptera Stål, 1865 and ***Onoralna falcata*** Boulard, 1996.
(Drawings Hélène Le Ruyet-Tan).

> ***Onoralna*** Boulard, genus created in 1996, with description of the species ***O. falcata*** characterized by oversized wings while having the apex slightly falsified (above, right).

8.- In the Lesser Antilles

> Presence in Guadeloupe and Martinique of the Cigale de Mérian, ***Fidicina mannifera*** (Fabricius, 1803), as well as the ***Proarna invaria*** (Walker, 1850) and ***P. hilaris*** (Germar, 1864).

> Creation of the genus ***Chalumalna*** Boulard, 2001: 83 and description of the species ***martinensis***, Cicada native to the island of Saint-Martin (Blrd, 2001b).

> Materials remaining under examination.

9.- In Western Australia

During the Commemoration of the Bicentenary of the Australian State Foundation, I had the honour, as a delegated EPHE/MNHN entomologist, to be part of the France-Southern Expedition organized by the Western Australian Museum (Perth) and the Muséum National d'Histoire Naturelle (Paris) in July 1988. The team, made up of Australian and French researchers, had to "revisit" some of the many sites where the first French navigators had to release on the west coast of a country which was not yet "Western Australia". Not only did they point out these releases on their current maps and name them, but their scientific accompanists in these places collected many natural history specimens. Many, at the time and on their return, were handed over to the MNHN and described. *Mythical taxonomy to which a whim of the fate allowed that an unknown Cicada appears and underlines forever our warm cooperation.*

a) Shark Bay

The Commemorative Ceremonies took place in the austral winter and the historic site for our group of researchers was "Shark Bay", the "Bay of the Sea Dogs" so named by the great navigator De Saint-Alloüarn[19]. Captivating, as far as marine biology and archaeo-ethnology are concerned, the coastal zone, and particularly the Péron Peninsula, the base of the Mission, was covered with short or stunted vegetation, which was not conducive to **entomic fauna**, which should concern me first of all. **Ethologically,** however, at Dorre Island, the barrier island of Shark Bay, I had the chance to make a few interesting slides on the subject of the large "brachycephalic" lizard that follows (**MB Phot**) and that I will recall a little later.

19) From Saint-Alloüarn, aboard the 'Gros Ventre', annexed, in the name of Louis XV, a large part of Western Australia... *Cf.* **Marchant Leslie**, France Australe, ed. France-Empire, 19)1982/1988: 332 p. **Boulard M., Expédition France-Australe** (5 VII-5 VIII, 1988, *Revue EPHE (2), 1989: 55-82, 3 Pl., 27 fig*. ***Berry P.F. et al, Reserch in Shark Bay,*** *Report of the France-Australale Bicentenary Expedition Committee*, Western Australian Museum, 1990: i-viii, 1-325 [237-243, 10 fig.]. **Guillou, L**., ***Sharkbay, un lieu historique***, *Bulletin de la Société des Études historique, New Caledonia*, 1990: 63-75].

Another satisfaction is the fabulous excursion to the Namburg National Park, a vast sandy area bristling with innumerable "pinnacles", more or less deformed false menhirs, sometimes curiously evocative (*cf.* p. 194; **MB Phots),**

b) From Shark Bay to Kimberley

In order to try to enhance the value of my participation in the field, and in agreement with the Mission's senior officials, **John Bannister**, Director of the Western Australian Museum and **Philippe Morat**, fellow botanist at the MNHN, I left my teammates to 'climb back up', alone in a large 4x4 and with official authorization (see p. 502), to more entomically lenient latitudes. After having crossed (and photographed myself) the Tropic of Capricorn, I drove through the extreme west of the sun-flattened "Great Sandy Desert", up to the shrubby foothills of the Kimberley...

July 20, 1988 (MB Phot)

As I passed Derby in the direction of Meda, and after some 1,800 kilometers, I heard the "call" of a Cicada. My first, and by the way, my last, West Australian Cicada. An unknown Cicada, unique, but of quality, since it represents not only **a new species but also a new genus.** However, before reaching the biotope specific to this species, in this case somewhat saving in terms of a personal contribution worthy of our Mission, Mimetology and the discovery of certain landscapes, which I had little idea, offered to assist Entomology temporarily ...

c) Mimetology and landscapes

First of all, I have collected **mimicry facts** concerning the particularly confusing adaptations of **young sand locusts** in the Great Red Desert, where periodic fires more or less blackened the sand. Worried, the orthopterans first settle to the ground, then, if necessary, jump up and "disappear". After I had inadvertently blown some up under my feet... Great difficulty

in finding them, although I had followed the not very far away drop-off points. The spotted subjects did not yet have wings, fortunately for the photographer.

Juvenile ***Urnisa guttulosa*** Walker (Catantopine Cricket, *Michel Donskoff, det*.) in perfect pictorial harmony with the granulation of the red sand.

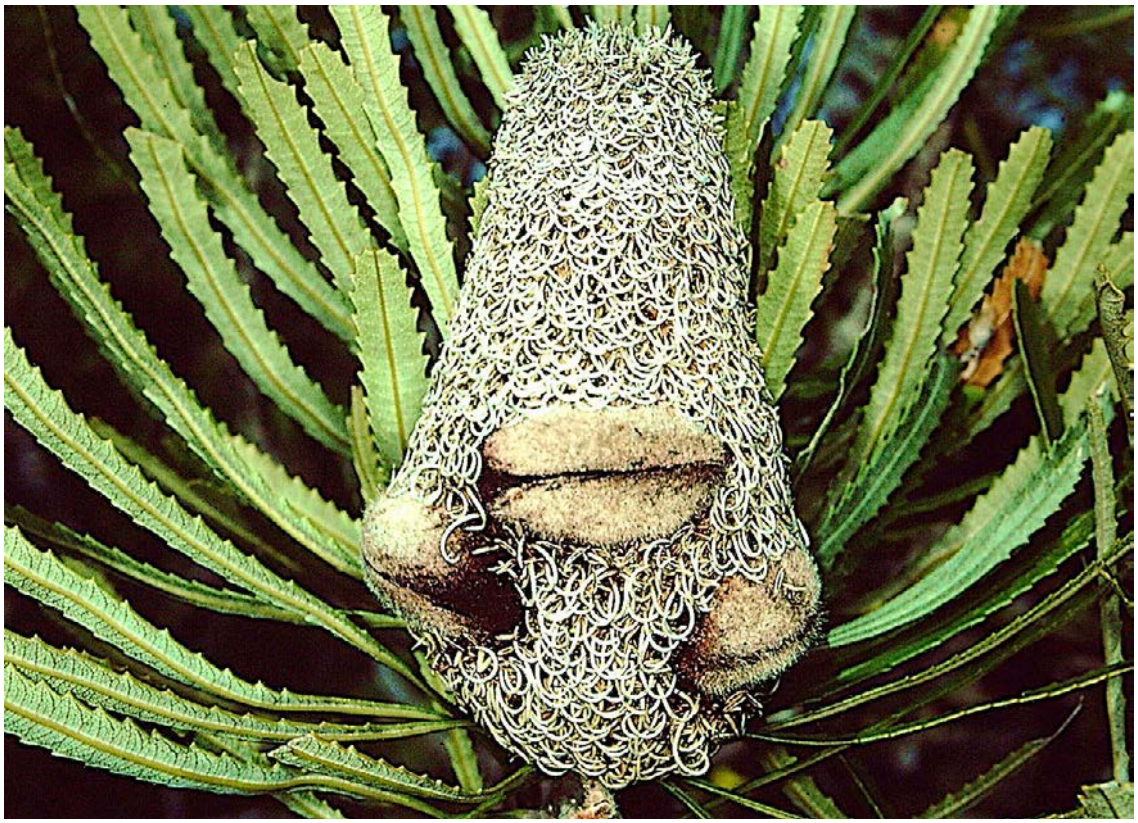
Juvenile of a Cricket found in a burnt area. **Immobile, it is only a "burnt plant remnant", among others ... Prodigious ammomimicry that these "false losses of identity"!** (**MB phots**)

> Another survival ploy, not to disappear anymore, but to scare... This was demonstrated to me by the **big lizard** invited above.

When it was spotted, it faced me, opening its mouth wide, blowing by reversing an unexpected black tongue! A devil who challenged certain reflexes...

Dorre Island, Sharks Bay, Western Australia. July 1988 (MB phot)

The astonishment was also great, concerning the Western Australian botanical domain and an endemic flora, which offers a strange world for a European, witness this first curious image of the fruit of a ***Branksia*** of indeterminate species (*prionotes*?):



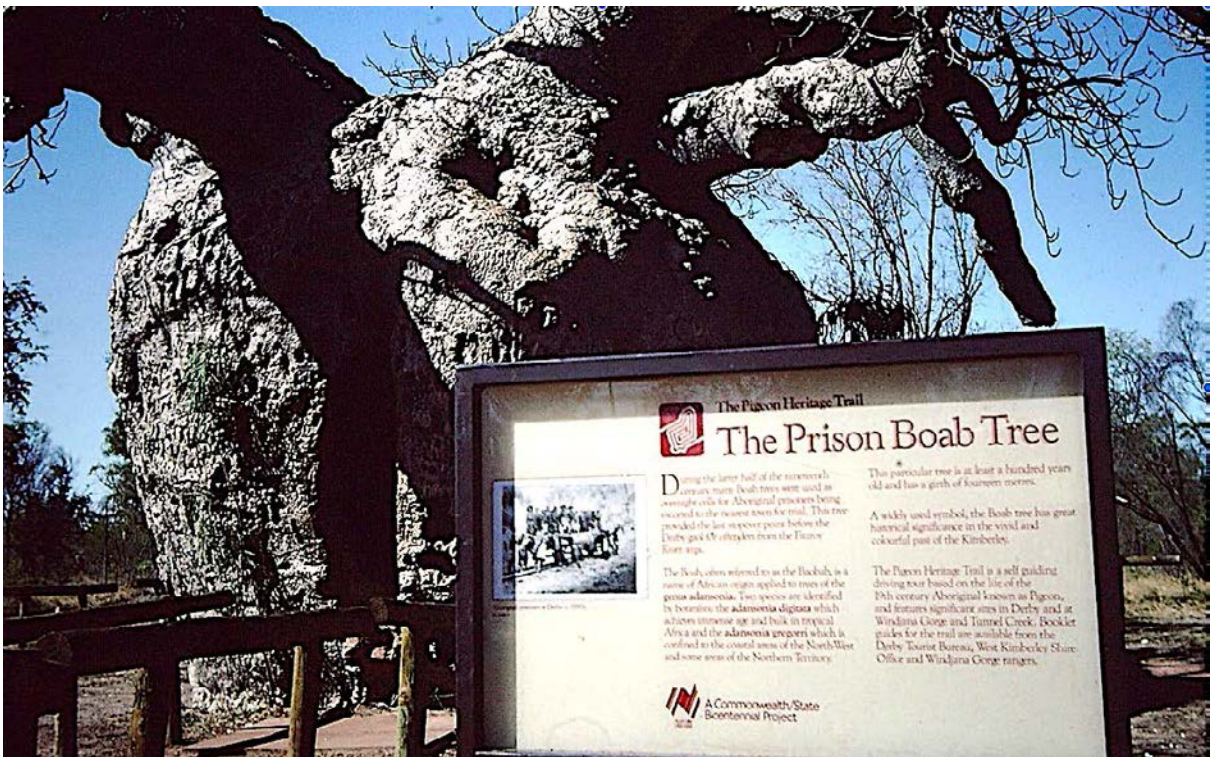
Forest surroundings of Moora, north of Perth, July 1988 (MB phot)

Or this totally flowering shrub of a *Verticodia* (Myrtacea), which I had the chance to photographing close to the Capricorn line!

Continuing my journey towards the North following the Coast, I took many pictures of the crossed biotopes. It was while passing Broome and arriving somewhat to shrubby savannahs, that the hope to hear cymbalizations gave me a bit of courage, embellished by the meeting of the giant termite mounds at *Nasutitermes*, larger than my big 4x4 (**MB phot**)

As well as no less extraordinary Baobabs, sometimes much more than those already seen elsewhere. Two appeared particularly spectacular, the first planted a "plural trunk", the second, huge and hollow, historically devolved to some nascent institutions...

Baobab plural, probably an *Adansonia gregorii*, among others more or less "fanciful";



Its enormity, its largely hollowed out interior, made it become an aboriginal prison, then a tourist attraction! Baobab supposedly about 1500 years old! Between Derby and Meda. July 1988 (MB phots).

d) Cicadology

Discovery in the **vast shrubby savannah** of Meda occupying the south of the "WA Kimberley", of the only Cicada encountered, four specimens captured. A small beauty, not exceeding 21.5 mm in length for 36 mm wingspan... And **new genus and species!**

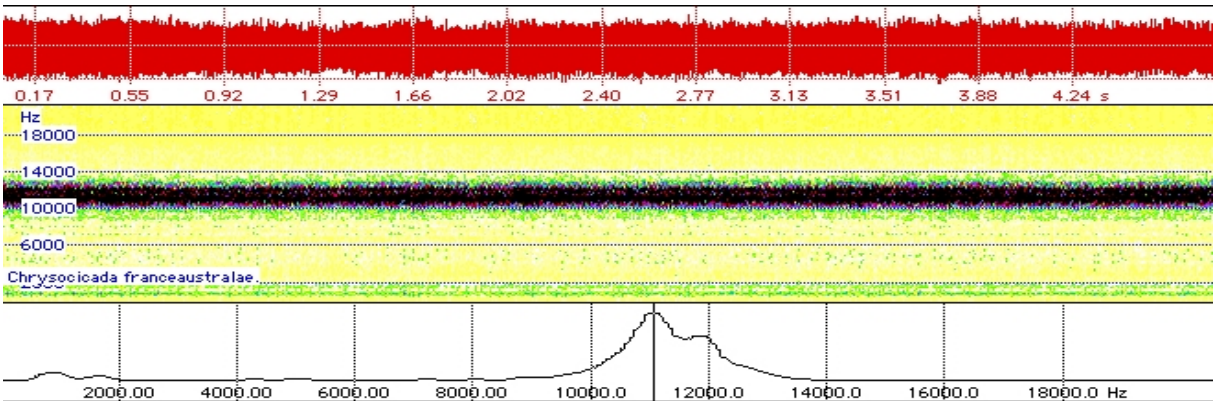
I described this novelty under the denomination ***Chrysocicada franceaustralae***, taking the liberty to compose the specific attribute as a global, modern and feminine epithet, which allowed to give to this species an evocative 'binomial'. The genus first refers to the pale yellow hue of the species, then... At the cost of its detection, some 3600 km in large 4x4 diesel, solitude as a bonus.

Chrysocicada franceaustralae Boulard, 1989. Males in the attitude taken to tymbalize easily, wings lowered on the sides, abdomen arched, the nervures 'a' of the large anteroposterior area of the tegmina are black. (MB, *EPHE, Laboratoire Biologie et Evolution des Insectes,* 2, 1989: 55-82. **Same in P.F. Berry *et al*, Reserch in SHARK BAY**, Report of the **France-Australe Bicentenary** Expedition Committee, Western Australian Museum, 1990: 237-243" (**MB Phots)**.

At this meeting, the population of the species appeared small and very diluted. In two days of effort, I could only spot 4 males, which could indicate that the species was at the very beginning of its seasonal cycle. These males were isolated, the tymbalization of one did not disturb those of the others. Tymbalization is weak, non-piercing, sizzling, expressed in continuous, irregular sequences of one to three minutes or slightly longer, with no encompassing periodicity, apparently very poorly reproduced by the recorder.

Here is the rehabilitation of the **AIC**, on *Signalyze*, software that I did not have at the time!

Successively: The temporal signal, the spectrogram and the average spectrum:



Chrysocicada franceaustralae Boulard, WA, Southeast Kimberley, July 88, 10 h (**MB rec.**)

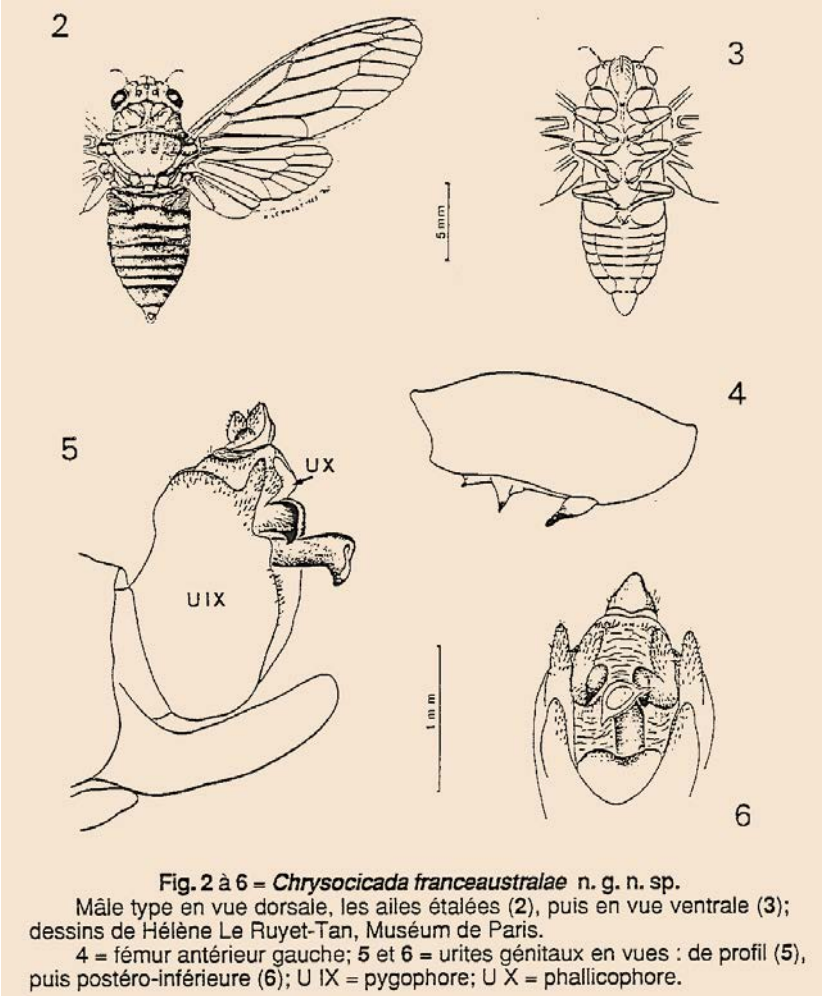
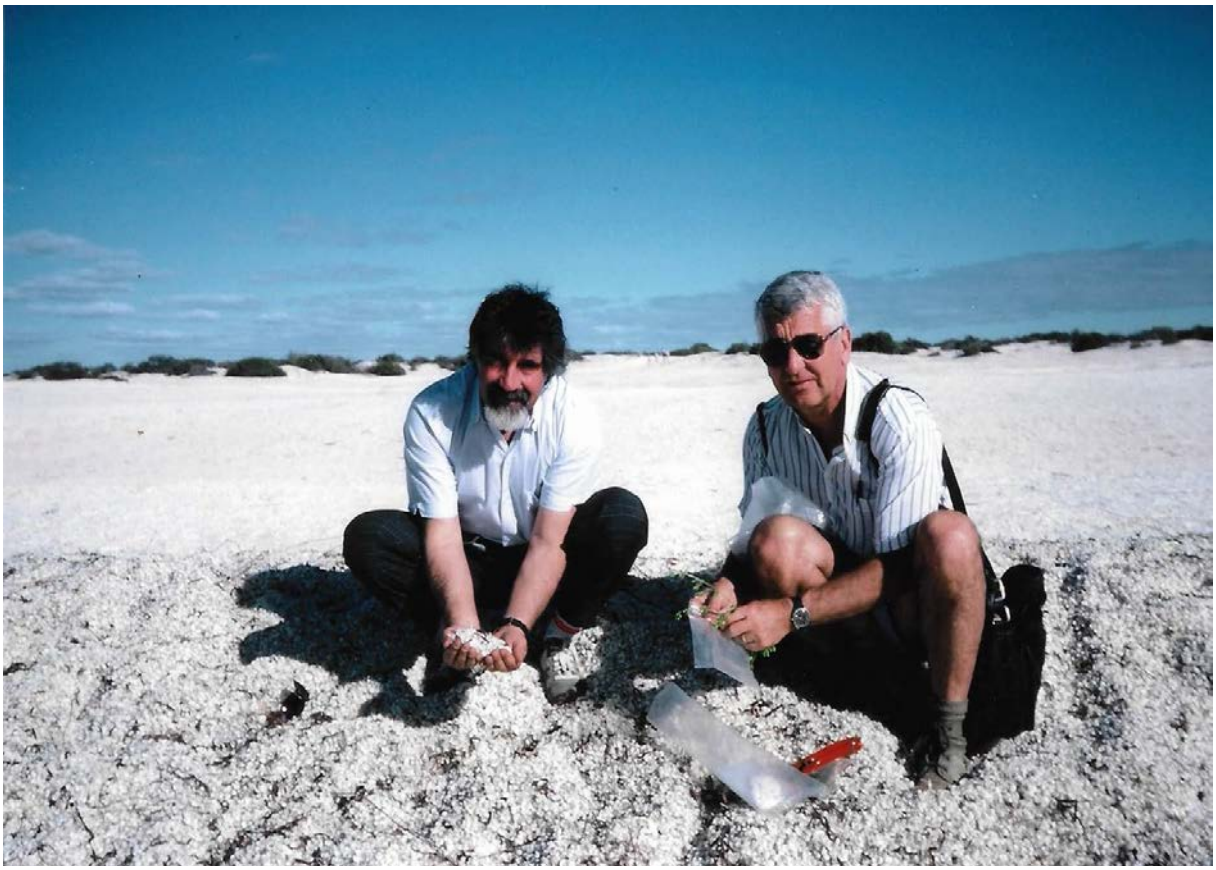


Fig. 2 à 6 = *Chrysocicada franceaustralae* n. g. n. sp.
Mâle type en vue dorsale, les ailes étalées (2), puis en vue ventrale (3); dessins de Hélène Le Ruyet-Tan, Muséum de Paris.
4 = fémur antérieur gauche; 5 et 6 = urites génitaux en vues : de profil (5), puis postéro-inférieure (6); U IX = pygophore; U X = phallicophore.

Facsimile of the original illustration *(Drawings HLRT & MB in Boulard, 1989h)* accompanying my article ruling the typification of this small West Australian Cicada... Now recognized at the molecular level *(Cf. Marshall, D.C. et al., Zootaxa 4224 (1), 28 May 2018: 1-64)*.

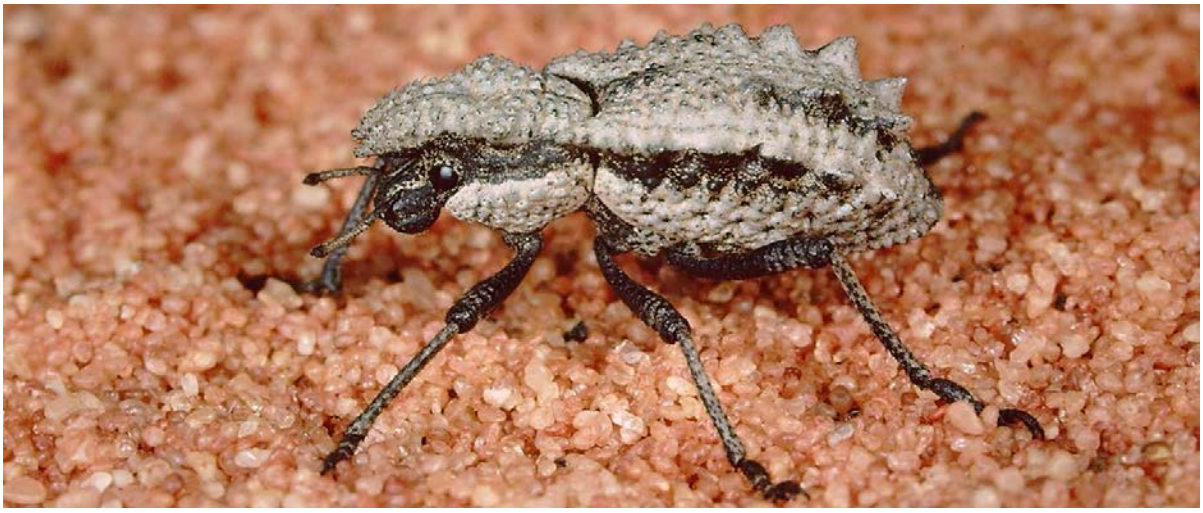


With Philippe Morat in Shark bay, on the extraordinary **Hamelin Coquina**, a beach about 1 km wide, only composed, on **4 m thick (!) of shells** of the small Bivalve ***Fragum erugatum*** (**MBPhot**)**:**

Another amazing "reality"...

Petrified! *In some arena of a proto-historic Aboriginal cult?* **Namburg National Park (MBPhot)**

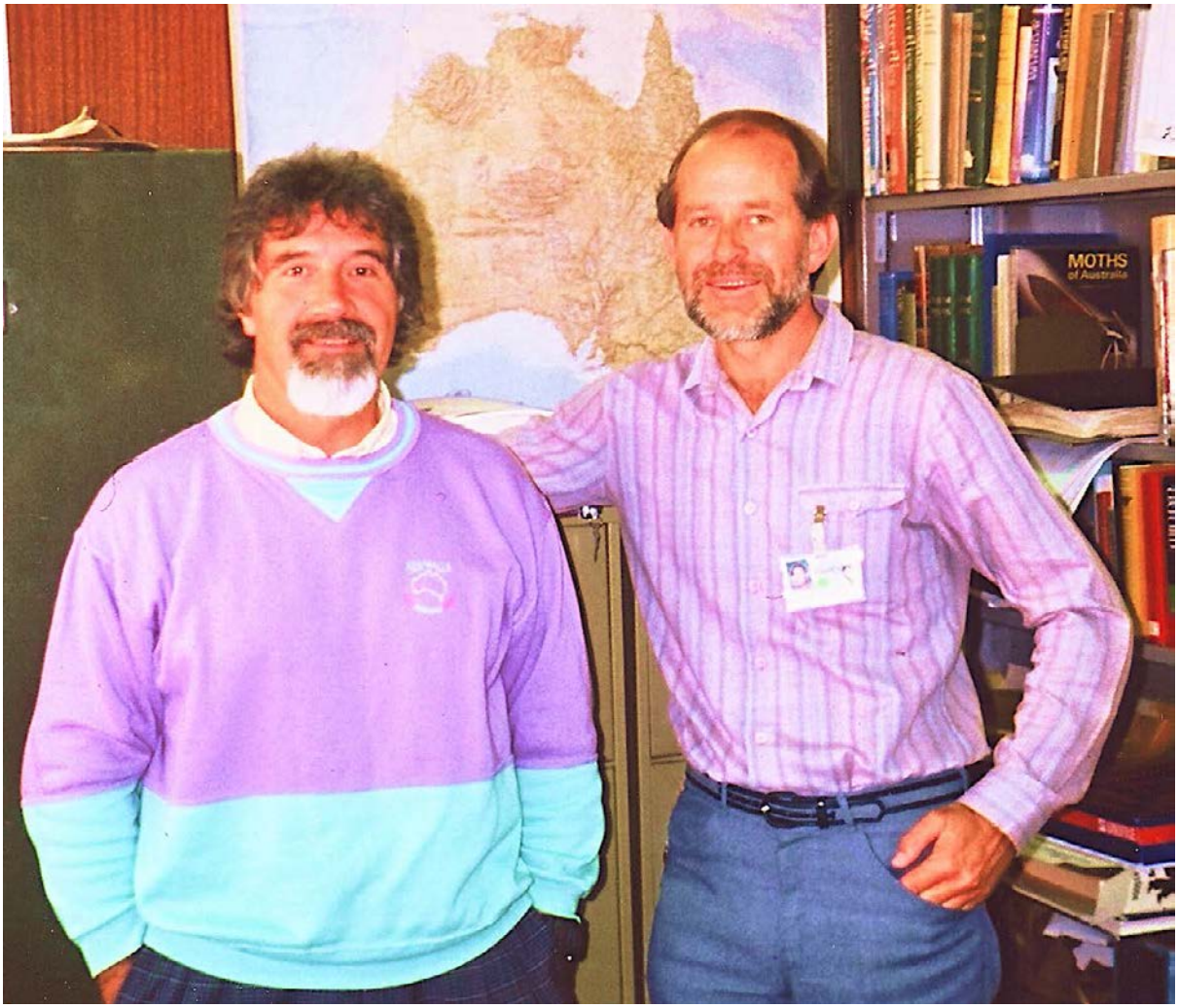
On the *NTH WEST COASTAL HWY...* The Horizon, not far... **(MB Phot)**



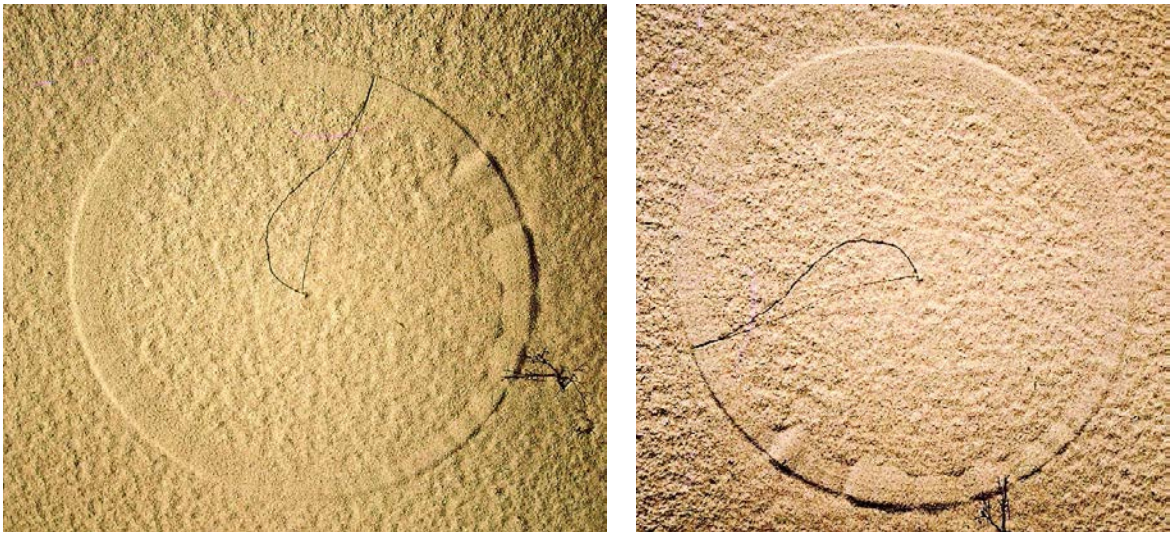
Funny and typical of the red sands of Western Australia:
> The Curculionnid beetle curiously 'caped', *Dialeptopus plantaris*;

> This sabulic mini Spider, crowned with 2+2 large eyes (with the two hind ones away from each other in a dorsal position) + 4 small lenses aligned on the front (MB Phots)

Gomochrus behri Angas (*H. de Tougoët det.*), Lepidoptera Agaristidae (nocturnal).



With **Terry Houston**, head of the Entomology Department of the Museum of Perth, 7.VII.1988
(We found ourselves in excellent company, promising to see each other again... Pious wishes, alas)



The wind, inventor of perfect circles. West Australian recovery!
Great Sandy Desert, July 1988 (MB Phot).

10.- In New Caledonia

My bio-ecological and faunistic investigations carried out during two long missions, Muséum and C.N.R.S., have made it possible to give an account of the richness of the Cicadidae of the Territory and of its fractional zoogeography, both hitherto not underlined, even unsuspected, although the weather is scarcely illuminated by the 'Photographic Trips' of **Edgar Aubert De La Rüe*** and his wife.

I published ten fundamental articles on the New Caledonian Cicadofauna, most of them with CIAs, a few CEAs, notes and archived cymbalisations, relating to the most closely monitored species, which constituted an essential data base. Materials for the Entomology Section of the MNHN, Paris.

a) Opening

The New Caledonian cicadofauna has become extremely diverse although it is – or perhaps because of being – represented only by the Tibicininae subfamily. That said, the existence of the first Key, which made it possible to distinguish the tribes and the main genera to which most of the species of Cicadas living on the "Caillou" belong, should be remembered. It was communicated to my New Caledonian colleagues in 1997, Jacques Chazeau and Christian Mille, as well as to our English-speaking colleagues, Chris Simon, Max Moulds and Pierre Arensburger during their stay in New Caledonia in early 1998. Key remained handwritten, a small fact of taxonomic history. Nevertheless, it has led to the recognition, naming by myself, of previously unknown generic taxa (***Panialna, Germalna, Myersalna, Poviliana, Rouxalna..***). Some of them remained mentioned "nomen nudum" on the list and the summary table accompanying my N-C boxes left behind, due to a lack of technical assistance and an overcharge of interest towards other cicadofauna. This imperfect key was communicated to an amateur at the MNHN in 2014, and then, recently and with a copy of the present pages of this chapter, to a young student native to the island, Pierre-Louis Laudereau.

b) Pests and mycology

The neo-Caledonian species that first concentrated my activity was a mini-Cicada, probably also the most detestable, since it was catalogued among the rare harmful cicadoïds. It is ***Abroma pumila*** (Distant, 1892), whose biology is accustomed to imaginary hatchings in more or less compact periodic masses that become detrimental to silviculture.

Abroma pumila, two adults, **female** on the left, **male** on the right, finishing together and nightly their 'imaginaison' (February 1990, **MB phot**).

---

*) **Édgar Aubert De La Rüe**, a Franco-Swiss geologist who was also the first explorer-photographer of the far-off 'TERRES FRANÇAISES' (*Société Parisienne d'Édition*, 1950, *in my library*), from which he brought back sumptuous sepias that made teenagers and young people dream. Always have a corner of memories for him, all the more so as he enriched the MNHN with the first witnesses of the Polynesian Cicadas (*cf.* Boulard, 1979 and here p. 216).

Because of this eco-ethological gregariousness, small *Abroma* cause great damage in nurseries and orchards. After the normal bionomic course (feeding, mating and egg-laying) carried out by these little Cicadas, nurseries and other young trees appear as yellowish to brownish "wigs". Most of the twigs then discoloured, having been subjected to the deadly scarifications made by the augers of innumerable small females to introduce their eggs:

Spectacular damage caused mainly by the laying of ***Abroma pumila***, in the young twigs and stems of the Bois-de-fer (*Casuarina*). **Koumac, February 1990** (MB Phot)

Same deadly attacks by ***Abroma pumila*** on young lychee plants in cultivation.
Northern New Caledonia, January (MB, 1992a).

-> The juveniles of *Abroma pumila* grow in soft ground

At the end of January 1993, I was able, in the company of **Yann Baudeuf** (a young farmer raising deer), to flush out and uncover, just before maturity, **juveniles V** established at about 10/15 centimetres deep and to try some breeding,

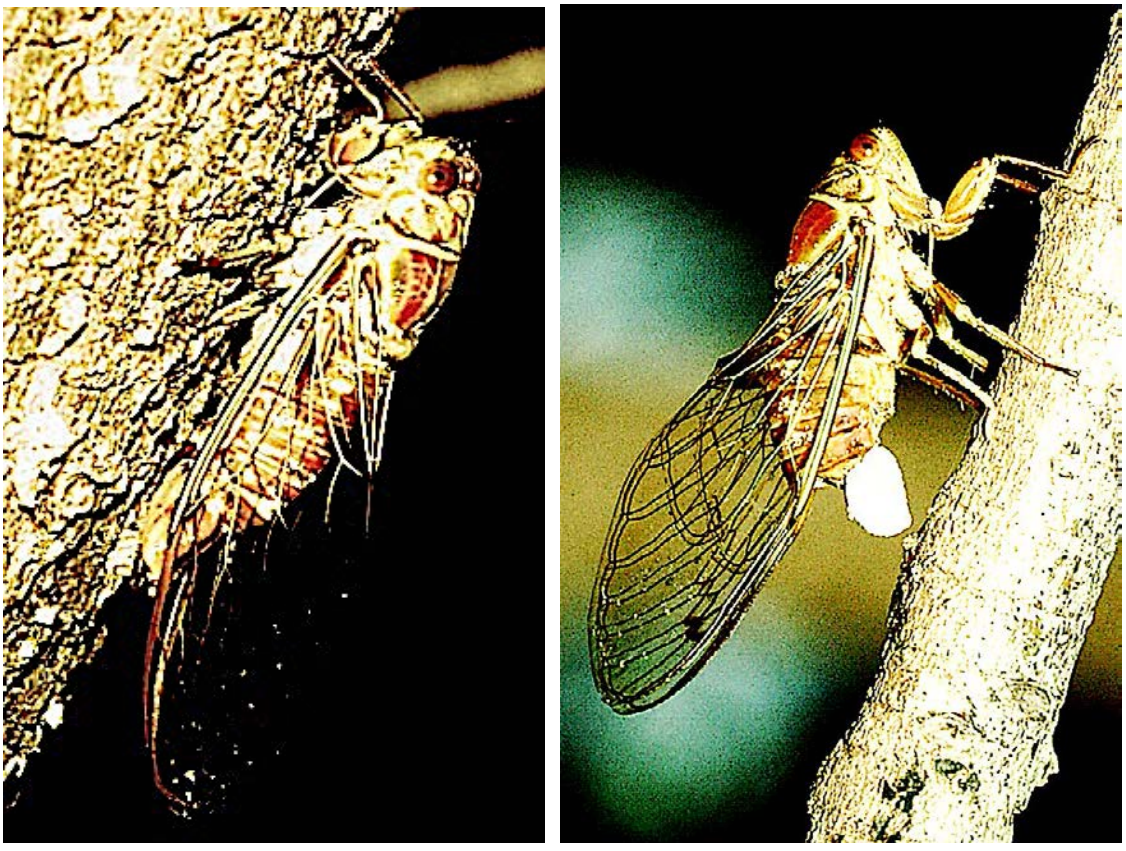
In spite of the abundance of these juvenile diggers (here very large), each one develops only in its own cubicle. **New Caledonia North, Ouaco, Taom embankment. January 1993 (MB Phots).**

Another Cicadaean genus predominates by the number of species distributed on the "Caillou", that of the ***Ueana***, a genus created by Distant in 1905. Currently 27 species of ***Ueana*** are known, of which 20 have been detected, named and described by me. All of them are in the range of medium sizes, some of them presenting more or less richly coloured clothes, as below, from left to right, of:

Ueana desserti and ***U. speciosa***, the latter called "Harlequin Cicada" (**MB Phots**).

> A castrating mushroom on the "Caillou", first report

Species of the genus ***Ueana*** are – sometimes, or in some years, often – parasitized by an Entomophthoral, of the genus ***Massospora***. This fungus, then unknown in New Caledonia before my own observations, **destroys the genital organs of both sexes, the males losing a quarter, the females a third, of the abdomen...** Long before they die for all that! The Cicadas thus castrated, truncated, continue to behave, feeding and flying as if nothing had happened, the 2 to 5 days, even more before their death. Wildering... And thought to *Charles Ventrillon* (*cf.* p.183). But for lack of specialist, I could not specifically determine this New Caledonian *Massospora* (or immigration?).



Ueana fungifera Boulard, 1991f, entomophthoralized males and females:

Above, left, female beginning to lose the apical third of its abdomen, starting from the white pre-pygophorian fissure; right, male whose cuticular armature of the last segments has fallen off, **revealing a dense white amalgam of spores.** Disease similarly attacking the other subjects below, also photographed in the same eco-photographs:

Ueana crepitans Boulard, 1992d:
On the left, male whose genital segments are internally entomophthorized and deformed.
On the right, a male who has lost the genital exoskeleton and carries only the massosporal sporiferous load... Sooner or later abandoned, better known as drooping and relieving the wearer for a while... **Southern New Caledonia, around Bourail, February 1993 (Boulard, 1992a and d).**

Another genus, ***Germalna*** [Boulard in lit.], which has the peculiarity of being monospecific, is similarly attacked by **the Massospora**:

Male of ***Germalna germaini*** (Distant, 1906), abdomen totally
'entomophthoralized' but still feeding, its short buccal rostrum stuck on the sprig!
New Caledonia, Pairies du Sud-Ouest, February 1993 (MB Phot).

-> Interestingly, the fungus also attacks *Abroma pumila* and a few other representatives, also seen clinging in rows on the branches and twigs of the 'Bois-de-fer' in the north of the Territory:

On the left, very magnified: ***Abroma pumila***. Present singularity, the central specimen has lost the distal half of its abdomen, most probably due to the action of the Entomophthoral.

On the right, very reduced: ***Ueana fongifera*** on the same *Cassuerina*, of which many specimens were found to be particularly carriers of the parasite **(MB Phots).**

Pair of ***Abroma pumila*** and Female ***Ueana fongifera*** laying (**MB Phots**).

As other species are similarly harmful, the mycological discovery was (and is!) of great importance by **the hope it raised for biological control**. Cicadas are difficult to control by conventional means because of their life cycle, which includes three ecophases that are not easily accessible to routine treatments, as already mentioned.

> Bureaucratic incompetence

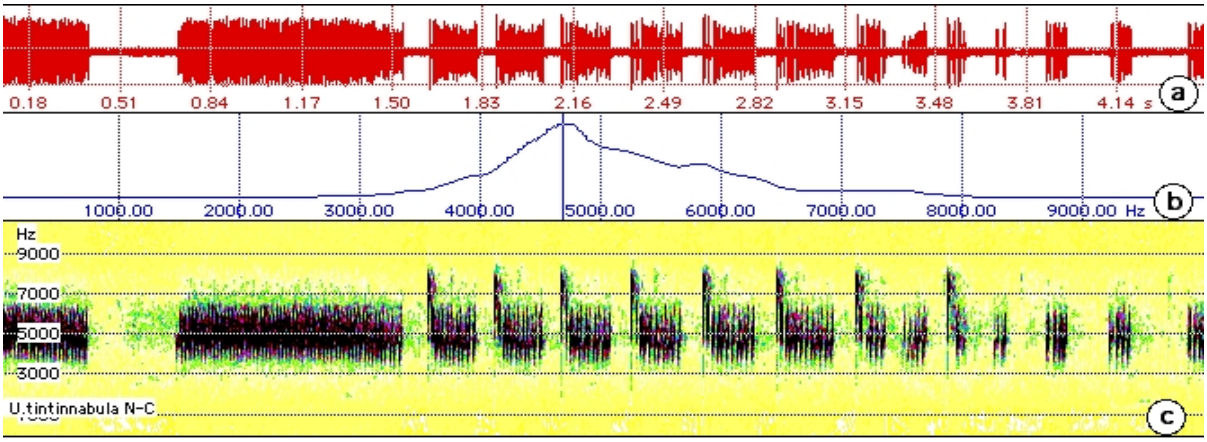
Hope was the subject of a research program, proposed by my Laboratory in collaboration with that of Ultrastructural Cryptogamy (EPHE and MNHN), then directed by my colleague **Michel Abadie** (*cf.*, EPHE/MNHN, Four-year Program 1992-1995).

The programme was not followed up, despite our efforts, together with those of our colleagues on the spot, notably **Alain Dessert** and **Christian Mille** (*cf.* with the latter, our last exchange of letters: CM, La Foa, I.A.C. Station forestière, 22/08/2000 - MB, Paris, 28.08.2000. Available in our archives).

c) Unexpected species and behaviours

While some ***Ueana*** suffer fatal fungal attacks, others follow infrequent habits, such as a propensity to stand upside down... Or surprise us with their, sometimes disconcerting, ways of tymbalizing. What I was able to transcribe on paper with Eric Keller's *Signalyze software* since 1995.

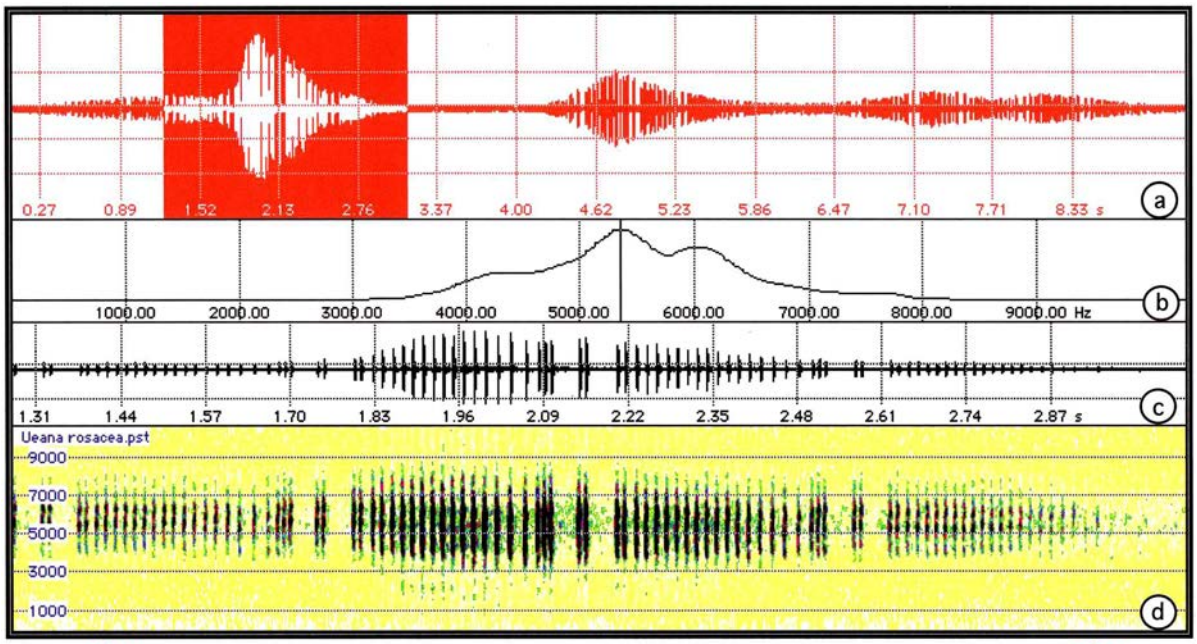
>From this point of view, that of a species, then solitary and unknown in the valley of the Rivière blanche (Parc Territorial de la Rivière bleue) is most curious. The male seems to be waving periodically on a common cicadidae sizzling, a vigorous eight of "impeccably shaken bells"... Frequently repeated 8 times in (c) on the following **AIC**.



An evocative epithet was thus attributed to this Cicada: ***Ueana tintinnabula*** Boulard, 1991, eco-photo below, left. (**MB Phot** & *on Signalyze 3,5*)

>***Ueana rosacea*** (Distant,1892), eco-photo above, right (**MB Phot**), is also a solitary species, whose males have an enigmatic behaviour, to say the least, the sonorous debauchery demonstrated by the males of this species that I nicknamed "Twirling Kestrel".

In the north of the island, in the region of Koumac, as dusk approaches, from the branch where it is located, each male starts to emit a curious plaintive tymbalization for about forty seconds... Then, suddenly leaving their support, they produce a powerful "rattle noise" while flying rapidly in a seemingly disorderly manner, going up swirling around the treetops, then going down to mid-height, or going on, zigzagging at ground level... The following figure shows the images of a male whirling around the tops of trees, then descending to mid-height, or going on, zigzagging at ground level...

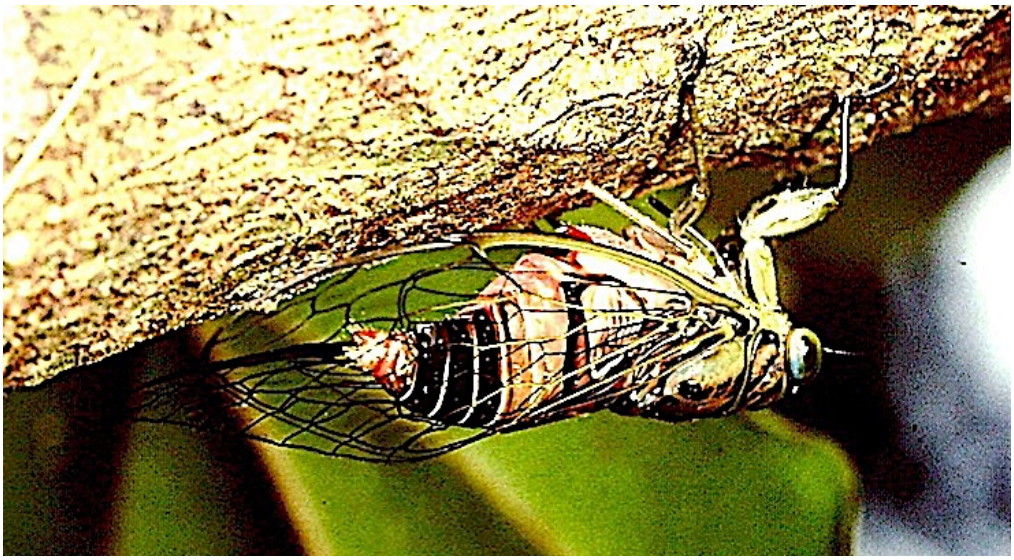


Ueana rosacea (Distant,1892), Nouvelle-Calédonie, Koumac, février, Carte d'Identité Acoustique

(a) Time waveform recording in real time the twirls of a male moving away from the microphone;
(b) Mean spectrum plot; **(c)** Waveform magnifying the first time turn (inverted in a);
(d) Spectrogram according to (c), allowing to know the frequencies used at chosen rhythms which can be found on the turns printed in (a). **From Boulard, 1999b, *on Signalyze 3.5*).**

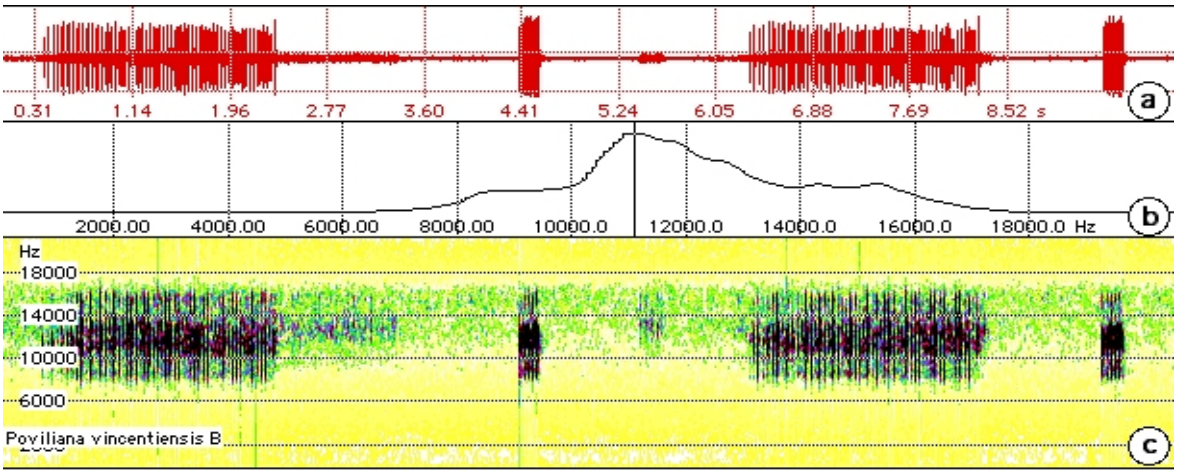
All this for 2 or 3 minutes, before returning to perch on another support and become silent again. After a rest, the merry-go-round continues in the same way, until nightfall. Can one qualify as a nuptial call this twirling tymbalization ... Unimaginable, dithyrambic, but what? ... In two evenings, if I saw and heard the males, I could see neither female nor mating. To review and follow!

> On a nearby Mount, **Pic Sant Vincent**, meets a small Cicada occupying an apparently adequate place to cymbal. It was a new species and a new genus, which I described on my return:



Poviliana vincentiensis Boulard, 1994, male cymbalizing in the shade from too much sun (**MB Phot**).

Here is the **AIC (a)** Time signal, 2 sequences; **(b)** Mean spectrum; **(c)** Spectrogram:



New Caledonia, summit forest of Pic Saint Vincent, February 1993 (**MB *on Signalyze***)

> Another astonishing species, ***Ueana latreillae**** whose males seem to live only to tymbalize under an advanced twilight. I give some first of all below, the descriptive components, habitus to the wings of good dimension and tymbal structure, this one of the most interesting, the intercostal sticks not totally individualized, prove to depend in filiation of the main coasts. This species tymbals only during the 3/4 hour of the vesperal twilight, whether the weather is clear, foggy or giving a fine rain.

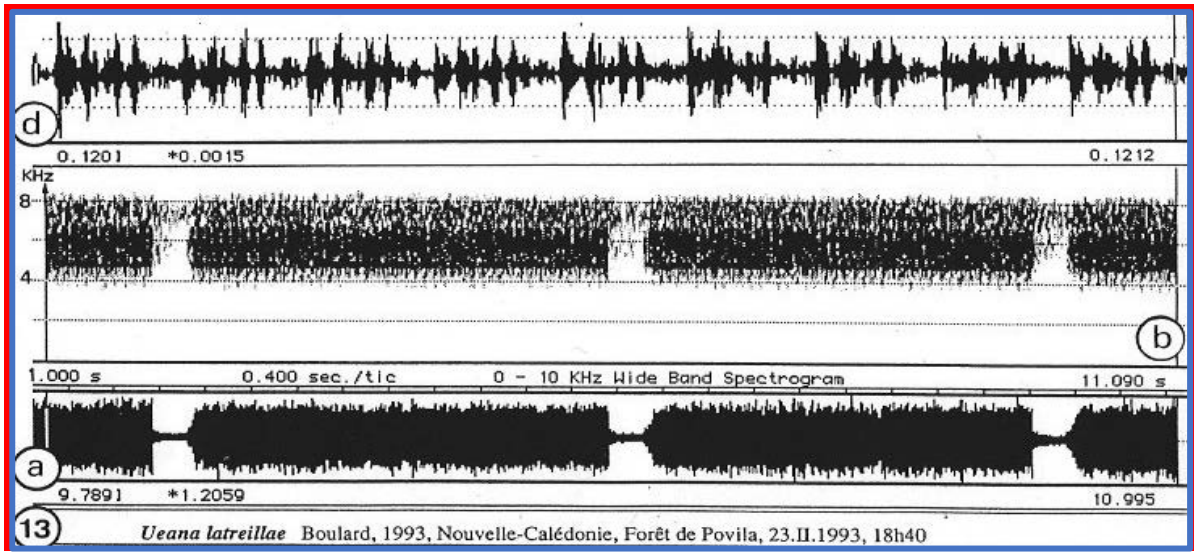
---

*) Species dedicated to Miss Catherine LATREILLE, forestry engineer then in charge of the Service "Agriculture and Forests of the North-East" in Poindimié, in thanks for her friendly welcome and her precious field indications in February 1993... A little also for her patronymic, famous in Entomology.

Ueana latreillae Boulard, 1993. Paratype ♂, Povila forest (890m) near Poindimié.
Close view of the left tymbal showing the origin of the intercostal sticks **(MB Phots)**

The males regularly emit long sound trains almost equal in intensity and time (about 3.5 seconds), starting abruptly, then separated from each other by remarkably equal short silences (30/100ths of a second). Each train is composed of a chain of modules regularly joined together in groups of four main elements, enhanced by a rather narrow frequency range, between 5 and 7 KHz.

Here, partially reproduced the original CIA



Ueana latreillae Boulard, 1993. **New Caledonia, Povila forest, 23 February 1993, 18h30/40.**
(a) 11s portion of the call tymbalization; **(b)** Frequency range; **(d)** Portion of the full signal arbitrarily spread out to evoke the elementary quadripartite of the signals modulating this tymbalization.
(**MB sur *MacSpeech Lab***).

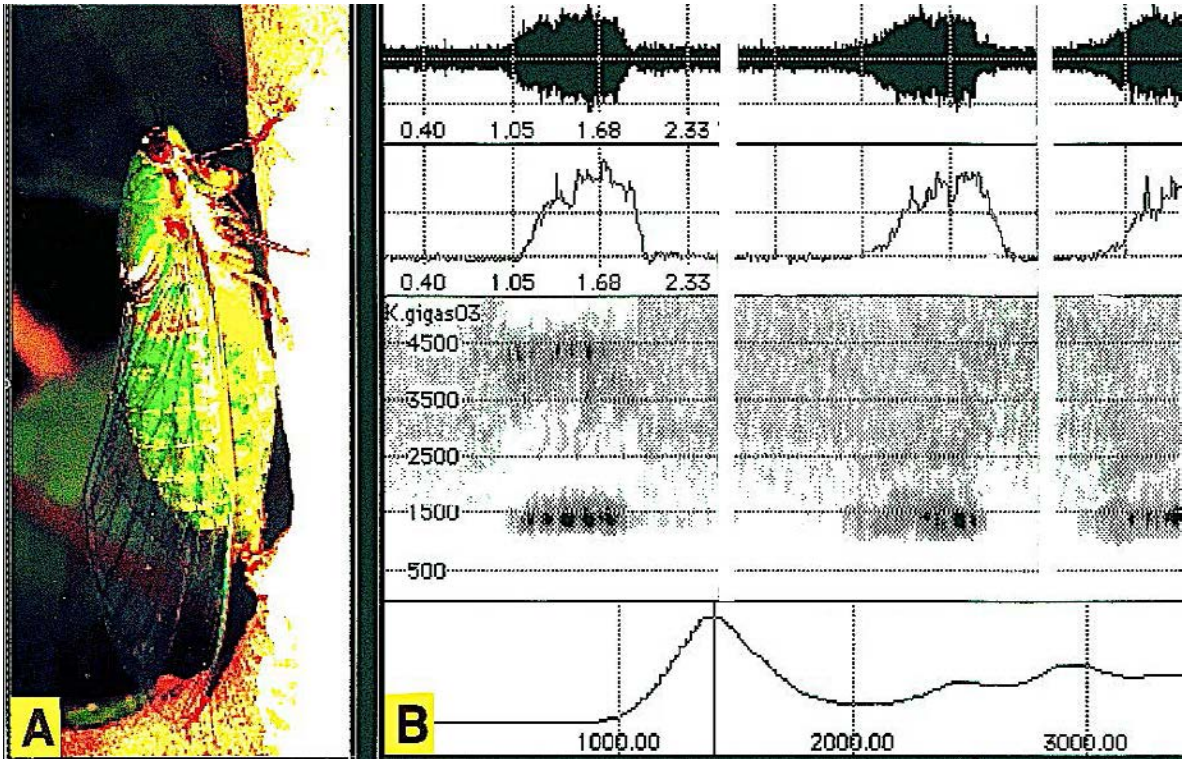
The full night installed, ***U. latreillae*** becomes silent again and most of the time, moves away! Could not see a seduced female...

New Caledonia has many other species not yet distinguished. The small *Pauropsalta, Poviliana, Germalna* are genera that I will have to come back to.

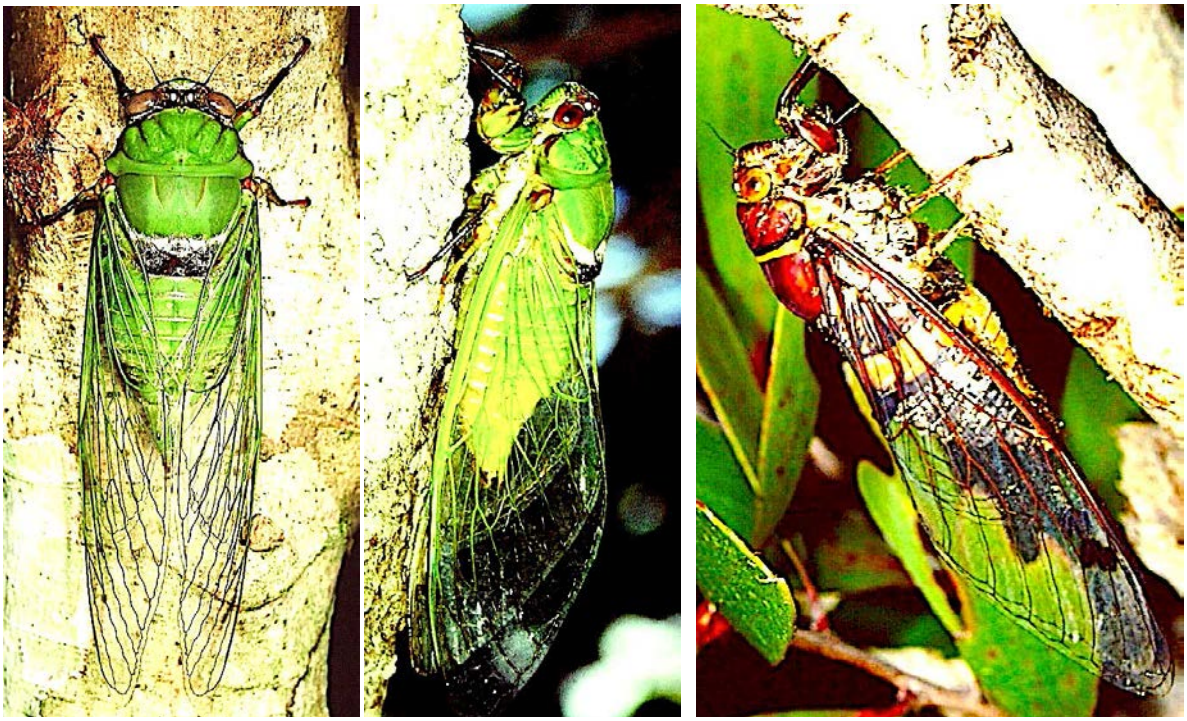
As opposed to the mini-Cicadas, New Caledonia conceals, rarely seen, sometimes heard, one of the biggest Cicadas in the World and, moreover, a species whose males, solitary, have frankly nocturnal " mœurs ": ***Kanakia gigas*** Boulard, 1988.

Huge Cicada (72 mm long, 127 mm wingspan), entirely green and with bright red eyes. The males, their abdomen genetically inflated by an internal "bass drum", perform nocturnal

flights, revealed by brief tymbalizations "bawling" in low frequencies (± 1500 Hz), which frighten the somewhat starry New Caledonian nights ...



Kanakia gigas Boulard, 1988. In **A**, profile of a male, characterized by its dilated abdomen. In **B**, an arbitrary CIA graph, the blanks between each "call" being out of all proportion to real space-time, which is highly variable. (**Excerpt from Boulard, 2006f: *on Signalyze***).



On the right and center, 2 females of ***Kanakia gigas*** Boulard, their abdomen shows the normal conformation. **N-C, Parc Territorial de la Rivière bleue, Col d'Amieu, Tibégui, February 1993 (MBPhots).**

On the *left*, male ***Kanakia flavoannulata*** (Distant, 1920) tymbalizing for a long time at dusk and in low frequencies, according to verses of about a minute similarly repeated...

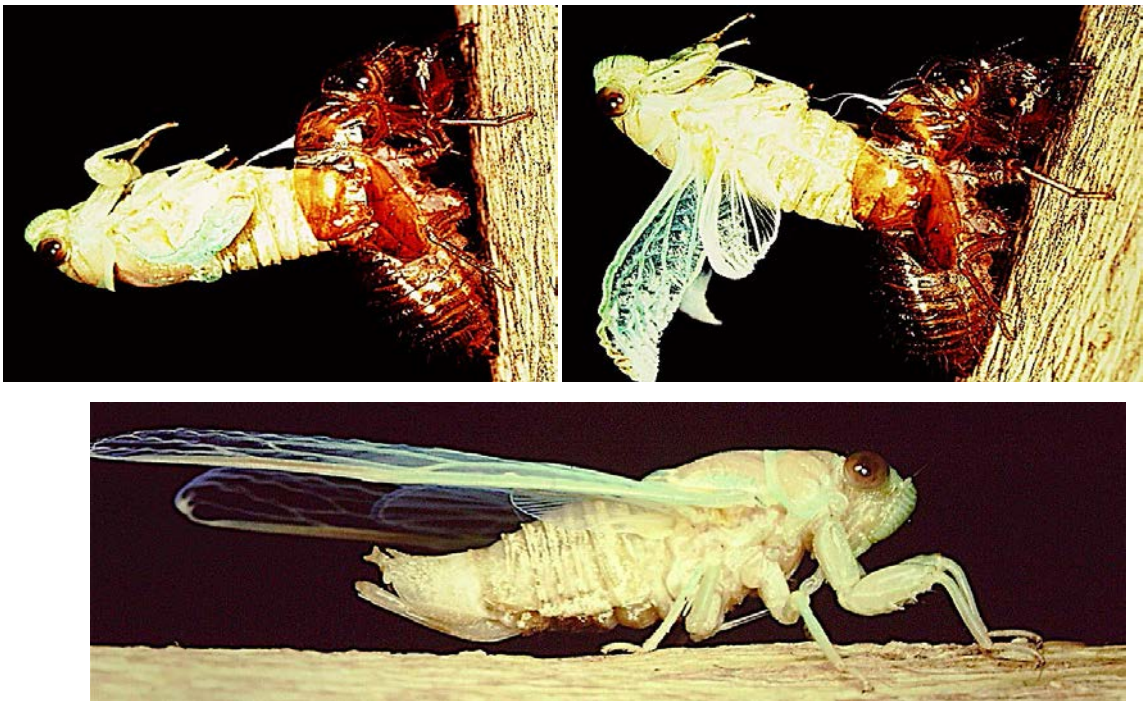
N-C, Blue River Territorial Park, Banche River Basin, February 1993 (MB Phot).

Les Cascades de la Rivière des Pirogues, Parc Territorial de la Rivière bleue, February 1990 (MB Phot)

> Another species of good size and remarkable, ***Mouia variabilis*** Distant, 1920 exists naturally, regardless of sex, under the following two costumes:

Mouia variabilis (laying), green habitus; ***Mouia variabilis***, reddish-brown habitus (**MB Phots**).

> Crucial moments in the 'imagina**is**on' of ***Ueana lifuana*** (Montrousier, 1861):



On the left, the imago, in abdominal suspension, finishes freeing its legs and thus takes some rest; on the right, having begun to unfold its wings, it gets up, its front legs ready to reach towards the head of the larval remains; below, the imago finishes unfolding its wings and tries to obtain its specific colours, completing its imaginary birth. **Noumea, near the Case de Passage, February 1990** (MB Phots);

> Crucial moment in the imagina**is**on of the **New Caledonian giant:**

Kanakia gigas Boulard, 1988**. In the middle of the night, a fabulous moment of its imaginary birth, when its rises up to seize its juvenile remains, then extracts the apex of its new abdomen. I owe this superb eco-photo** to my colleague **Christian Orsucci**, entomo-photographer from Lyon, who had the perseverance to track down the giant at night. **Successfully immortalizing the rise of its imaginary birth.**
N-C, Farino refuge, January 26, 2012, around 4 am (Chr. Orsucci Phot).

Ueana lifuana (Montrousier, 1861); **left**: Male freshly imagined. **Right**: Female during an 'upside-down' egg-laying session, as is quite often the case in New Caledonian species.
Blue River Territorial Park, February 1995 (MB Phots).

Abroma pumila, male and ***Germalna germaini***, laying female on the same branch.
On the right, another beautiful small species, ***Ueana hyalinata*** Boulard, 1994 **(MB phots)**.

Ueana simonae, mini-species described with the complicity of **Max Moulds**,
friend of always, in 2001 **(MB Phot).**

d) Faunistic complement

AU MOINS 12 ESPÈCES NOUVELLES SUR LE CAILLOU...

L'HOMME QUI AIMAIT LES CIGALES

LE PROFESSEUR MICHEL BOULARD, chef de service au Muséum d'histoire naturelle de Paris, spécialiste mondial des cigales, achève une mission de deux mois et demi sur le Territoire. Qui sait que toutes nos cigales sont endémiques ? Que nous en avons de tout à fait remarquables : une géante et une naine, une qui tintinnabule comme une clochette et d'autres qui chantent en choeur... Dûment armé de son filet et de ses appareils photo, ce docte professeur est allé chercher la petite bête...

Michel Boulard : *"Cela fait 32 ans que je cours après les cigales du monde entier" !*

POURQUOI un séjour de plus de deux mois sur le Caillou ? *"Parce que l'on ne connaît à peu près rien sur les ci-*

trouvé douze espèces nouvelles. C'est vous dire la richesse du Territoire"! Dans le monde entier, on compte environ 5 000 espèces de ces *"hémiptères"*, dont près de 500 en Australie et 700 en Asie du Sud-Est. Comparé à la superficie du Territoire, il semble que la Calédonie soit donc particulièrement riche de ces insectes (encore que l'inventaire n'en soit qu'à ses débuts). Mais surtout, explique le Pr. Boulard *"toutes les cigales que j'ai rencontrées n'existent qu'ici ! Il s'agit d'un endémisme très caractérisé et assez étonnant"*.

Autre aspect remarquable : nous possédons à la fois une espèce géante et une espèce pygmée. La *Kanaka gigas* qui mesure 12 cm et dont les cris ressemblent à des coassements. Et

Photo : Michel Boulard

Un phénomène spectaculaire : ce superbe mâle a en effet été littéralement "castré" par un champignon inconnu jusqu'alors, qui a formé une sorte de bouchon jaunâtre à l'extrémité de son abdomen... Une solution écologique toute trouvée pour détruire les espèces nuisibles !

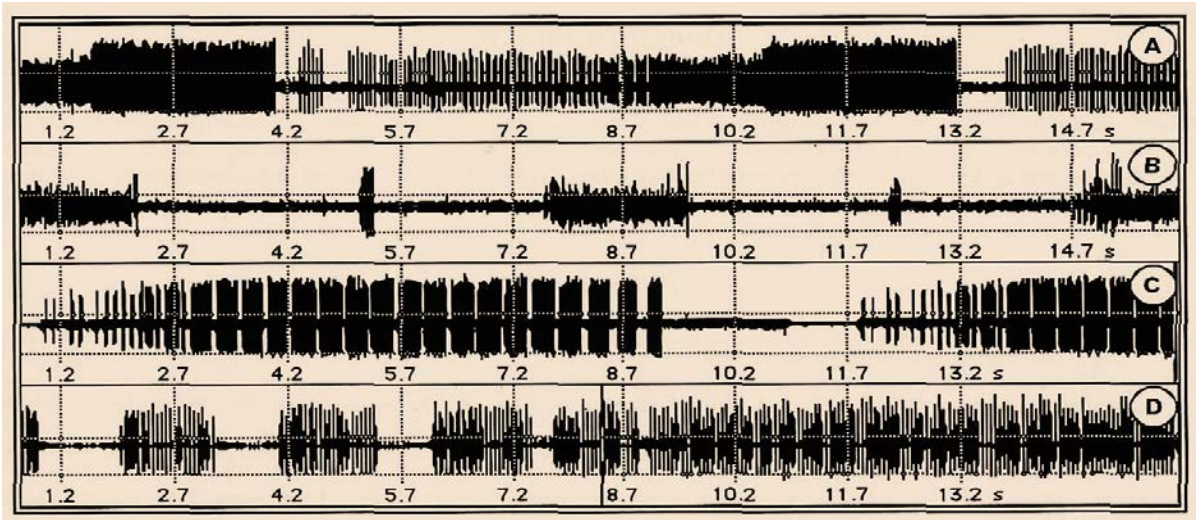
"Calédonie, Les Nouvelles Hebdo", N° 260, Week of February 24 to March 3 / 1993.

In reality about thirty species were collected, including 24 new ones with, for the most part, their cymbalisations recorded: ***Kanakia gigas*** Boulard, 1988. ***Panialna parva*** (Boulard, 1991). ***Ueana bergerae*** Boulard, 1993. ***Ueana boudinoti*** Boulard, 1992. ***Ueana bouleti*** Boulard, 1993. ***Ueana crepitans*** Boulard, 1992. ***Ueana desserti*** Boulard, 1997. ***Ueana fungifera*** Boulard, 1991. ***Ueana hyalinata*** Boulard, 1994. ***Ueana procera*** Boulard, 1994. ***Ueana simonae*** Boulard & Moulds, 2001. ***Ueana speciosa*** Boulard, 1992. ***Ueana spectabile*** Boulard, 1997. ***Ueana latreillae*** Boulard, 1993. ***Ueana letocarti*** Boulard, 1992. ***Ueana lullae*** Boulard, 1994. ***Ueana lifuana*** (Montrouzier, 1861). ***Ueana procera*** Boulard, 1994. ***Ueana rosacea*** (Distant, 1892). ***Ueana stasserae*** Boulard, 1991. ***Ueana tintinnabula*** Boulard, 1991. ***Ueana tiyanni*** Boulard, 1992. ***Ueana variegata*** Boulard, 1993. ***Pauropsalta johanae*** Boulard, 1993. ***Pauropsalta judithae*** Boulard, 1997. ***Poviliana sarasini*** (Distant, 1914). ***Poviliana vincentiensis*** Boulard, 1997. ***Germalna germaini*** (Distant, 1906). ***Myersalna flavocaerulea*** Boulard, 1992.

e) Eco-ethological overviews

In the above list, the four species composing two by two the brother genera ***Pauropsalta*** Goding & Froggatt, 1904 and ***Poviliana*** Boulard, 1997 - immediately distinguished by the absence or presence of a sixth apical cell on the hind wings - showed me a remarkably common ecology, opposite to their respective ethologies.

All of them, in fact, occupy the ombrophilous undergrowth and the males tymbalize clinging to the young trunks or to certain low branches or falling branches, in any case up to heights not exceeding three meters. However, during the few repeated investigations, their nuptial call tymbalizations characterizing them very distinctly, they were never heard in concert, nor observed in the same territory. The following figure compares their relative sound performances: the tymbalizations were captured within the same arbitrary 15-second period. The comparative montage of the AICs reveals the great differences that exist not only in the structure and composition of the sound signals, but also in the rhythms of action that animate them. Here are the comparative and selected tymbalisations in real time (15 seconds) of the 4 ‘cicadettes’ (*mini-cicadas*) encountered in the humid undergrowth of New Caledonia:



(A) ***Poviliana sarasini***, Povila Mountain, 24/I/1993. **(B)** ***Poviliana vincentiensis***, Col d'Amieu, forest surroundings of Pic Vincent, 11/II/1993. **(C)** ***Pauropsalta johanae***, Blue River Park, 6/III/1993. **(D)** ***Pauropsalta judithae***, Col d'Amieu, Forest Station, 4/III/1993.

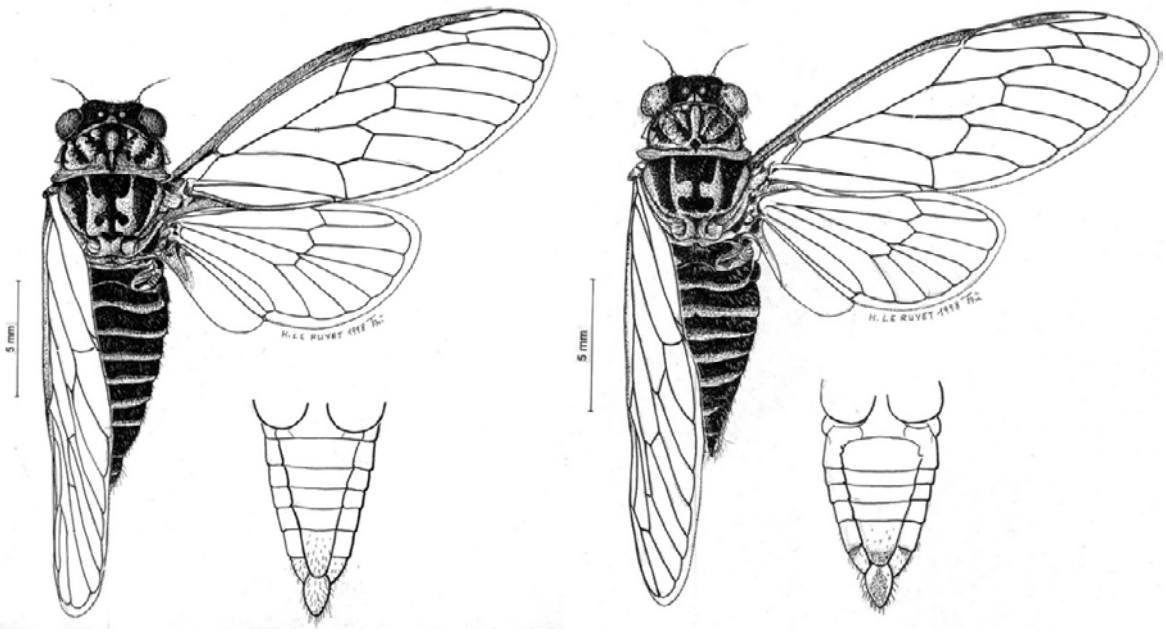
The ensemble expresses a striking acoustic diversity.

(Repris de **Boulard, 1997b**; ***on Signalyze***).

f) For the Record

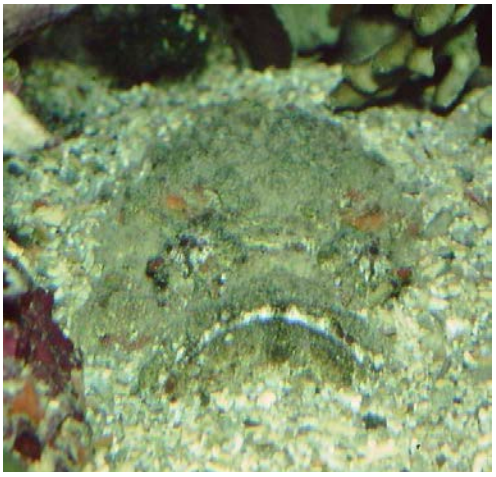
>Before ending this chapter on "New Caledonia", I would like to underline the concern shown administratively or in the field by **Mrs Berger, Messrs Marcel Boulet, Alain Dessert** and **Yves Letocart,** as well as the **Baudeuf** family and many hepful Kanaks or Caldoches. I reiterate my gratitude to them. All of them shared with me most of the original views of the lagoon and the Territory.

>I would also like to underline the help of **Hélène Le Ruyet-Tan**, talented draftswoman of the MNHN. At my request, Hélène drew some Cicadas of the Territory. Three of her originals illustrate the catalogued descriptions of ***Ueana tiyanni*** Boulard, 1992**,** ***U. variegata*** and ***Pauropsalta johanae*** Boulard, 1993. Four others remain in my boxes, of which the next two belong to the subfamily Cicadettinae and to my genus ***Rouxalna***, quickly recognized in 1999:



The first is a male ***Rouxalna rouxi*** (Distant, 1914) recorded and captured at Port boisé, Forêt du Nord, MB rec. 28 February 1993. As for the second one, it represents "***Rouxalna* n. sp. 2**", thus appearing, with others without status, in my notes and cardboard boxes.

>Setting up some comparses and landscapes of one of those so far away "French Lands" around the Globe, that ***Edgar Aubert de la Rüe* (1950)** made me dream of...



The extraordinary Stonefish, burrowing in... Then flushed out, profile of the huge head and float
Noumea Aquarium, with Alain Gerbault in February 1990 (MB Phots)

Antennae at the end of a long cephalic rostrum, a singular invention of a New Caledonian Cucurlionide.
The **Cagou**, the ghostly avian emblem of the Forest **Caillou** (**MB Phot, with Yves Letoquart**).

The invasion of the Peregrine Locust on the Népoui Peninsula in March 1995 was a godsend for the local predators, including the Mantises (MB Phot; see also p. 454).

Laying hen's bay sitting on the world's largest lagoon. January 1993 (**MB Phot**)

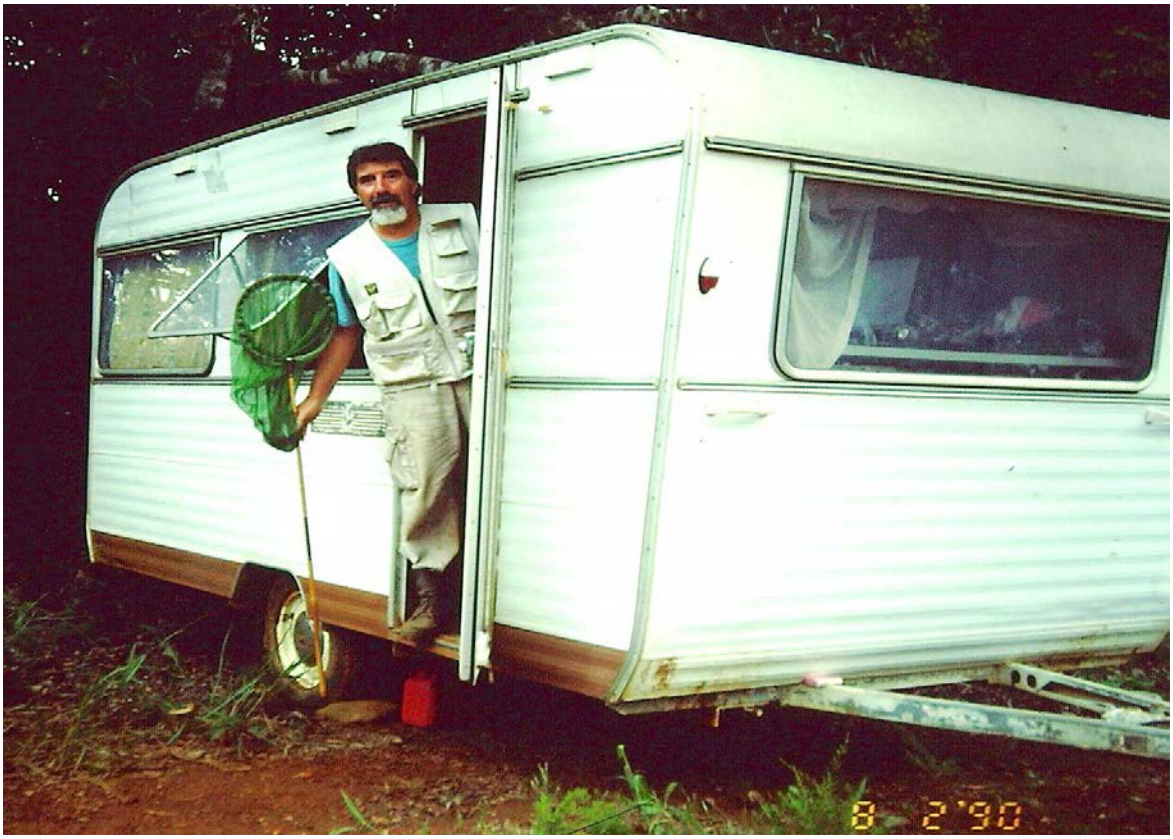
The pierced rock and the 'guardian'; around Bourail (MB Phot)

Yaté Dam, full and releasing gates closed (!) **February 1990** **(MB Phot)**

Méandre de la Rivière bleue passant sous le Pont Saint Germain, près de la case forestière (MB Phot)

East coast, Amoa Valley, Saint Michael's Church, obviously chosen here. **February 1990** (**MB Phot**).

Finally, to end the story of my New Caledonian expeditions with some humour, the photo of the *'case de passage'* of the place called *'Mois de mai*' taken by friend **Yves**:



11.- In French Polynesia (Central-South Pacific)

A Cicada was at the origin of my Polynesian journeys... And the installation of part of my family on Tahiti, the main island of the Society Archipelago.

This Cicada, ***Raiateana oulietea*** Boulard, 1979i, whose I discovered the type incognito with several other specimens (*in old cardboard magazines of the National Collections*), gathered by **Edgar Aubert de la Rüe**, during his 19**35**-1936 expedition focused on the France's Overseas Territories round the world.

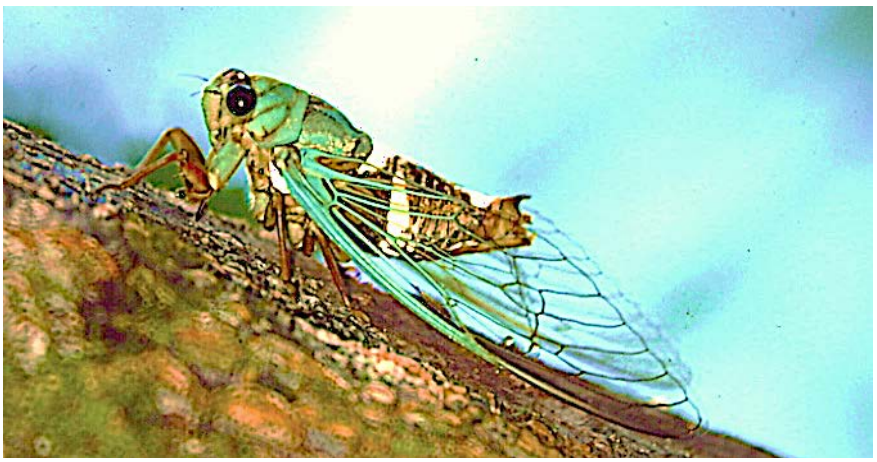
Arriving at the Antipodes with the only concern "See, listen, study *Raiateana*", even with the help and the Parisian information of Bernard Salvat, then in charge of the Coral Ecology Antenna of the EPHE in Moorea… Oops! The problem was fortuitously introduced during an unforeseen plane transition, which led to some exchanges between travellers... Problem solved in the best way, "my" Polynesian Cicada had some knowledge, not in Tahiti, but in Raiatea!

I found the species in perfect health, and studied it on its sub-mountainous terrain, during two first long personal stays. I am especially indebted to **Eric Poinsignon**, the traveler living in Raiatea, then to **Jacques and Sylvie Guillots**, to **Albert Athané and his wife**, all four natives of the island. The welcome they all gave and the help they provided were and remain equal to the friendly warmth of French Polynesia. Many thanks to these vaillants friends. *And a wink to my daughter Christine who, some time later, established herself as a general nurse in Tahiti, with my grandchildren, Yann and Johana.*

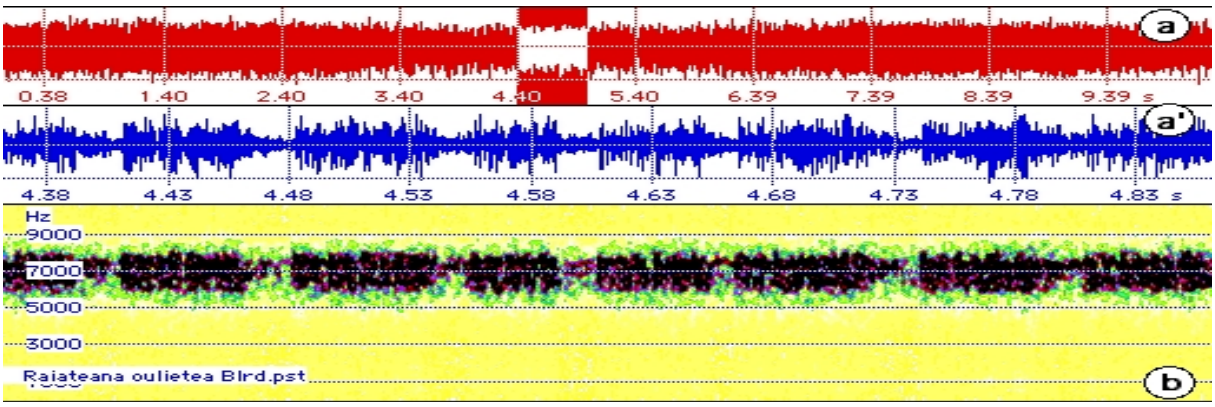
a) Cicadology and Zoogeography

In the Society's Archipelago, the "Belle de Raiatéa", a turquoise, brown and white cicada, enhanced by dazzling black eyes, raises, in addition to its biology not yet fully elucidated, a very interesting problem of zoogeography. It is found only on this island, yes, only! A thorny observation that we will find again after the colorful presentation of this Entomological Pearl...

Raiateana oulietea Boulard, a colourful species, whose tymbalized male ramage is not up to the splendid typical livery of the known varieties. To the nominal habitus above right were added the IPs (photographic identities) of two neighbouring morphs (*cf.* Boulard, 1995f).



Call tymbalization is a sizzle emitted in sequences of uncertain dimensions, separated by sentences of syllabic patterns all sizzled in the same way. Performance little superior to the emission of a noise (!); perhaps because the "defendant" found itself without competition on the island... In any case, here is its CIA, a graphic of a "little worked" range of sounds.



Raiateana oulietea Boulard, 1979, **A**coustic **I**dentity **C**ard: **(a)** Approximately 10 seconds of the time signal; **(a')** Approximately 50/100 seconds extended in a time space allowing to observe the ultrastructural rudiments of the signal; **(b)** Spectrogram corresponding to the oscillogram (a'), globally centered on 7000 Hz. (**Blrd 1995, *on Signalyze***).

My ethno-zoological researches and discussions with raiataean friends, contributed to explain the insular endemism of this Cicada, from the fact demonstrated by my care, that it offers undeniable relatives with species from South-Nippon. Some investigations (**Boulard 1995f**) have concluded that a cicada was installed at the same time as the protohistoric installation of sailors from Southeast Asia, barracks loaded with plants rooted in jugs or earthen casks (capable of containing juvenile cicadidae), sailors, some of whom settled in Raiatea.

Benefiting from the warm and rainy climate of Raiatea, the Cicadas have been able to get used to it and thus evolve, in the first sense of the word, under welcoming environmental conditions.

Ethnologically speaking, the island, where there is a pretty endemic flower, the ***Tiare apetahi***, was and is said to be "sacred". That said, it should be pointed out that the current Cicada, anonymous until I got involved in its affairs, has anchored itself perfectly on the island, not having left it, even to invest Tahaa, the immediate neighbor of the lagoon.

There are three arguments that should be put on record:

> Other species, belonging to my genus ***Raiateana***, were discovered in Fiji and Samoa by my excellent Dutch colleague J.P. Duffels and which he described, or reported in 1988. Findings which seem to support the hypothesis of the protohistoric and geographical origin of the 'raiataean precursors' in the islands of the Western Pacific.

> The installation of ***Raiateana oulietea*** in one of the Leeward Islands led me:

- to estimate that the species, seen with limited flight, is inherently sedentary... It is practically not found in Tahaa, not in Tahiti, nor elsewhere in the Society Islands;
- to understand the sub-equatorial centre of the Pacific as the limit of expansion, originally more or less aided by the very special "*R. oulietea* case", no Cicada is currently reported from the other South Polynesian islands, nor from the Marquesas Islands, nor from the Tuamotu and Gambier, still less from the Austral Islands, all of them relatively distant from each other.

Raiatea, one of the mountainous aspects of the island that were conducive to the protohistoric settlement of the ascendants of *Raiateana oulietea* **(MB Phot)**

b) Mimetology, applied mimicry and camouflage

I couldn't find the "Dead leaf fish" seen in the Seychelles, but I met many other subjects gifted with mimicry, mainly mimesis, but also camouflage. First of all, they were **Rock Crabs**... That I end up identifying on the pebble tidal flats discovered by the weak negative amplitudes of the lagoon encompassing the islands of **Raiatea** and **Tahaa**.

Case of the ***Calappa***, pebble crabs, of which here are portraits "slided" on the spot:

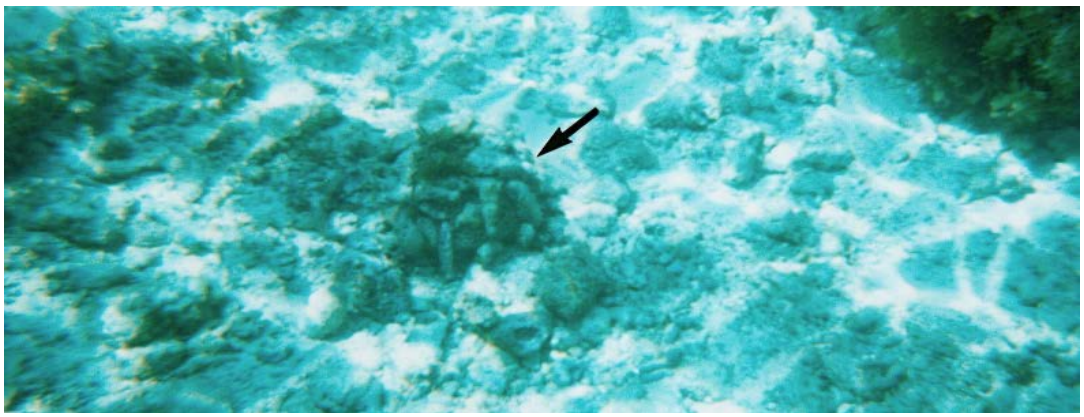
Two "pebbles", multi-pointed cephalothoracic tests closed. The crabs having immobilized on my approach;

One of them, seen from the front "box closed", the two clamps tightly fitted to each other and to the back test;

A third ***Calappa***, the claws somewhat open. **Raiatea, March 1993** (**MB Phots**).

The lagoon's shallows conceal many mimetic scenes. With a snorkel and a little snorkeling experience, many can be easily photographed, especially those camouflaging certain echinoids. Some examples, panoramic and macro photography:

> Toxopneous sea urchins, devoid of large prickles, are often masked by various debris, coral fragments, algae shreds from their immediate environment, **so they camouflage themselves**

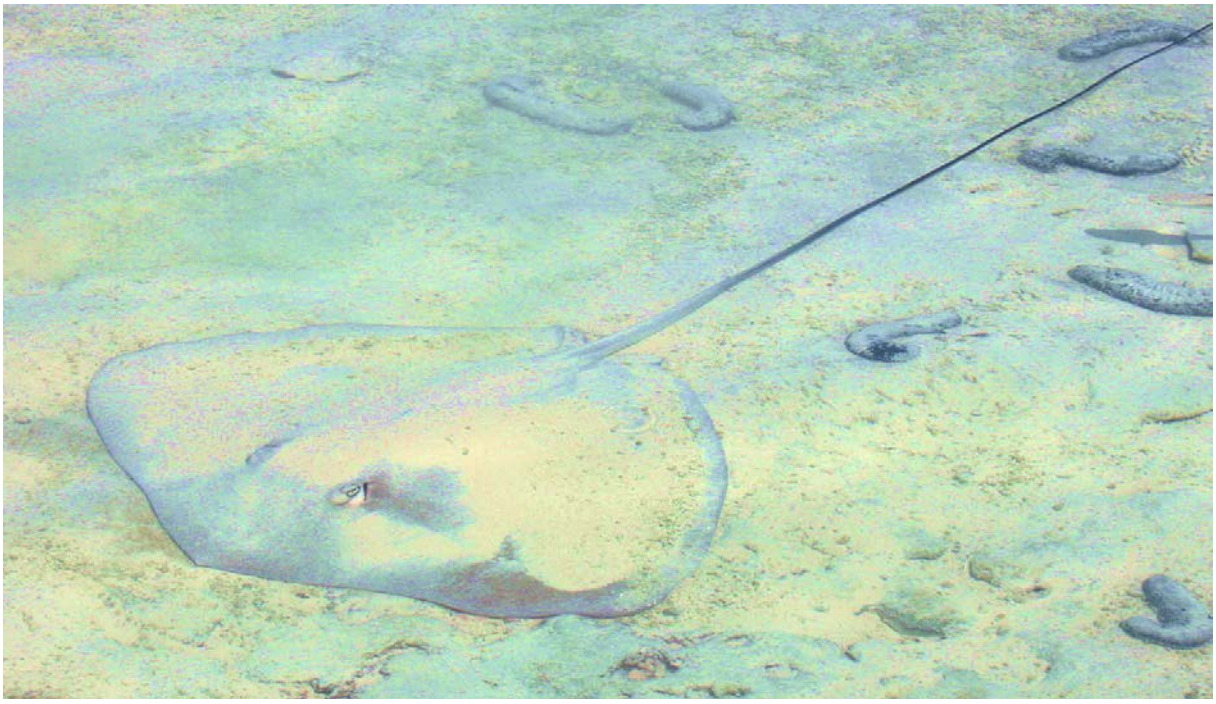


More or less carried by the waves of the lagoon, these fragments hit the sea urchins which capture them, place them and hold them in place with their ambulatory suction cups, so they're camouflaged.

These captures of objects put into action by the ebb and flow of the lagoon are assimilated to active allocryptics making these extraordinary animals "enter" into the scenery and falsely disappear.
Raiatea, Society Archipelago, French Polynesia, February 2002/2005 (MB Phots).

c) For the record

To conclude this first Franco-Polynesian chapter, the **psammophilic Stingray**, common in the lagoons and atolls, is the best way to end this chapter. Superb mimicry, it is also capable of camouflage, being able to cover itself with a cloud of sand after landing:



**Majestic, it is only through its (provoked) movements that it can be spotted and photographed.
Rangirora Atoll, Tuamotu Archipelago, French Polynesia, March 2005 (MJB Phot).**

12.- In the Western Pacific

a) Vanuatu Islands

Many years ago, I became interested in a collection of cicadas brought back from the New Hebrides (now the **Vanuatu Archipelago**) by the great traveller **Édgar Aubert De La Rüe.** They all belonged to the genus *Baeturia*, very close to each other, originating from different islands of the archipelago and can be considered "geographical twin species". One can thus perceive the *Baeturia edauberti, B. aubertae, B. efatensis and B. epiensis* described from the ex-condominium, where no other genera of Cicadas seem to exist **(Boulard, 1979b).**

In fact, the *Baeturia* are essentially Papuan. New Guinea, which is said to contain about 20 species, appears to be the centre of dispersal. Their presence in the **Vanuatu Archipelago** could, however, mark the south-eastern limit of their expansion, as neither New Caledonian nor Fijian *Baeturia* are known, at least for the moment.

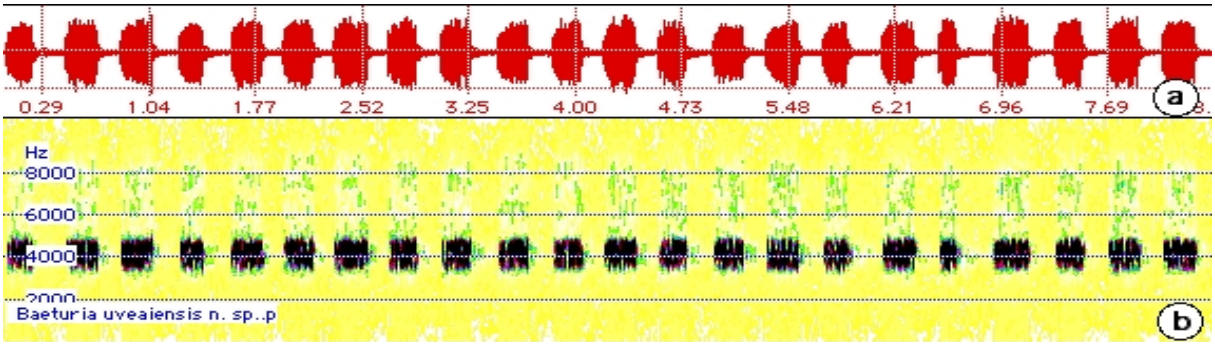
b) Uvea Island of Wallis

In the first quarter of 1995, I flew over the Pacific in three cicadidae stopovers: Raiatea-Wallis-New Caledonia. If I had some good subjects, rubbed shoulders with Raiatea and New Caledonia, I had no Wallisian element, not even books. In February 95, leaving Central Polynesia for New Caledonia, I made a short stopover in the Wallis Islands, also included in a magnificent lagoon, dominated by Uvéa, the big central island.

Please do so. After two and a half days of crapahutage ending with a rainy evening, I heard and discovered Cicadas, not only twilight-night, but also ombrophile, in the full sense of the word, that is to say who likes rain!

With the help of *Michel-Tailiné Lenato*, a young native of the area equipped with a flashlight, the tymbalizers were spotted, recorded and photographed. Individually, many of them were clinging to the underside of the leaves, or upside down. It was an unknown *Baeturia*, of which I have given a full description, including the AIC, "a taxonomic parameter suitable for separating the island forms of this genus, whose general and genital morphologies are often very similar" (**MB, 1996, p.152).**

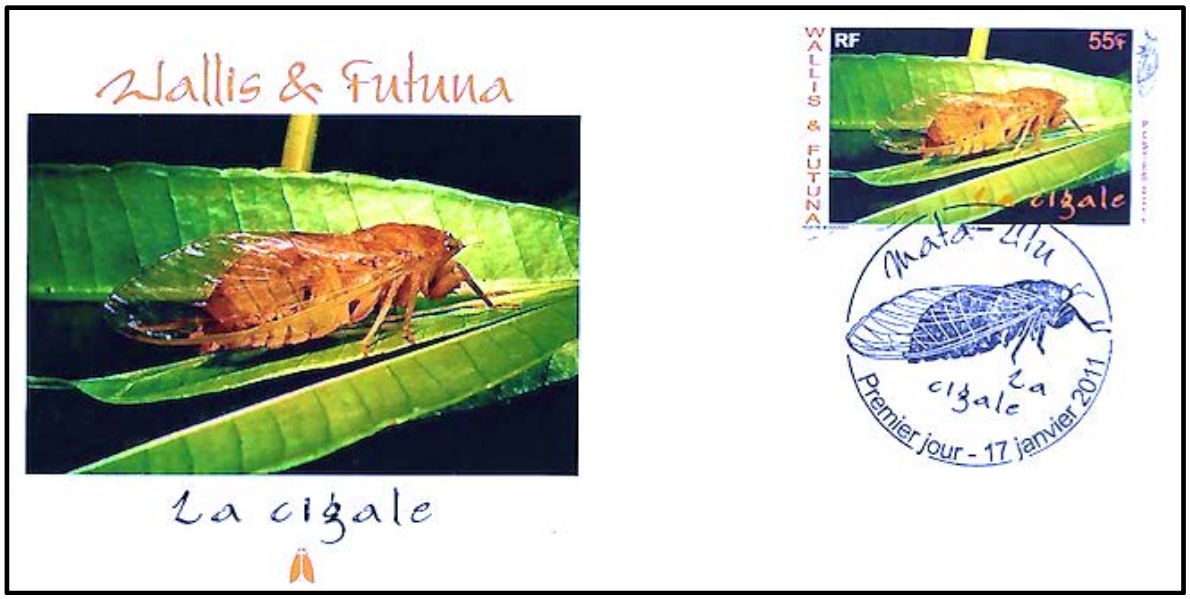
Baeturia uveiensis Boulard, 1996. The males, after a stormy evening, began to tymbalize at night, under a light rain... Encouraging me to bring out of anonymity this nocturnal species "*singing in the rain!* **Uvéa, forest edges of Lake Kikila, February 1995 (MB Phot)**



This is its AIC, Male registered at night on 14 February 1995, around 18h40/50.
(MB rec. with a friendly nod to *Michel-Tailiné Lenato*).

-> For memories

Uvea, Mata'Utu Cathedral (MB Phot)

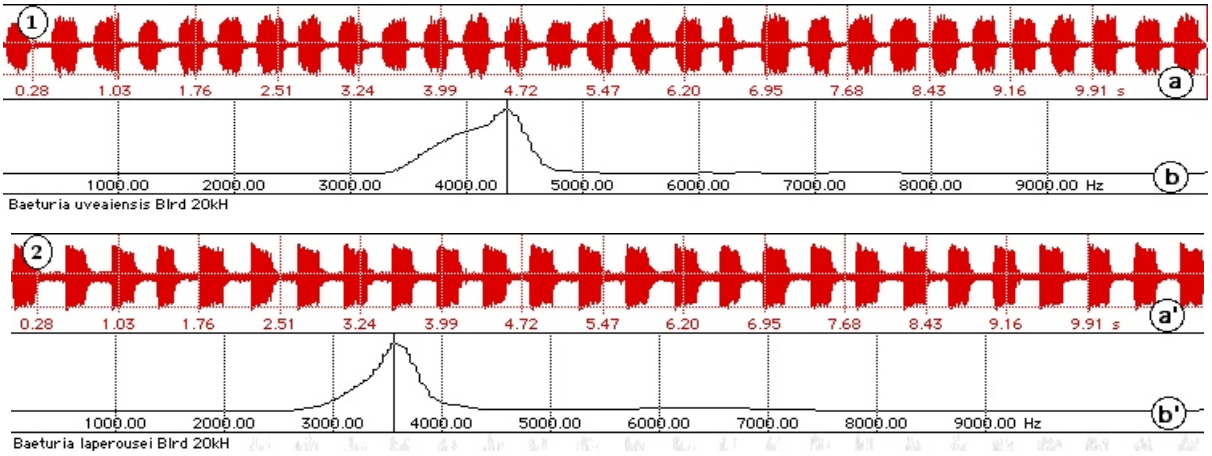


c) Solomon Islands (including Bougainville Island)

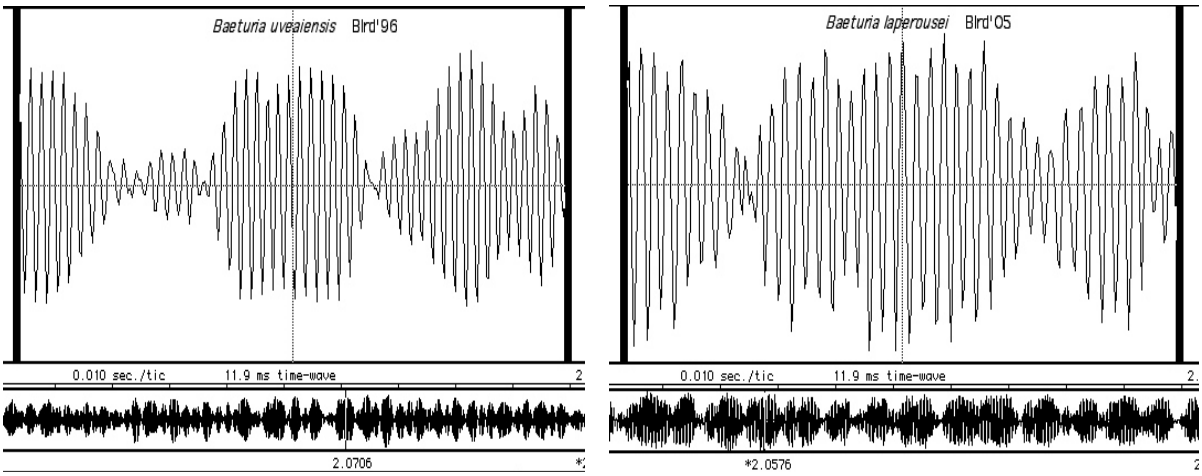
1) Vanikoro Island

In Melanesia, among the first islands of the Solomon archipelago towards the West, is the island of Vanikoro, cicadologically interesting, but also of sad memory. The "Ancestors" of ***Baeturia laperousei*** Boulard, 2005, were able to witness the shipwrecks of '**La Boussole**' and **L'Astrolabe**, Louis XVI's exploratory ships.

Thanks to the help of my excellent colleagues **Henri-Pierre Aberlenc** and **Michel Faure** who, in situ, were able to record and capture ***Baeturia laperousei***, the acoustics made it possible to compare its sound status with that of "my" Wallisian and to confirm the specific distinctions, while confirming the expansionist faculty of the genre towards islands, not very far from each other and more or less under carrying winds:



AIC, first parts compared, 10 seconds time records + different average spectra : **(1)** ***Baeturia uveaiensis*** (29 modules, 4400 Hz **(2)** ***Baeturia laperousei*** (26 modules, 3500 Hz) *on Signalyze*.

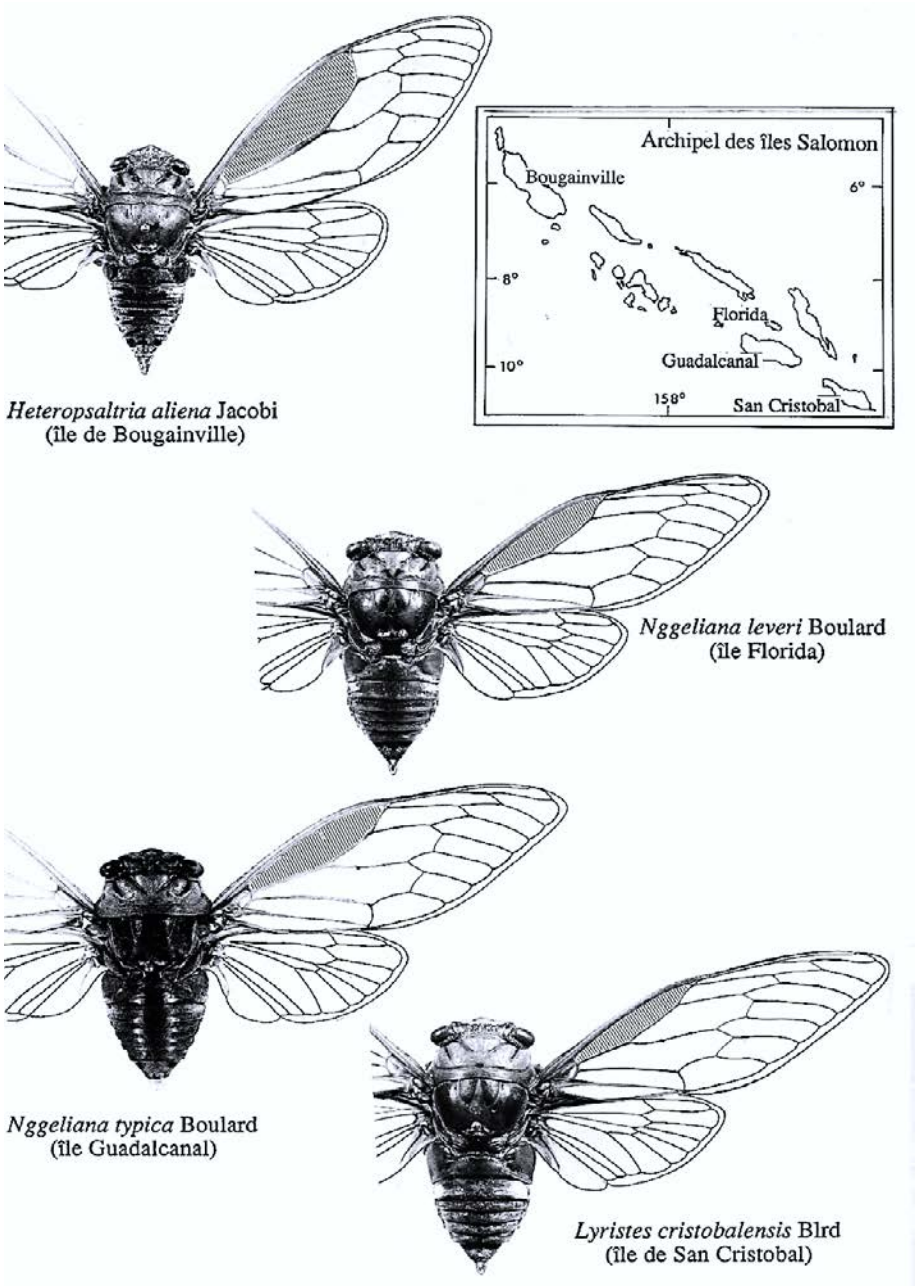


AIC, second comparative sections detailing the geographical status of the two sister species
Documents extracted from Boulard, 2009d *on MacSpeech Lab*.

2) Large Cryptotympana

I made known an interesting synapomorphism in the Great Cicadas of the Solomon Islands, preserved in the British Museum. A drift which, according to the specimens in our possession, seems to be observable from island to island from the South to the North of the Archipelago and which concerns at the same time homelytral, cymbalic and genital characters.

Hard to imagine the surprise then experienced: San Cristobal of Salomon Island, the southernmost island of the Archipelago, holds the species as the "basal" of the drift, here it is...



On the left, *Nggeliana typica* - *Heteropsaltria aliena* --- On the right, *Lyristes cristobalensis* - *Nggeliana leveri.*

It happens to be ***Lyristes cristobalensis*** Boulard, 1990, the largest known species of *Lyristes*, a genus invented in the study of European Cicadas by Horváth in 1912. What I've been able to ensure since 1979 and many times (*cf.* Blrd, 1979i, 1988c, 1990a ... *passim*) and again here ***cristobalensis*** being a true *Lyristes*, presenting only some visible differences just specific to the European type of the genus. Which a molecular study may or may not definitively confirm.

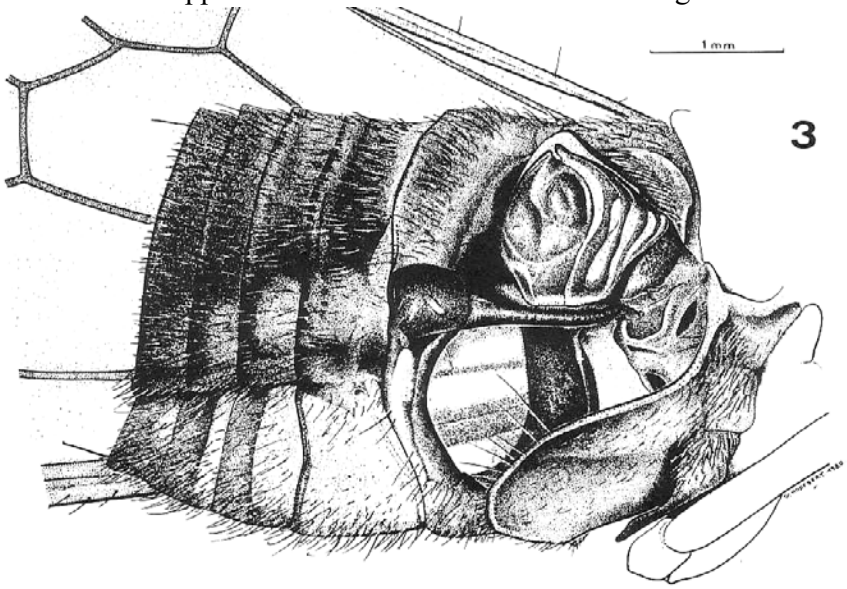
On the other hand, the species *leveri* Boulard should be taken out of the taxon *Nggeliana* and placed in a new genus close to *Lyristes,* such as ***Lyristoides***, n. gen., with which the image of the species *leveri* in Boulard, 1990a fits infinitely better... ***Lyristoides leveri*** n. syn. Sorry, I don't have the space here to confirm the amendment!

13.- New Guinea

a) Dr. Smart's strange species

From this Territory I received, also via the BM, little Cicadas, then unknown, collected by **Dr Smart** and which I was able to describe, naturally calling them ***Toxopeusella smarti.*** They

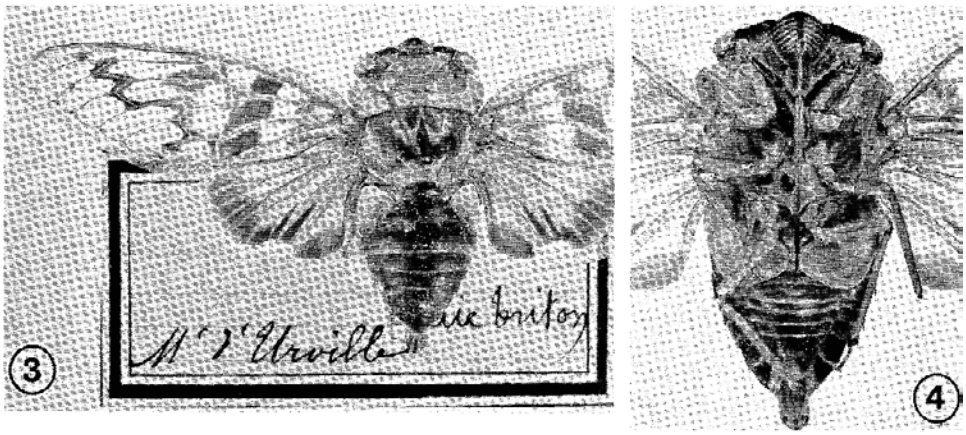
belong to a species quite remarkable by the magnitude of the different components of the cymbalic organ, particularly the auditory capsules, which are voluminous, and even more so the eardrums. Hypertrophied, hypertensive, they are transparent and in such a situation that through the base of the body, one can distinguish the wings on the opposite side. A simple "genetic amusement", apparently, that can be better appreciated thanks to the brilliant drawing of Hélène:



Toxopeusella smarti Boulard, 1981.
Close-up on the profile of the abdominal base and cymbalic apparatus. The relative size of the auditory capsule and the almost parallel situations of the tympanic mirrors and their sublime transparency allowing the gaze to "cross the body"! (**Document HLRT in Blrd, 1981i**).

b) The forgotten of the ASTROLABE

During the Discovery Travels of the ASTROLABE and the ZÉLÉE carried out by order of Louis-Philippe I, Cicadas were collected in Oceania, then entrusted to the MNHN where they were recorded in the "Catalogue of Articulated Animals, 1841 Series". Most of them were examined and described in the 19th century, with the exception of two specimens of the same species, forgotten in a box in an old wardrobe of the National Collections. With happiness, it came back to me to "bring back to life" this species now qualified as historical, dedicating it to **Jules Dumont d'Urville**, a great navigator and naturalist who released in the **Bay of Triton**, anchored and stayed at the "Dubus" harbour where, it seems, these two Cicadas were captured.



Poecilopsaltria durvillei Boulard, 1991. Male holotype, Western New Guinea, April 1839, J. Dumont d'Urville Rec. and Leg. no. 1992/41 (**Boulard, 1991e**).

14.- Thailand

From March 2000 to end 2014, I made long and very long study stays in Thailand (the first one thanks to an EPHE credit, the following ones on my personal fund), essentially devoted to Tropical-Asian Cicadology, without neglecting mimetology, both of them not very prolix in the literature initiated so far. The faunistic richness of this country, with its extended continental-tropical latitudes, which **Lucien Beaudouin**[20] never ceased to let me foresee by his accessory harvests of "***Tcha-kat-chan***", **cicadas** that he periodically entrusted to me. The latter, fallen into his traps, rarely mentioned in catalogues, prompted me to go and study them on the spot, accepting a friendly repeated invitation.

The profusion of genera and species, now largely listed, is spread over a phenotypic and taxonomic range rarely equalled elsewhere and, I must stress, many times, ethologically surprising. During the numerous expeditions conducted with the help and devotion of **Khuankanok Chueata** (*Lucien's great-cousin and my Buddhist-partner*), **Max Somraj, Sumboom Sulayea, Pornnapa Boonyu** and a few temporary workers, our knowledge made real progress on these insects, both in their physical reality and in their behavioural diversity. Two books are references.

Witnesses to be quoted immediately, all seen and recorded *in natura*, the genera with the largest and most attractive species on the planet by their musical abilities, such as ***Cryptotympana, Angamiana, Tosena, Megapomponia***... Many of them also have beautiful colourful ecotypes distinguishing ***Ayuthia, Distantalna, Meimuna, Platylomia*** and more ***Salvazana***, whose variety of the species *mirabilis* adorns the cover of my first volume on Thai Cicadas (**2007a**), while the ***melanoptera*** species, new to the genus ***Angamiana***, adorns that of the main second (**2013c**).

The faunistic abundance of Thai species often parallels the bionomic feats that I have never seen before: concerts and serenades emitted from dawn to the twilight-night levels; extremely varied sound performances, sizzling or melodious, offering, digitized, the making of astonishing musical graphics, never seen before. Mixed bio-reality of the so-called "sono-guiding" tymbalizations... "Pre-imaginal constructions"... Paces, postures of the nicknames of my fact "*Butterfly Cicadas*" and *"Bird Cicadas*", while species, with incredible if not frightening behaviours - adjectives not too strong - show singular ethological drifts, up to an inexplicable present. The *Tcha-kat-chan* excited me even more than the French, African, Malagasy, Guyana and New-Caledonian cicadofauna, to the point of almost 'phagocyting' myself into a 'dedicated land of cocagne'!

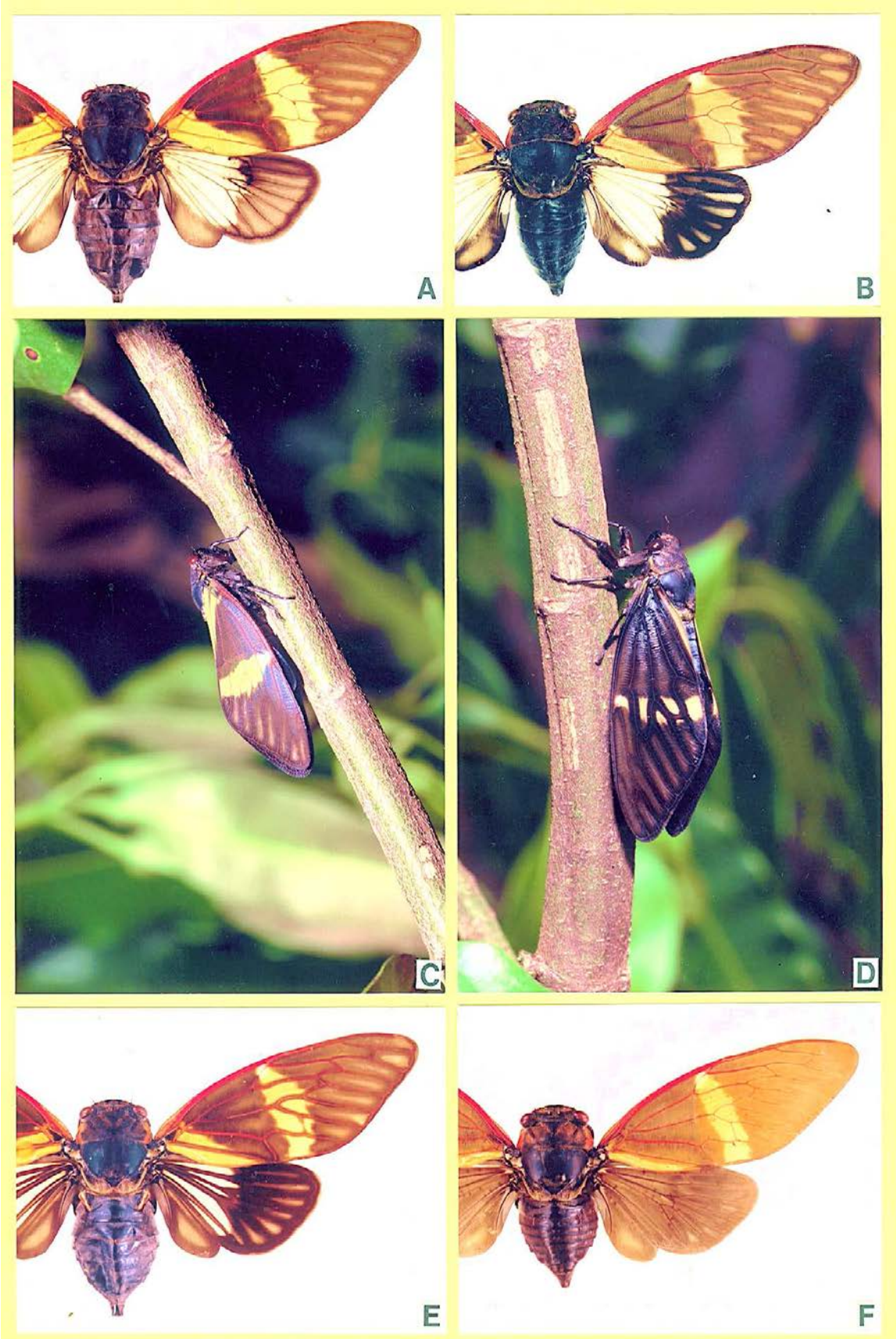
A) "Amazing Thai Cicadas", selected overviews

a) Polychrome and heterochrome species

> Polychrome species: ***Becquartina versicolor*** Boulard, 2005, one of the "butterfly cicadas" with a beaten flight, not vibrated as many Cicadidae do. In the same place, living in the same space-time, this Butterfly Cicada has four habitus. Here, framing two eco-photographs of a specimen at rest, then of a cymbalizing male, are four costumed spotted:

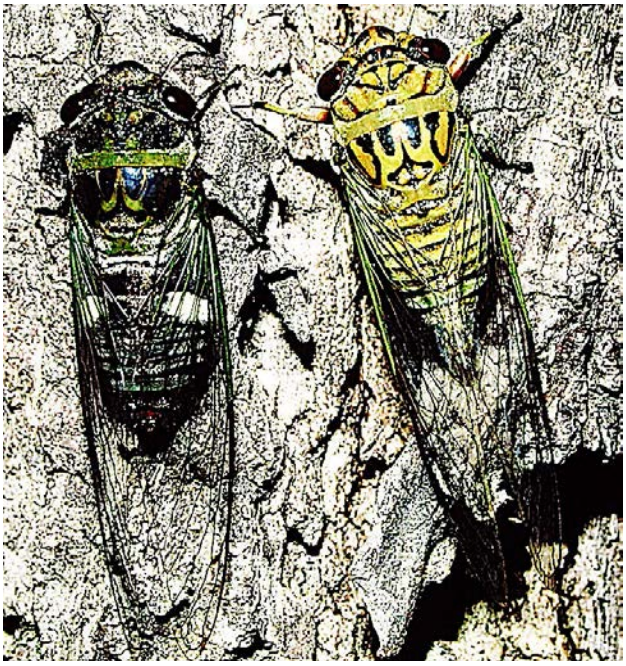
---

20) Lucien Beaudouin†, close friend of the Entomological Society of France, alas left recently. Was Engineer of the 'Saclay C.E.A.', but also a fine lepidopterist and specialist in light traps, about which he defended a thesis, the first on the subject, which was published in 1983 at the Pierre and Marie Curie University (Paris). The same year, he was awarded the Prix RÉAUMUR of the Entomological Society of France. See also L'Entomologiste 1999, 55(4): 151-165). For his research on Heterocerous Lepidoptera and light attractions, my dear 'Lulu' periodically resided in Thailand, with some of his people, who immediately accepted me as one of their own. Together now in his memory.



(A) and **(B)** Male and female types *Becquartina versicolor, versicolor*. **(C)** and **(D)** Eco-diapos of two specimens, **D** tymbalising. (E) Male *B. versicolor, chantrainei*; (F) Female *B. versicolor, fuscalae.* Full excerpt from Boulard 2005a). (See a different genus and species on page 294).

> Heterochrome species. Male and female do not have the same ground colours. The following examples, which have given rise to good memories gleaned in the field of breathtaking explorations of wich I will have to come-back to later:



On the right, ***Chremistica inthanonensis*** (Boulard, 2006), an invariable heterochromic couple, male and female, each retaining its statutory habitus. **Huai Kaeo, July 2007**. On the left, ***Mogannia saucia*** Noualhier, 1896, a red male and two black-bodied females. **Sura Thani, November 2004 (MB Phots).**

Mogannia funettae Boulard, 2008. Close-up on another heterochrome couple, flashed just before the end of copulation, the male is on the right. **Chiang Mai Province, Huai Kaeo, August 2007 (MB Phot).**

b) The stars of the Sonosphere

1) The bright species, colours and singings

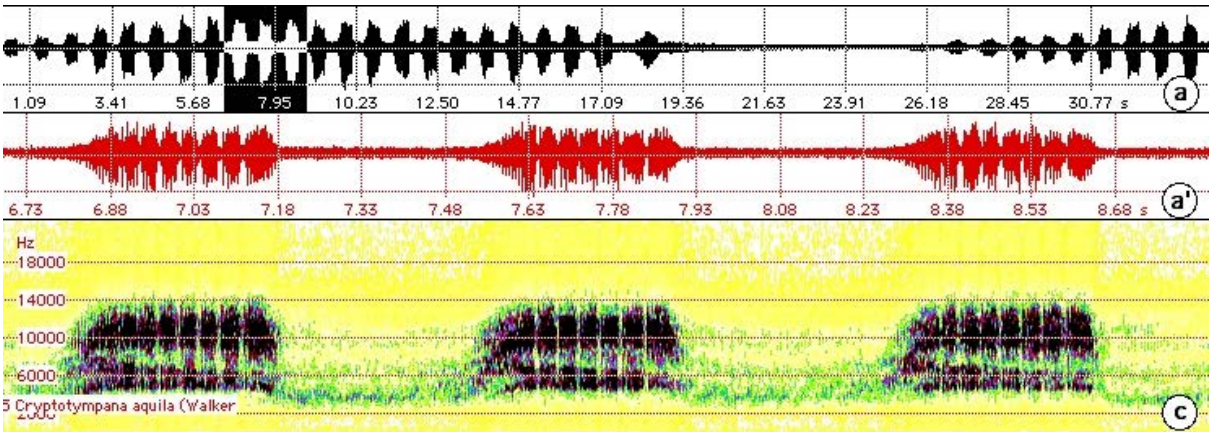
>The *Cryptotympana.* Large and robust Cicadas dorsally tinted with a deep, glossy black, with a head wider than the rest of the body. ***Cryptotympana aquila*** (60 mm long, 118 mm wingspan) is the most characteristic species of the genus with its orange abdomen and forewings (homelytral) where the coriaceous black occupies the entire anternodal range and extends in a sub-costal band to the r- and r-m veins of the post-nodal range; the rest of the wing is hyaline but parchment. Males and females look the same, but the females are slightly smaller.

The species is a forest in the humid mountains of Northern Thailand where, as early as April, the adults are in the emergent phase. And I have been able to write, so many of them are carrying out their exuviation in calm nocturnal periods. A whole day and, for most of them, the whole following night, will be necessary before they fly away to the canopies, from where few will come back down.

Cryptotympana aquila (Walker, 1850) in natura.
With one of my usual field tools, a Canon 100-400-800 mm: **(a)** general scene at 100 mm), then **(b)** close-up at strong 800 mm telephoto, both centred on a female; **(c)** Close-up view at the same 800 mm, on a neighbouring male tymbalizing. **Doi Mon Kia Cordillera, April 2001 (MB phots).**

Cryptotympana aquila (Walker, 1850), male collecting sap from a strong twig (**MB phot**).

The males, heliophilic, early-morning and daytime, are solitary travellers of the high forests. It is only when feeding and tymbalizing that they can be observed, with binoculars or a good telephoto lens. The call tymbalization, rhythmed by arched extensions of the abdomen, is made up of sequences with an apparently very random number of modules. The call repeats the same phrase, which increases, goes through a maximum, then fades until it comes to a complete stop. Its **AIC**:



(a) Time waveform based on a 32-second recording, transcribing in real time, an entire sequence and then, after a silence of about 6 seconds, the beginning of the next one. The sequences thus have a fusiform appearance, while the sentence, or module, seems almost immutable in its elementary composition.
(a') Partial oscillogram, stretched in a space-time chosen so as to detail the three modules appearing in inverted form in (a). For each one, the conformation is almost identical with 7 to 8 lower patterns, while equivalent distances separate the modules from each other.
(c) Spectrogram based on the previous oscillogram and transcribing the frequency occupancy. Two groups of harmonics stand out, one around 6000 Hz (without being able to distinguish the fundamental), the second, more extensive, is apparently centred on 11000 Hz. In green, between each, a crackle oscillating lower in frequency, could correspond to the fundamental. (**in Boulard 2007a,** ***on Signalyze 3.12***).

> The *Salvazana*

Only one species, ***S. mirabilis*** Distant, 1913, but several varieties. Cryptotympanins of good size (66 mm long, 123 mm wingspan), with females with a slightly heavier wingspan. They are superb black-bodied, broad and stocky cicadas, with a relatively long, pronotally long, more or less yellowish green collar. Short rostrum. In males, short, domed, half-black, half-yellowish lids, their outer rim closely adjoining the tymbacalyptres, which completely obscure the tymbals. The beautiful habitus of this species is enhanced by wings edged with bistre and with a richly, but differently coloured blade, following two main varietal lines. The differences lie in the colouration of the anternodal area of the homelytra, as well as in the anterapical colouration of the hindwings:

->Variety ***mirabilis*** (Distant, 1913, nominal), homelytral anternodal area, green, proximal half of hind wings, white. This form is by far the most abundant.

->Variety i***mperialis*** (Distant, 1918), anternodal area of forewings, green, proximal half of hindwings, red:

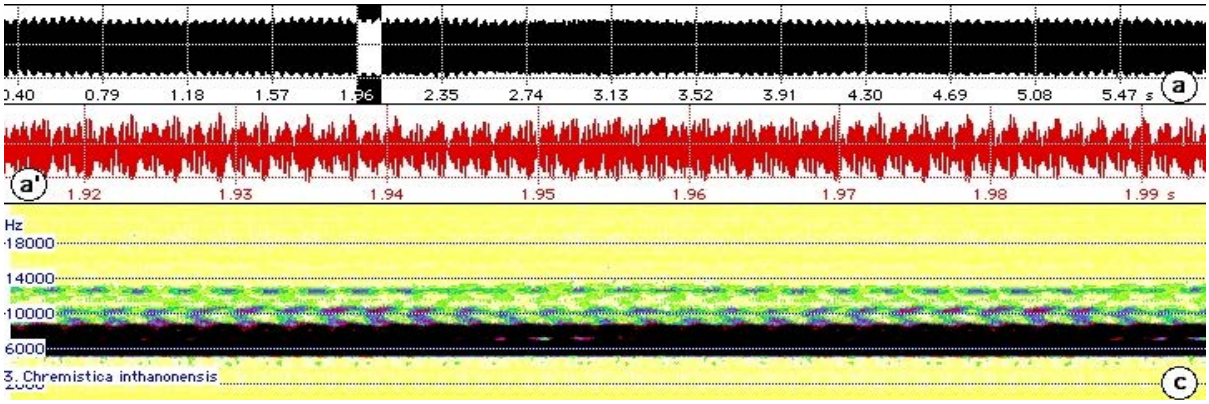
Salvazana mirabilis imperialis (Distant, 1918), males who have finished their imaginaison but have not fully acquired their dyeing costume.

Chiang Rai Province, Doi Mon Kia Cordillera, April 2002 (MB phots).

>The *Chremistica*

Species in the average sizes specific to the group of the "Two Spotted Cicadas" according to **Gaspar Stoll** (1781), or **Guillaume Olivier** (1790), but whose multi-species character I have noted (Boulard, 2006). ***Chremistica inthanonensis*** (Boulard, 2006), which has the particularity of being one of those rare cicadas with heterochrome sexes, as shown on a previous page. The dorsal lining of the male is predominantly black with the abdomen very clearly bi-fasciated with white, while that of the female is predominantly green or brown, fasciated with bistre or black on the forebody, the abdomen without white spots. A full-day species, both heliophilic and dendrophilic, often clinging to the high part of the trunks where they excel in periods of dense tymbalization, interspersed with silences of inconstant value and broken from time to time by "territorial occupation tymbalizations, or presence signalling", consisting of the emission of rapid and brief cymbal strokes.

To tymbalize, the male folds its wings to the sides and keeps its abdomen arched. The tymbalized call is a piercing, very sustained whistle of almost immeasurable rapidity, hereafter in **(a)**, revealing the poor quality of my recorder at the time, betrayed by the long and uniform black band of the 6000/9000 Hz of the Spectrogram **(c).** See, in (**a' red**), how the patterns, themselves very dense, are tightly packed together: no less than 53 in 1/100th of a second! **Fantastic metamorphosed performance, here is its AIC *on Signalyze 3.12*:**



Chremistica inthanonnensis Boulard, 2006, male tymbalizing (left), then (right) another one at the end of mating, the female hanging on to her edeage and trying to get out of it.
Huai Kaeo, July 2007 (MB Phots).

In a neighbouring colonial species, ***Chremistica moultoni*** Boulard, 2002, both sexes are black and bear the same white fascia, which is less strong than in the previous species:

Chremistica moultoni Boulard. **Doi Khun Tan N.P., Chiang Mai Prov. June 2001 (MB phot)**

The sexual phases are carried out in isolation, giving rise to the sexual sono-guidance... Surprisingly, sometimes they include some tymbalic communications underlining the fact, already demonstrated in the study of French species, that males, here therefore ***moultoni***, do not know how to distinguish the image of a male from that of a female:

The "targeted" male does not integrate the musical efforts of the second male for it... He'll end up flying away... (MB Phot)

Hunting Cicadas is a sport. A device with a long handle and two circles, holding the opening of the net open, was very often indispensable. **Khuankanok, Doi Inthanon, July 2002 (MB Phot).**

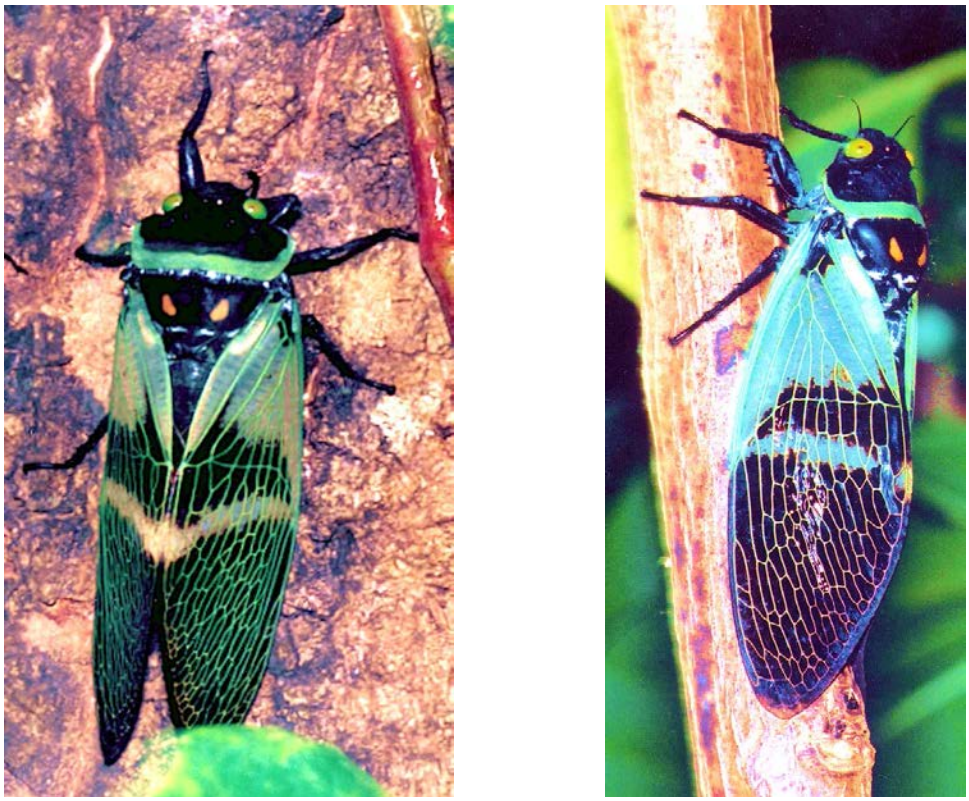
Other related species

Chremistica atratula Boulard, 2007. Colonial too, but both sexes in an entirely black body.
Khun Pawor N.P. (N-W Thaïlande), octobre 2006 (*cf.* **Sonotype,** *in* Boulard **2007a).**

> **The Angamiana.**

They are four to compose a small group of large and nicely colored Cicadas (75 mm length, 135 mm wingspan). Two were followed and recorded in Thailand. Body bistre to blackish, the abdominal apex powdered with white wax, eyes and collar green or yellow-green. Tegmina long and wide, somewhat coriaceous the base colored of a deep green or pastel blue, polynervate, then reticulate. Wide posterior wings, either orange and more or less invaded by hieroglyphic-like drawings, or totally black.

The two Thai species studied live in the mountainous forests of northern Thailand where I was able to see them and admire their majestic flight, both being large Cicada-butterflies with a flapping flight, not vibrated and not very long sustained. Of almost identical sizes, they differ by the dye palettes of the tegmina and the membranous wings, as on the explanatory sonotypes materialized on the following page. Emotion! the second cicada was then unknown to the Museums.



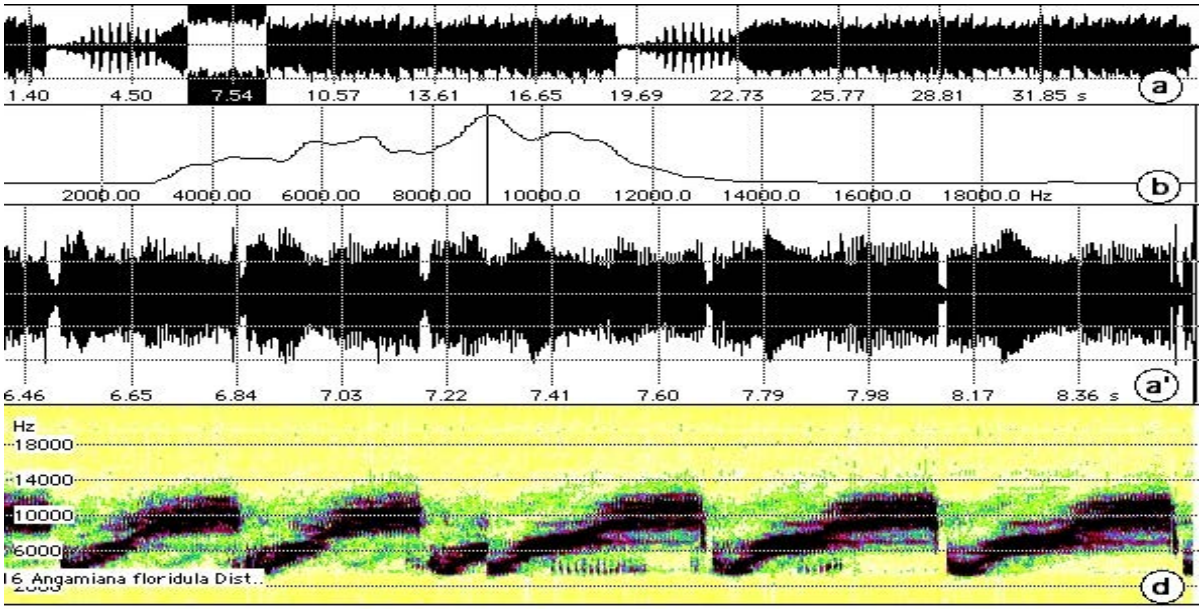
Beautiful habitus of the two Thai species of the genus ***Angamiana*** Distant, 1890 **(MB phots)**:
A. floridula Distant, 1904, green variety, Blrd, 2013 and ***A. melanoptera*** Boulard, typical, 2005.

Angamiana floridula presents the anterior wings fawn or green, then brown or black and, on the orange of the posterior wings, blackish spots in very variable dimensions and numbers, see below

Angamiana melanoptera Boulard is only known with the turquoise blue of the proximal third of the forewings, followed by a dominant black and the deep black of the hindwings, hence the specific

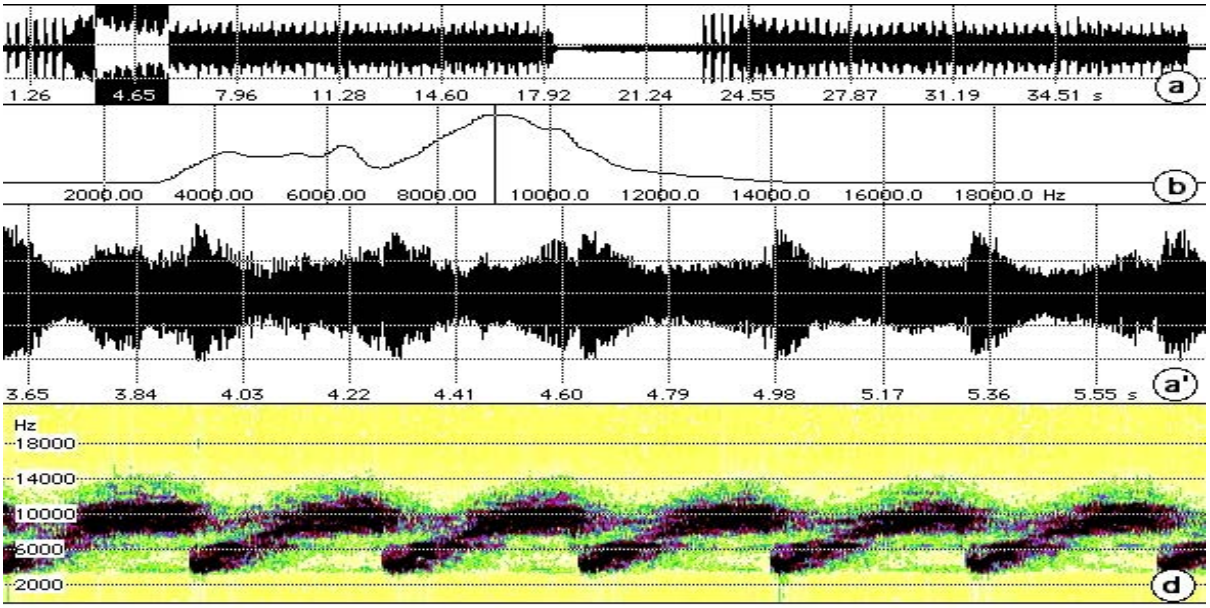
epithet. Both are common, they live in more or less dense populations and, as far as I know, do not live in the same mountainous localities.

In the field, the call tymbalizations are so similar to the ear, that I doubted the specific reality of ***Angamiana melanoptera***. The computer transcriptions delivered close, but not identical graphs, confirming the validity of the distinction of two species. This is demonstrated by the comparative analysis of the **AIC**s of the two species, reproduced and captioned below:



Angamiana floridula Distant, 1904. **AIC** (Sonotype)**.**

Mountain forests between Fang and Myanmar, in September.



Angamiana melanoptera Boulard, 2005. **AIC** (Sonotype).

Mountain forests, Khun Lao, Chiang Rai Province, in October.

(a') Stretching of tymbalisations in an arbitrary time space of about 2.5 s (narrow inverted patches in a). **The signal morphology appears distinctly different between the two species.**

(d) Spectrograms corresponding to the previous oscillograms a', allowing to appreciate the composition and the physiognomy of the modules. The range of frequencies extends from 2500 Hz to 14000 Hz, **but if in *A. floridula*, the modules are clearly separated from each other at the base, at the same level, they overlap in glissando in *A. melanoptera*.** (From **Boulard 2005d**, **k** and **2013c**, on *Signalyze 3.12*).

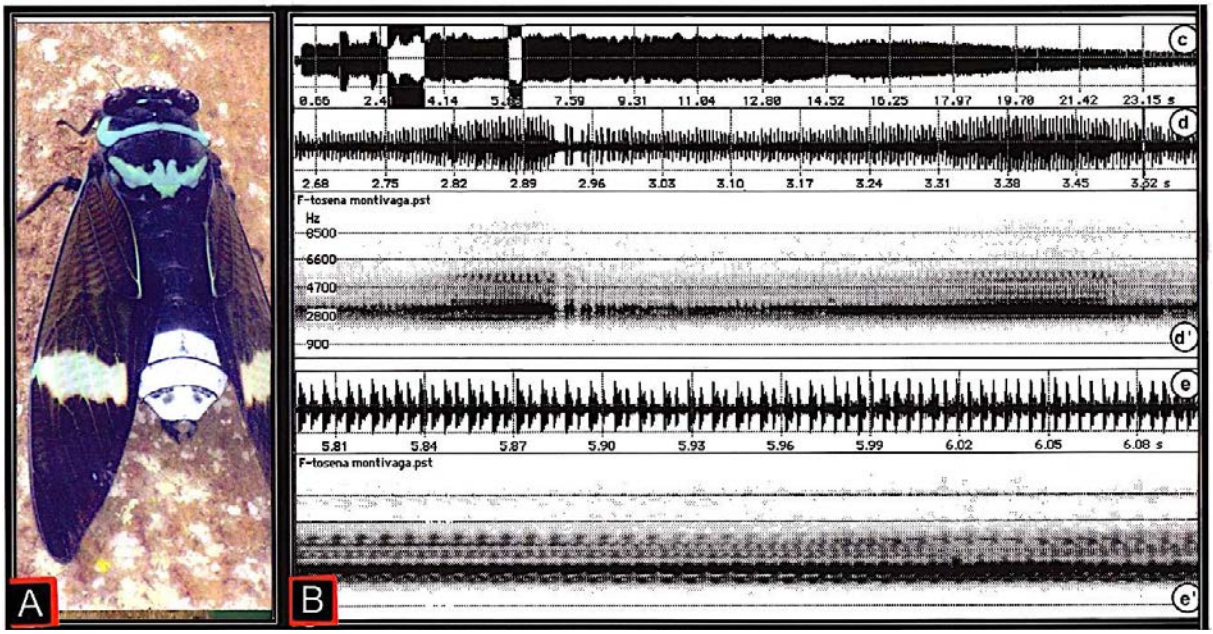
Imaginary birth of an ***Angamiana melanoptera***. Moment when it will extract itself from its juvenile gangue until it places its head down and then, precisely here, straightens up, its front legs ready to stretch out to grasp the exoskeleton and then acquire the possibility to extract its abdominal apex.

Chiang Mai Province, Doi Langka, September 2006 (MB phot).

> The *Formotosena*

Only one species exists in Thailand, ***Formotosena montivaga*** (Distant, 1889). Beautiful and large species (66 mm long, 127 mm wingspan), with a strong black livery, typically enhanced with a turquoise blue on the entire collar and which, on the mesonotum, sketches a specific signature simulating, in our eyes, "the flight of an Earling" (photo below).

Black abdomen with the apical third sprinkled with white wax. Males fly from trunk to trunk widely apart and, at each stage, tymbalize one or more call sequences (rarely more than three) in very comparable frequency registers:



Formotosena montivaga (Distant, 1889). **(A)** Male tymbalizing, wings semi-spreading. **(B)** AIC, sonotype. **Northern Thailand, Doi Mon Kia Cordillera, April 2001 (MB phot & *Signalyze 3.12*).**

> The ***Tosena***

They differ from the previous one by the conformation of the genitals. ***T. albata*** (Distant, 1878: Boulard, 2000j), ***T. melanoptera*** (White, 1846), large and medium species and the 'small' ***T. paviei*** (Noualhier, 1896), occur throughout the sub-mountain and forest north of Thailand, where

adults hatch in September. They share the same biotopes, carry out imagination apparently during similar periods, and then compete in occupying the sonosphere of the area. From far and wide, the large ***Formotosena***, about the size of ***T. melanoptera***, also tymbals its presence here. All of them have black homelytra, rather narrow and crossed by a wide white or grey fascia. ***Tosena albata*** is the largest: 85 mm in length against 75 mm for ***T. melanoptera*** and 45 mm for ***T. paviei***. The first two have an orange abdomen more or less marked with black, while the body of the third is completely glossy black. The females of the three, which are notably smaller, have the same livery as the males; the forebody is identical, the conical abdomen being distinctly shorter.

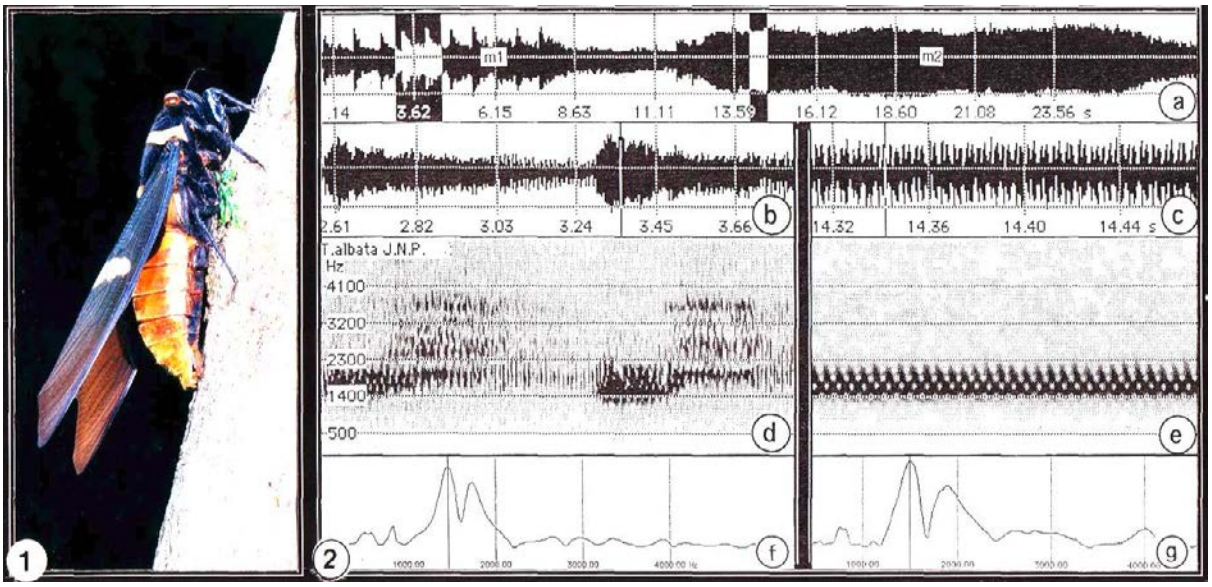
> ***Tosena albata***, emits verses that last about forty seconds, but which are very complex, producing three very distinct sets of signals, two of which are somewhat surprising for our ears.

-> This tymbalization gives the impression of the need for the powerful tymbalic muscles to be "turned on"... Indeed, following a phase of feeding, or rest, the first manifestation is more or less preceded by a good fifteen sizzling waves called "warm-up", emitted with closed wings.

-> The last two waves increase in decibel power and, afterwards, something reminiscent of the vagrancy of *newborn children* (**m1**), which is relayed by a set of only sizzled waves, relatively low in decibels, produced with wings still closed.

-> Then there is a very long and powerful whistling in the low register **(m2)** during which the insect spreads its wings somewhat, revealing the magnificent orange colour of its abdomen, which is dorsally stained with black.

-> Once the paddle is finished, the male flies to another trunk, where it starts its music again without going through the warm-up phase. It is then that we can establish the CIA, an edifying image of it and of the performances of the "tymbalic machinery":



Tosena albata Distant 1878. **(1)** Male about to fly, just after emitting a complete tymbalization sequence. **(2)** Detailed **AIC (a)** Real-time transcription of the sequence composed of two main modules **m1** and **m2**; **(b)** Waveform stretching a 1-second space-time of m1 taken in the first range inverted in a; **(c)** Waveform stretching 0.5 second of m2 taken in the second range inverted in a; **(d)** Spectrogram corresponding to the waveform b; **(e)** Spectrogram corresponding to the waveform c; **(f)** and **(g)** Average spectra emanating from the modules m1 and m2, respectively.

Doi Mon Kia chain, Pang Daeng hill, in September (**Sonotype Boulard, 2000j *on Signalyze***).

Burning question: during the sound events, the males of the two great *Tosena* and those of the *Formotosena* travel from trunk to trunk, staying in place only long enough to emit, each in its own way, an extraordinary musical composition, and then leave without further ado. A sibylline behaviour that left me many times pantois, as for the bio-ethological quality of these acoustic

exercises with apparently lost rehearsals, having been able to see and photograph only one coupling, already in action, without ever observing any premise...

> ***Tosena paviei*** (Noualhier, 1896). *Butterfly cicada* with bright red eyes, black body with wide wings and contrasting colours. Tosenian character, a wide band of a pinkish fawn tending to yellow, crosses the homelysters in their middle, these of a dark brown almost shiny and radiated with yellow. Hindwings half orange, half black

Species of forested cover in hollow of a small valley. Tight groups of a few specimens, almost all males, feeding mainly on *Aframomum*, a large monocot with a strong stem and long, broad leaves, growing near streams on humus-rich soil.

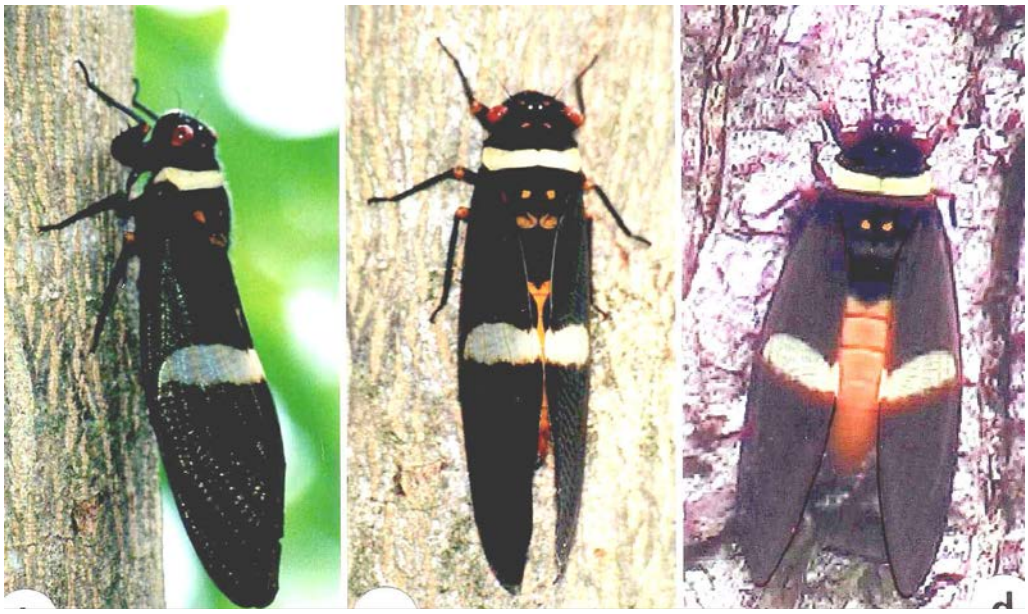
Tosena paviei regularly and alternately expelled short streams of whitish-coloured urine. None of the males in this small colony made sounds during the time spent near them. All seemed to particularly appreciate the sap of the plant. The elements of a group, frightened by our care until they found themselves scattered on the surrounding essences, soon returned to the *Aframomum*. In barely 2 hours, the small company was almost completely reconstituted, on the same *Aframomum* (Boulard, 2007a, Pl. 22).

Tosena paviei (Noualhier, 1896). **Doi Mon Kia Forest Range, April 2003 (MB Phot)**

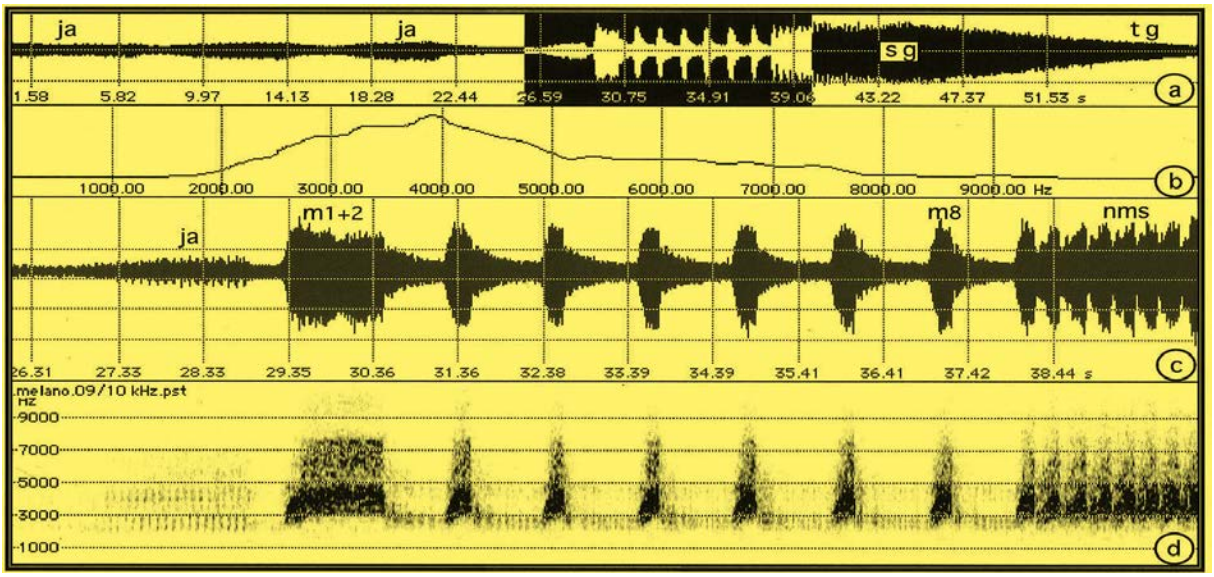
The perceived tymbalisations were the work of solitary males that had reached the canopy at the hottest time of the day. The call tymbalization has a somewhat metallic consonance, reminiscent of the *Angamiana*, which was confirmed by the graphical frequencies. The call of the ***Tosena paviei*** is made of the rapid succession of the same short phrase or sequence

(*cf.* Sonotype in Boulard, 2003a).

> ***Tosena melanoptera*** (White, 1846). Its tymbalization obliges it to take from the outset a particular posture, wings just spread apart, releasing the yellow-orange of the abdomen.
See the 3rd view, taken from a video:



And it is a powerful aubade, complex here too, because it is composed of several very different, prodigious musical phrases, whose transcription into images has revealed an "artistic and precise AIC". The aubade begins with several long 'jacassées' (ja) phrases, separated from each other by short, weak crackling noises. Then appears a shorter and stronger chattered module, almost immediately preceding a succession of short signals. At first tymbalized into a powerful double module (m1+2), followed by 5 to 6 modules still well individualized, then by (n ms) successive modules closer and closer together... Until they telescope into a highly sizzling sequence for about twelve seconds, to finish decrescendo into a train (sg) of increasingly weakly sonorous (tg)...



Tosena melanoptera (White, 1846). **AIC** established on an entire sequence **(a)** of tymbalization. The graph of the highlighted modules reaches 8500 Hz.

Doi Mon Kia forest chain, in September (MB Sonotype, 2007a *on Signalyze 3.*5).

How are the acoustic performances of the tymbalic complex orchestrated, with an instrument of macroscopic observations not very different from one species to another? As for the pre-copulatory efficiency, I was still disconcerted. Each time it was repeated in the same way, the verse does not seem very attractive. I have not seen any female arriving from a nuptial flight near a male in exercise... But the noisy attempts of a male *T. melanoptera* "harassing" tymbals and front legs, a large female *T. albata*,

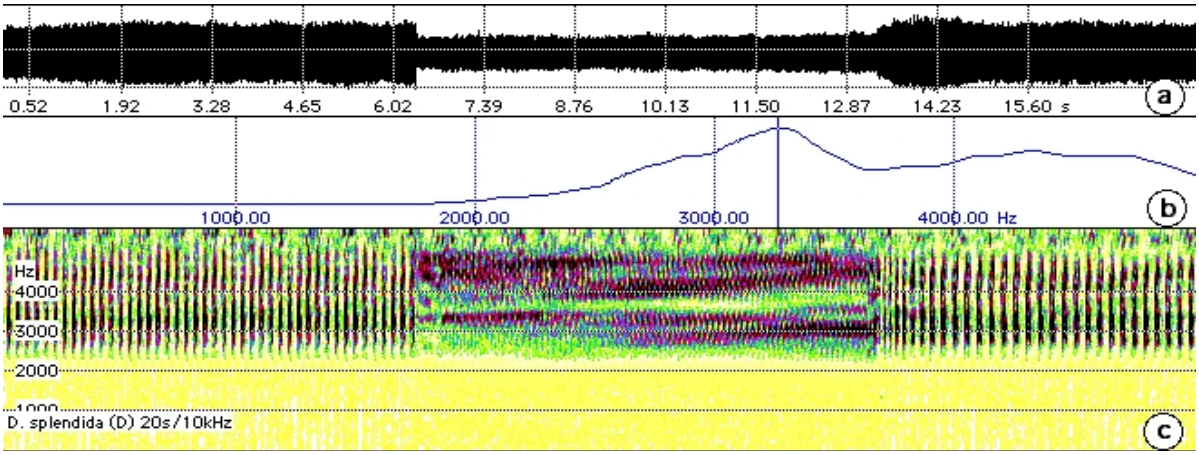
did not let istself be taken in by it. This male, there as elsewhere, seemed to be motivated only by the "cicada image" (*cf.* p. 36) sent back by the *T. albata* (!?)....

> The genus ***Distantalna*** Boulard, 2009, monospecific with ***splendida*** Distant, 1878, which differs in many ways from the ***Tosena*** with which it remained catalogued since the original description. The imaginary habitus and the male genital block have nothing in common with those of the Tosenines.

Distantalna splendida (Distant, 1878) is a remarkable species, one of the largest and most richly coloured, and deserves its nominal epithet: the blue-black, yellow and blood-red colours make it one of the most beautiful liveries in the Cicadidae family. The body is massive, black, with large yellow spots on the thorax, while the abdominal sternites are entirely red. Rare specific coquetry, a turquoise blue extends over the proximal half of the second pair of spread wings. Unlike again the *Tosena*, the *Distantalna* live in a colony with large meshes and are oligophagous; a large Sapindacae with leaves made feathery by long leaflets, is their almost exclusive plant.

Distantalna splendida (Distant). Imagos (one in full micturition) on the Sapindacea host (**MKB video**)

The females are stronger, a little, than the males. Moreover, the males have only two specific registers in their call tymbalization, this one focused on long sizzling segments interspersed with very short intensely vibrated sequences, the whole confined to relatively low frequencies. Gregarious, they do not emit a court tymbal and mate "without problems" for the observer:



Distantalna splendida (Distant,1878). Descriptive **AIC**, temporal transcription of a sizzling segment framing one of the short vibrating sequences (7 seconds) that characterize this species.
(a) Oscillogram **(b)** mean spectrum plot **(c)** spectrogram.
(***cf.*** **Boulard, 2013** ***on Signalyze***)

a **b**

Distantalna splendida (Distant 1878). The **mature V juveniles** emerge, the old tegument singularly clean and transparent, offering a palette of imaginary colours, extremely rare at this biological level, allowing the already vibrant colours of the nascent imago to be seen. An enigmatic peculiarity, their antennas display one or two items together curiously thick and black: **a) Mature juvenile** just out of the ground, perfectly clean and colourful climbing, the antennas armoured, in search of a support where to exuviate it, **b)** High magnification of the right antenna **(MB Phots)**.

Distantalna splendida, female pointing its auger for a ninth oviposition in the twig, from which its has hung on all six legs. Traces ovipositions, the small shavings remaining raised, after each laying and the removal of its instrument. **Doi Mon Kia forest chain, April 2003** (**MB Phots**).

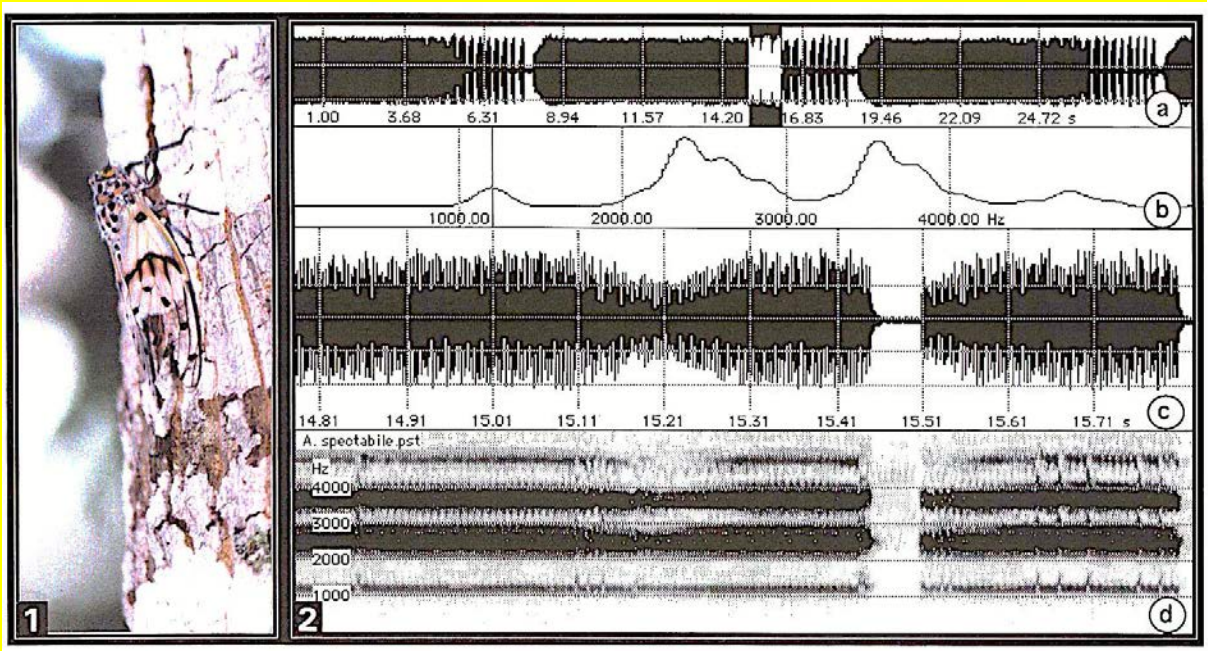
2) Two models for mimetology

>The genus ***Ayuthia***, created by Distant for the species ***A. spectabile*** described at the same time (1919) remains, like the previous taxon, monospecific. The species, spectacularly inscribed in the ethological and mimetological fields, has largely attracted my attention.

Ayuthia spectabile is this great cicada with lichenomorphic allures nicknamed *Spectral cicada* and *Ghost cicada* because of its astonishing white livery occupying only the proximal half of the homelytra, the rest being transparent:

Ayuthia spectabile is an excellent example of phloeolichenomorphic mimicry (**Boulard, 2007b**).

Present from the end of March to the end of June. Only dendrophilous, permanently observed in steep environments, ***Ayuthia spectabile*** is first of all a nonchalant species, not endowed with a vigorous flight and, moreover, does not fly away willingly. Most often, it is at dusk that the species makes itself heard. The tymbalization is emitted at relatively low frequencies and has a somewhat metallic tone... A peculiarity peculiar to ghosts, it would seem.



Ayuthia spectabile Distant, 1919. **1)** Male seen from the side. **2)** AIC (Sonotype in Boulard, 2002a, on S.3,5).

Initially launched individually, other males seem to be synchronous, in tymbal ensembles ("domino effect" according to Jérôme Sueur, a former student). A sort of extra-temporal treat for the ear, especially during the second half of twilight and until nightfall. The ***Ayuthia***, then, do not appear any more... Intimidating us to join the camp, without being able to see the slightest mating.

Curiously and unexpectedly, it is during fully sunny mornings that the males, wings very slightly raised, tymbalize with ardour and mate... If need be, not without having struggled:

Ayuthia spectabile. Sexual competition between two males. The first one, already mated (female on the right), shows wings to spread a second one, untimely!

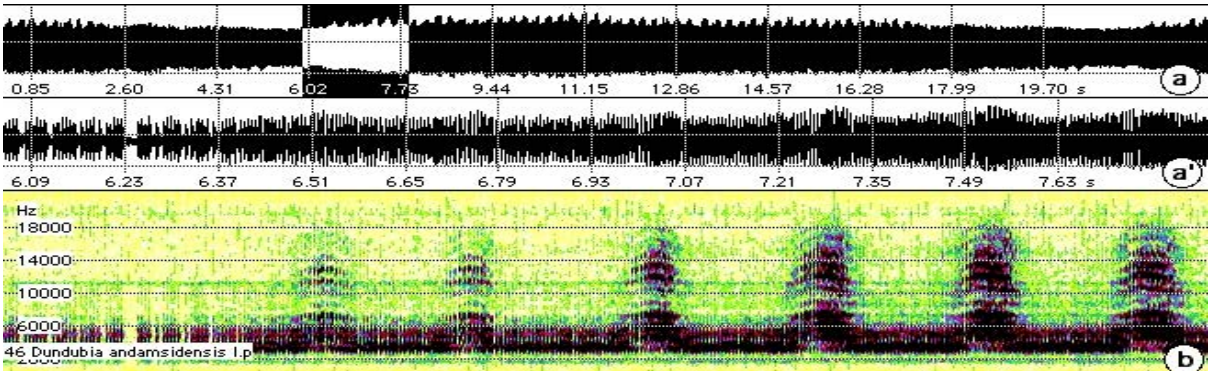
Chae Sorn N.P., May 2012 (MB phots).

> ***Dundubia andamansidensis*** (Boulard, 2001), PI (Photographic Identity) and **AIC**

Mimesian species of good size (L.= 53 & E.= 93 mm) inferred, corticultural living on the trunks and branches of the large ***Casuerina***, these famous "Ironwoods" which border, on a slice of land, the

Andaman Sea in south-western Thailand (*cf.* p. 309). Cryptically, the entire dorsal part of his body merges marvelously with the bark of the giants of the coast.

Of twilight and somewhat auroral ethology, ***Dundubia andamansidensis*** tymbalizes a nuptial call distinct from that of its more continental sister species ***D. nagarasinga*** (**Blrd 2005c**):



(a) Time waveform of an approximately 22-second recording of the call tymbalization, consisting of two different signal ranges. **(a')** Oscillogram provided by the inverted part a, then spread out in an arbitrary space-time of about 1.80 seconds, widening just one passage between the two sound ranges, the first one hardly exceeding 6000 Hz! **(b)** Spectrogram transcribing a' and revealing a quasi-continuous fundamental, surmounted by a narrow frequency ribbon, constant in both formations, but embellished, in the second, by equidistant, multi-arched columns rising high in frequency, until reaching 18000 Hz.

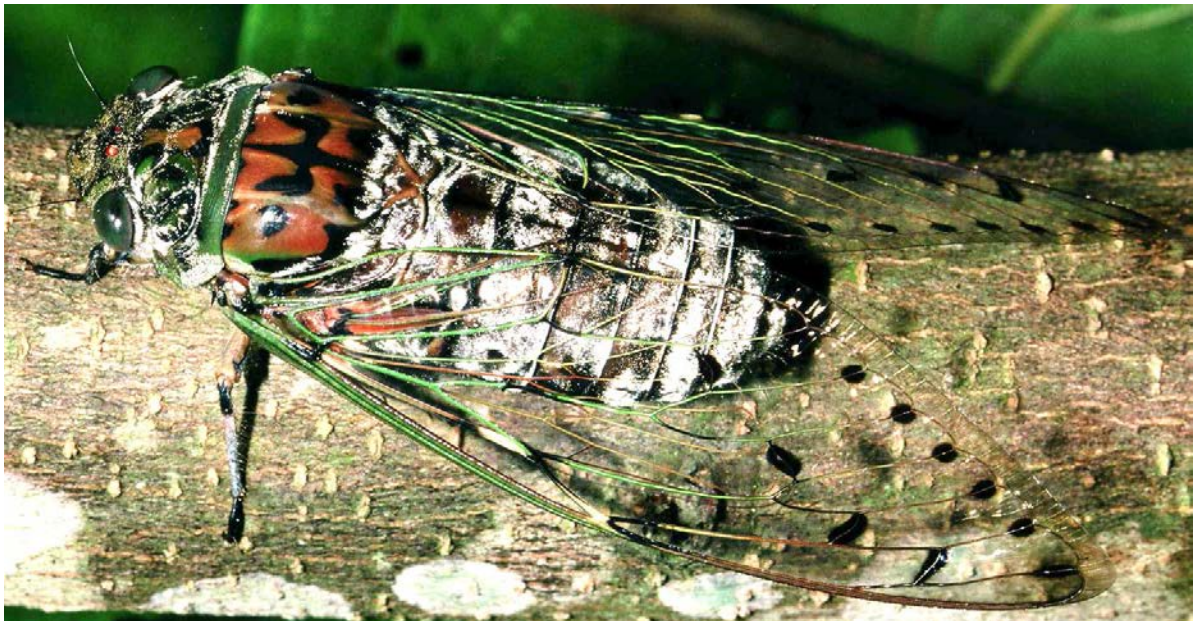
Southern Thailand, Ranong Province, in February (MB phot & Signalyze 3.12).

3) Trumpet and Tuba cicadas

The genus ***Megapomponia*** includes enormous Forest Cicadas with strong diaphanous wings. Species of this genus make up a taxon of giant forms that are similar in size, exceeding 10 cm in length, 20/23 cm in wingspan and similar genotypic characters (Boulard, 2005e). Four species were encountered in Thailand, and I was able to approach three of them sufficiently to elucidate some parts of their ethologies and to draw up their respective CIAs, namely: ***Megapomponia intermedia*** (Distant, 1905), ***M. pendleburyi*** (Boulard, 2001) and ***Megapomponia clamorigravis*** Boulard, 2005. All three, **alive**, can be recognized immediately by the colour of their **eyes**.

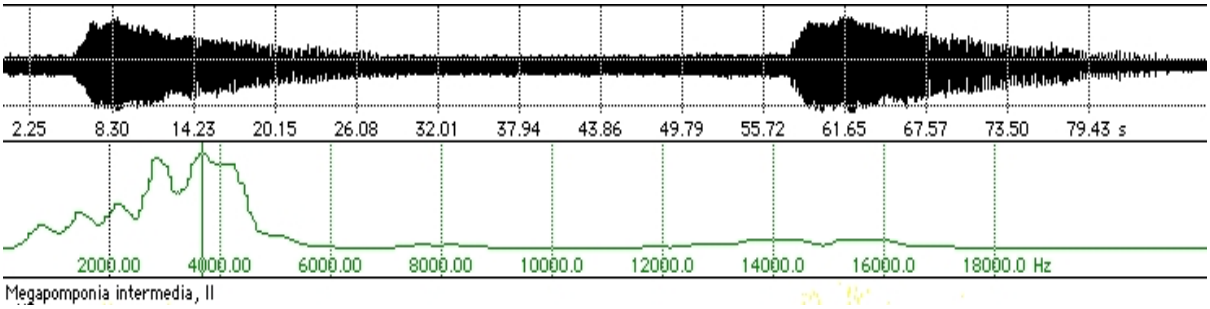
All three are twilight-night musicians, working in the same safeguarding strategy based on the vesperal penumbra. The first two, ecologically separated, are "Trumpet Cicadas",

reaching or barely exceeding 4200 Hz. The first, ***Megapomponia intermedia*** (Distant, 1905), was detected in the north, and is the loudest of the three. Alive, it displays bistre eyes:

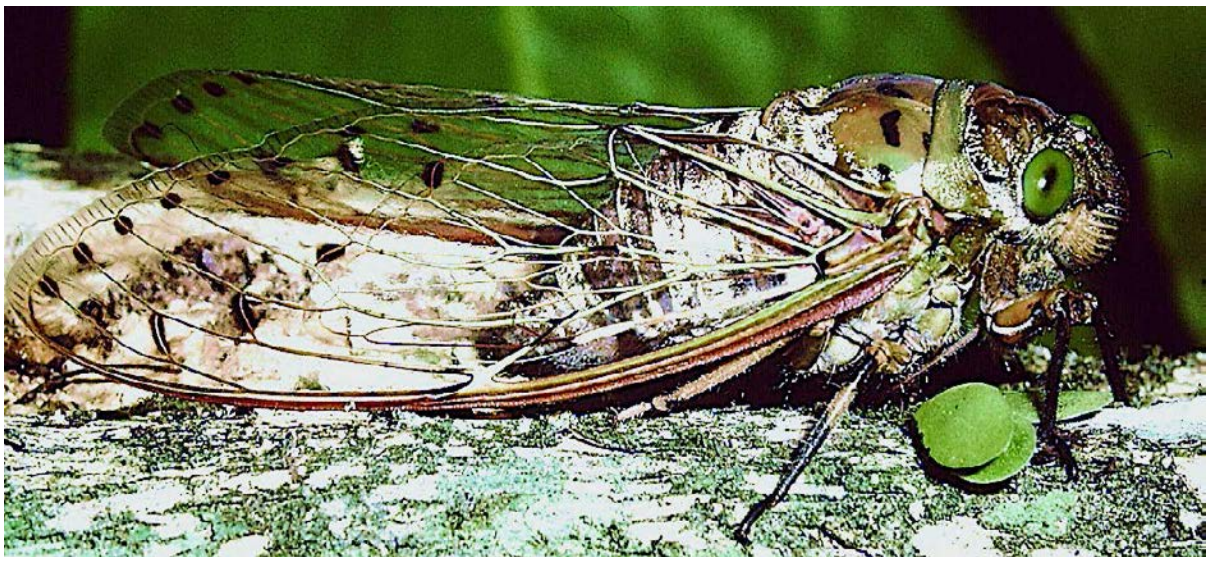


Alive, *Megapomponia intermedia* with its bistre eyes (**MB phot**).

It manifests itself at the end of dusk and even at night under lunar clarity, by strong trumpet blows followed by a decrescendo that goes on for a long time towards fainting, before resuming, trumpeting in the same way. Here is the AIC Indicator, Time Graph and Average Spectrum:



The second, ***Megapomponia pendleburyi*** (Boulard, 2001), is a southern species slightly smaller, with light green eyes centered in black (appreciable in living organisms):

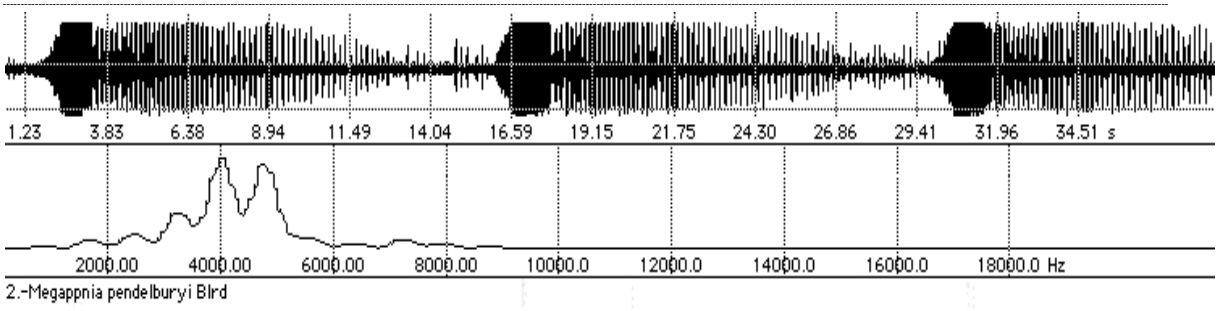


Megapomponia pendleburyi (Boulard, 2001), **Cicada trumpet with emerald green eyes** (**MB phot**)

In January-February, in the sub-mountain forests of the Southern Ranong Province bordering the Andaman Sea, the ***Megapomponia pendleburyi*** are, as dusk sets in, thriving, dominating the environment.

Around 6.30 pm, the males first emit a kind of deaf crackling, called "warm-up tymbalization", very low in decibels, as in frequencies, and this for 2 to 2.5 minutes. This is followed by a sudden and very powerful continuous "trumpet blast" which, gradually, passes into short "trumpet" phrases alternating with sizzling phrases two to three times longer, the whole going decrescendo, until almost total extinction ... To gush out with force, following the same structural scheme, with a sound that justifies the nickname of "*Trumpeters*" given to these big Cicadas by the *'Captain Pendlebury'*, discoverer of the species, as reported by Moulton in 1923.

Here are the first elements of the AIC, Time Oscillogram and Average Spectrum of this second musician, who emits deceived verses that are very much shorter than those of the previous chorus and reach nearly 5000 Hz :



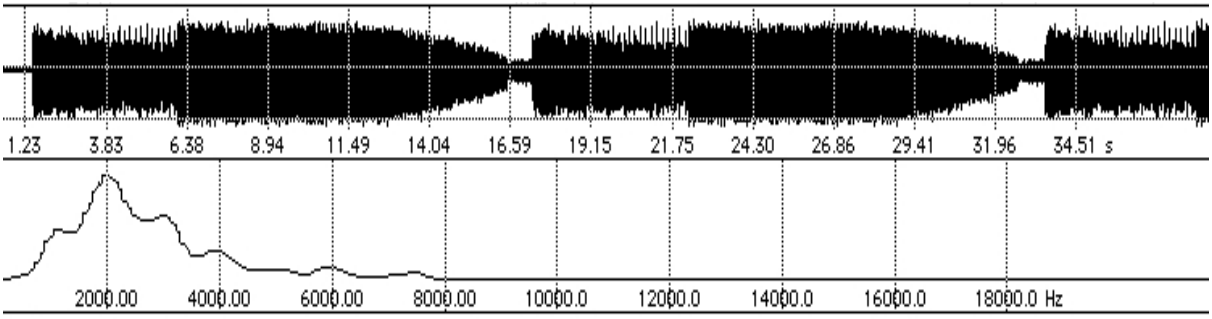
At the same time, the "great megapomponian din", trumpeting without a conductor, takes place under the forest. Each male manifesting for himself, resulting in multiple cacophonic overlaps of the individual tymbalizations.

The third, ***Megapomponia clamorigravis*** Boulard, 2005, a twin species of the previous one, a little more massive and brownish, with dark green eyes only appreciable in living organisms. It's an amazing Cicada that tymbalizes in the very low frequencies...

Megapomponia clamorigravis Boulard, 2005, Cicada-tuba with **dark green eyes** (**MB phot**)

At the beginning of its emergence phase, ***Megapomponia clamorigravis*** mingles with the cacophony of *pendleburyi* at the end of the cycle. Impromptu overlaps or even replacements then occur. To the ear, however, they cannot be confused, ***clamorigravis*** is a **tuba-Cicada**! low-

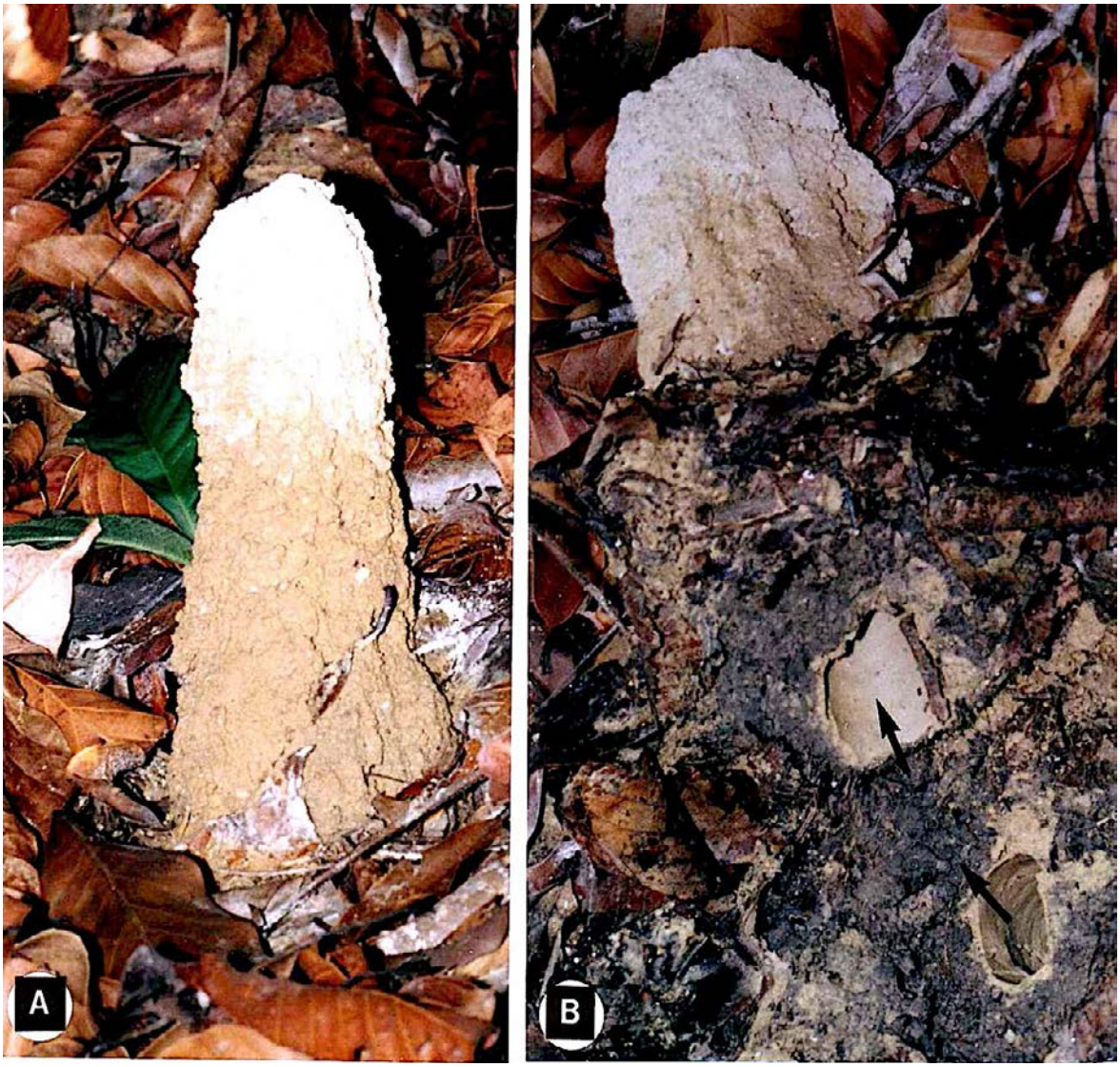
frequency emitting (1000-3500 Hz), hence the nominative epithet given to it. It is the "**Tuba-performer**" of the megapomponian concerts (Boulard 2005). Here is the AIC Indicator, Time Graph and Average Spectrum:



13.-Megappnia. clamorigravis B

4) Pre-imaginal constructions

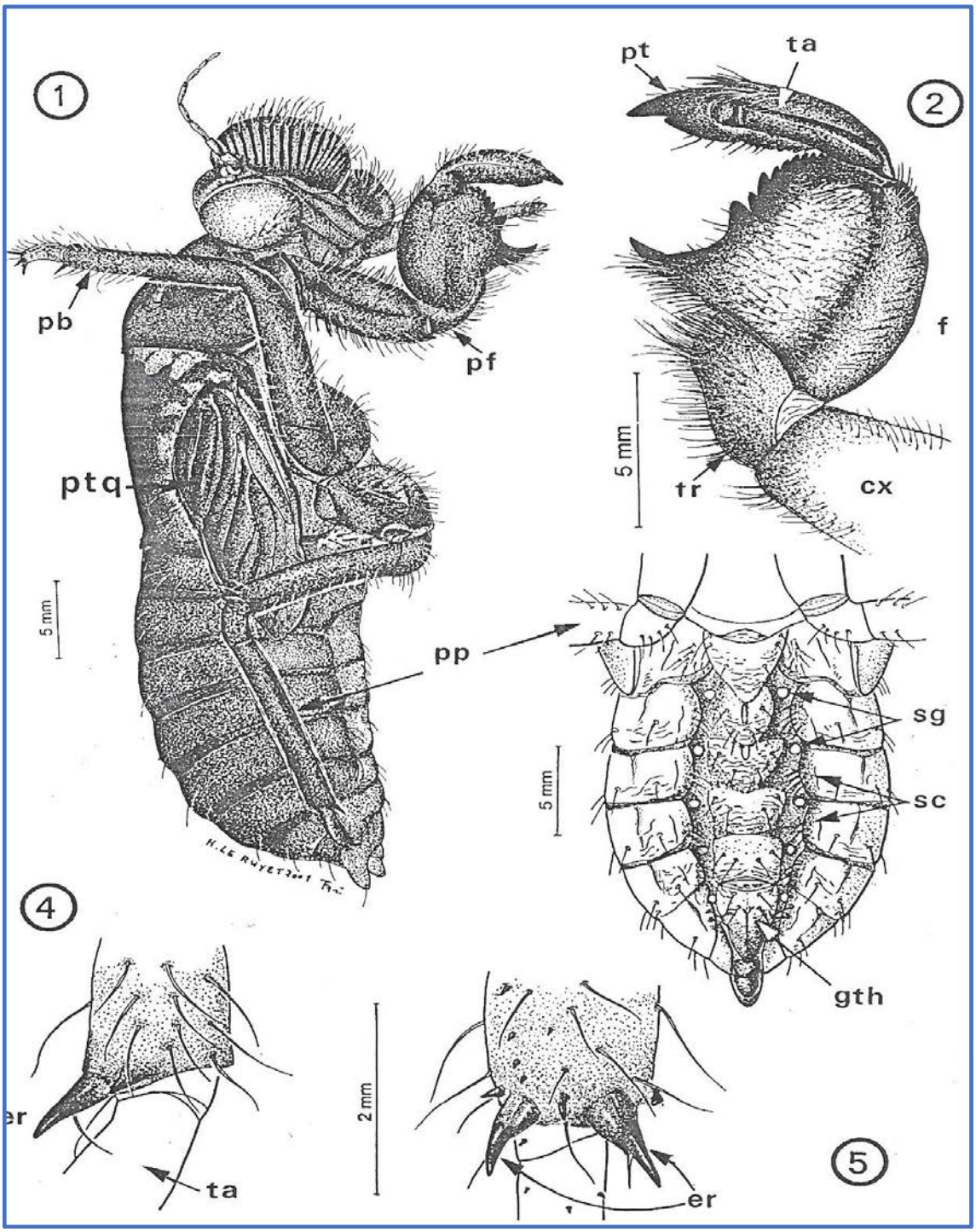
At the end of the soil phase, the ***Megapomponia*** – certainly ***pendleburyi*** and ***clamorigravis*** – build strong towers of about fifteen centimetres above the silvicultural litter. Axially hollow, high muddy load after muddy load brought back from the bottom soiled with mucinous urine by the **Juvenile cicada IV & V**. Successively, the inhabitant smoothes the inner tubular wall of its structure.



Megapomponia pendleburyi (Boulard, 2001) and its "**Grands Travaux terricoles**":
(a) Pre-imaginal tower, the greyish top colour attests to recent work; **(b)** Broken tower to show its hollow structure with the inner wall perfectly smoothed; **(c) Juvenile IV**, working to seal the open tower, judiciously applying pellet after pellet... until closing the opening.
Ranong province, Tungka forest, February 2001 (MB phots)

Another amazing aspect of these constructions is the interior space. It appears "designed" sufficiently spacious from the third juvenile stage, and with an exemplary finish. Below a second tower ***of M. pendleburyi*** broken at the base and its occupant, **a juvenile IV** (still small head and long antennae; strong forelegs), extirpated thanks to the use of a precisely thorny stem, a young rachis of the "Tunanham" palm. From this stage, the internal diameter of the tower, with a smooth wall, will be the same in the following stages, **V** and **mature**, evoking the "*nymphoïd"* status without being one!

Megapomponia pendleburyi (Blrd 2001). Stages **III** to **V** have long antennae and long legs (**MB phot**)



Megapomponia pendleburyi (Boulard, 2001): **Habitus juvenile, stage V, near mature female**.

(1) Viewed from the side, usual attitude of the insect in its tubular burrow, crutct-legs inverted.
(2) Straight shoveling-leg seen from the inside and opposite fold of the tarsus unnecessary underground.
(3) Abdomen in ventral view showing: > the poor development of paratergites, which do not mask the stigmata; > the **total absence of tomentum**, as produced by juveniles of the Central African *Muansa* and *Ugada* (see pp. 76/79).
(4) Apex of a crutch-leg, external side and its dewclaw.
(5) Apex of a push-leg, ventro-external edge and its spikes.

Letters: **cx**, coxa; **er**, dewclaws or tibial spikes; **f**, femur; **gth**, gonotheca; **pb**, crutch-legs; pf, digging and shoveling legs; **pp**, pushing hind legs; pt, tibial spike; sc, paratergites; sg, stigmata; ta, tarsus 1 (inverted); **tr**, trochanter. (in **Boulard, 2001f;** drawings **Hélène LeRuyet-Tan**).

Megapomponia clamorigravis Boulard, 2008. Three large pre-imaginal towers emerging from kaolinite-rich soil. **Muang Tuad P.N., Surat Thani Province, 2007 (MB phot)**

Juvenile towers. On the left, fifth stage of ***Megapomponia clamorigravis*** clogging the broken top of its tower. On the right, two mini-towers, open tops, built by a small, as yet unknown species, whose imagos have "gone, without leaving any addresses". *(A nice gift will be offered to whoever brings me a copy of the responsible cicada, with proof).* **Muang Tuad P.N., 2007 (MB phots).**

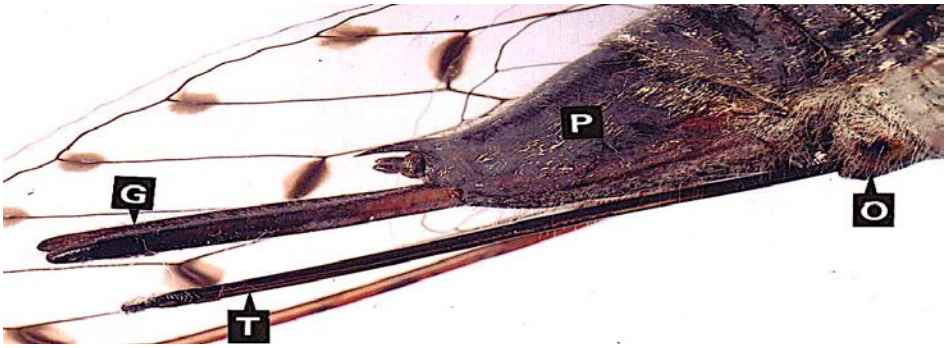
c) Synonymous status of a Stars of the genus *Macrosemia*

In 2001, I described the male of a great "star", ***Macrosemia khuanae***, trapped in Northern Thailand and remarkable for its long, wide lids totally framing the abdomen (Blrd 2001a). In 2004, large females were named ***Macrosemia longiterebra***, because of the exceptional length of their laying apparatus (Blrd 2004a), worthy of being placed in the cicadological record books. However, a few weeks later, it appeared to me that each of the nominative epithets corresponded to each of the sexes of the species described in 2001, *longiterebrata* becoming synonymous, the law of priority prevailing.

Macrosemia khuanae Boulard, 2001 (**MB phot).**

Above, a pair, prepared with wings spread out and showing the great difference in the shape of the abdomen between the sexes, then a male seen enlarged and in profile left, displaying one of its vast opercula.

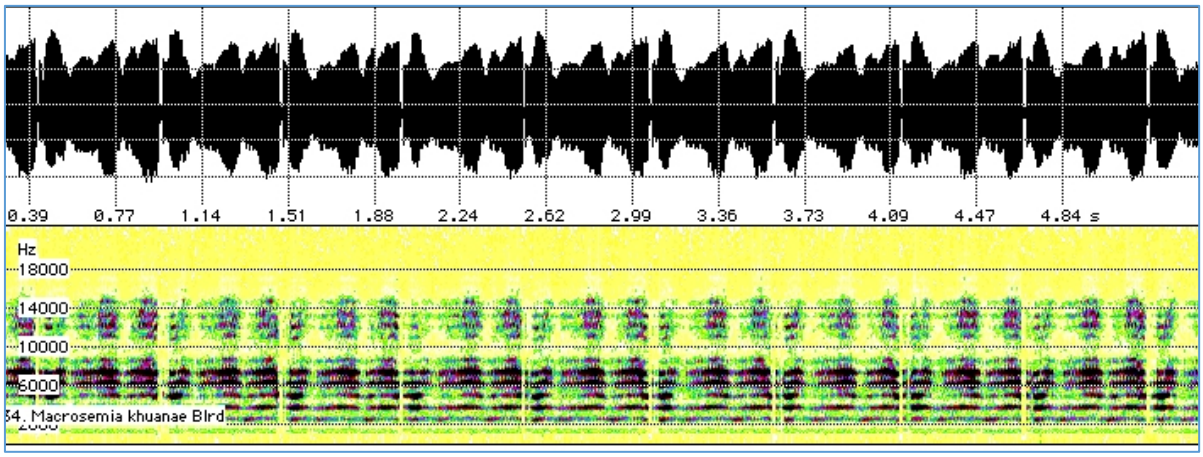
Below, macro picture of a female at rest or feeding; the arrow pointing towards the ovipositor and its record length, even more appreciable on the next view:



Macrosemia khuanae B., macrophoto of the abdominal apex of a female and its extremely elongated ovipositor. **G**., sheath of the auger and the two leaves protecting it at rest; **T**., the long, artificially "unsheathed" auger. **O**, ovivalvula, the seventh sternite protecting the base of this amazing organ. P, pygophore, first genital urite (**MB phots. Boulard 2005j**).

In fact, things were put back in place during the expedition carried out in October 2004 on the **Khun Lao**, one of those mountain peaks culminating between 1300 and 1500 meters in the Province of Chang Rai and which was approached by the southern slope. Approaching the summit, scattered small trees dominate magnificent clumps of a fuchsia Rhododendron, about 60-80 centimetres high on a rocky meadow **(MB phot).** From September to November, the rainy season is at its peak, so that in the morning the mountain is often covered with thick cloud fog, the density of which varies according to the movement of the air masses.

With the sun well established, we were greeted by the untimely cymbalizations of many ***khuanae*** males, which were accompanied by *longiterebra* females! There, my mistake was rectified and the sound ethology of the species was re-established thanks to better recordings **(MB phot)**. The tymbalization consists of a long chain of modules tirelessly repeated in the same succession and on the same "wild" rhythm:



Macrosemia khuanae Boulard, 2001. **Indicative CIA**: Dense oscillogram and spectrogram, transcribing, in real time, 5 seconds of a very vigorously emitted cymbalization. The fundamental, which is close to 1000Hz, is reinforced by about ten harmonics divided into two effective sets: one set between 2000 and 8000 Hz, then the second set between 10000 and 15000 Hz. (**MB Phot & Sonotype in Boulard 2013**).

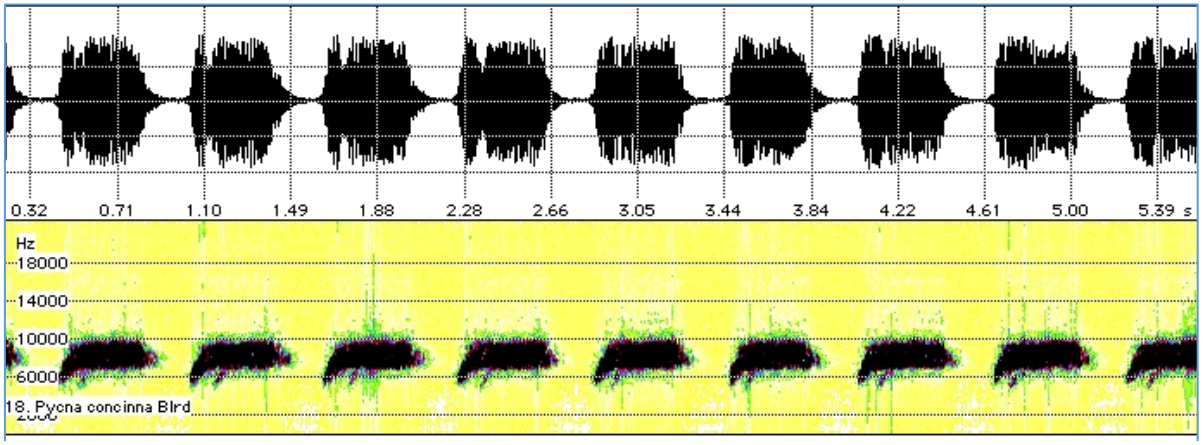
d) Ecological preference of a species now of the new *Eopycna* genus*

Then the mountain warns of an ecological distinction, then another, taxonomic one. The large and noisy ***Macrosemia*** led us to detect a Platypeurin of an *ex-genus* ***Pycna*** then encountered on the other side of **Khun Lao**, in a less hot environment, devoid of Rhododendrons, with more numerous, stronger, lichenous and mossy trees, with very foggy mornings ... The two species do not coexist, the ***Eopycna*** occupies the slope abandoned ± by the sun (**MB phot**).

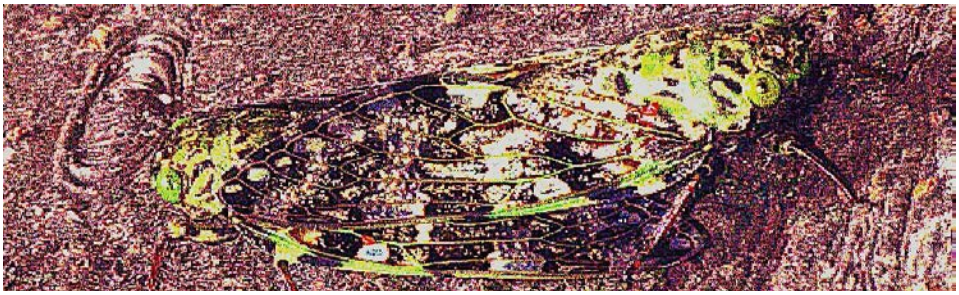
At first glance, I had assimilated the new recruit to *Eopycna repanda* (L.), a species native to sub-himalayan regions. The binoculars in the laboratory showed that it was a new species, smaller and with a somewhat different coat, which fits into the genus. Here are the portraits, male and female, double-sided, then the **AIC** of the species.

Eopycna conncina (Boulard, 2005). Habitus of both sexes (Boulard 2005j).
Males and females have identical dimensions, especially for the respective lengths of the abdomen. Total length: 38 mm; wingspan: 68 mm. Males emit a tymbalization that resembles a kind of short hissing interspersed with shorter silences, always repeated in the same way, at an almost perfect tempo:

*) Reminder. The genus *Pycna*, Amyot & Serville, 1843, fundamentally polyphyletic, represented in tropical Africa and Asia, has just been redistributed into 2 new geographical taxa: *Dyticopycna*, African and *Eopycna*, Asian (Sanborn, 2020).



Eopycna conncina (Boulard 200). **Indicative AIC,** Oscillogram and spectrogram transcribing, in real time, 6 seconds of the tymbalization: sequence carrying monotonous repetition of modules very similar between them and separated by silences of equivalent time. On the Spectrogram, each of the modules starts the attack slightly below 6000 Hz, then, at the same level, a weak frequency movement, barely noticeable on the oscillogram. **(Sonotype in Boulard 2005j,** *on Signalyze 3.5*).



Eopycna conncina, mated. **Khun Lao rainforest, November (MB phot).**

e) Glances at neighbouring species and genera

> Two ***Ambragaeana ambra*** Chou & Yao, 1985, completing their imagination, then a Male at rest.

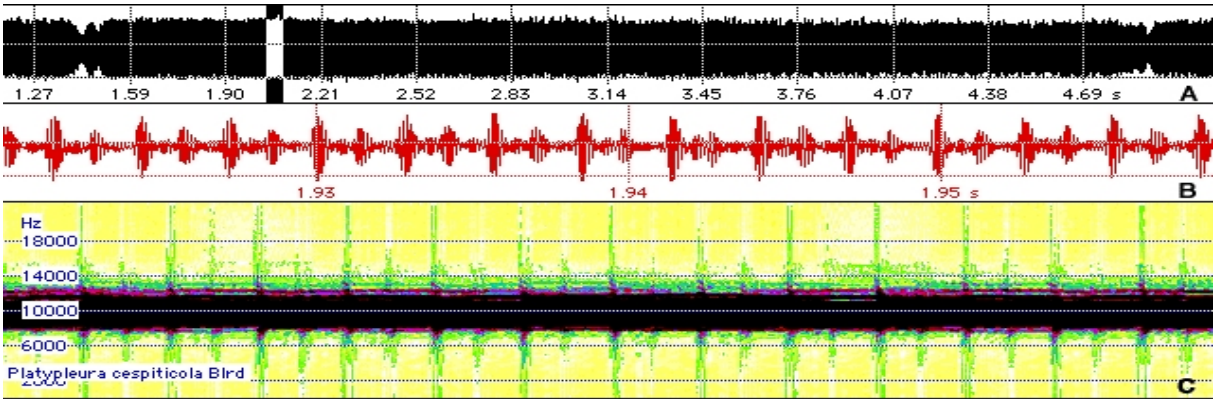
>On the same trunk, ***Platypleura mira*** Distant, 1904 and a female ***Pomponia quadrispinae*** Boulard, 2002, feeding. While another female ***4-spinae*** receives the care of a very enterprising male.
Northern Thailand, Houaï Nam Gun (MB phots).

f) Little Star of Residual Grasslands

The overwhelming majority of the species treated so far in this book are dendrophils, i.e. those living in woods and forests, and, among them, those of the genus ***Platypleura***. The discovery of a first exception occurred to me in May 2005, in some residues of Thai tall grass prairie, between two devastating oil palm plantations. There, in this vast natural fragment, was, quite at ease, a charming little ***Platypleura*** of surprising ecology, because it is a **cespiticole**!

Platypleura cespiticola Boulard, 2006. Male feeding; female, likewise, while laying eggs. Male is 47 mm long, female 51 mm. **(MB phots).**

Its tymbalization is a kind of crackling whistle produced by tymbals on an extremely fast rhythm:

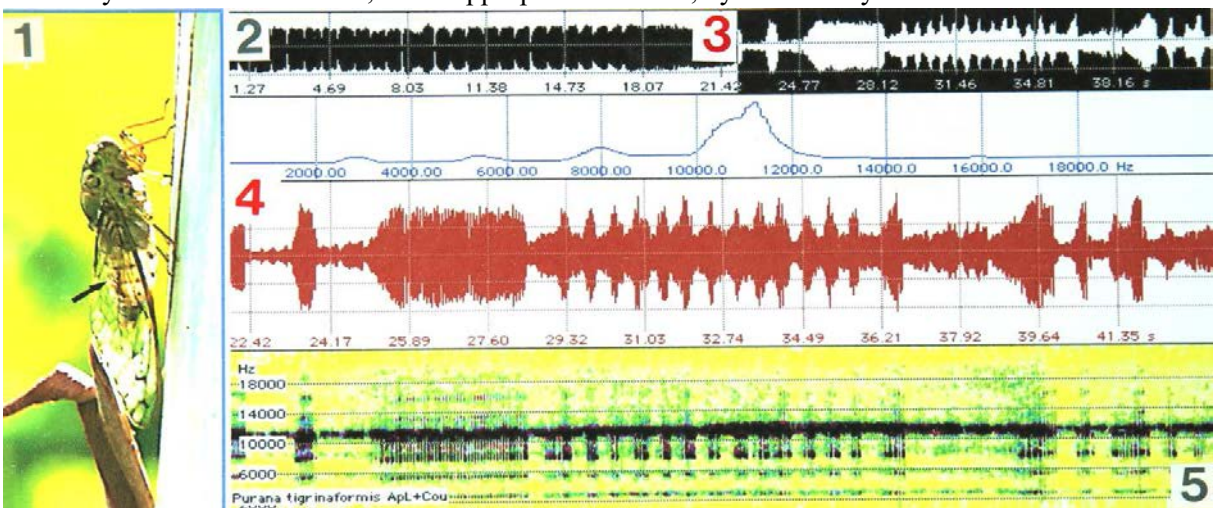


Platypleura cespiticola Boulard. **AIC** established on 20 seconds of the time signal, of which 5, then 2 seconds were taken at the end of the analysis. **A)** Waveform prefiguring the system of short fractional silences regularly emitting sound. **B)** Waveform stretching the inverted range in the previous graph and revealing the liveliness and double quality of the emitted signals. **C)** Spectrogram reflecting the high frequency occupancy centered on 10000Hz with, on both sides, astonishing linear formants (**MB phots & sonotype *on Signalyze***).

Province of Pratchuab Kirikan, at the very South of the Kra Isthmus, May 2005.

g) Nominal vicissitudes of an encrypted species

The identification of species is sometimes a delicate matter, especially when they are morphologically very similar entities, but geographically more or less separated and individually cited by different authors at different times. This was the case ***of Purana tigrinaformis***, which was only correctly identified in connection with my colleagues **J.-P. Duffels** and **M. Gogala**. The status of this 'epistolarily' cryptic species was definitively assured by acoustics (Blrd, 2007f). This reminder gives the opportunity to complete the bio-ethological knowledge of this *Purana* by providing the sound differential between the call tymbalization followed, at the appropriate moment, by the court tymbalization:



Purana tigrinaformris Boulard, 2007. **1) Male** in contre-jour demonstrating the magnitude of the sound box of the acoustic system, occupying the abdominal cavity. **2)** Graph of sound ethology, part **AIC** (*in black*) followed immediately. **3)** in inverted, then **4)** enlarged in red, the **AEC** as soon as the male had perceived the approach of a female.

Northern Thailand, forest surroundings of Pang Daeng, in September (MB phot, *on Signalyze*).

B) Frequency specificities of Thai tymbalizations

The great Asian Cicadas, the "heavyweights" of Cicadology, tymbalize at low or relatively low frequencies. Depending on the other genus and species quotas and often in relation to a smaller size, the frequencies used are often higher and higher, apparently in relation to the relative smallness of the tymbalizer's "sound box". The range is, as far as one can grasp,

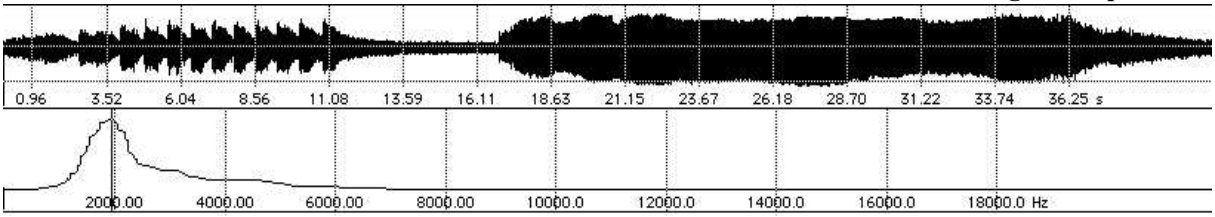
from 1000 to some more than 20000 Hz, allowed by my recorders. In the low frequencies, the two *Megapomponia* selected gave "speaking" graphs, albeit elementary (*cf.* p. 247 / 249). The *Tosena albata* and *T. melanoptera* will confirm. Then will follow some additional examples relating to the size of the subjects and expressed on the Time Waveform model underlined by the plot of the Mean Spectrum, which makes it possible to appreciate if, over the range, it is unitary, multistage or (and) modulated and at what height(s). If this is the case, all the parameters useful and/or spectacular for the making of the elementary AICs will be noted.

a) Time graphs, immediate reflection of specific tymbalizations

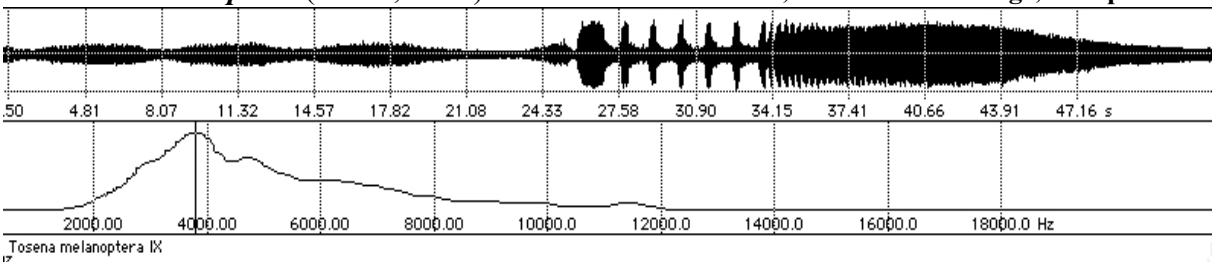
(MB, *Signalyze* 3.12)

> Tymbalizations without formants, or almost

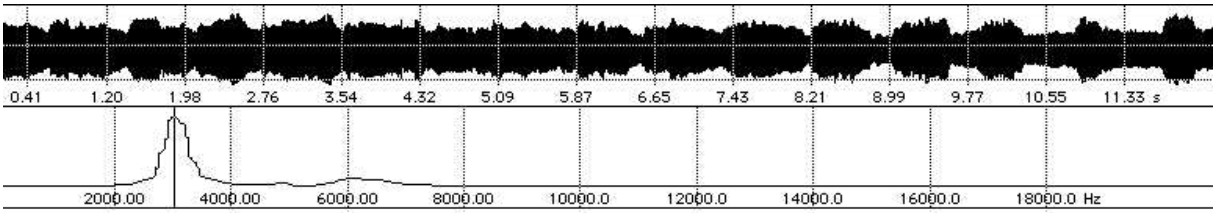
>***Tosena albata*** Distant, 1778. **Northern Thailand, Doi Mon Kia Range, in September**



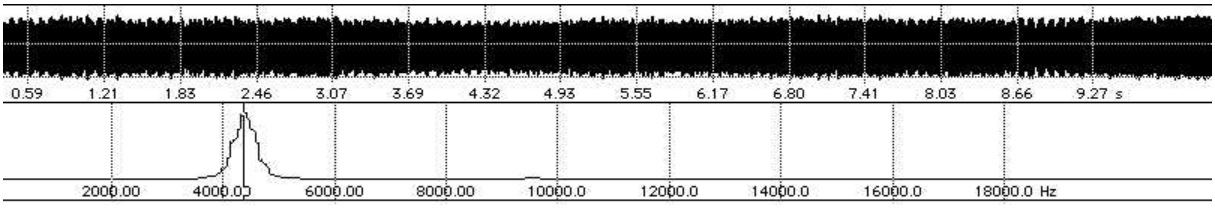
> ***Tosena melanoptera*** (White, 1846). **Thaïlande nord, Doi Mon Kia Range, in September**



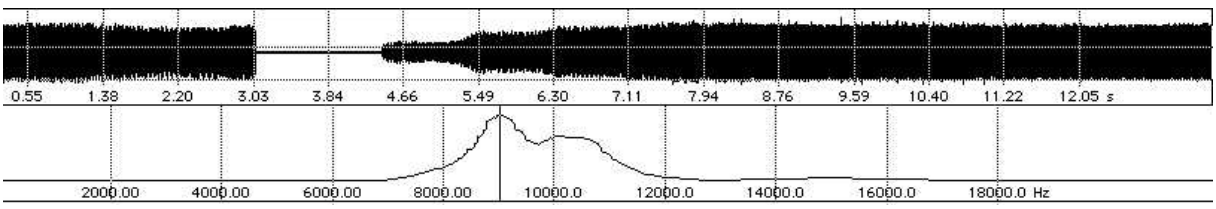
>***Salvazana mirabilis*** (Distant, 1913). **Thaïlande nord, Doi Mon Kia Range, In April**



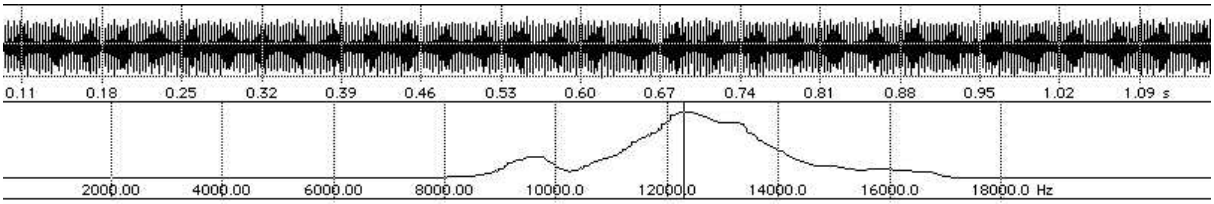
>***Chremistica numida*** (Distant, 1911). **Lampang Province, Wang Nua, in May**



>***Cicadalna takensis*** Boulard, 2006. **Tak Province, Samnago district, in November**

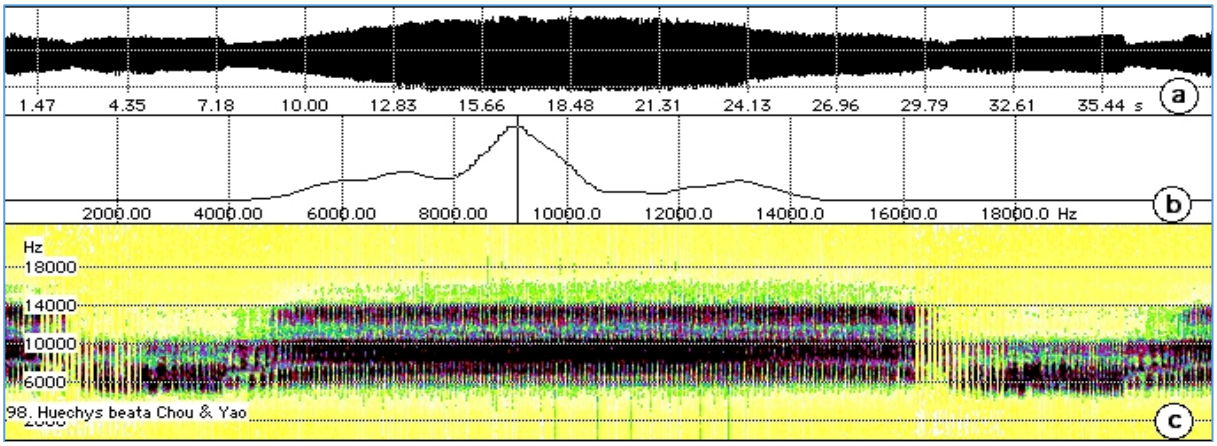


>***Abroma cincturae*** Boulard, 2009 (mini-cigale). **Petchabun Province, Nam Nao, in May**



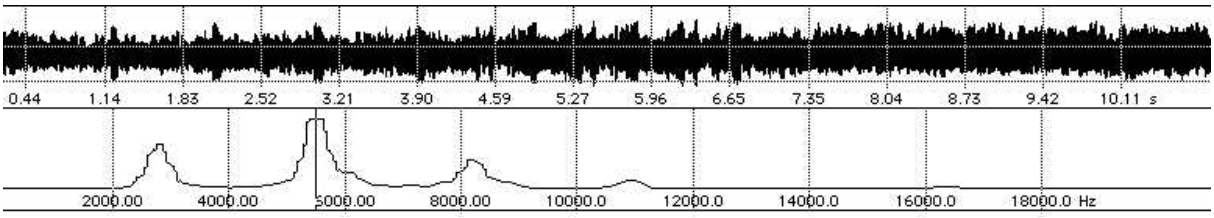
> Complicated tymbalizations of Individual Acoustic Formants

>***Huechys beata*** Chou et Yaho, 1997. Complexe CIA. **Lampang Prov., Wang Nua, in April**

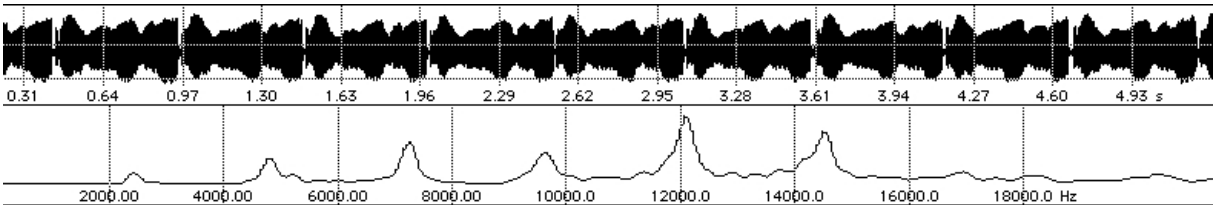


(a) Transcription of a complete identity sequence, (b) Medium spectrum with three unequal vertices, 7000, 9000 and 13000 Hz, **(c) Spectrogram imaging** the requested frequency bands.
(from Boulard, 2013, modified).

>***Dundubia spiculata*** Noualhier, 1896. **Chang Rai Province, Khun Lao, en octobre**

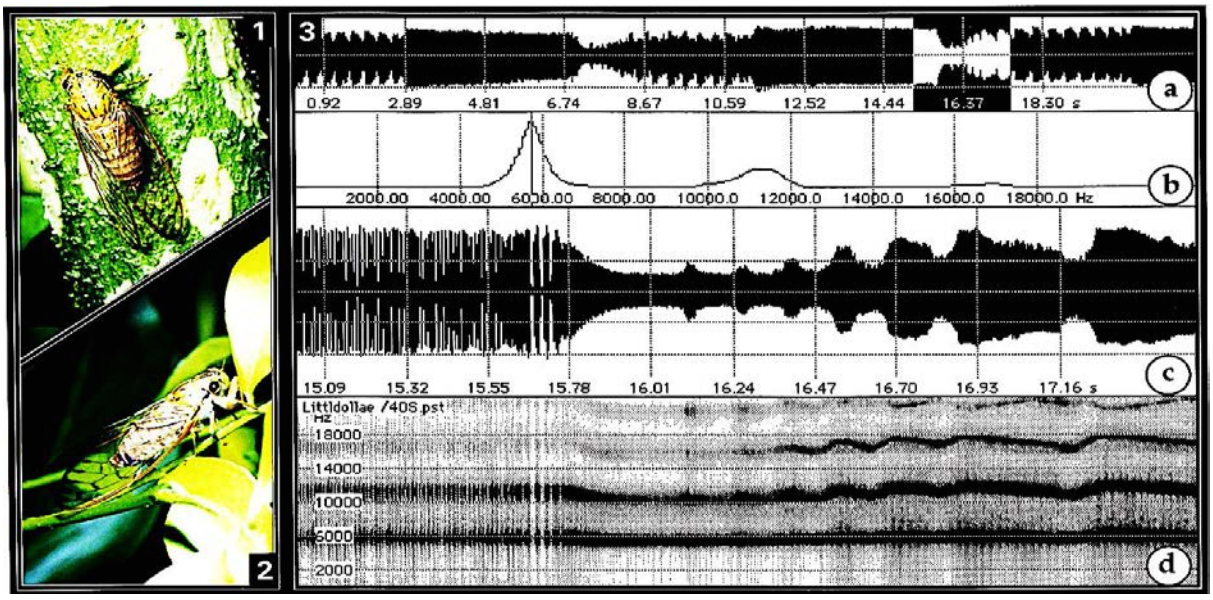


>***Macrosemia khuanae*** Boulard, 2001. **Chang Rai Province, Huai Nam Gun, en septembre**



>With examples of the high frequencies characterizing small species

> ***Minipomponia littldollae*** (Boulard, 2002), (28 mm long, 52 mm wingspan). Like it, many small species can tymbalize at or above the 18000 Hz accessible to portable recorders, at least those accessible in my time. On some sonograms with indicative CIA values, frequency formants exceed 18-20000 Hz:

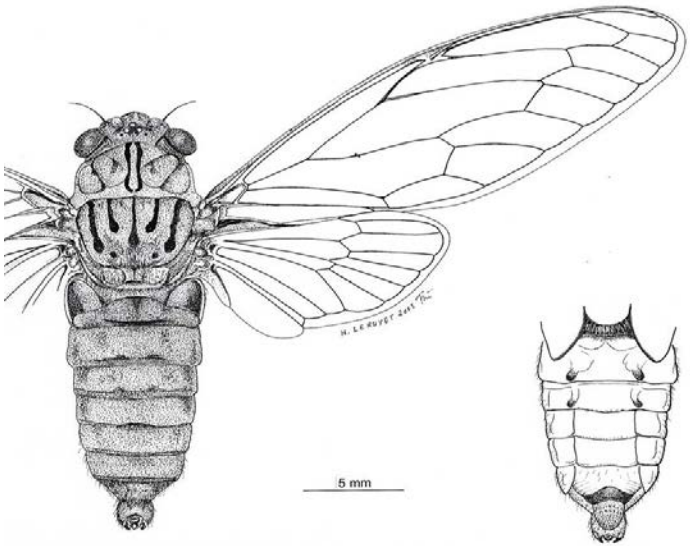


Minipomponia littldollae: (**1**) and (**2**) in natura: males dorsally, then in profile. (**3**) CIA whose spectrogram (**d**) seems to cross the upper limits of the recorder used.

Lampang Province, Ban Thuong Kouy, in June (MB Phot. *Sonotype* in Boulard 2002a).

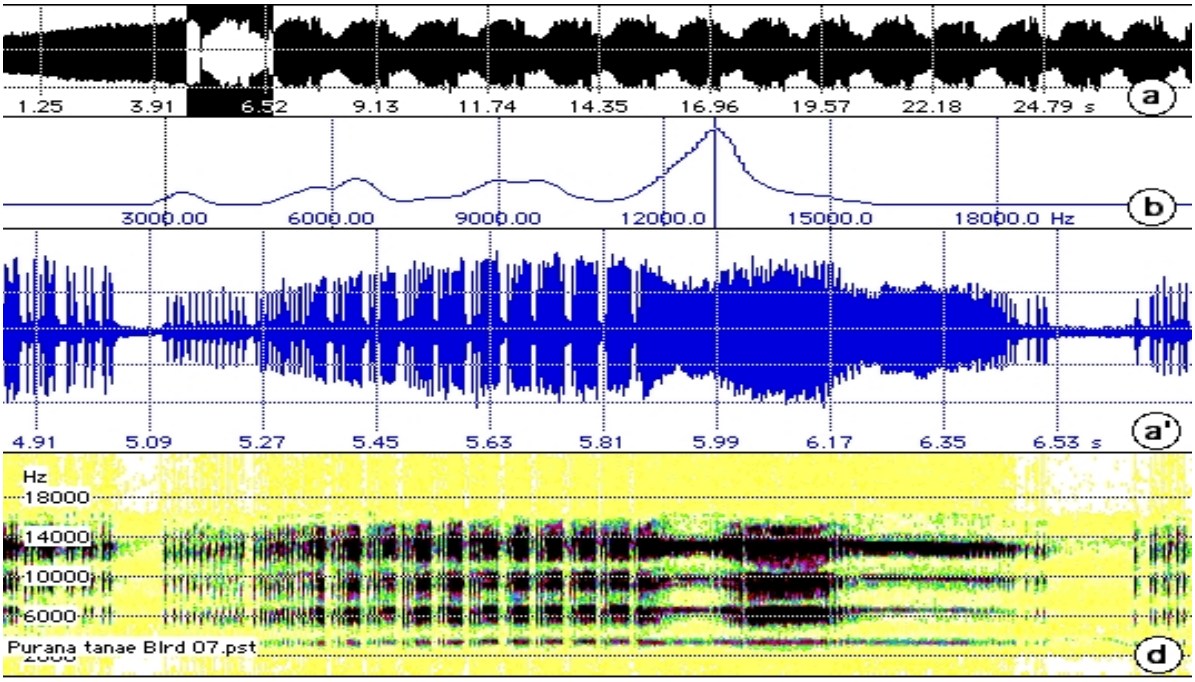
Placed in an outdoor mini-cage, just ***M. littldollae*** can tymbalize from dusk until very late on clear nights, in a soft and warm, windless atmosphere (see Boulard 2006f).

> **Other remarkable small species**, those gathered in the genus ***Purana*** Distant, 1905, a homogeneous genus, where twin species coexist which can only be distinguished by listening to and analysing their respective cymbalisations. They are dendrophils frequenting young trunks and the first branches of the canopy. Males tymbalize in broad daylight, on sunny or just cloudy days. Even when guided by their call, these species are difficult to locate because their liveries are so confused with the camaieu of bark often masked by the foliage.



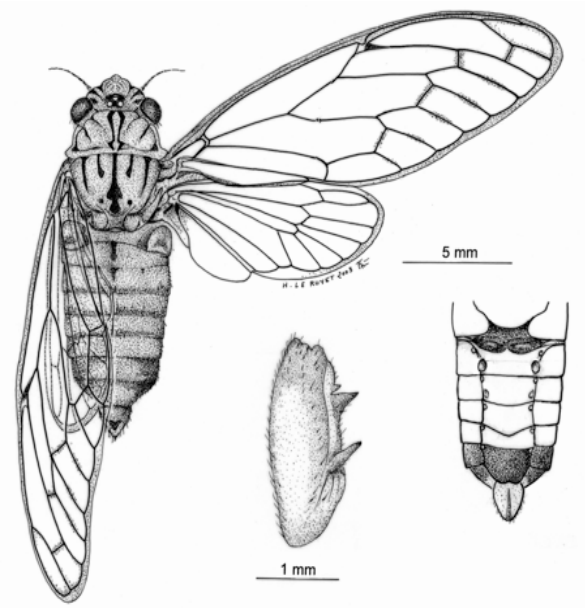
Purana tanae Boulard, 2007 (26.5 mm long, 56 mm wingspan).
Male holotype in dorsal view, abdomen in ventral view.
(Drawings Hélène LeRuyet-Tan to whom this beautiful and curious little species was friendly dedicated).

Species very close, by size and habitus, to *Purana khuanae* that I described in 2002 and of which it is twin, macroscopically. Interesting remark because the call tymbalization of *P. tanae* is much closer to that emitted by *P. atroclunes* Boulard, 2002, to which *P. tanae* hardly resembles (*cf.* Blrd 2002a and 2007d). Here is the AIC sonotype of *P. tanae*:



Purana tanae Boulard, 2007. **AIC, Surat Thani Province, Ban Muang Tuad in May**
(MB *Sonotype on* S.3,5).

This is followed by the smallest known ***Purana*** (23 and 41 mm), spotted heliophile and in broad daylight. This small species was first recorded in a young bamboo grove, thanks to its surprisingly high-pitched cymbal, cyclical but musical and well above 18500 Hz.

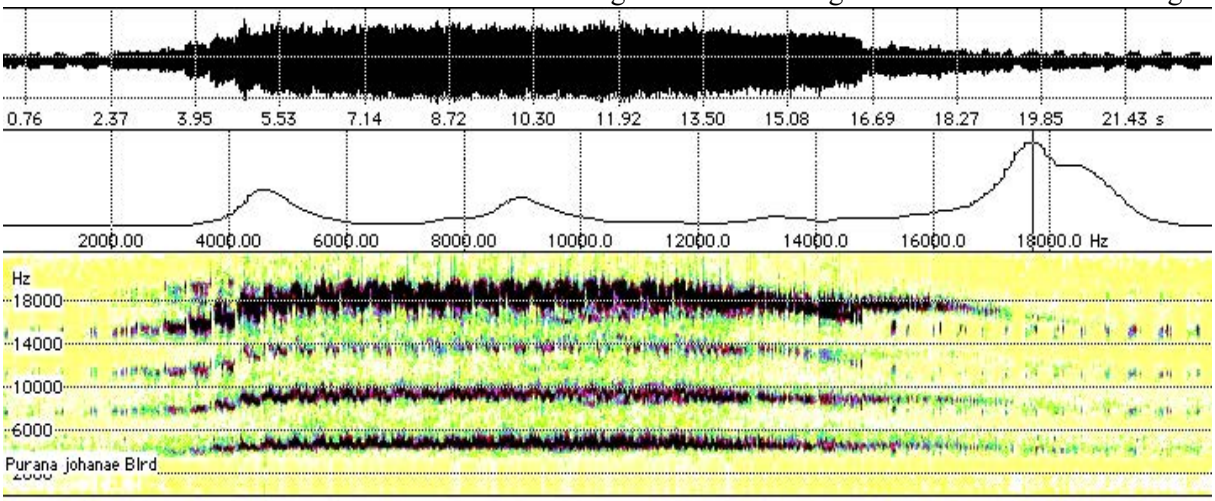


Purana johanae Boulard, 2005. Male holotype in dorsal view, right femur, abdomen in ventral view. (*Dessins Hélène LeRuyet-Tan*).

Hélène Le Ruyet-Tan and her 'Binocular' at his workstation at MNHN, Paris. (*Photo Philippe Blanchot**)

*) **Philippe Blanchot,** former student, graduated from EPHE (1991). Entomologist, macroportraitist of the Insect at the MNHN... He could not make a career there for lack and lack of jobs! in spite of the hopes of his mentors. As an entrepreneurial naturalist, **Philippe** became a freelance photojournalist, now renowned with a gable on the "web".

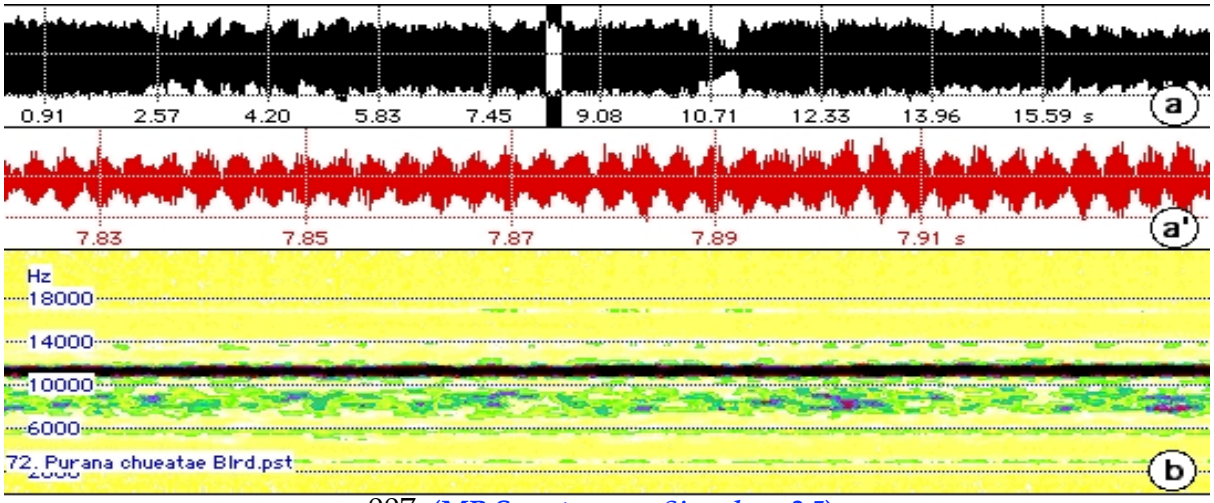
Moreover, in an external cage (as shown in 2006f), This small cicada was able to emit its tymbalization in the same very sustained rhythm and so beautifully perceptible almost non-stop during the first three or four hours of the warm and calm nights. Without being able to see a female arriving.



Purana johanae Boulard, 2005.
Lampang Province, Wang Nua N.P., in April (MB *Sonotype on Signalyze 3,5*).

> On the other hand, the extremely condensed whistling of a close consœur, ***Purana chueatae*** Boulard, 2007, does not exceed 11000 Hz:

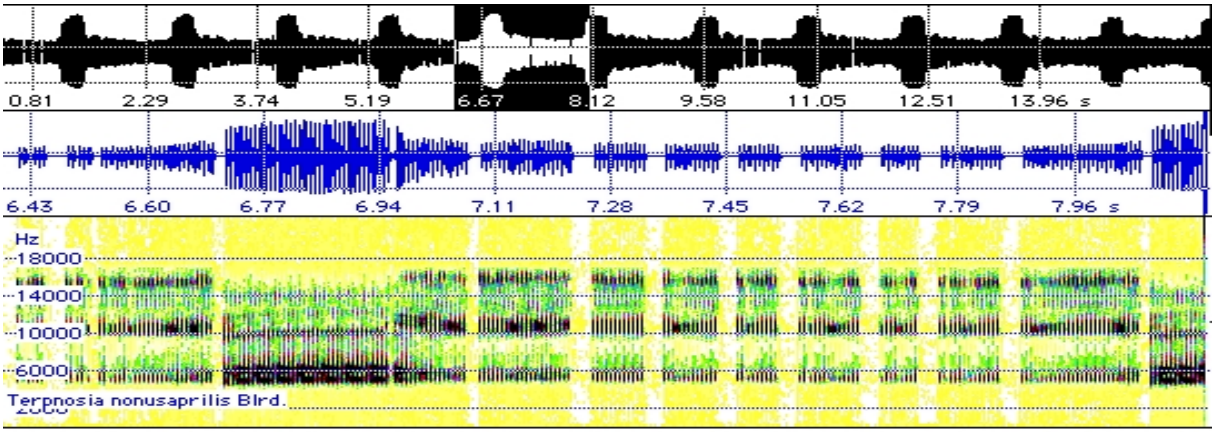
Purana chueatae Boulard, 2



007. **(MB Sonotype *on Signalyze 3.5*).**

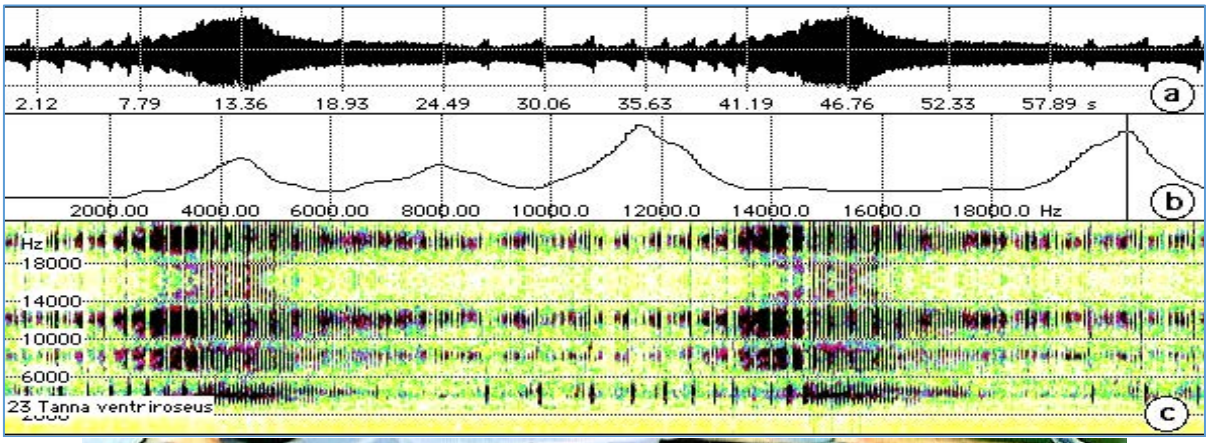
> ***Terpnosia nonusaprilis***, another amazing "performer", a small metronome style "alarm clock" that perseveres very regularly until reaching 16500 Hz:

Mounting in a cage, after in natura readings



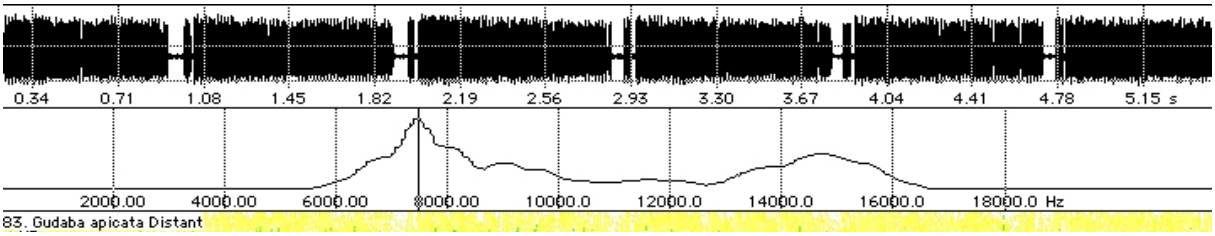
Terpnosia nonusaprilis Boulard, 2003, **AIC, sonotype**
Doi Mon Kia Range, in April (MB Phot & *Sonotype on Signalyze 3.5*).

This was demonstrated by ***Tanna ventriroseus***, also an astonishing small species. Its would use an **echo** sent back from its resonance box, which then allows its to emit signals well above 18500 Hz. Phenomenon sometimes perceived in other, more important species. **AIC:**



Tanna ventriroseus Boulard, 2003 and transcription of its echo above 18000 Hz!
Northern Thailand, Huay Nam Gun, in April (MB Phot. & *Sonotype on S. 3.5*).

On the other hand, one of the smallest Thai Cicadas, ***Gudaba apicata*** Distant, 1906, 16 mm long, 31 mm wingspan, it has little repercussion above 15,000 Hz:



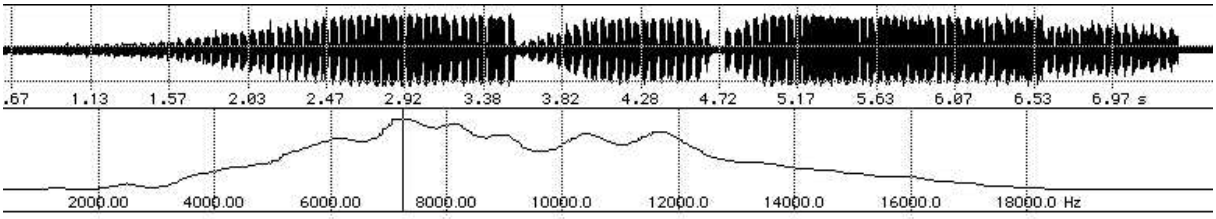
[*Cf.*, Blrd, 2006e, 2013c, under the determination "*G. maculata* Distant, 1912", error!].

Tak Province, Khun Pawor N.P., in May (MB Phots & *on S. 3,5*).

b) Morphology of the Middle Spectral Pattern

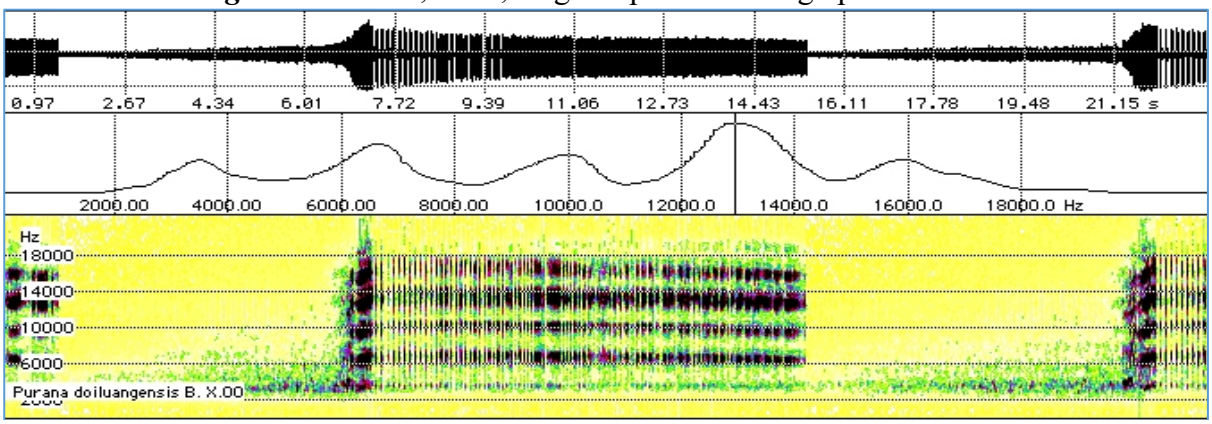
> In large irregular dome:

>***Cryptotympana gracilis*** Hayashi,1987. Chiang Rai Province, Wiang Papao, in May (MB *S.3,5*):



> At the progressive summits, in waves:

>***Purana doiluangensis*** Boulard, 2005; elegant spectral tracing up to 18000 Hz :

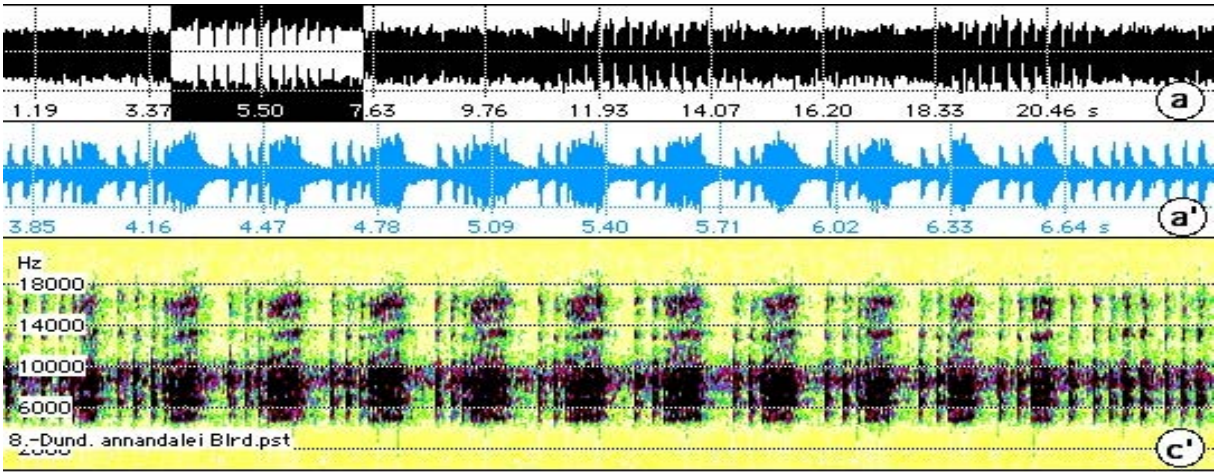


Lampang Province, Doi Lang N.P. in October (MB Phot & Sonotype *on Signalyze 3.5*).

c) 'Imaginative' species. Cymbal artists… With which the visualization of the spectrograms revealed surprising, unexpected graphics...

>***Dundubia annandalei*** Boulard, 2007. Green cicada, also known as "comb-scraper". This species is also difficult to spot, its total analochromy hiding it in any foliage. Below, camcorder eco-portraits of a male in action from the back, then in profile **(MKB video):**

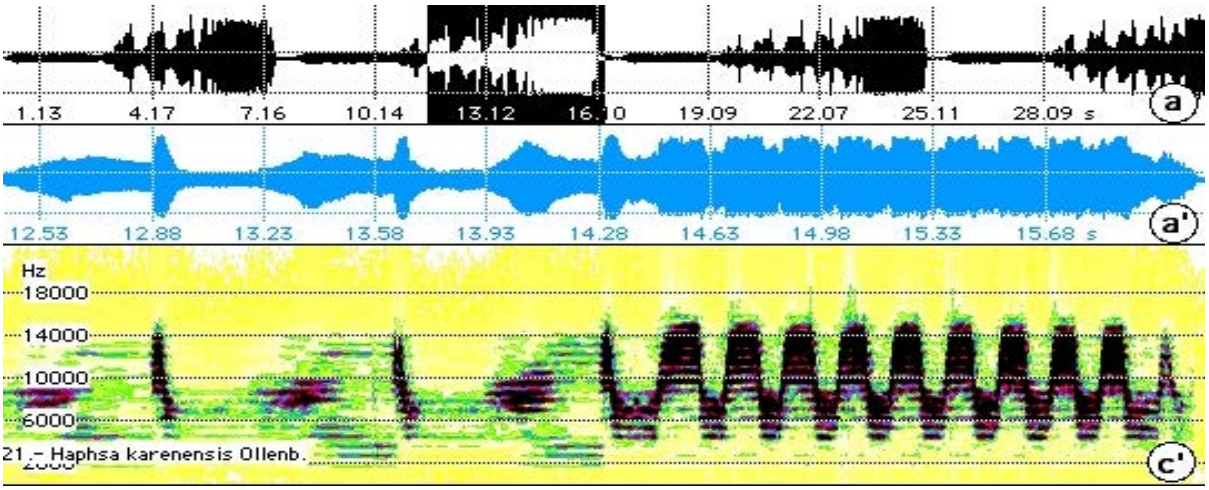
The males, each in their own territory, emit curious acoustic jousts reminiscent of the sounds produced by scratching with a European comb, hence the nickname "comb-scratcher". This species is also to be placed in the group of "Cicada alarm clocks" (**Boulard, 2006f**). It appears 10/15 minutes before dawn and during daybreak. Its tymbalization, relatively simple, is a long background crackle, interspersed with six to eight phrases imitating the sound drift of a heavily scraped comb, **AIC**:



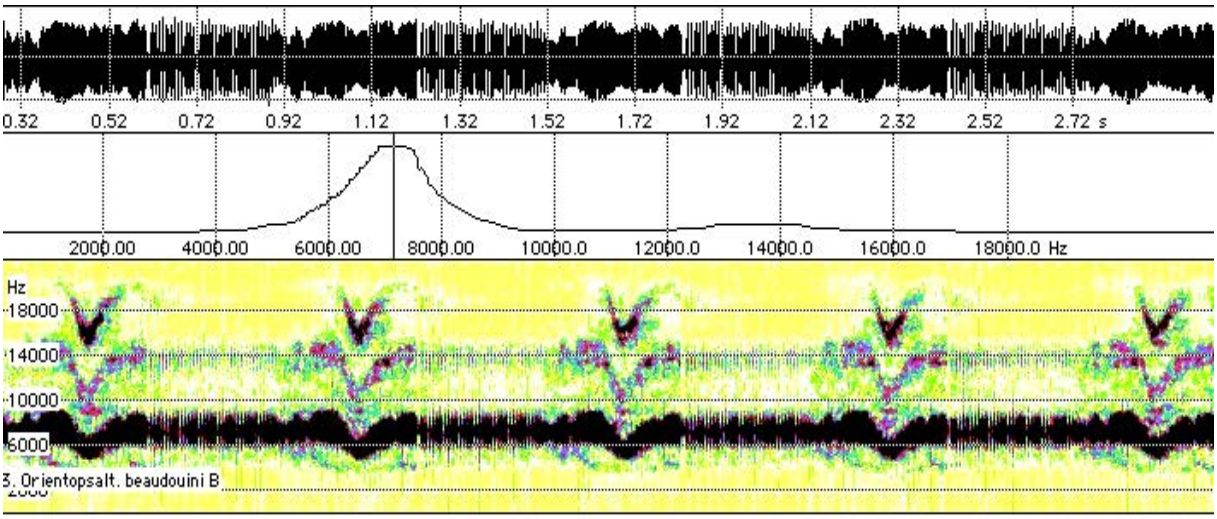
Dundubia annandalei. **Southern Thailand, Khao Sok N.P. February (MB Phots. & Sonotype *on S. 3,5*)**

Then *D. annandalei* disappears from the soundscape, during a long silence that can last more than half the morning, then it appears again, throughout the day, with random pauses, only to stop completely at the end of dusk.

>***Haphsa karenensis*** Ollenback, 1929. Males holding a computer patent "www" discussed...



>***Orientopsaltria beaudouini*** Boulard, 2004. "Super-performing" with the avian flights, **AIC:**

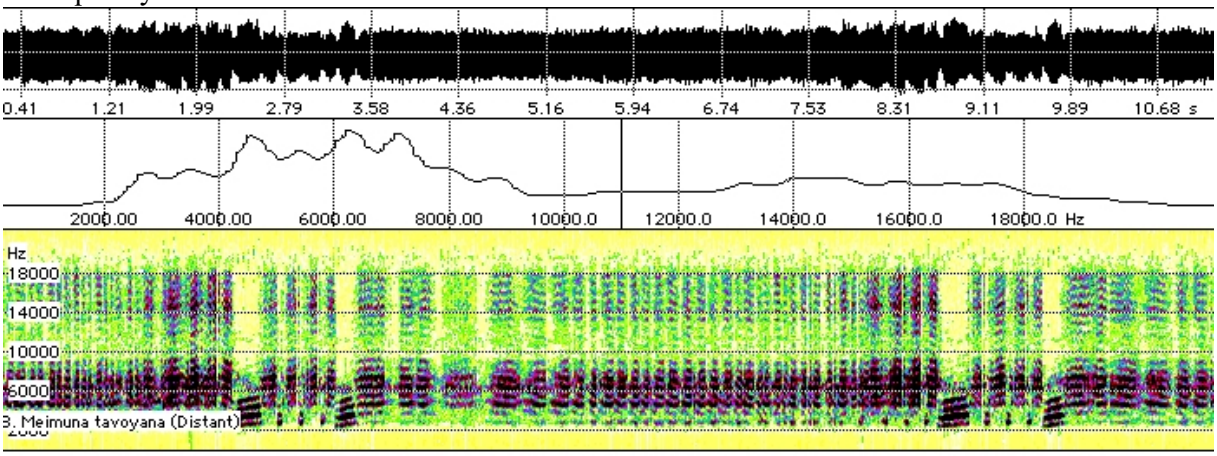


Orientopsaltria beaudouini. **Phetchabun Provi, Nam Nao, July (MB Phot & Sonotype *on S. 3.5*).**

d) "Bird Cicadas"

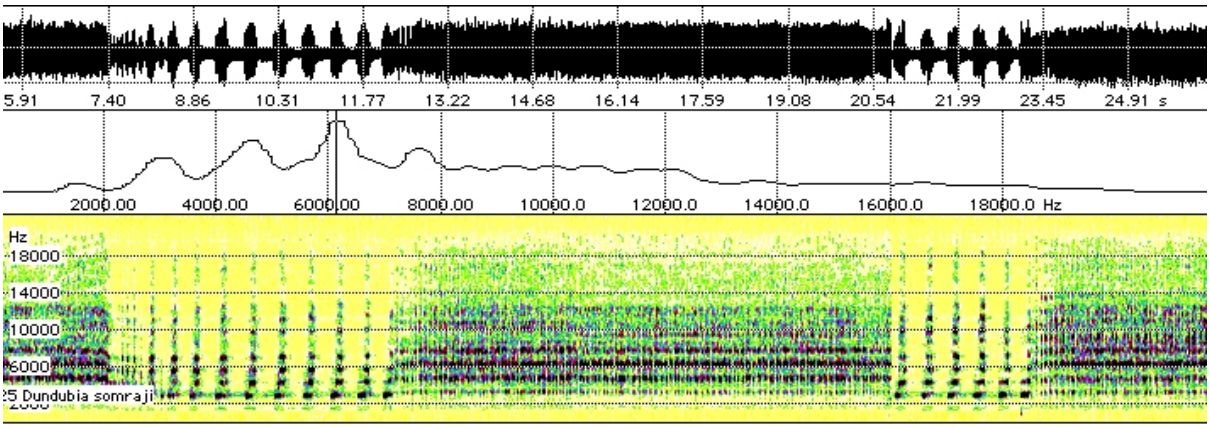
Other Thai Cicadas emit even more astonishing sound registers, at least for the field cicadologist and sound recorder. Music heard with the "*Bird cicadas*", species so nicknamed because they include, in a typically cicadidaean sound accompaniment, some kind of trills of avian consonances. The exercise is so convincing that when you record the target species for the first time, you are looking for the "bird" that disturbs your work! Currently we have three species, whose males tymbalize by striking our ears in such different ways.

> ***Meimuna tavoyana*** (Distant, 1888): the low-frequency staggered patches are similar to a bird song in the low frequencies, which is periodically interrupted by a loud cicadidae sizzling very high in frequency:



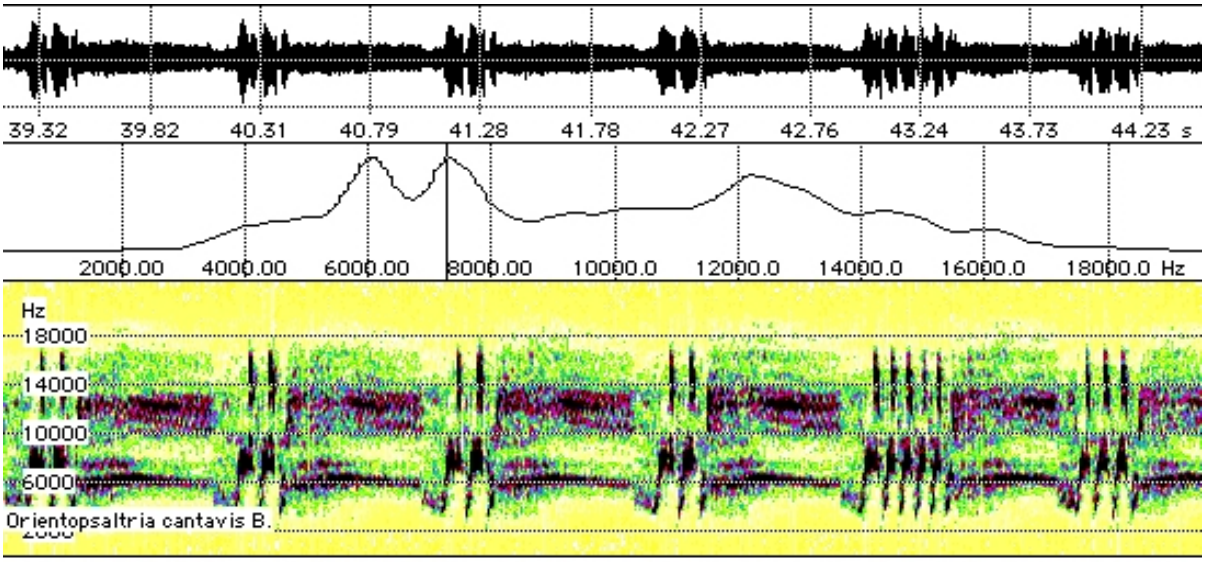
AIC, Chae Sorn N.P., in March (MB Sonotype *on S. 3.5*)

> ***Dundubia somraji*** **Boulard, 2003.** Green species like the leaves, "the bird" reveals itself in dotted lines... **AIC,**



Dundubia somraji **Ranong Prov., Toungka forest, en décembre** (**MB Sonotype** ***on S. 3.5***).

> ***Orientopsaltria cantavis*** Boulard, 2003: here is the transcription of the extraordinary cantata issued by these beauties with rhodonite eyes. The frequent bursts of tymbalization resound like avian "twitts" with several syllables. Fantastic **AIC sonotype,**



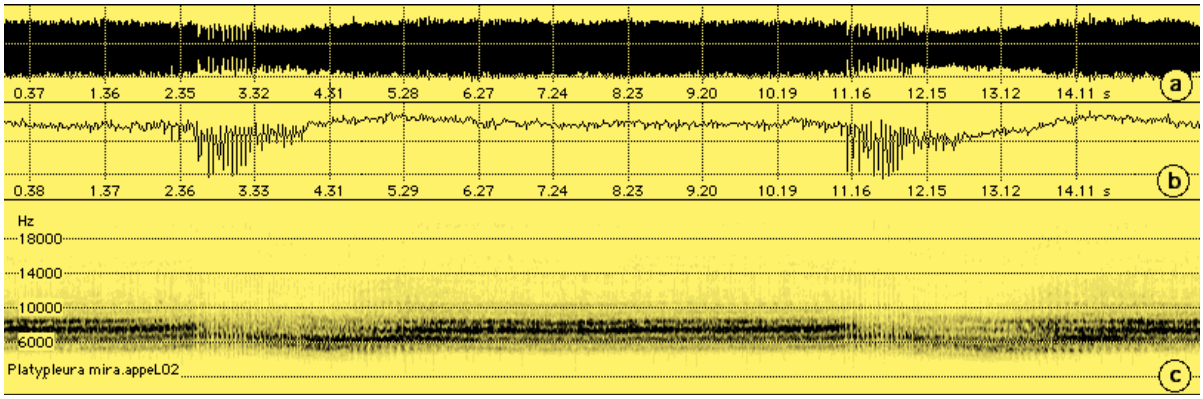
Orientopsaltria cantavis Boulard. **Lampang Prov, Wang Nuea N.P., April** (**MB Phot & Sonotype**).

Questions motivated even more by these fabulous graphics. How does each Cicada species achieve these acoustic performances, varying notes, pitches and tempos? How does the tymbalic machinery - brain and accredited accessory devices - produce such prowess, specifically stable from one male to the next… Subject, it seems, to the distorting, concomitant or alternating hyper-speeds of the tymbalic surfaces! As already just pointed out on p. 27.

e) Cicadas with "territorial expressions" or one "well-being", so called to rekindle some old questions.

These are notions suspected during particularly hot and nocturnal periods of a Provençal boreal owl, or perfectly perceived during a captured dialogue between two Central African *Ugadas* (*cf.* p. 32). Notions that have been affirmed by listening to several Thai Cicadas. Two examples.

-> *Platypleura mira* Distant, 1904. Most often gregarious species, but not colonial, particularly followed in the forest of Mae Moh (Lampang Province):

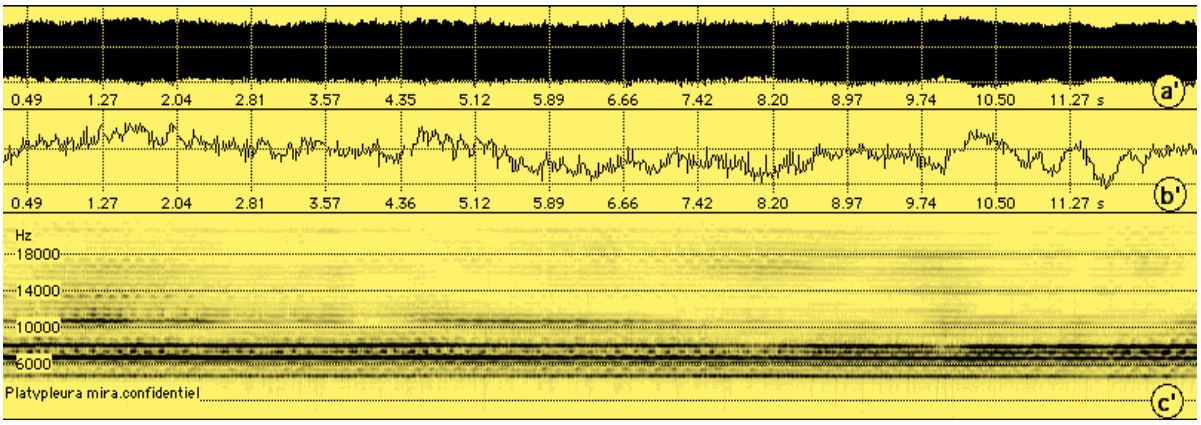


During the nuptial period, the imagos position themselves on the trunks or branches, whatever their diameter or height (this one is not canopic) and the males tymbalize to who better, without being really synchronous. The tymbalizing posture of males is typical: wings lowered to the sides, the abdomen curved at first, then the apex bent towards the support (*cf.* **Boulard, 2007a**). At the ear, this tymbalization of ***P. mira***, with a largely undulating consonance, delivers a loud crackling sound in decibels**.** Mating takes place, while one perceives, or not, a courtyard tymbalization; the latter is manifest in diluted population (**Blrd, 2000g**).

Simple method to record a tymbalizer somewhat isolated from the other males. Here recording a male ***Platypleura*** **mira** Distant, thanks to a microphone approached with a long stick.

Lampang Province, Mae Mo, in August (MKB phot)

Still in the gregarious population, but outside the periods of sexual quest and the ensuing din, some groups of male ***P. mira*** emit a completely different form of sound signal. It is a non-wavey, tenuous, "confidential" broadcast, produced without these males taking any particular posture and whose graphic transcription gives images of different amplitude and rhythm from the previous one.

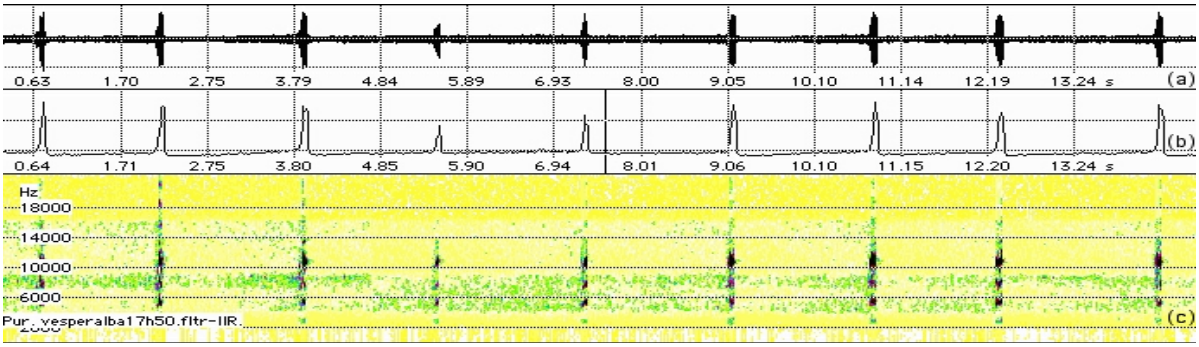


This random activity remains enigmatic. Perhaps it corresponds to a phase of grouping of individuals, although they are very close to each other simply because of their abundance at the Mae Moh site... In any case, and according to a well-smelt appearance, the ***Platypleura mira*** "feel good", express it and do it too… **A "Jam"!** (*Cf.* p. 32).

-> ***Purana vesperalba*** Boulard, 2009 **and the nycthemeral vocation of males**

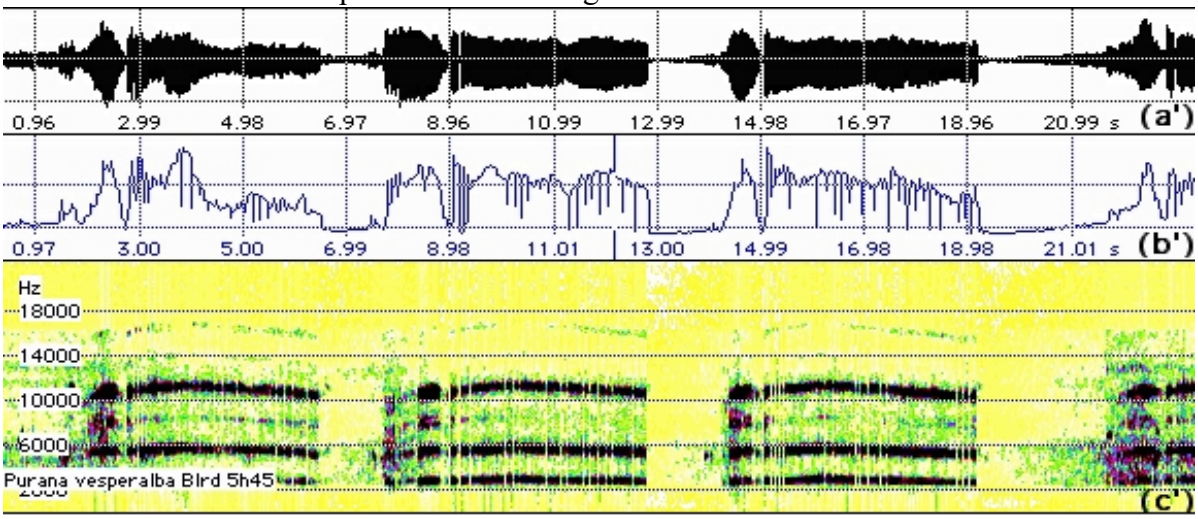
Purana relatively large for the genus (42 mm long and 70 mm wingspan), with a predominantly green tegument more or less stained with diffuse brown. Curiously, the male appears at the extremities of the nocturnal half nycthemer, hence the epithet "*vesperalba*" given to the species discovered near the villages *Thung Salaeng Luand* and *Chae Sorn.*

At the end of the day, short sound fragments are similarly emitted and separated by long, almost equal silences; the insect remains in place, or takes a few steps for another point of sap. The species is then semi-gregarious, the two sexes are calmly adjacent to each other, preferably on the trunks of coppices. When night settles in, the "tymbal blows" stop.



Purana vesperalba Boulard. Quiet male and **AEC of twilight acoustic activity, "convivial! ».**
Lampang Province, Chae Sorn N. P., in May.

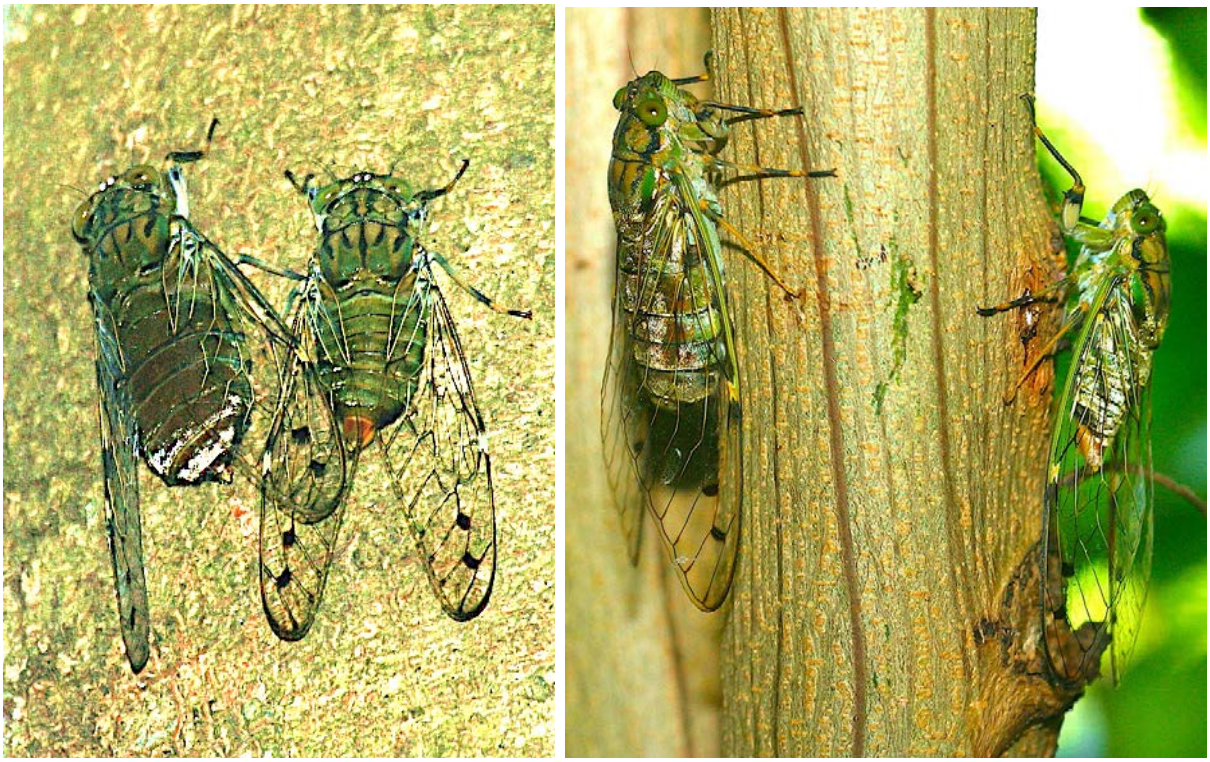
All different was the auroral exercise and the sonogram established had in common with the previous one only the four-stage pitch of the frequencies used. As early as before and during the rising of the day, the tymbalizations are emitted, several times on the spot, in a subcontinuous whistling of 4 to 5 seconds... Then the males carry out more or less prolonged flights, gain another support where to launch again "the call" in the same way. Where it was very difficult to find them, especially as this period of morning activities does not exceed twenty minutes! These tymbalized displacements cease indeed, the sun shining. Without the slightest match being seen. The behavior of this species remains quite strange and does not correspond at all to those of the other species of the same genus until then met.



Purana vesperalba **flashed at dawn: AEC /ACI, (a')** Time oscillograms, **(b')** Amplitudes, **(c')** Spectrograms (frequency transcripts).
Lampang Province, Chae Sorn N.P., in May, at dawn (MB Sonotypes on *Signalyze 3.5*).

f) Cicada having only a narrow nycthemeral window:

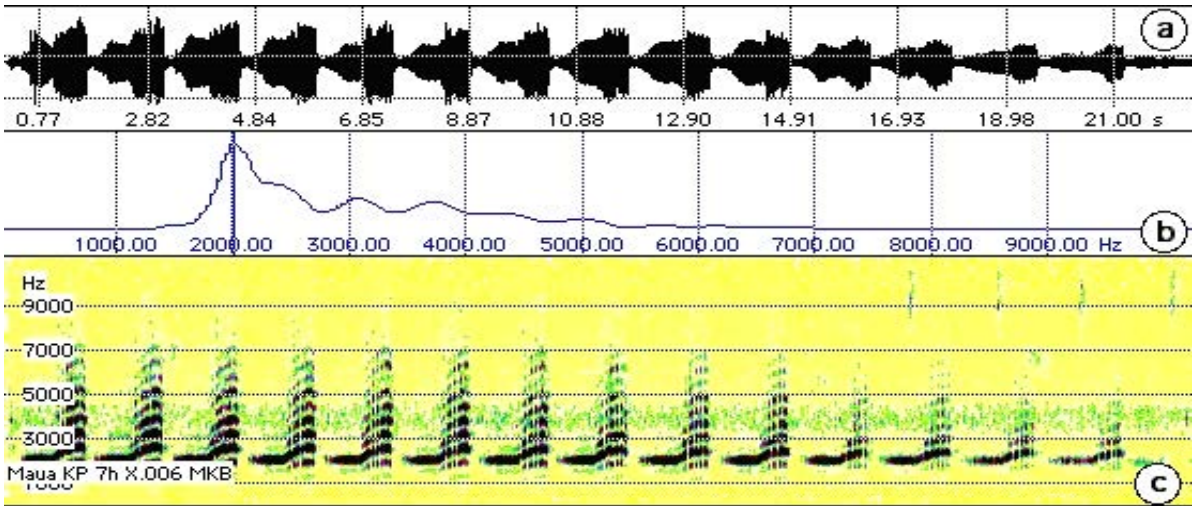
A singular case, unique to my knowledge, that of the morning call of ***Maua quadri-tuberculata tavoyana*** (Ollenbach, 1929). Belle Cigale rediscovered and studied in Northern Thailand, in Khun Pawor N. P. (*Tak Province*), in October 2006. Cicada of good size, 57 mm long and 103 mm wingspan, for the male, whose large abdomen bears four bistre and shiny tubers, with a sub-lateral direction (see these tubers p. 476) and whose function, if any, is unknown. The female, slightly smaller, has a short, conical abdomen with a ventral yellow smear and no tuber. In fact, it is a continental subspecies of the *Maua quadrituberculata* (Signoret, 1847) described from Java (*cf.* Boulard, 2013). Gregarious, but not colonial, the population followed occupied the steep southern flank of a hill about 50 metres high in the "Khun Pawor N.P.". Here are two eco-photographs taken in the first two hours of the morning,



Maua 4-tuberculata tavoyana (Ollenbach, 1929). **Male and female flashed when uncoupled (seen a little too high), then both clutched at rest (MB Phots).**

Another singular ethological characteristic, therefore, the ***Maua***, also, **get up in the morning to mate!** They appear at dawn and during the dawn, that is to say in October at Khun Pawor N. P., between 5:45/50 and 6:55/7h. They are not heard during the day or at dusk. As far as I can tell, it is the only cicada that behaves like this. To emit their sound identity, the males spread their wings just a little and give rhythm to their emissions by slightly raising their abdominal apex.

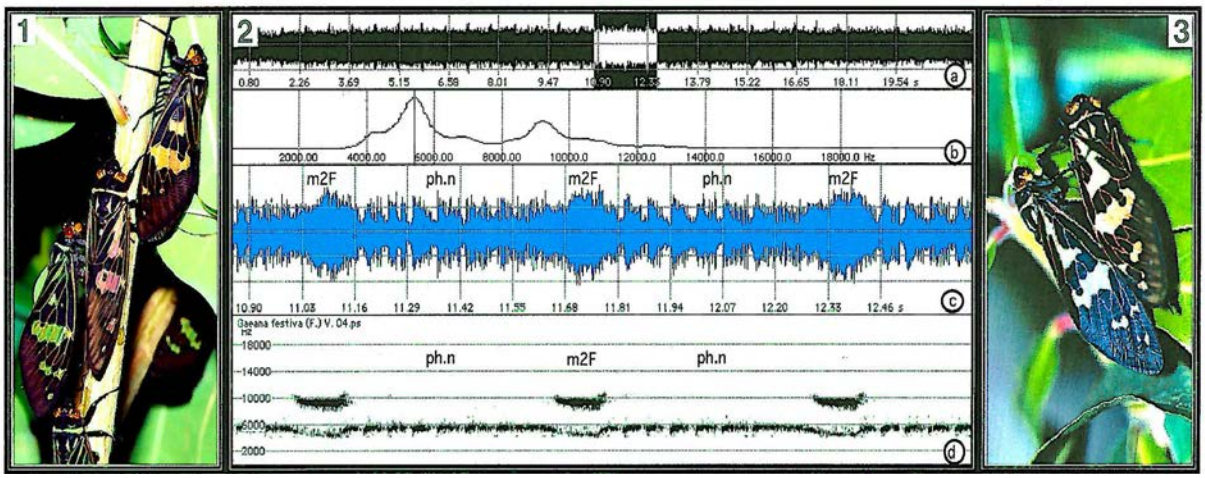
The tymbalized call, which strangely evokes the siren of ambulances (hence the nickname "emergency cicada" which was given to it), is not emitted continuously and its periodicity is random. Each male emits only one sequence at a time, which lasts only about a minute, alternating with a more or less long silence. There is no synchronization between the males, each tymbalizes for itself, which, at the height of the general activity, results in a lot of cacophonic overlapping, making unitary sound recording problematic. These morning concerts were strikingly "alarm clock-like" and biologically effective. Here is one of our best CIAs that we have been able to achieve listening to this sub-species.



Maua quadri-tubercula tavoyana (Ollenbach,1929). **ICA**. Partial transcription of a call sequence at the end of a tymbalized verse**. Tak Province, Khun Pawor N.P. in October (MB Phot & Sonotype *on S.3*).**

g) The astonishing *Gaeana festiva*, periodic, episodic (?)

No information about this type of biological evolution in the Asian cicadofauna was available until the early 2000s. This silence was broken in 2004, in northern Thailand, where a similar outbreak was intercepted with ***Gaeana festiva*** (Fabricius, 1803), a medium-sized, forest polychrome species. Coming out of the ground only from afar, a popular tale, we do not know whether the exuviation, a normal outcome of post-embryonic development, is periodic or simply random and under what influences. Here is the main document relating to this short factual event, which has not yet been reviewed or reported (*cf.* MB, 2004e).



Gaeana festiva (Fabricius, 1803). Photographic Identity (**PI**) and **A**coustic **I**dentity **C**ard.

1) IP, Polychrome specimens photographed during the massive hatching noticed in April 2004.

2) AIC, **Graphic metamorphosis of a cymbal call**, sampled at 44100 Hz: **(a)** Time waveform translating 20 seconds of the full signal (a structure just suspect at this scale); **(b) Plot of the mean spectrum** centering the fundamental on 5200 Hz, followed at a distance by a harmonic centered on 9200 Hz; **(c) Waveform stretching,** in a space-time based on the inverted range in a, 2 seconds of the full signal; two categories of sentence are distinguished, **m2F** which is still condensed and strongly doubled in curved frequency lines (5000/10000 Hz), and the second, **ph.n** which is composed of irregular and inconstant modules; **(d)** Spectrogram revealing a multi-fragmented fundamental whose linearity becomes concave under the **m2F** harmonic, thus reflecting the singularity of the tymbalization emitted by this species.

3) Heterochromic pair, the male has homelytral yellow-green spots, which are pink in the female.

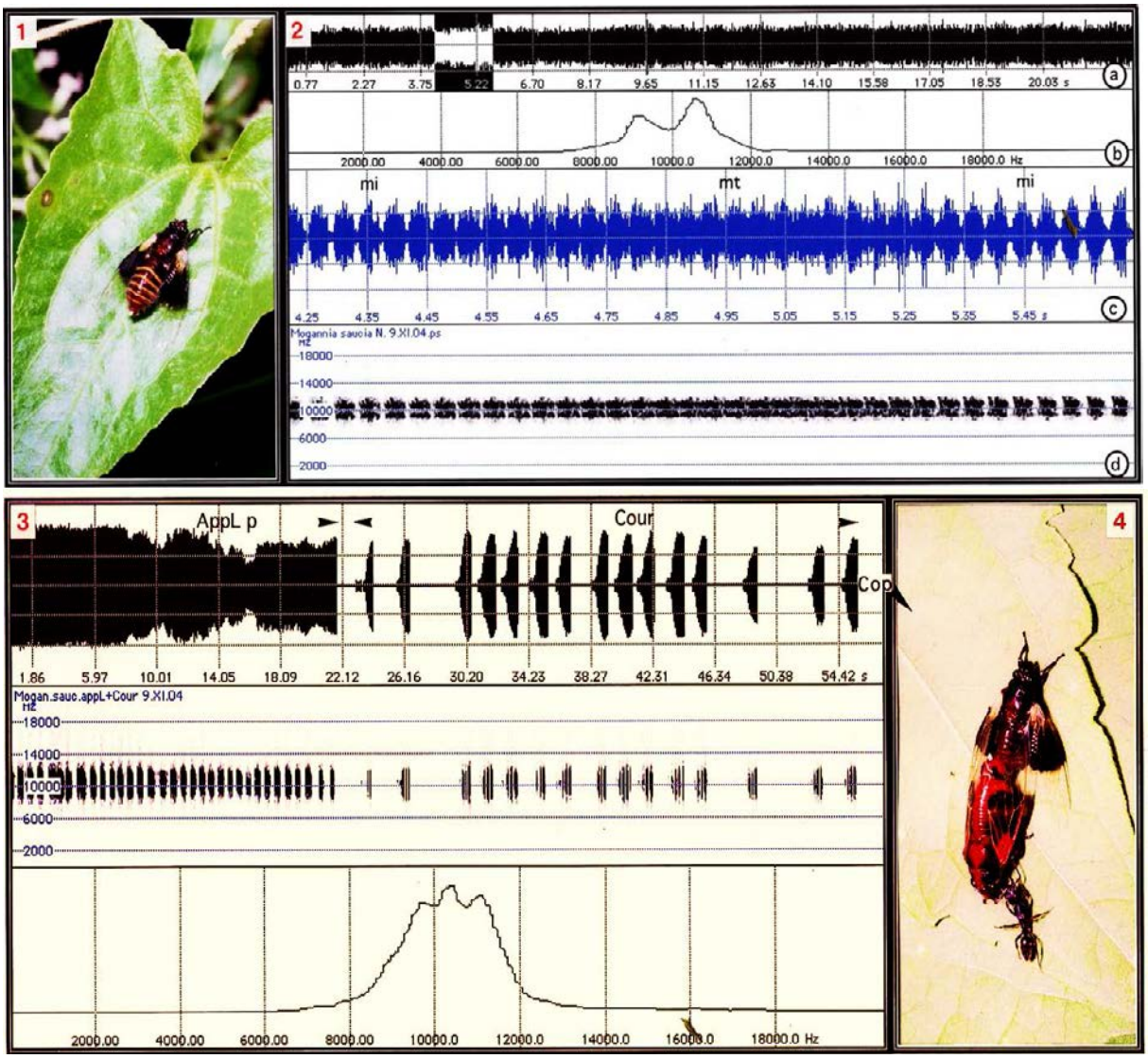
Thailand, Chiang Rai Province, Khun Pra, May 2004 (**MBK Phots & Sonotype *on Signalyze 3.5***).

In some years and for a few known Cicadas, imaginary hatchings occur massively within a short period of time, a few days, not much more. This is the phenomenon known as *Periodic Cicadas*, well known in North America with the famous *Magicicada* in cycles of 13 and 17 years. I made known a similar reality in New Caledonia, to a lesser explosive degree, but with a harmful impact on food crops, with the tiny ***Abroma pumila*** (Distant, 1892), whose bionomic period is much shorter, bi or triennial (*cf.* p. 197).

h) The small world of Mogannia

It was a real pride to find, *in situ*, some of the species collected by the Administrator-Explorer **Auguste Pavie** (in Indochina and Siam) and described by the hemipterist **Maurice Noualhier**, illustrious predecessors. And even more so when I was able to rediscover the species described by **Noualhier** in 1896. The type originates from Laos, but the species exists in Surat Thani, a province listed in the southern third of Thailand. We were able to follow one of the populations, capture the tymbalisations of the males and observe couples. New geographical detection, ethology, photographs not carried out before... Which allowed us to complete somewhat the scientific capital already linked to this species. Here are, a hundred years later, two bionomic images (*Cf.* Boulard, 2005l), presenting the CIA and CEA commented

on this valiant little Cicada, ***Mogannia saucia*** Noualhier, 1896, a species having variable polychromy with the individuals.



1) **Male**, predominantly black, tymbalizing, wings spread, abdomen taut,

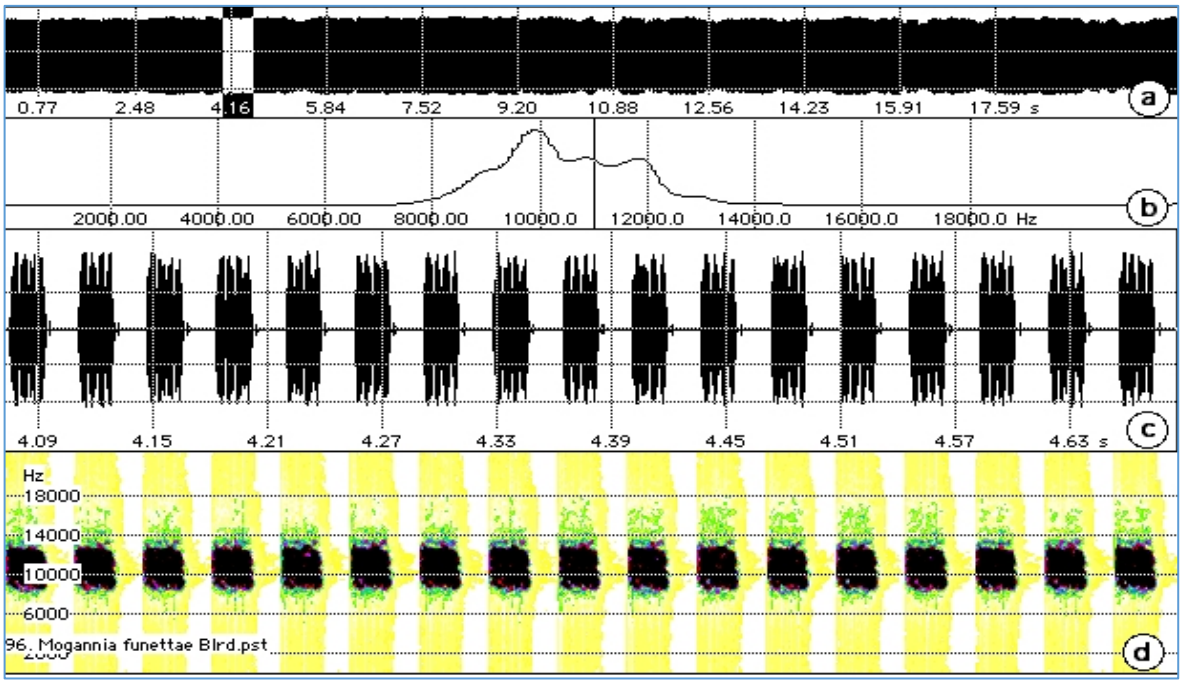
2) **AIC (a)** Time waveform transcribing 22 s of the full signal, the latter illegible; **(b)** Mean spectrum plot recording 2 peaks largely merged from the base, but at distinct vertices; **(c)** Waveform stretching the inverted range in (a), then distinguishing groups of individualized modules (**mi**) alternating with groups of telescoped modules (**mt**) and releasing the rhythmicity of the tymbalization; **(d)** Spectrogram proceeding from (c) and narrowly focused on 10000 Hz.

3) **AEC**, Sonographic transcription of the tymbalization of Appel passing to that of Cour and their pictorial translations… (AppLp), male having just seen the arrival of a female and expressing its Court, cymbal emission slowed down and irregularly fragmented, during the thirty seconds or so it takes for the accomplices to meet and (Cop) to copulate.

4) **Heterochrome couple**, dominantly black for the male, bright red for the female. During the exchange, an ant came to add a "little tropical plus" towards a certain Fable.

Surat Thani Province, in November (MBK Phots & Sonotype *on Signalyze3.5. Cf.* Boulard, 2005l).

Subsequently, we discovered other species, two of which turned out to be unpublished at that time, namely: ***Mogannia funettae*** Boulard, 2008a, also heterochrome, but differently, and ***Mogannia paae*** Boulard, 2009g, perfectly homochrome. Both are specifically identifiable by the tymbalizations of the males.

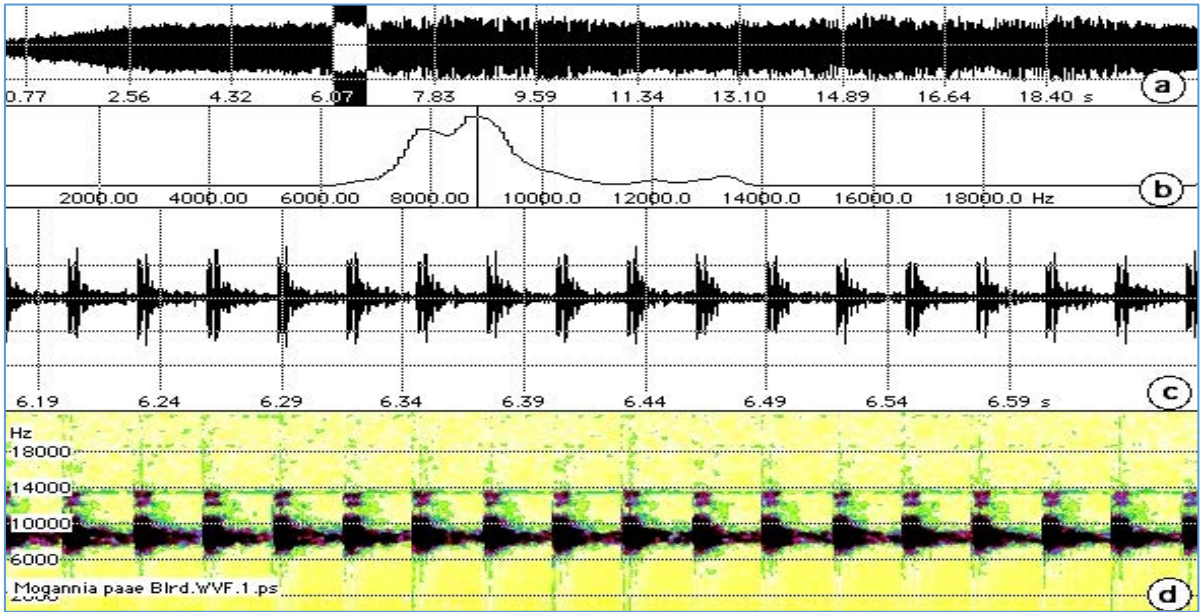


Mogannia funettae Boulard, 2008. **AIC** established according to the same parameters as for *M. saucia*: **(a)** an illegible signal, but presenting in (b) 3 degressive peaks. in **(c)** an oscillogram giving off remarkably regular modules, translating in **(d)** a spectrogram of beautiful sharpness.

Mogannia funettae, male and female remaining side by side after copulation (**MBK phot**)

Chiang Mai Province, Huai Kaeo, in July (MB Sonotype Signalyze. *Cf.* Boulard, 2008a)

> ***Mogannia paae*** Boulard, 2009. Male tymbalizing and Couple. Habitus of the heterochrome sexes with black and red dominance, the hind half of the hyaline forewings.



Mogannia paae, **AIC** established according to the same parameters as before: **(a)** temporal oscillogram transcribing about fifteen seconds of an illegible full signal; **(b)** mean spectrum recording two peaks largely and highly fused from the base and rising in the 8000-9500 Hz range, then a very slight rise, trace of harmonics, towards the 13500 Hz range; **(c)** Waveform stretching the inverted range in a, individualizing closely spaced 2-component modules, but also emphasizing the near-perfect rhythmicity of the tymbalization; **(d)** Spectrogram proceeding from (c) and occupying a large frequency space between 6000 and 12000 Hz, each group of modules being capped by a double formant reaching 14000 Hz.

Phetchabun Province, Khao Kho, in July (MB Phots & Sonotype *on Signalyze*. *Cf.* Boulard, 2009g).

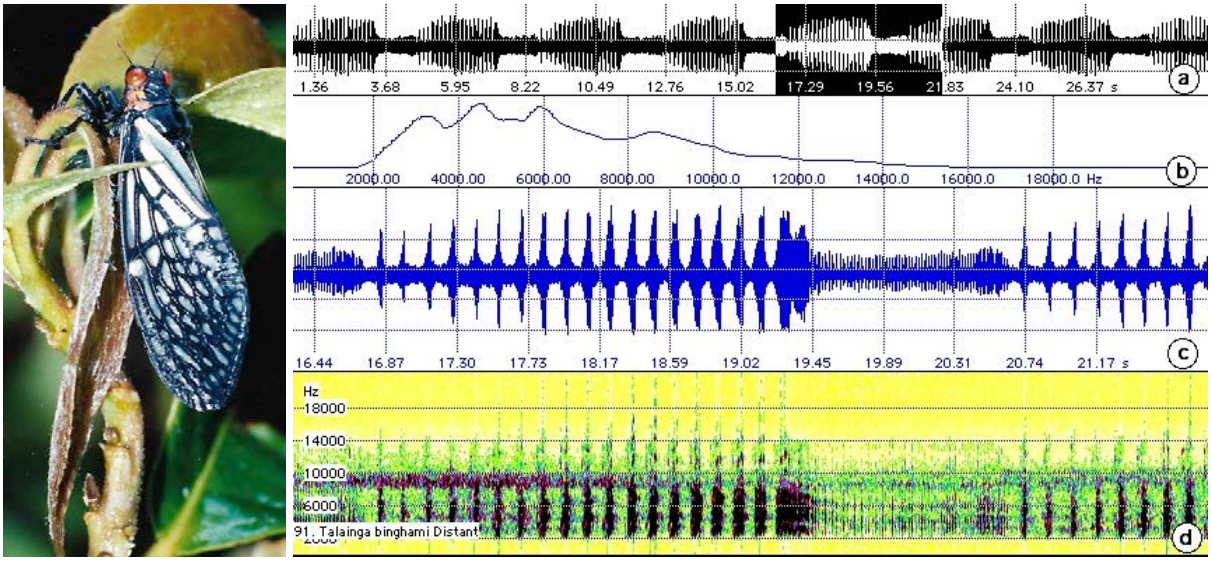
Among the rediscovered species, ***Mogannia caesar***, described on dry collector's material by **Arnold Jacobi** in 1902, takes its place here, "flashed" at the start of a flight.

Thaïlande Nord, Ban Khun Lao, 18.V. 2004 (MB Phot).

i) Mention for a particular canopian species that flutters

Pretty species of lower average size, at once recognizable by its tegmina, of which the post-nodal line is reticulated, and by its beautiful red eyes and thoracic margins. The rest of the body is a deep and brilliant black, hindwings with antenodal area of unspotted white, the terminal cells irregular.

Talainga binghami Distant, 1890 is a magnificent *butterfly cicada*, which flutters in and around the canopy. Every male tymbalizes in isolation, without adopting any particular attitude. However, we noted the start of a sort of dialogue, or a rivalry between relatively close males and a certain amount of competition, some of them repeating their tune before others finish theirs.



Talainga binghami Distant, 1890, **Photo / Identity and AIC** (**MB Phots & Sonotype** *sur* ***Signalyze).***
North Thailand, Doi Mon Kia mountains, in March 2002

j) The very first "*Symphonies fantastiques*"...

Many Thai Cicadas tymbalize during the day, while many others are mainly auroral and/or twilight. Such is the case of many small discrete species, but also, in thunderous ways, of *Megapomponia* nicknamed "Six o'clock cicadas" (in fact Cicadas of 18h), while some can tymbalize at night, like *Mgp. intermedia*, or *Purana johanae*, for example). On the other hand, many species have morning males... who start cymbalizing at daybreak, some even just before. This is the case of *Dundubia oopaga* Distant, *D. feae* Distant, *Terpnosia nonusaprilis* Boulard which are, each in their own landscape, '**alarm clocks cicadas**!'. You can feel this, mainly in the Thai mountain forests where dawns and auroras are greeted by astonishing cicadid concerts! During these moments, which last about twenty minutes, a chorus of species invades the sonosphere. After which, all the tymbalizers stop... Under the baton of a Maestro as mysterious as it is invisible, although perhaps in connection with a rise in the ambient temperature... During these morning cymbalisations, one cannot know who is expressing what, especially as the exercise does not seem to have any pre-copulatory influence... "Symphonie fantastique au soleil levant"? No less, no more, apparently!

I had already perceived similar manifestations in the great wooded savannas of the Central African Republic, emitted by early morning *Soudaniella*, but less striking and often covered by bird concerts performed at the same hours, with the same spirit of "satisfaction".

C) Fancy cicadas and cicadological scoops

Until the last few years, it remained established that cicadas were only phytophilic, sucivorous or opophagous insects, i.e. living on plants, or near their roots, from which they consume juices and sap. This state of affairs nowadays suffers from astonishing exceptions.

I had the good fortune to surprise the existence, hitherto unsuspected, of cicadas which can be psammophilic, moving on the wet banks, usually stopping there for a long time to absorb an aqueous food, their rostrum stuck between the grains of wet sand ... And this, while other Cicadas, as well as species of Auchenorhynchus neighboring the same biotope, including many Leafhoppers, were even looking for food with them, in apparently soiled substrates, very humifers bordering the rus of hot springs ... I will have to agree a little further on. This is historical entomology, the first fact of which, hereafter retraced, was described as the "**Bionomic Discovery of the 21st Century**" as far as these insects are concerned.

An anecdotal discovery as it should be, but authentic, told, illustrated in the French Review "INSECTES", N° 142 published in 2006 and subtitled with **an unthinkable cicadological "Scoop"!** Reproduced in extenso in these pages.

Individus mâles de *Meimuna duffelsi*, espèce récemment découverte.

Par Michel Boulard Photographies de l'auteur

Une Cigale sabulicole et buveuse d'eau : un « scoop » cicadologique !

« Les cigales n'ont pas fini de nous étonner [1] »... En écrivant ces mots, l'auteur n'imaginait sans doute pas qu'il en aurait lui-même la plus surprenante des confirmations à peine deux ans plus tard.

1 « *Les cigales n'ont pas fini de nous étonner.* » est la phrase initiale de l'article de M. Boulard paru dans *Insectes* n°139 (4e trimestre 2005) sous le titre « *La polychromie des Mogannia, petites cigales nonchalantes du Sud-Est asiatique* », en ligne à *www.inra.fr/opie-insectes/pdf/i139boulard.pdf*.

Alors qu'il était auparavant établi que les cigales, larves et adultes, sont des insectes phytophiles et opotrophes - c'est à dire vivant sur les plantes dont elles consomment la sève - on vient de surprendre en Thaïlande une cigale à l'éthologie jusque-là impensable, psammophile et hydrotrophe, se nourrissant d'un liquide qu'elle puise dans des sables ripicoles. En avril-mai 2004, dans la vallée très encaissée de la petite rivière torrentielle Huai Maekampong (province de Chiang Mai, Thaïlande), j'ai découvert une nouvelle espèce de *Meimuna* [2] et noté que les adultes semblaient aimer se poser sur le sable émergeant du cours d'eau. N'ayant pu procéder qu'à 3 captures, je n'ai pas prêté davantage d'attention à ce comportement, que j'ai jugé sur le moment anecdotique et j'ai choisi un nom d'espèce sans aucun rapport avec lui [3].

Cigale s'abreuvant, le rostre fiché dans le sable humide.

L'imago de *M. duffelsi* est d'assez bonne taille (47 mm de longueur, 77 mm d'envergure) ; il a la tête et le thorax vert marbré de noir ; le mâle est caractérisé par un abdomen ventru de teinte rosée, ceint plusieurs fois de noir et paraissant

2 Genre de cigales asiennes créé par Distant en 1905, *Ann. Mag. Nat. Hist.* (7)15:67

3 *Meimuna duffelsi* : dédiée à un collègue néerlandais pour commémorer son départ à la retraite. Par ailleurs, j'ai retenu Mae Kam Pong, village proche du site de découverte comme localité originelle.

Meimuna duffelsi sur les plagettes et bancs de sable du Huai Maekampong.

soutenu par de vastes opercules blanchâtres.

Au cours de la première quinzaine d'avril 2006, en revisitant le *locus typicus* de l'espèce, notre surprise fut immense de voir nombre d'individus installés posément sur les plagettes et bancs de sable du Huai Maekampong. Grâce à un zoom puissant, nous avons pu observer et photographier ces scènes singulières : les cigales étaient toutes occupées à s'abreuver, calmement, le rostre fiché dans le sable humide (celui-ci parfois plus ou moins limoneux). Comme pour ajouter à cette scène incongrue, elles émettaient régulièrement des jets d'urine grisâtre, que nous avons pu filmer. Certaines se trouvaient si près du cours d'eau, que parfois des vaguelettes touchaient leurs ailes ou l'extrémité abdominale, sans les déranger.

Lors de nos essais de captures, la plupart des *M. duffelsi* s'échappèrent d'un vol rapide. Quelque deux heures plus tard, les gros insectes étaient revenus « se ravitailler », apparemment aussi nombreux : l'éthologie psammophile et hydrotrophe n'est donc pas anecdotique chez cette espèce, mais une règle dans sa biologie. Bien des questions restent posées : le rostre fiché dans le sable, les stylets ne ponctionnent-ils pas aussi les micro algues de ce milieu ? L'observation de la couleur des mictions permet de supposer que l'eau absorbée n'est certainement pas pure... Autre constat tout aussi énigmatique : les cigales observées s'avèrent, sans exception, être toutes des mâles ! De petits groupes de buveurs semblaient particulièrement concentrés par endroits [4] : le sable y était-il plus attractif, plus riche en eau minérale, en algules, ou chargée davantage de souillures diluées ?

Affaire à suivre ! ■

4 Que l'auteur qualifie avec humour de « *duffelsi's pubs* », la Thaïlande étant partiellement anglophone.

M. duffelsi en petits groupes de buveurs.

Au cours d'une carrière déjà longue, largement consacrée à la biologie et à l'éthologie des Cigales du monde, je n'ai jamais rien vu de pareil. Qu'on veuille bien, alors, me pardonner de plagier un très vieil « Honorable » : « *L'incroyable est dans tout, il faut savoir l'extraire* »*.

(*) « *La joie est en tout, il faut savoir l'extraire* ». *Confucius.*

Référence

Boulard, M., 2005. Taxonomie et statut acoustique de huit Cigales thaïlandaises, incluant cinq espèces nouvelles (*Rhynchota, Cicadoidea, Cicadidae*). *Revue française d'Entomologie*, 27 (3) : 117-143, 28 fig. et 10 pl.

This integrated, several species of Thai Cicadas have shown incredible food preferences, which, surprisingly, only concern males!

a) Hydrophobic Cicadas (who drink water!)

> ***Meimuna duffelsi*** Boulard, 2005. Beforehand, I had dedicated this species, first captured in the light trap, to my excellent taxonomist colleague, the Dutchman J.P. Duffels, when he retired. A good-sized cicada (47mm long, 77mm wingspan), with a broad body and contrasting colours: green head and pronotum, brown-tinged belly and large lids sprinkled with whitish wax. Adults are canopic and do not disdain the usual elaborate sap intake. **However, males can develop an ethological phase never scientifically observed, nor reported in Cicadas until my own observations:**

Meimuna duffelsi Boulard, male, photographed, the mouth rostrum stuck in the wet sand of a torrential bank; **it draws interstitial water from a frightening "cicadian environment"** **(MB Phot);**

>**Strange:** The males are so indulgent, numerous on the small beaches of a sub-mountain torrent in Northern Thailand... Long busy "drinking" between the grains of sand, water probably less mineralized.

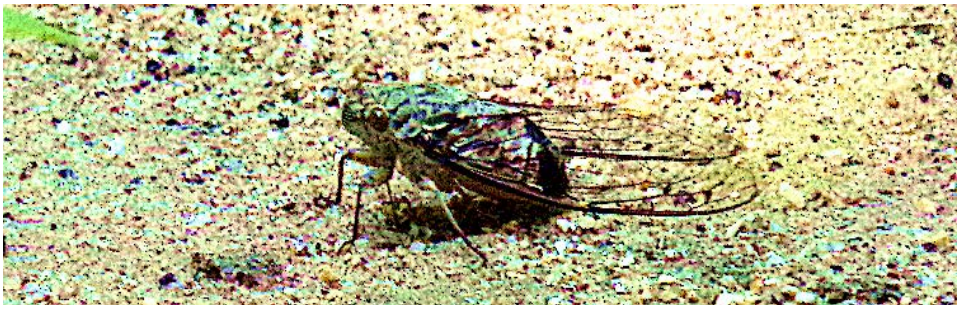
>Navrating: these torrential beaches can be soiled with muddy alluvium during extreme floods. It doesn't matter, the *duffelsi* come back by flying to "feed" on seemingly unsuitable beaches... Where they literally let themselves fall!

Without waiting any longer for a cleaning flow! **(MB Phot).**

>**Troubling: No female *Meimuna* on these beaches**! After large punctures, the males return to the canopies, from where many will tymbalize (*cf.* **Boulard, 2006d, 2013c**).

Thereafter, a few other species of Thai Cicadas were detected, following the unthinkable gustatory recipe!

> ***Haphsa karenensis*** Ollenbach, 1929. Species near to *Meimuna duffelsi*, green and black. Some specimens photographed in April on the sandy banks of the small *Maekampang* river. This one, rostrum planted, also seemed to refresh its abdominal apex in the sand... Comportement vu aussi avec de rares *duffelsi*. See similarly p. 395.

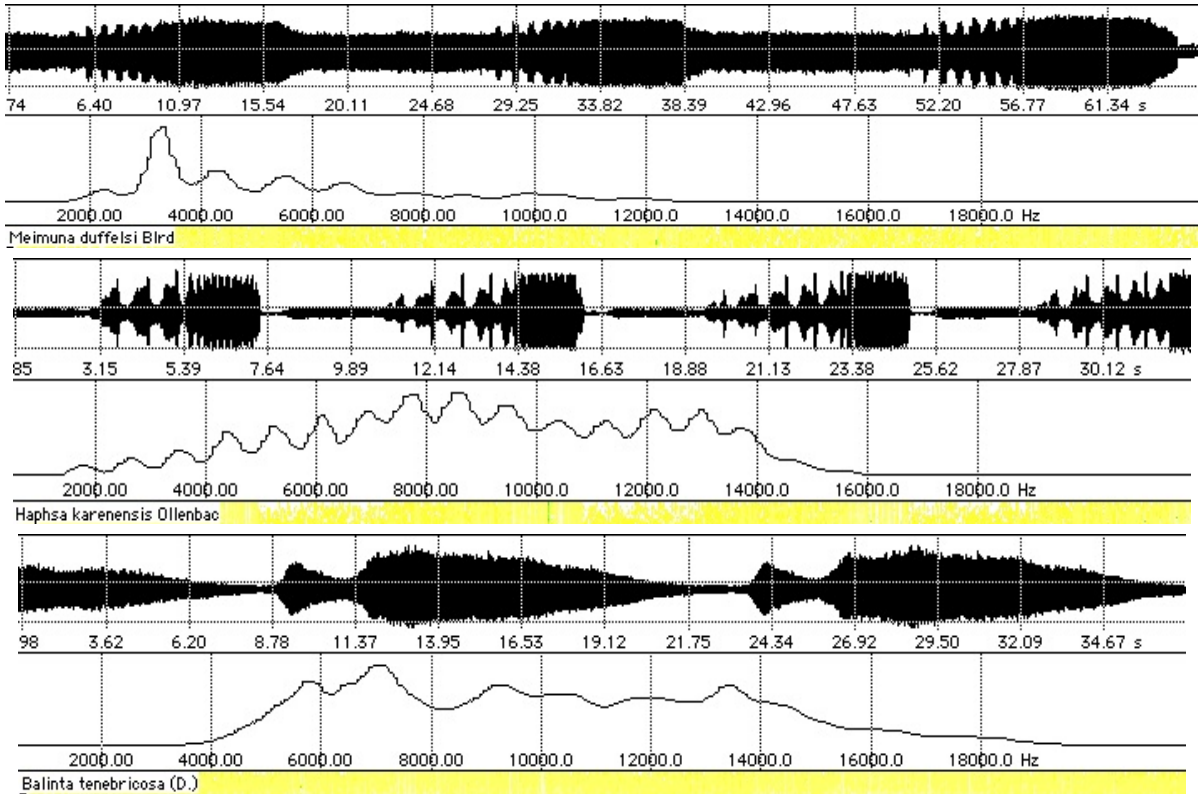


(MB Phot)

> ***Balinta tenebricosa*** (Distant, 1888). Smaller, in black dress and from a tribe different from the previous ones, was the third species surprised to stay for long periods, the rostrum planted in the wet sand. Seen only isolated males on the small temporal beaches, submerged from time to time by the small river crossing the Chae Sorn National Park.

(MB Phot)

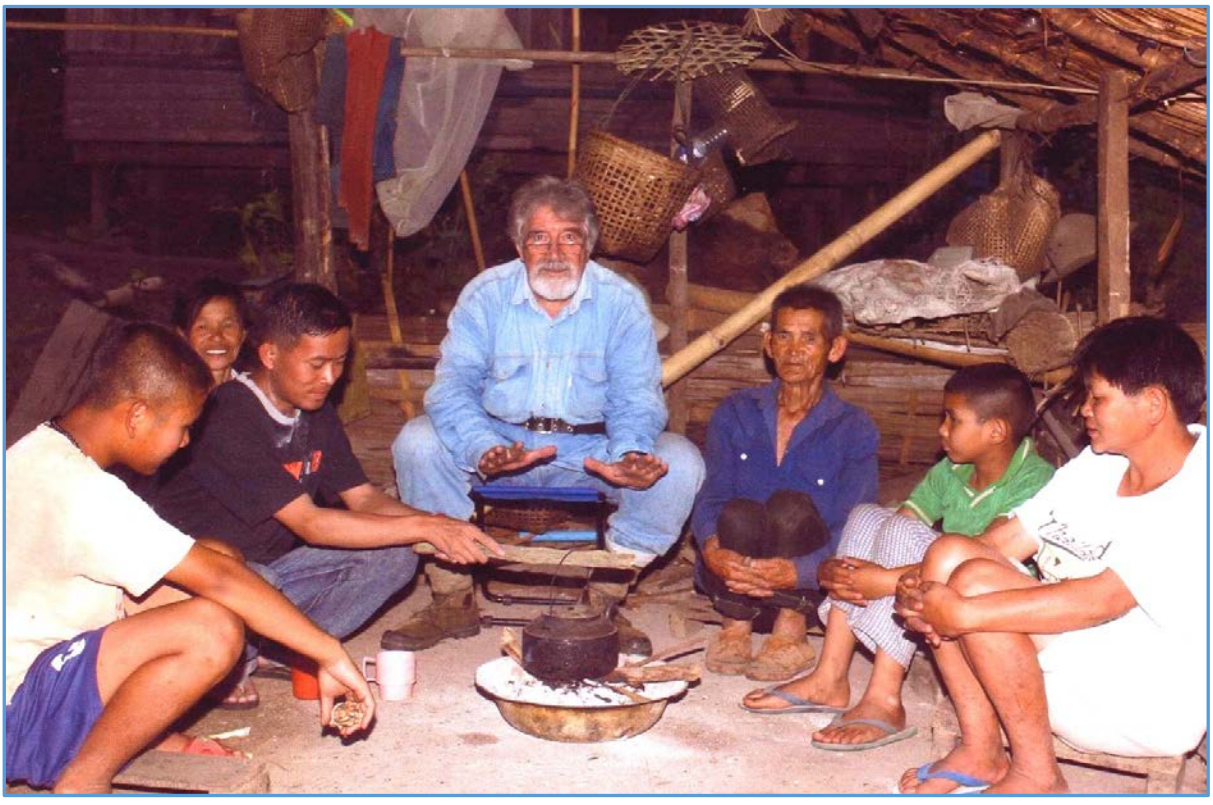
When they're drunk, these Cicadas don't fly away unless they're scared. Nevertheless, these males return to the foliage where they will tymbalize. Here are the indicative **AICs** of ***Meimuna duffelsi, Haphsa karenensis*** and ***Balinta tenebricosa*** (*cf.* sonotypes ***Signalyze*** *in* **Boulard, 2013c**).



> ***Euterpnosia chibensis nuaiensis*** Boulard, 2005. Contrary to the above species, all three of which are diurnal, this subspecies has, in addition to the sound motivations that normally occur in sunny weather, a twilight-night habit. ***E. ch. nuaiensis*** has the ability to "drink" water at night. This observation was made for the first time in April 2006 in the hamlet of **Pang Ma Kat** (Chiang Rai Province), where a torrential stream runs through. During the night, many ***E. ch. nuaiensis*** come to let themselves fall on the small gravel banks strewn along the stream, incidentally joining the 'already at table' and drink together the water oozing between the stones. As in the "pub" here flashed (pub, because there again, only males!).

Euterpnosia chibensis nuaiensis, flashing at night, busy sucking up weeping water among the gravel beds of a small stream (**MKB Phot**).

I owe these notes and photographs to a peasant family, whose welcome and kindness were, alas, equalled only by their great poverty. Several times, we shared the dinners offered, some cooked with ***nuaiensis*** picked up a few hours before...



Cool evening. MB and the Pankula Family around a rustic tea kettle (**KC phot**).

That lived and appreciated, I was not at the end of the surprises, as for the diets that some Thai Cicadas can follow...

I must, first cicadologist visiting Chae Sorn N.P., free myself here from its calm source of very hot water flowing into radiant streams that make it a surprising ecological area, frequented by other Cicadas with astonishing behaviors!

Chae Sorn "Hotspring" N.P. morning vapours from the surface of a short arm of very hot water, deafening at 82°C. Lampang Province (MB Phot).

b) A limicolous cicada, *Leptopsaltria jaesornensis* Boulard, 2009

Small, 29 mm long and 52 mm wingspan, ochre-yellow body and hyaline canopy, this low forest species is usually sap-sucking (sucivore), on stems and young twigs (**MB Phots**).

An unusual new fact, several male specimens of this species were filmed and photographed, feeding for long periods of time on the blackish humus-forming vase, which borders certain streams of burning darkness.

Leptopsaltria jaesornensis Boulard, 2009. Male, the rostrum stuck straight into the black mud, ejecting, every 8-10 seconds, spectacular micturition, does not leaving no doubt as to the ongoing nutrition...

Another male, the rostrum, is likewise stuck in black mud... While emitting, also metronome, long and short jets of urine. Several males were surprised, isolated in this way and camcoded.

Chae Sorn National Park, May (MKB video, 2008).

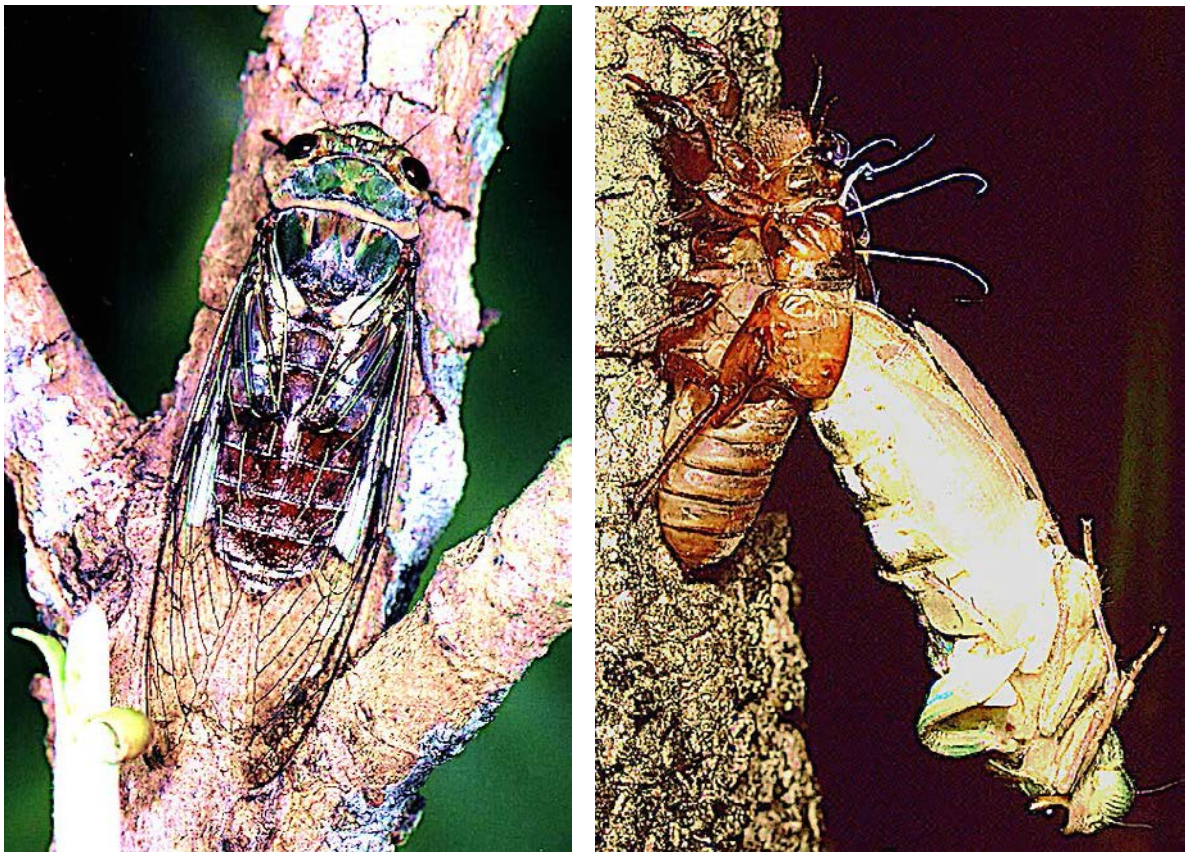
Leptopsaltria jaesornensis (and a few others that I'll see later), became temporarily accustomed to taking a new type of food, a liquid, but more or less loaded with mineral salts and organic molecules. Surprisingly, no female was concerned. As for the d*uffelsi* group seen above, an aptitude hitherto unknown in the Cicadas worldwide (*cf.* Boulard, 2013). This behaviour, which is not very common if not incredible, was found to be perfectly followed by many Leafhoppers in the same places and, for the first time (*cf.* below, pp. 322-323). In a career already long and under many skies, I have never been so fulfilled! There, a precept of **Confucius** comes back to me which I still dare to plagiarize "*The incredible is in everything, it is necessary to know how to extract it".*

But, at my mast of ethological cocagne, the incredible was still bubbling…

c*) Platylomia operculata*, or when the natural goes beyond its limits...

Large and beutifull species (73 mm long, 132 mm wingspan), unevenly brown, more or less reddish on the abdomen; males are otherwise notable for the exceptional size of the opercula. These have the form of long sub-ventral gouges which protrude widely over the sides of the abdomen, the apexes visible in dorsal view under the transparent wings (first figure below). **Distan**t described it on a dry, more or less brownish collection specimen.

I found it again in its country of origin, Northern Thailand, full of life force. Notably in the **Doi Mon Kia mountain range**, also in the **Chae Sorn N. P.**, where the adults are born in May and remain there until early July. Its nymphoids amazed me by their agility to move... Climb sharply on the first trunk that came and proceed to exuviation (second figure below)!

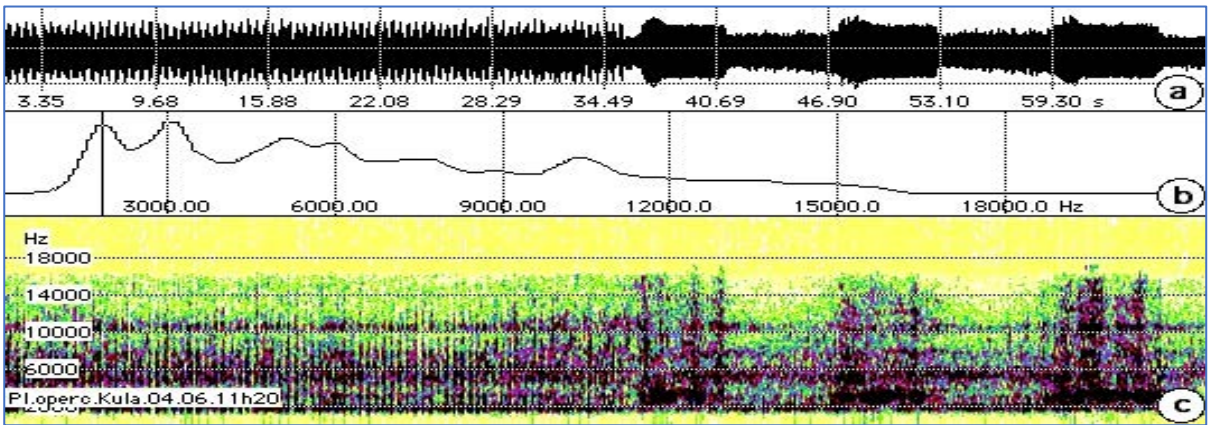


Platylomia operculata Distant, 1913. Adult male in dorsal view and a second, in the course of imagining, precisely in the crucial phase of total inversion, highlighting the long, wide, completely unobstructed but not yet deeply coloured opercula. **Chae Sorn N.P., June 2008 (MB Phots)**

Platylomia operculata is one of the most incredible Cicada, more than all the others already noted surprising. It develops an enigmatic form of behaviour. I was lucky enough to be able to detail this extraordinary passage of its natural history.

In certain localities, *Platylomia operculata*, whose adults appear each year more or less abundantly (the ecological or random periodicities of the post-embryonic state have yet to be established), offers a singular ethological phase accompanied by an occasional anthropological sequence, with the staging of a dramatic scenario.

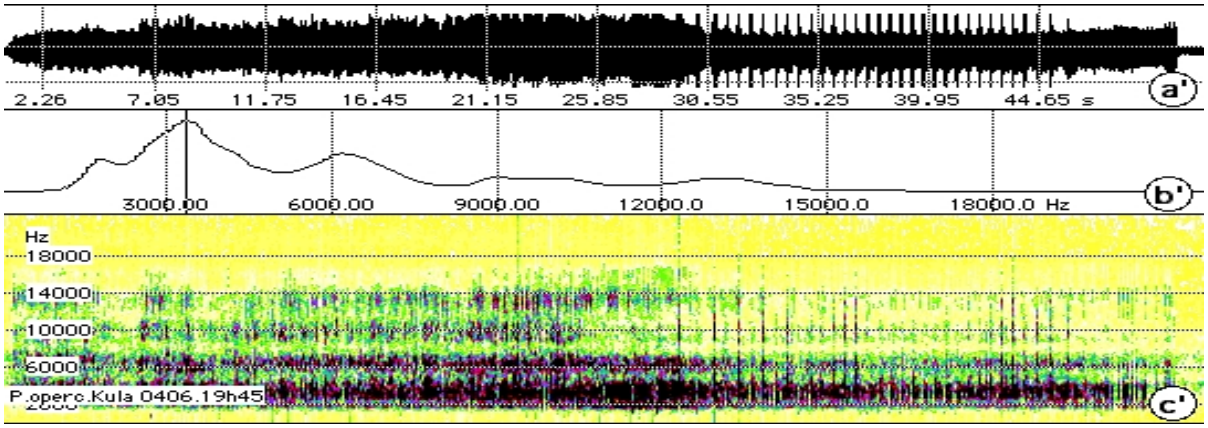
Explanations: *In natura*, during the day, *Platylomia operculata* draw sap, move from time to time, the males tymbalizing then in an identity way (see below the AIC), mating and the females laying eggs...



Platylomia operculata Distant. Acoustic Identity Card, April, in the morning **(MBK *on S. 3,5*)**

Nevertheless, as twilight is becoming more prevalent, many males have an imperative need: **to absorb clear, warm or lukewarm water (!),** a need that will trigger a scientifically unprecedented behaviour. More unusual than strange, sibylline, a general action will take place during the twilight-night period and in a "theatrical" way followed in turn by many extras! Let's report.

The end of the day giving way to the beginning of the night, the males seem to "snort" themselves **to emit a singular tymbalization** of barely a minute, but often taken up several times, by "*performers without bandmaster*", without one can assure that they are the same “exalted individuals!”, or performers newly arrived near the hot springs, second hypothesis however accredited later on. Here is the **AEC** as it can be established, resulting from a **twilight jazz band,** individually tymbalized identically:



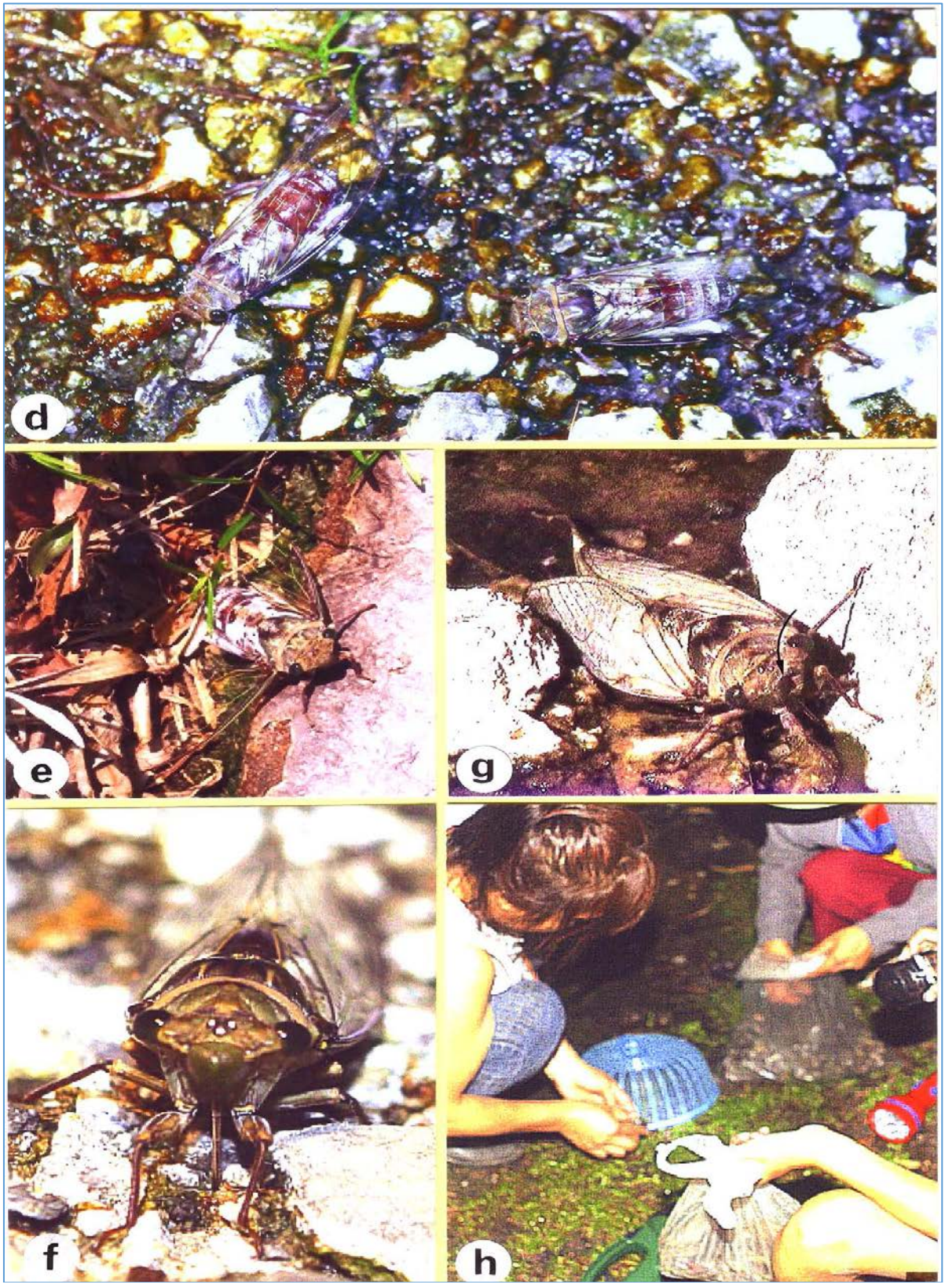
Platylomia operculata. **Twilight AEC**, April, advanced daytime ethiology **(MKB *on S. 3.5*)**;

Then, darkness established, the males, one by one, fly away... Until they fall here and there on the multiple rocky outpourings of the "thermal" waters **and drink for a long time!** A frightening driving if there is, carried out by these males evolving "normally during the day" in the forest of the hot springs flowing in multiple brooks on stony ground without, then, provoking the least interest in these same Cicadas. This conduct, in advanced twilight, remains without explanation, except a supposed requirement of mineral salts coming from the depths of the earth and which would miss the spermatic balance of these males, to say the least.

Moreover, this behaviour, which is unaccustomed and bewildering for the cicadologist, is well known to the indigenous populations and is put to good use. In the good years, in March-April, my Thai friends from the Chae Sorn region go in the N.P. with permission, to pick up hundreds and hundreds (!) of "*Tcha-kat-chan*" for culinary purposes. A concomitant fact underlined in the underlying observation: **the theatrical unfolding concerns only the males**[21]. No female, neither observed nor collected! (**Boulard, 2008d & e; 2013c**).

---

21) ***males***. From Laos, it was reported, a contrario, that only the females of a twilight-night species were appreciated, but following a completely different capture process... By mimicking the tymbalization of the males! At dusk, villagers gather around a fire and, clapping their hands rhythmically, they attracted many females... *(Annandale*, 1900; Berger, E., 1941).



Close-up views of the night-time collection of "thirsty" males

(d) Males having just fallen on the rocky bed of the hot spring. **(e)** Male stranding near a large rock. **(f)** Frontal view of a male, with its mouth rostrum planted between the stones delimiting tiny streams of hot water. **(g)** Postclypeus deformed by supposed collision (arrow) during the "uncalculated landing", this male still drinks, rostrum held on the watery fringe near the rock where he fell.
(**h**) Partial view of the harvesters and their cigalicides bags; in each of these, several hundred dying males (**e**, **g** and **h**, shots from a video). **(Plate taken from Boulard 2008d & e).**

The following morning, the few surviving male *Platylomia operculata* return to the nearby forest. Only a few corpses remain in the warm waters, males "badly fallen, more or less scalded in the too wide streams".

While the stalls of the neighbouring markets offer cooked "*Tcha-kat-chan*" dishes:

In a nearby market, appetizing cicada fricassees are offered.
"I'd like to savour a grilled *Tchakatchan*"...
The saleswoman, very amused, shows how! **(KC Phot).**

Last observation and supposed parameter: the quantities of males collected daily by the villagers in the first hours of the night, for nearly two months, suggest a kind of massive regional migration of males, newly hatched somewhere, towards the calm hot springs... Without any further comment, except to place this unusual species in the "**Cicadian Singularities of Asian species**" locker, joining the drinkers of water, clear or more or less polluted, the "always in a hurry" large *Tosena albata* and *T. melanoptera*, the hyper-bruisantes *Pomponia linearis* and others still, whose males, endowed with an astonishing movement, tymbalize from tree to tree, apparently without any sono-guidance followed... Without, either, waiting for the slightest female! (*cf.* Boulard 2013c, pl. 24 and 25). Males that amazed me, but also too often annoyed by their frivolous impatience, incomprehensible for an average cicadologist.

Also, the astonishing behaviour of the males...*operculata* arrived somewhat at the right time to make the " Front page " of a French-speaking ‘bangkokoise gazette’:

lepetitjournal.com
Le media des Français et francophones à l'étranger

BANGKOK Bangkok, Vendredi 12 Avril 2013 28°C

INSOLITE — Le suicide extraordinaire des cigales régale les Thaïlandais

UNUSUAL - The extraordinary suicide of cicadas treats the Thais

Après douze années de recherches en Thaïlande un spécialiste français a mis en relief un comportement unique au monde chez des cigales vivant dans le nord du royaume.

Entre avril et mai, les riverains du parc national Jaesom dans la province de Lampang s'équipent chaque soir de lampes électriques pour un rituel gourmand dont le scénario est connu depuis des générations. Ils savent qu'au crépuscule les cigales viendront au bord des eaux peu profondes des sources chaudes dont la température avoisine 80°. La elles sont d'autant plus vulnérables que la végétation a été éclaircie pour le confort des touristes nombreux pendant la journée. Les villageois prélèvent plusieurs kilogrammes d'insectes qui seront consommés bouillis et salés ou sous forme de tempuras. La cueillette peut être répétée chaque nuit, car les cigales reviennent inlassablement s'abreuver sans que leur population semble pâtir de ces prélèvements massifs qui fournissent une manne de protéines appréciée par la population locale. Généralement sourcilleuses, les autorités supervisant le parc naturel ont même émis une directive spéciale autorisant la pratique tout au long de la nuit au bon vouloir des villageois.

Le phénomène peut également être observé près des sources d'eau chaude de San Kamphaeng et de Ban Pong Din dans la province de Chiang Mai. Rentré dans les mœurs, il n'avait pas suscité de curiosité particulière jusqu'à ce qu'un Français en relève le caractère exceptionnel après avoir passé une douzaine d'années dans le nord de la Thaïlande. Une période essentiellement consacrée à l'étude des cigales dont Michel Boulard a analysé le comportement dans le monde entier. La genèse de cette passion fleure bon le tableau noir, la craie et les blouses grises des hussards de la République... et Pagnol. La passion des cigales a gagné le jeune étudiant parisien lorsque celui-ci s'est aventuré pour la première fois au sud de la Loire en 1960. Une jolie place au certificat de géologie générale avait alors été récompensée par un voyage en Provence organisé par la Faculté des Sciences.

De son séjour au pays du sourire Michel Boulard a tiré 49 articles et 2 livres (1) consacrés aux cigales siamoises tant leur comportement tranche avec ceux qu'il avait pu observer à travers le monde. Jamais il n'avait vu des cigales s'abreuver auprès d'un point d'eau, car celles-ci ponctionnent d'ordinaire la sève des plantes. En outre tous les individus observés en train de s'imbiber de la sorte sont indistinctement mâles. Aveugles durant la nuit, ceux-ci parviennent à se diriger jusqu'à l'eau sans coup férir. Une chance, car leur soif se manifeste exclusivement durant la nuit. Lorsque pointent les premiers rayons du soleil matinal, les rares survivants de la razzia nocturne opérée par les villageois regagnent le feuillage et se désintéressent complètement de la réserve d'eau toujours disponible. Quant aux autres espèces partageant le même environnement, aucune ne démontre la même soif que cette cigale si particulière, nommée Platylomia operculata, dont les ailes non colorées attestent du caractère comestible.

(1) The Cicadas of Thailand (2 volumes avec disque audio), Michel Boulard, Editions White Lotus 2012.

E.D. (http://www.lepetitjournal.com/bangkok) vendredi 12 avril 2013

SONGKRAN – Le nouvel an lunaire fêté du 12 au 16 avril

Les Thaïlandais vont célébrer leur nouvelle année à partir du 12 avril. Au menu : repas en famille et bataille d'eau. Si vous n'aimez pas être arrosé, tant pis pour vous, il vous sera difficile de passer entre les gouttes.

Anyway, at my "mast of cocagne" of the Asian Cicadas,
an unexpected species... Was waiting!

d) *Cicadmalleus micheli*, the unexpected, the unimaginable Hammer-Cicada!

The cicadologist in me had not experienced, nor even wished for the most unexpected of all the possible genetically-typical discoveries in the training of his discipline: the existence of a distant little cousin of the unbelievable Diptera and Psylla, or even, let's say it, of a certain Shark, a Hammerhead Cicada!...

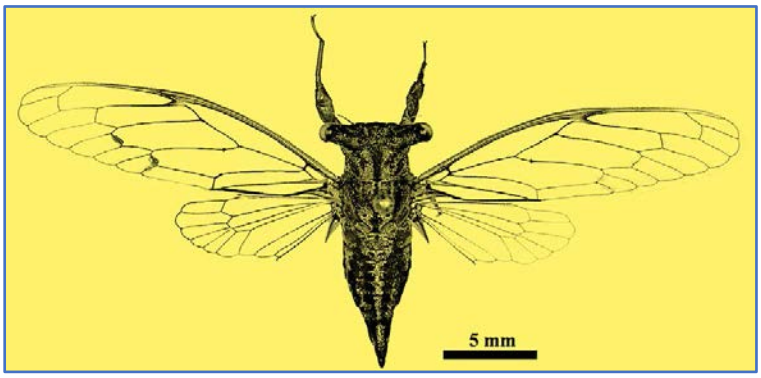
Well, '***Tonnerre de Brest!'*** It does exist! Not in front of anything in the 'Comic Book'. The revelation was even a gift of chance, which sometimes does things well, even with some delay...

Let's reveal the most incredible cephalic morphology shown by this very singular representative of the world's Cicadofauna. It is a confession that is full of astonishing anecdotes, all the more so as it took place "on my land, cicadologically dug out for a good dozen years", but in a Thai province that my team and I rarely visit, because it is very anthropized! Go understand... Well, here it is:

In April 2002, during one of his Missions in Thailand, in the Central Plateau Province of Nakhon Ratchasima, **Bruno Michel**, a colleague specialized in Myrmelontidae Neuropterans (antlions in larval state) had the good fortune to capture two "mini-Cicadas", during threshing to catch the adults of his study subjects with a net. Good fortune at first not considered as such.

Bruno, with his myrmeleons in mind, labelled and kept the mini-cicadas with a few other catches from hunts not immediately controlled, to be reviewed in a "later" ... Forgotten.

It wasn't until the end of 2013, talking about the field and entomological research with **Stéphane Puissant**, one of my former students who became a confirmed cicadologist, that **Bruno** remembered the mini-captures in question. So he showed them, just out of curiosity... **Stephane**, he said, fell more than a little, took two pictures that, without delay, he sent me ...



Amazing weather! Not daring to believe my eyes... In front of the photographic enlargements... I, an experienced cicadologist, who had just published a big work, precisely on the Thai Cicadas, had before my eyes, the images of a Cicada with symmetrically hyper-pedunculated eyes, "hammered" therefore and Thai, what is more! Thunderbolt, echoed in the 210 years of Cicadology: 1802, *Pierre André Latreille*, inventor.

With Stéphane, we described the species, dedicating it to our excellent colleague MICHEL, ***Cicadmalleus micheli*** Boulard et Puissant, 2013 and published this new "scoop" in my EPHE magazine, referring, somewhat torrential (!), to the only two females we had at the time, believing that they were very special representatives of the Cicadetta group... Error rectified shortly after... After that, with the help of the season, I took back my 4x4 for the center of Thailand and the Province of Nakhon Ratchasima.

In April 2014, locating the locus typicus, the initial territory of the species prescribed by Bruno, two of us, then three of us, searched for a long time... Nearly three days... Finally, we managed to locate a small population of ***Cicadmalleus micheli*** in the large outbuildings of an old Buddhist temple, surrounded by a high wall and long established in the Pak Chong district. There we were able to see, photograph and record the prodigious species, a 'mini-exception', about 21 millimeters long, wings in place included. Below is one of the first females spotted with strong binoculars, then caught at the 800 mm.

(MB phot. April 2014, with a big thank you to Buddha!)

"**Kraho Sai Sayan**"(name of this Temple) is located on a vast domain largely in abandonment, although the religious building, as well as some close outbuildings are in perfect condition, inhabited. A few specimens of both sexes were followed and captured in their midst, the canopy of trees and shrubs occupying a hill with steep slopes.

Cicadmalleus micheli Boulard & Puissant, 2013 in natura**);** above, facial portrait and below is a profile of a newly harvested female **(MB and SP phots)**:

At the net and in 10 days, only 4 males and 6 females of the little monster were captured, which, moreover, our light trap did not seduce. But finaly here it is:

From the first capture of a male, I noticed that it was in no way a Cicadetta, as first evoked by the examination of the two typical females, but a mini-Cicadina... The examination of the males allowed to rectify and to specify the real systematic position: it is advisable to place the genus *Cicadmalleus* in the Tribe of **Cicadmalleini Boulard & Puissant, 2016 (Stat. Nov.)**, being situated, by the conformation of the external genitalia, relatively close to the *Tanna* group of the *Leptopsaltriini* (Moulton, 1923: Lee & Emery, 2013), in the Sub-Family **Cicadinae**. Recorded.

Cicadmalleus micheli, a) Male prepared for examination of left profile; b) Close-up view of cymbacalypta, triangular piece with rounded apex overhanging the tymbal, cicadinean character (**MB Phots**).

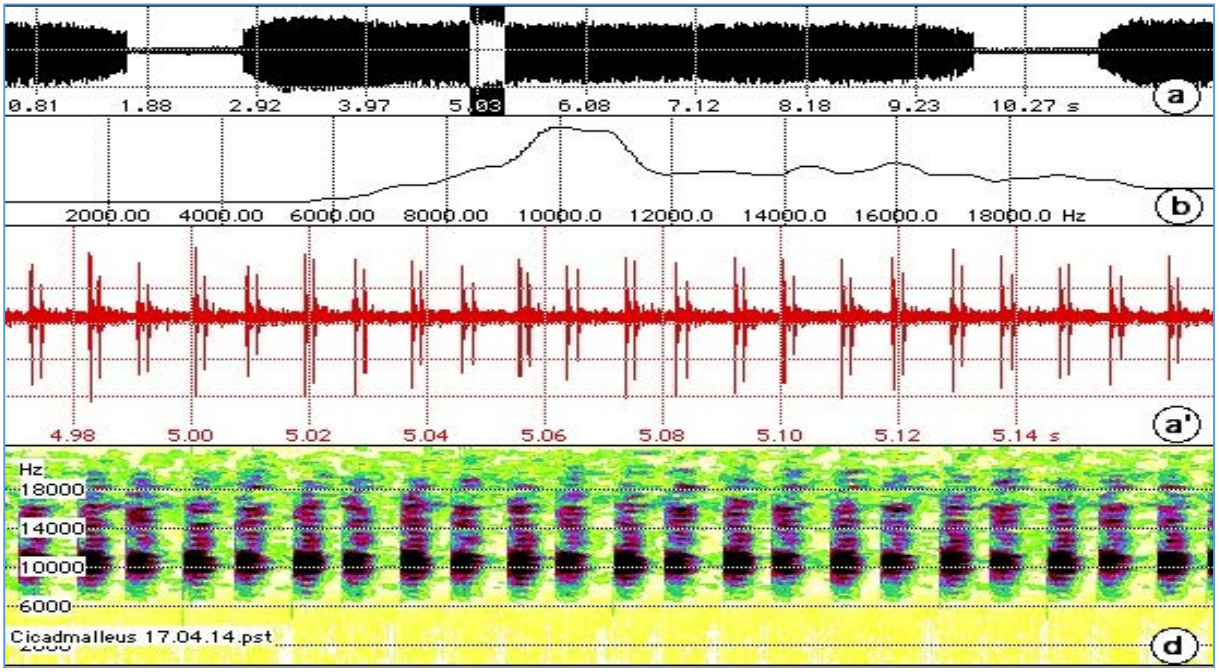
Eco-ethology:

The detected population seems to have been confined in a very isolated locus typicus, little humanly visited. In addition, males and females showed solitary behaviour, both affectionating isolated pre-Canopian twigs and stems. During the day, they feed or take some rest. It is only in the late afternoon, as dusk approaches, that males activate their tymbals until the early hours of the night. They produce a music quite high in frequency, very tenuous, inaudible to our old ears.

Thanks to the excellent hearing of **Pornnapa**, our young assistant, we were able to make good recordings, listening to several males in succession.

Pornnapa Boonyu effectively contributed to the discovery and registration of *Cicadmalleus*.
Pak Chong Temple, April 2014 (MB Phot).

The very explicit Acoustic Identity Card of this extraordinary species could then be drawn up on the spot, once again using "*Signalyze*", the sound signal analysis software created by **Eric Keller** of the University of Lausanne. I have already said how much I owe to this Swiss Colleague in my ethological approach of the Cicadofauna in their environment.



***Cicadmalleus micheli* Boulard & Puissant, original AIC graphic explained below**

(a) Waveform based on 12 seconds of the time signal with transcription of a call sequence framed by short silences of barely 1 second, each lasting about 7 seconds. **(b)** Medium spectrum plot showing a low peak centred at 7200 Hz, an expression of the fundamental, then, culminating at 10,000 Hz, an effective dome based between 8,000 and 12,000 Hz, which is followed by an evanescent formantic train, undulating five times until it exceeds 18,000 Hz. **(a')** Waveform extending in an arbitrary 1/4 second space-time taken in the middle of the sequence (range inverted in (a)): the elementary signals appear individualized, operating in very close pairs and regularly repeated. In each pair, the first element appears slightly stronger than the second, an apparent translation of a slightly shifted operation of the tymbals (?)... **(d)** Spectrogram specifying the height of the effective frequency values of the call signal and the regularity of their repetitive function.

Nakhon Ratchasima Province, Pak Chong, Wooded Hill, April 2014 (MB Sonotype *Signalyze 3.5*).

Cicadmalleus micheli, on the left, a Male at rest; on the right, a Female, its first legs up, seems to appreciate the sap that has been tapped. **Pak Chong, April 2014. Specimens in breeding (MB Phots).**

e) The Thai Cicadas have not finished surprising us...

First witnesses for the prosecution, the *Gaeana* and their periodic hatching

These ***Gaeana festiva*** (Fabricius, 1803), during a mass outbreak... Episodic, periodic?
Thailand, Ban Khun Pra forest, (MKB Phot).

Second prosecution witnesses, the *Becquartina* and their different phenotypic costumes

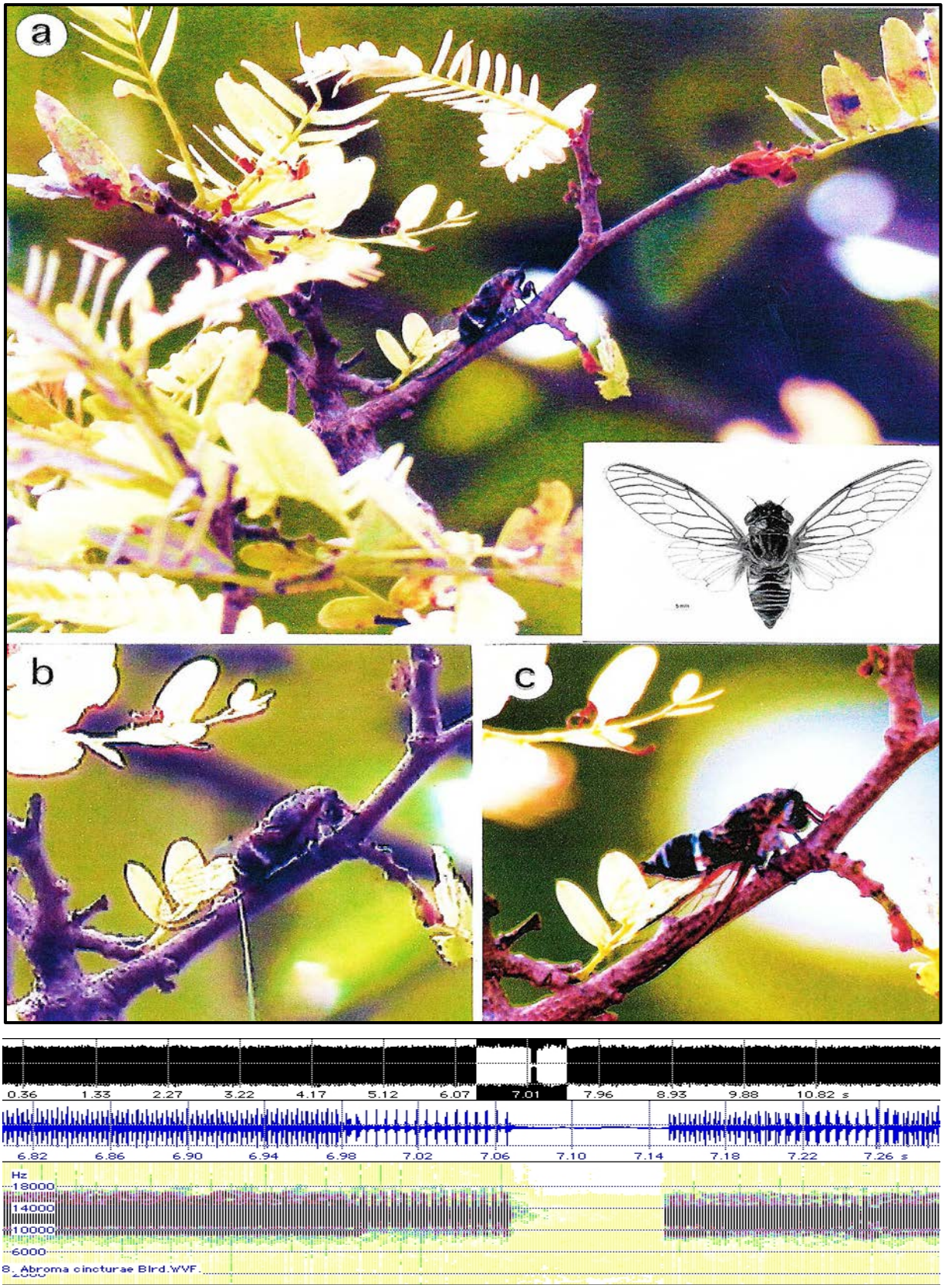
Thaiand, Houaï Nam Gun forest (MB Phot).

Also on charge

-> Psammophiles, *Meimuna* and the like! Occupying, such as here, a small sandbank allowing to draw water from the then quiet course of a small mountain river:

Close snapshot of a small group of the previous ones (MKB Phots).

-> Canopy species, control: ***Abroma cincturea*** Boulard, 2009, mini species about 25 mm long. Daily stages of a male feeding (a), urinating (b) and tymbalizing (c) on a tall branch of one of its favourite trees, a large Tamarind:



Phetchabun Province, Nam Nao, May 2008.
(Drawing Gilbert Hodebert. MKB Video + Sonotype *on Signalyze)*

-> And many others that are on revealing documents, such as the one below

Near the small Maekampang torrential river that has become familiar, one of my last photographs: **two Thai Cicadas drinking together on a mini beach:**

Male of **an unknown Big Cicada brown-green unknown** (?!), drawing water from the wet bank in the company of a 'regular', a male ***Meimuna duffelsi*** Blrd... (**MB phot. April 2014**).

f) Cicadas, provender of the Thai Gastronomy

In addition to the *Platylomia operculata*, distinguished above, other species of Cicadas enter the Thai gastronomy, in the imaginary state as well as in the juvenile state and are trapped in various ways. Some adults are captured individually with long poles pointed with fat, as already reported among Central African Boffis (*cf.* p. 90); others are captured collectively, using a series of large sticks stuck for a long time with a sticky paste prepared with rice (*cf.* Boulard, 2013c, Pl 41).

A little-known folk case, that due to *Platypleura mira* :

During the last subterranean stage, about a month before the imaginary hatching of the species**, the juvenile V**, pre-mature are only found at a depth of 5/10 centimeters; they are then "harvested" with a hoe (!):

***Platypleura mira* in human nutrition**

-> In November, entomophagous villagers in the Mae Mo region (Lampang province), armed with simple hoes, scrape the ground to flush out pre-mature juveniles already close to the surface.
-> Juvenile V in its open burrow. **->** Basket where juvenile V collected alive are piled up.
-> Two villagers are satisfied to bring back their harvest [made in 3 hours of hoeing on a favourable ground, not known to all]; the juvenile V will be boiled and then sold at the Market.
-> A customer (*Khuankanok*) asks about the price of the packages offered...
-> 50 Baht is the price of a bag containing **100 boiled juveniles V (!)**.

Mae Mo (Lampang Province), end of November 2009 (MB Phots).

D) Mimetology

a) Usual ploy of the “amazingly colourful” **prey**, warning that they “are not edible”, The trenchant colours of a small Cicada of the Thai sub-mountain forests, make it known, true or false, that it is not delectable.

Mogannia paae discovered in 2009.

b) Kallima's confounding strategy with one of the most surprising mimetological falsifications.

These Butterflies hold this strange power to suddenly escape from the sight of their enemies, whether they are in flight or drinking, wings open, more or less quivering ... The richly coloured upper side of these wings (hereafter **slide 1**), attract predators, most often a bird... which will foment an obvious attack...

As soon as it perceives a danger, the *Kallima* closes its wings above it, or flies away to land in the immediate vegetation, showy wings closed, and... Disappears!

Not only does it expose only the grey underside, more or less mixed with red, of its double canopy, but in an attitude and a cut such that the Insect "is nothing more than a useless old leaf" (**slide 2**). The hind tips of the closed wings draw a sort of old broken petiole... Another colour, another shape, the bird quickly lost sight of the appetizing promise? Magnificent case of instantaneous mimicry, disappearance pushed to the extreme!

The immediate pseudolysis of *Kallima inachus siamensis* in two paintings:

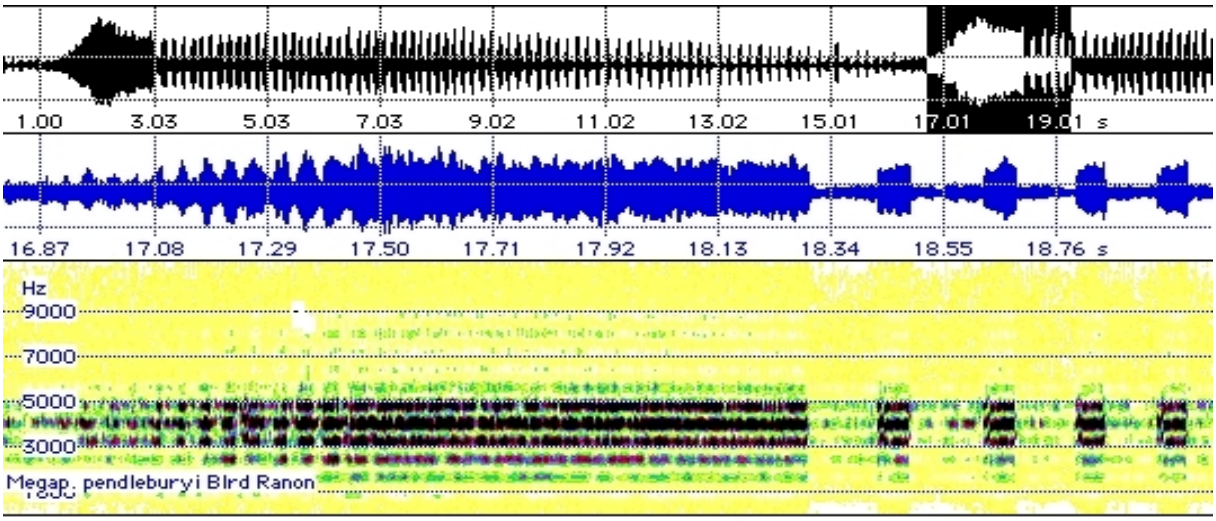
Slide 1) *Kallima* drinking, wings open, on the wet bank of the Ping River (**J.D. Moore Phot**)
Slide 2) *Kallima* just escaped the worst (**MB Phot**).

E) For the Record

->With my Suzuki Caribean posing and dating on an excellent footbridge spanning a drift of **the "Ping River", near Chiang Mai. April 2000**

->Discovering ***Megapomponia***. I am challenged by tymbalizations of ***Mgp. pendleburyi.***

Twilight trumpet player. PI, Photographic Identity (9, 1 cm, from head to wing tips)



Megapomponia pendleburyi (Boulard, 2001f), first soloist, **its Acoustic Identity Card**.
Ranong, Tungka forest highland, February 2001 (MB Phot; on *Signalyze,* in MB 2013)

Above left: 4 laps due **to juveniles V/nymphoid**. On the right, **1)** I point the first construction detected, then **2)** breaking it to show that it is indeed a Cicadidian tower. **3)** Max Somraj Chanso inserts a stem of "*Thonham*" (palm leaf rachis with inverted spines) into the burrow... until, in **4)** taking out the nymphoid thus hooked.

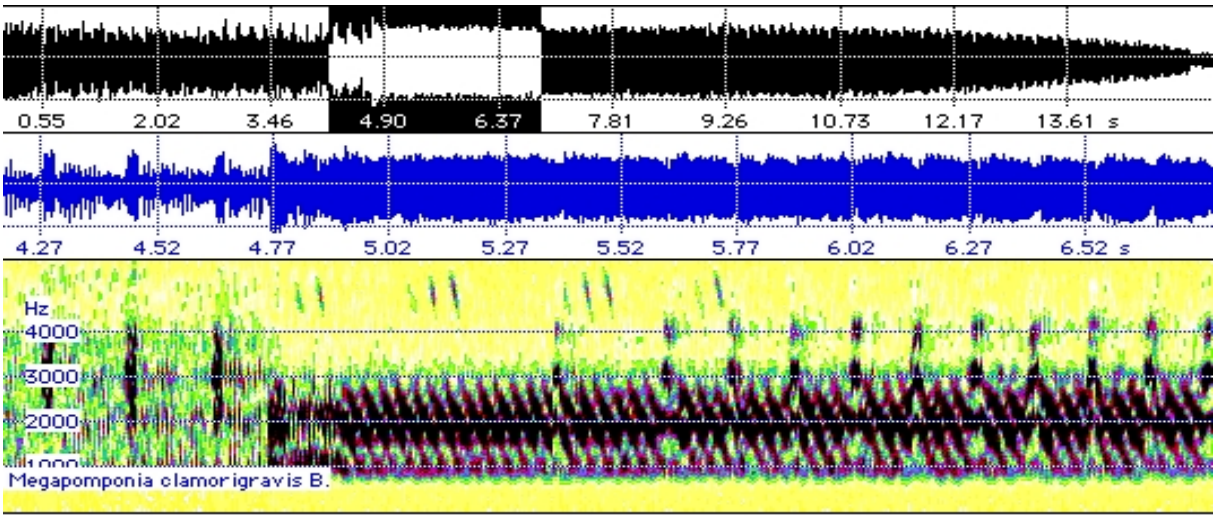
[3]

***Megapomponia pendleburyi*... Gone, no forwarding address!**

Ranong, montane forest, February (MKB Phots; Boulard 2001f).

The unexpected Twilight Tubist

PI: more massive body (9, 7 cm, from the head to the tip of the wings)



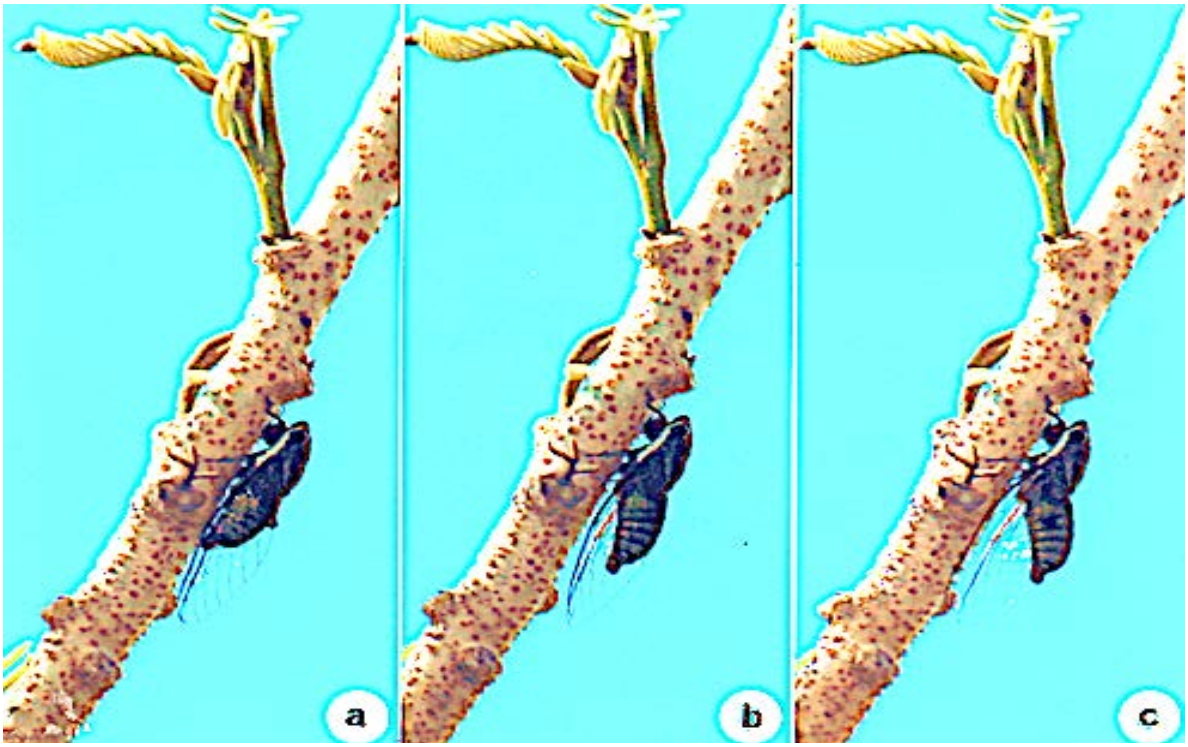
***Megapomponia clamorigravis* Boulard, 2005e, PI and AIC of the second twilight musician!**

Ranong, Tungka montane forest, December 2003 (MB Phot; sonotype *on Signalyze,* in MB 2013).

In the multiple sub-mountainous forests of Thailand

-> Recording ***Macrosemia khuanae*. Top forest of Khun Lao, 1300 m, in October (KC Phot)**

-> Recording *Platypleura mira* in Mae Mo Dry Forest, June (Lampang Province) (MB Phot)

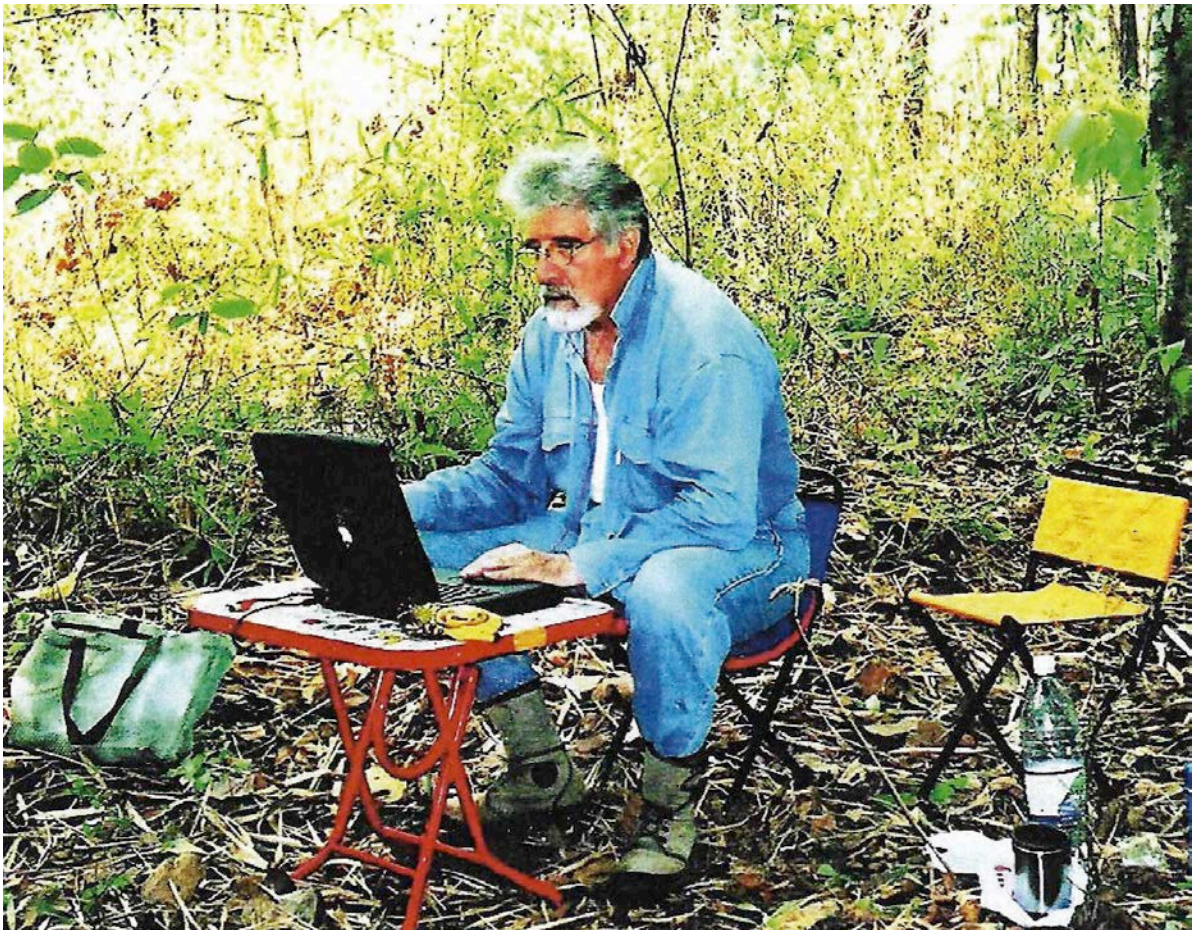


-> **Sumboom** attempting to detect and capture ***Abroma canopea*** Boulard, 2007, mini-species canopy: **(a)** Male at rest; **(b)** and **(c)**, the same in its tymbalizing phases...

Ranong Province, Tungka Forest in February (MB Phots)

Khuan recording ***Cryptotympana gracilis*** **in the Ban Khuang Dry Forest, in April (MB Phot)**

With my old camcorder... In a green valley around Lampang, in September (KC Phot)



Noting some impromptus offered by the Cicadas of "Wang Nea N.P. (KC Phot).

Working at home in music

I owe to her the preparation, spread wings and stretched pygophores *for the binocular,*
of a good part of my Thai Cicadas collection **(MB Phot).**

Between Pa Miang and the Chae Sorn N.P., the lightning of a Giant put this one overhanging of the steep runway, a few days before our passage (KC Phot).

-> Fossiles

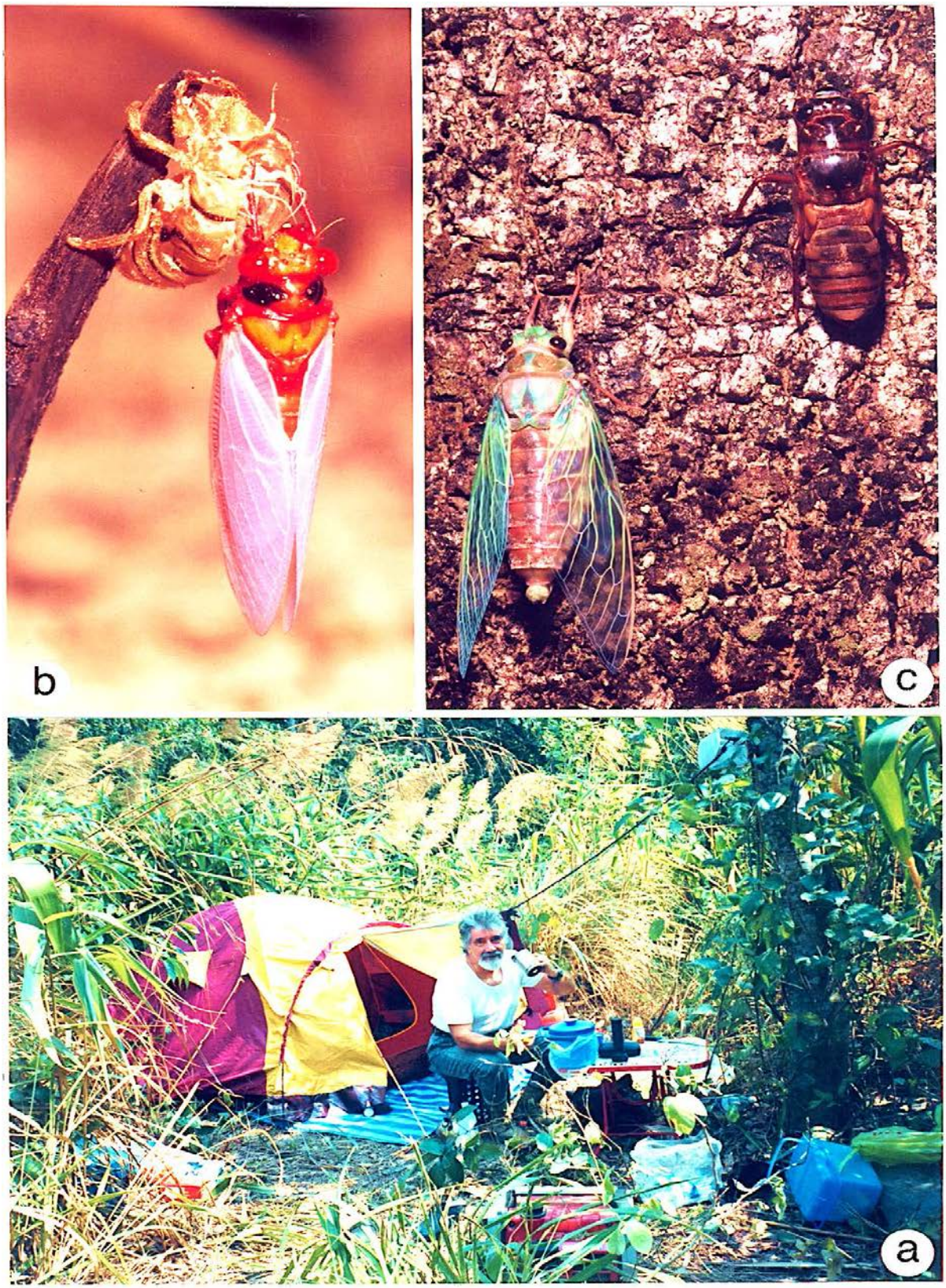
A few months before we spent exploring the forest surrounding Tak, a city in western Thailand, huge silicified trees were discovered and dated to the dawn of the Quaternary. This photo, a precious document, shows the most beautiful perfectly clear trunk (73 m long), still exposed to the open air. Today, it is kept in a shed that is perfectly adapted to its size. **Tak District, January 2006 (KC Phot)**

-> Tsunami 2004

Coastal biotope of Kapoe and its large Casuerina (Ranong Province) specific to ***Dundubia andamansidensis*** (Boulard, 2001). This strip of land resisted the strong tidal wave of 26 XII 2004, partly thanks to the enormous white concrete stones (w-w) lining the shore, but also and above all by the deep roots of the Casuerina, which have remained perfectly erected, thus honouring their nickname of "Iron Wood".

A month before, we were on **Phi-Phi**, a neighboring island that was totally devastated (**MBK Phot 02.07**)

The Chiang Mai '*Boulardière*', shortly after the Storm of December 4, 2007.



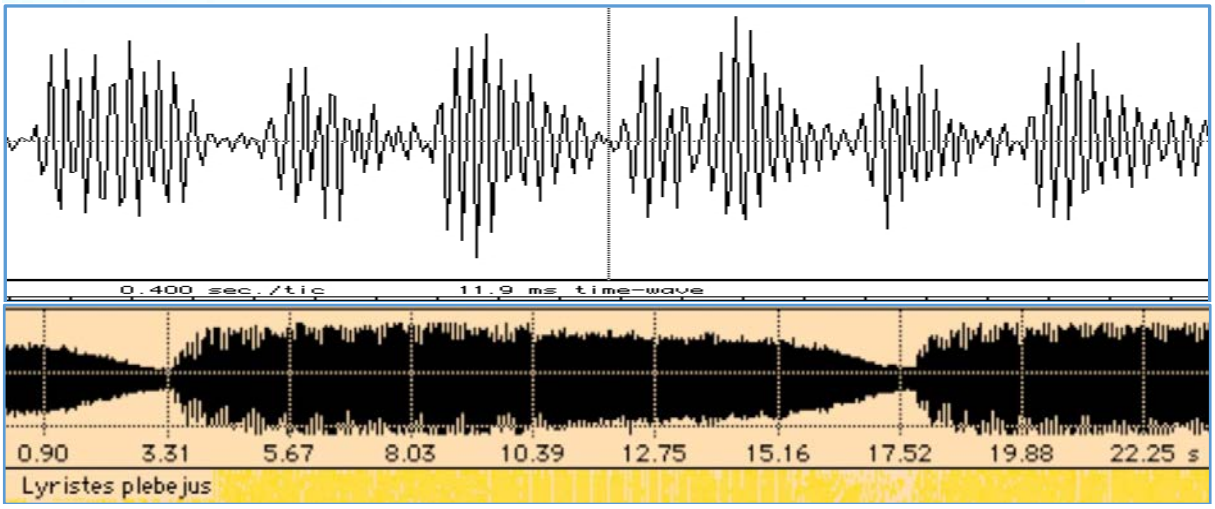
-> On April 9, 2009, anniversary day supposed to compile some actions in the forested south of Chiang Rai province: (a) 8 o'clock, I taste a cup of cocoa. **(b)** 10:30 am, a ***Huechys beata*** (very fat) finishes its imaginaison. **(c)** In the evening, two sympathetic neighbors -> on the left, a male ***Pomponia linearis*** finishes obtaining its specific coloration, -> on the right, a nymphoid of ***Platylomia operculata*** climbs the trunk, developing its astonishing exuvial phase, **very eager** to find the appropriate place to finish its imaginary moult… (**MKB Phots**).

Well installed in front of the Sapindacea host of *Distantalna splendida* (Distant, 1878), I collect a series of slides on this splendid Cicada. **Chaîne forestière du Doi Mon Kia, avril (*Sumboom Phot*).**

The calm of the Buddhist temples was often favourable to the cicadologist… (KC Phot).

***Cicadmalleus micheli* (MB Phot)**

Concluding the essentials of my studies and research on Cicadas, these Visuals



Lyristes plebejus **(Scopoli), the musical jewel of Provençal France, the first "guinea pig" who contributed to the elaboration of the instructions metamorphosing the cicadidian sounds into taxonomic graphics.**
Homage to André-Jaques Andrieu, to Éric Keller, inventor of *Signalyze*, as well as the engineers that created the *"MacSpeech Lab"*.

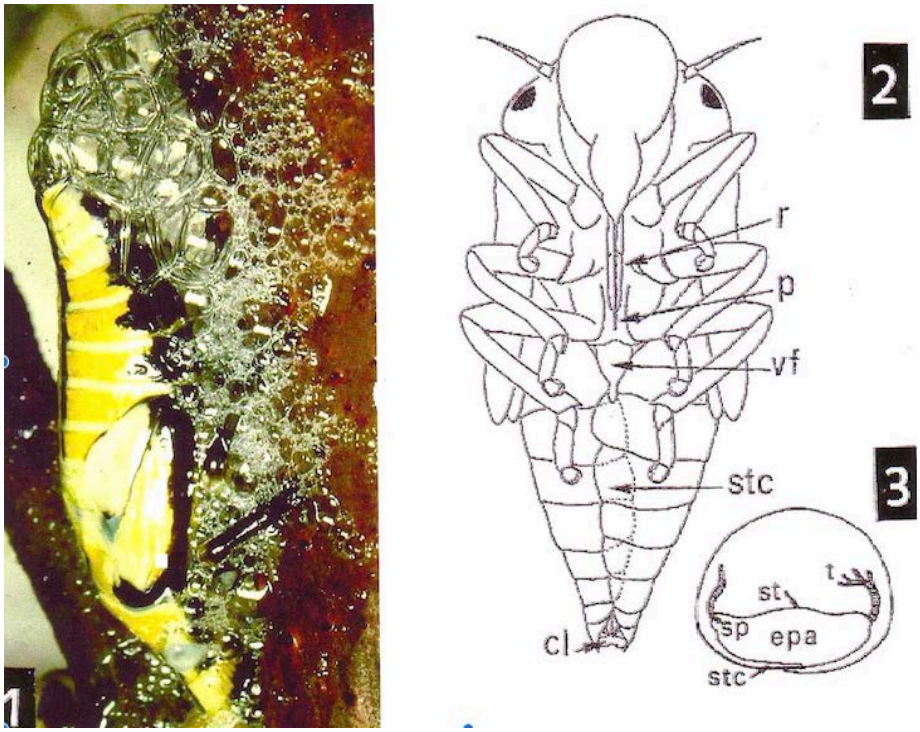
II.- Cercopidae

Close relatives of the Cicadas, the Cercopidae, Cercopides or Cercopes make up a family of Auchenorhynchous of more modest dimensions and without "giant" species as in the Cicadas, or even in the Fulgores seen further on. Their forewings are often narrow and sclerotized (non-foldable homelytra), while the hind wings are broad and membranous, longitudinally foldable under the former. The hind tibias bear 1 to 3 spicules, which are strongly attached. The Cercopes are large sap-suckers, with hemimetabole development, whose newborns develop rapidly as juveniles, but in a curious protective environment isolating them from the outside.

My investigations concerning Cercopids were only occasional, carried out first with harmful species (Boulard, 1967e, 1969d), then oriented towards the study of the genital apparatus and certain structures related to the female sex.

a) The astonishing post-embryonic environment of Cercopidae

Like the Cicadas, the Cercopidae, and spectacularly the Aphrophorinae, have a three-phase development only out of the ground. From birth to imagination (French '*imaginaison*'), they remain on the nourishing host plant in a singular isolating environment, a bubbly, foamy abyss made by newborns and juveniles, where they all stand upside down. The main material, their mucinous urine, is infused with air from a spumiferous system, an abdominal "mini-blowhole" resulting from their post-embryonic state. Each individual will develop, covered with a bubbly blanket, thus directly subtracted from the aerial environment, which the adults will reach, imagination accomplished.



1) Juvenile of *Ptyelus flavescens* (Fabricius, 1794) rebuilding, *upside down*, its foamy shelter, which was pushed aside by the observer. **2** and **3** Diagrammes of the face and of a cross section of the abdomen showing the particular extent of the stigmacalyptes (**stc**) which form the parasternal aerial enclosure (**eap**), which is closed at the front by the triangular flap (**vf**) emanating from the second abdominal segment and possibly opened at the rear by the flap (**cl**), during bubbling emissions. Other letters: **p**, piercing (vulnating mouth styli); **r**, rostrum; **sp**, spiracle (stigma, respiratory orifice); **st**, sternite; **t**, trachea (**Boulard, 1991b**).

These bubbly clusters are known under the nicknames Frog-Hoppers, "cuckoo spit" or accompanied by the poetic "spring foam", since it is in April-May that the European species appear in this way.

b) Cercopes imagination.

Some tropical representatives live in "foamy colonies" that are often dense, because they are composed of many juveniles all upside down, incontinent and blowers ... To the point that, under the feeder trees, the ground can appear wet, soaked as if by heavy rain. Thus, with ***Ptyelus***, large bulliferous cercopes common in tropical Africa.

Imagination being imminent, adults almost complete, the nymphoids turn around to leave, head high, the bullous cover, then the nymphoid remains, the exuviation revealing imagos quickly reaching the specific imaginal hues:

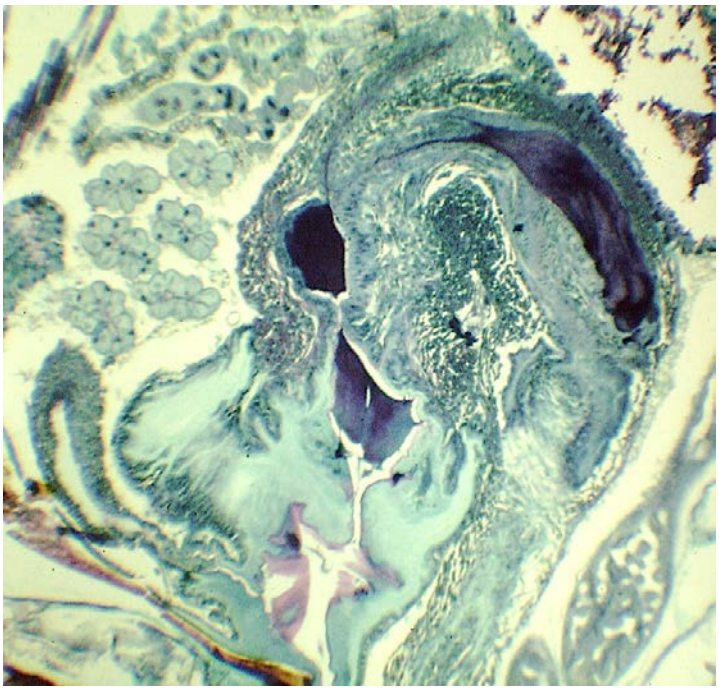
Here, the species ***Ptyelus grossus*** (Fabricius,1794). Central African Republic.
Boukoko, April 1966 (MB Phots).

Vigorous jumpers in the imaginal state, with a fast but short flight, Cercopides move easily, in search of a suitable plant, or a reproductive achievement.

c) Ectodermal genital tracts

The genital apparatus of the female Cercopes is of a fundamental construction very similar to, or close to, that of the Cicadas, but has some significant particularities. I give two examples that have attracted the attention of.

> ***Lepyronia coleoptrata*** (Linnaeus, 1758), an european species usually found in wet wastelands, has a genital system very comparable to that of the Cicadas, but with a single external orifice. We find the long vermiform gland, the voluminous spermo-destructive pouch and the seminal ampulla, the latter elongated:



Lepyronia coleoptrata, imaginal morphology (**MB Phot**) and para-axial histological section from the genital tract of a female shortly after being inseminated (Boulard, unpublished).

Only the filamentous glands and their reservoirs are missing, as in all the Cercopides examined.

> ***Locris maculata*** (Fabricius, 1781), an Afro-tropical species which showed a different structure, as it does not have a seminal ampulla. The role of the latter is played by an even formation, symmetrically dependent on the common oviduct and consisting of two strong, long "seminal tubes" folded in the proximal third and ampuled at the distal end (Boulard, 1979k; TS in figure, next page). This species and all those of the same genus examined (and more precisely ***Locris hieroglyphica*** Lethierry, 1883) with the help of Jeanine, at the time technical assistant at the EPHE, drew our attention by the morphological singularities carried by the sixth and seventh sternites, ventral territories preceding the base of the ovipositor.

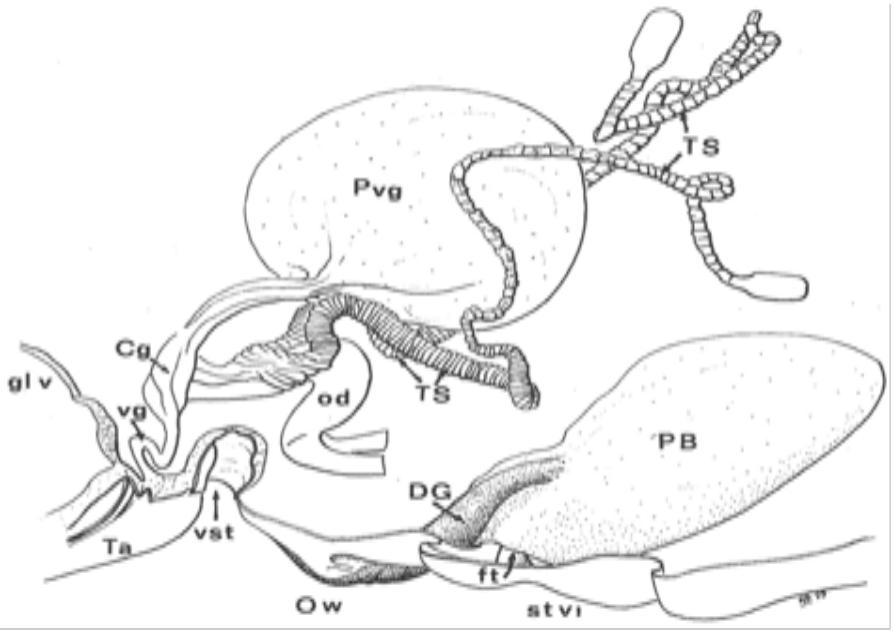
e**) The locrisian apparatus** (MB/JB, 1979k)

In female *Locris*, Sternite VII, or ovivalvula, has a large, coarse, cylindro-conical, mid-longitudinal bulge whose apex disappears into the body in the middle of the anterior margin. Sternite VI is characterized by a tiny medial opening on the back. These singular conformations, never observed before, betray externally the existence of an internal structure associated or not with the genital tract of these female ***Locris***. Dissections and histological sections revealed (fig. next page):

> The bulge constitutes a kind of two-gutter pipe in a prolonged relationship with an internal formation, piriform and relatively large in volume (PB of the figures).

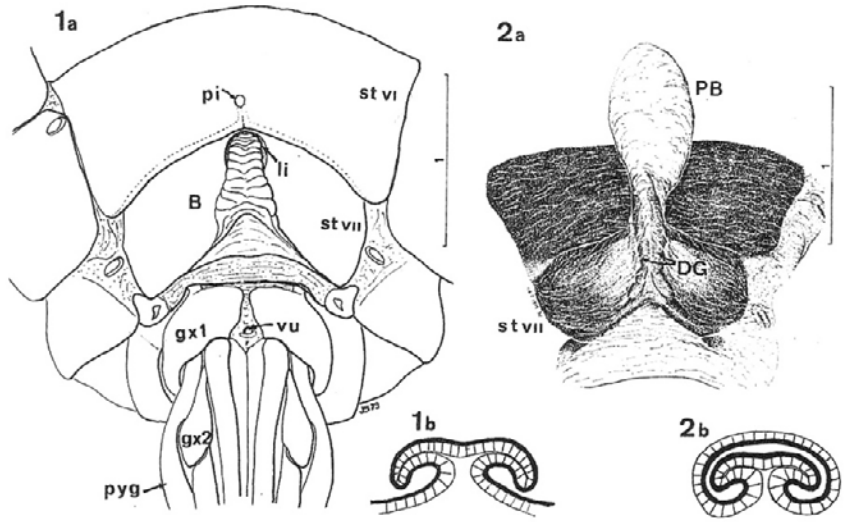
> The small orifice of sternite VI corresponds to a tubulo-conical invagination that is implanted in the base of the piriform formation in question, opposite the gutters.

> No apparent relationship with the genital tract itself.



Locris maculata, female: **Dissection of the Genital-Locris Complex**.

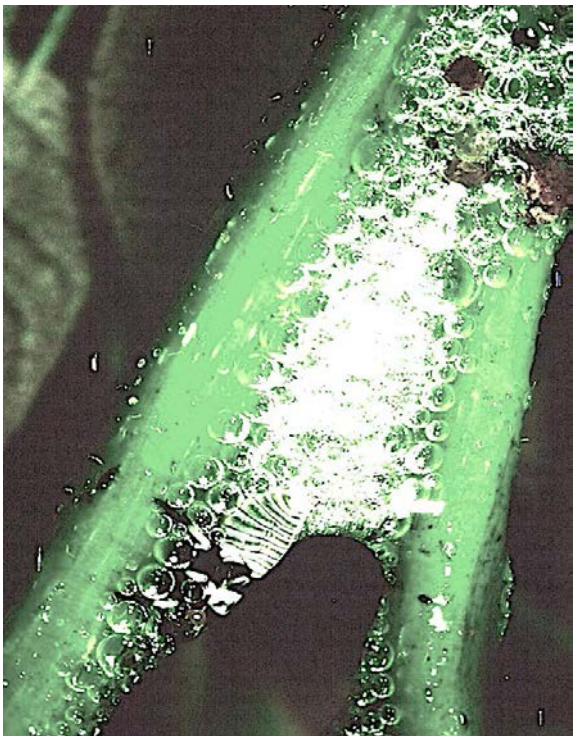
Explanation of letters: **Cg**, genital oven-ridge; **DG**, double gutter; **ft**, tubular formation emanating from Sternite VI; **glv**, vermiform gland; od, common oviduct; **Ow**, ovivalvula; **PB**, bulla, producing and accumulating secretion; **st**, sternite VI; **Ta**, auger base; **TS**, seminal tubes; **vg**, vagina; **vst**, vestibulum, (MB sketch).



Locris maculata, female: **1a**) Ventral apex of abdomen; **2a)** Internal view of sternites and position of local organ: bulla **(PB**) and double gutter (**DG**); **1b, 2b)** Schematic sections of DG at mid-height, then basally. Other letters: **B**, medio-longitudinal bulge masking DG; **gx**, gonocoxite; **li** or **pi**, place or point of invagination respectively on st VII and st VI; **pyg,** pygophore; **vu**, vulva.
MB Sketches, Hélène Le Ruyet-Tan drawing.

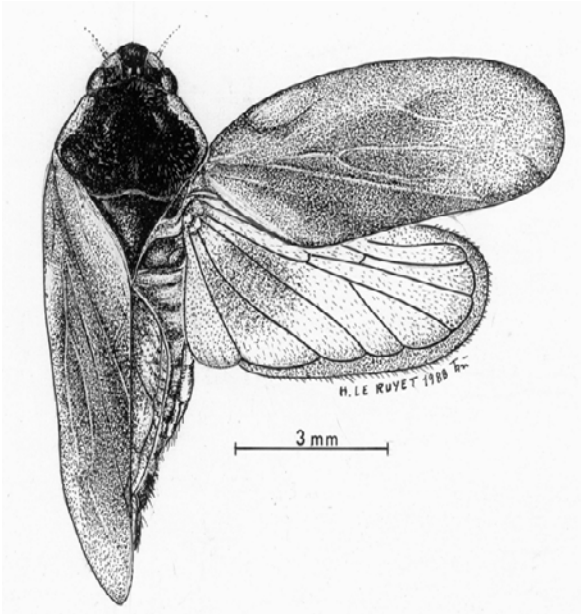
The locrisian apparatus is thus an intra-abdominal glandular formation with external efferent canalicles (PB-DG) and, to date, not seen elsewhere in Cicadomorphs. In ethological comparison with the large, sensillium-filled antennal pedicels of various types that these Cercopids carry, we have assumed that this apparatus could have the function of secreting a pheromonal-type sexual attractant, which, until further information was obtained, has neither been confirmed nor refuted (MB/JB, 1979k). This is an interesting area of research that could open up the prospect of biological control against some of these large sap-suckers in tropical environments.

f) For the Record

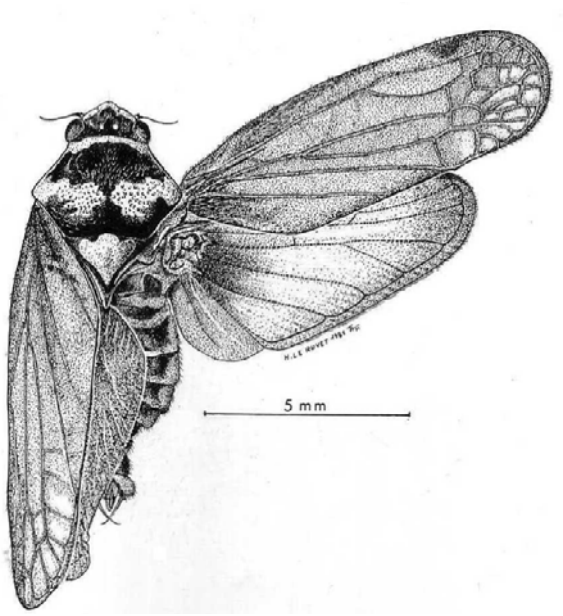


Locris maculata*, variety *obscura (Fabricius, 1794). Juvenile bulliferous and adult (individual ectoparasite by a red mite**). Central African Republic, Boukoko, May 1967 (MB Phots)**

Two portraits of *Locris* (or similar) due to the talent of **Hélène Le Ruyet-Tan**



***'Locris' synavei* Boulard, 1999c, iconotype.**



***Locris erythromela* (Walker,1858), variety.**

The first, originally from Zambia and which Jeanine and I dedicated to the memory of **Henri Synave,** a great Belgian friend who died too soon, a world specialist in Cercopidae and to whom we owe our rapid progress in the study of African species. In particular, **Henri** was enthusiastic about the discovery of the *Locrisian* apparatus... Which had totally escaped him, as it only worked on males, and only the study of their external genitalia allowed the species to be properly separated. In the future, this *synavei* will undoubtedly be far from the other *Locris*, considering the shape of the pronotum and the shape of the homelytra, moreover blurring the venation. As for the latter, it is an undescribed variety, originating in Cameroon.

Couple of ***Locris ibadana*** Lallemand, 1923. **Ivory Coast, May 1986** (MB phot).

Other ***Locris*** personally collected and determined: ***L. cardinalis*** Ghestaecker, 1873 (Kenya, Gedi, XI, Mount Marsabit, XII.1972); ***L. pullata*** Stål, 1866 and ***L. quadrinotata*** Lallemand, 1923 (Ivory Coast, Nimba, 1500m, May 1964).

III- Cicadellidae, Aetalionidae and Membracidae

Close to the Cercopidae, they are small Auchenorhynchus with thorny posterior tibias, jumpers (at least in the adult state), very largely sucking sap and juices punctured in the leaf cells, but of paurometabole bionomy, young and adults living the same outside and in the same biotopes. The Cicadellidae or *Leafhoppers*, are images of the morphological and biological archetype of the group; the Aetalionides, close neighbours, have particular wing topographies; as for the Membracids or *Tree-hoppers*, they are very strange representatives by the curious and multiple compositions of part of their prothorax.

1.- Cicadellidae, or *Leafhoppers*

a) Morphological features

The Leafhoppers (Cicadellidae) just interested me by the various particularities, both morphological and ethological, presented by some species, starting with the sexual dimorphism expressed mainly at the level of the wings, which can be micropterous, but most often brachypterous as in the following species:

In ***Evacanthus interruptus*** (Linnaeus) the male (top right) is macropterous, while the female (bottom left) is brachypterous (**MB phot**).

The morphological and phenotypical fantasy can characterize entire tribes, at the level of colours as below, on the left, **a small neotropical marvel**, or by the **cephalic excrescences** with the most varied shapes, as shown by the ***Ulopa reticulata*** (F.) of our heathers, by this African ***Petalocephala sp*** or, more spectacularly, by the astonishing "*shovel carrier*" ***Listrophora evansi***, a typical species of the **Listrophorini Boulard, 1971.**

(MB Phots).

> **The shovel holder**, a "little story" with two drawers, in the company of **historical mentors**:

1) Discovery. I collected this strange leafhopper, this "shovel carrier" when I was in the Central African Republic (CAR), during a trip to the savannah. Its cephalic morphology immediately intrigued me... And was not the only one. My Professor, **J. Carayon**, who was quickly contacted, directed me to **Professor John Evans**, then a leading authority on leafhoppers and Director of the Australian Museum in Sydney... **Mr. Evans** did me the great honor of answering me at Boukoko, expressing his enthusiasm, revealing the "height" of my discovery: **new species, new genus, new tribe!** He encouraged me to offer the illustrated description. More than determined, I spent several long evenings on a good old “Bino” helped by an "applied library" received from Australia. Too happy and respectful, I dedicated the species to my scholarly correspondence. ***Listrophora evansi*** Boulard, 1971. This was my only contribution to the taxonomy of Leafhoppers.

2) Interlude "Moss bugs". John Evans was one of my early teacher friends whom we had the great pleasure of knowing during the trip he made to Europe with his wife in 1972. Notably in May at the British Museum, at the MNHN with Mr. and Mrs. Carayon's, or at our home in Boissy-Saint-Léger (Val de Marne), where Jeanine and I had our house:

Prof. Jacques Carayon, Mrs. Evans, Mrs. Boulard, Mrs. Carayon and Prof. John Evans (MB Phot. 05 1972).

During an impassioned conversation between the two professors, the existence of the "Moss bugs", classified in the Peloridiidae, a small family of archaic Hemiptera which was of particular interest to them, was revealed.

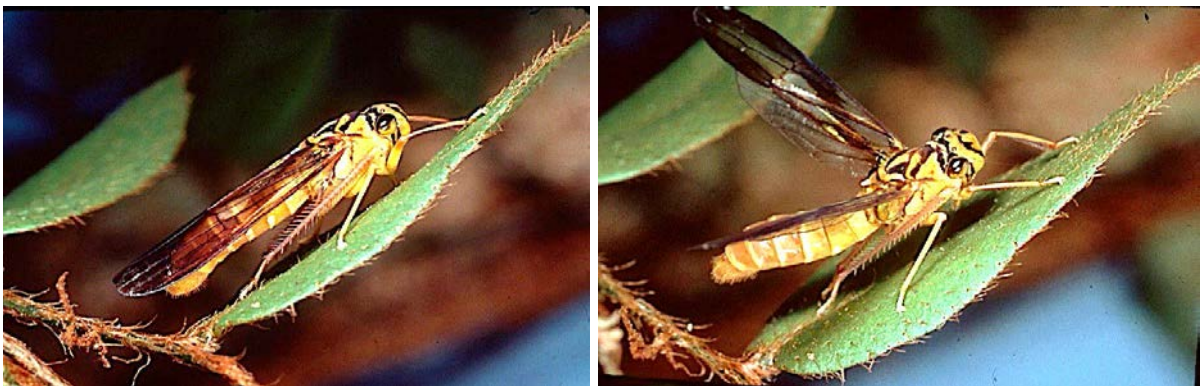
In 1981, **J. Evans** described ***Oiophysella degenerata***, a New Caledonian Peloridiidae of a new genus. **Professor John** sent me a reprint of his article, very precious! I knew then really, what were, what represented these funny and tiny Insects.

In 1990, **Thierry Bourgoin**, a former student who became a colleague (*cf.* Note p. 350), had to carry out a hemiptherological mission in New Caledonia. Thanks to a Berlese trap installed on the mountain top of the "*Table Unio*", Thierry was able to bring back a few specimens of the Peloridiidae in question. On his return to Paris, an environment was reconstituted to photograph one of the specimens, a perfectly preserved female, prepared by Jacques Boudinot (MNHN). Here is one of the very first macrophotos then made on this Moss bug:

Oiophysella degenerata Evans, 1981, Female (2 mm long). Entity characterized by its convex and coriaceous homelytra, without visible veins. Reconstitution, Paris, January 1991 (MB & TB Phot).

b) Mimetological features

Other leafhoppers, such as ***Lissoscarta vespiformis*** (Fabricius), having delivered vespiformis, can suddenly take on the appearance of a threatening wasp. It is a species living in the Guyano-Amazonian Sylva. Approach the finger towards it, "turns it into a wasp" and quickly, the finger is removed. This behaviour is very different from the defence system common to most Leafhoppers, which is based on flight: dodge, then jump followed by flight and disappearance into the landscape:



From left to right: Usual attitude of the Leafhopper feeding peacefully; then 'Attitude of Wasp on alert' taken on the spot, instantly, a non-pressing danger being perceived. The Leafhopper turns into a "Threatening Wasp, V-shaped wings, spiky abdomen".

Left: Front view, the rostrum fixed on the leaf, the same leafhopper on alert, not frightened. On the right, another individual photographed dorsally to reveal the "wasp waist" and "pseudopedunculated abdomen" unusual in most leafhoppers. **French Guyana, November 1975** (**MB phots**)

The above example is illustrative of the behaviour of the Wasp-Leafhopper: the perception of imminent danger triggers in it a kind of animal parody, which I have called **ostensible mimicry**: to frighten by appearing, in the moment, an "all-other" and a threatening all-other! (**Boulard, 1978b**, Note to the French Academy of Sciences). Having abandoned certain ethological parameters of safeguarding

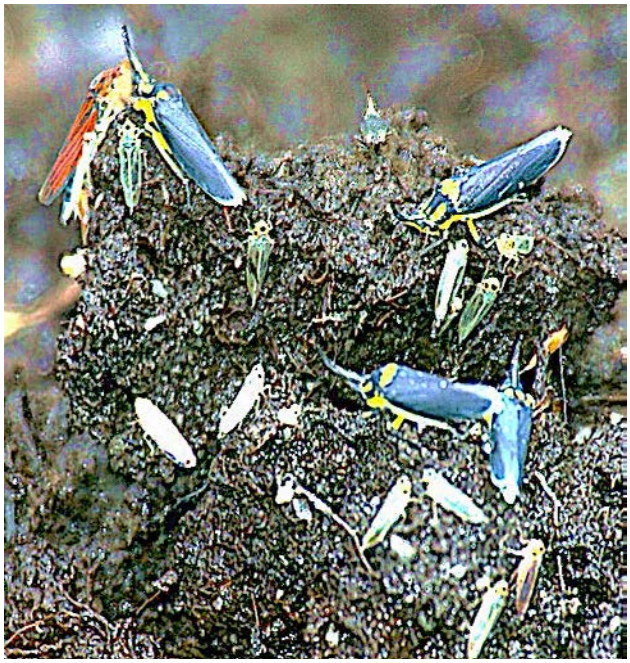
specific to their lineage, these Cicadelles have become prodigiously accomplished mimes... And emblems of my works on mimicry (**2007b, 2012c**).

This propensity to open the wings brutally "wasp-like", happens to be an ethological acquisition relative to the group of *Lissoscarta*. The following witness is a leafhopper of a similar species, but without yellow, which reacted in the same way to the approach of my macro-objective:

Mimetologically, the ombrophilous environment of this Amazonian Leafhopper could, somewhere harboring a black wasp of similar dimensions... **(MB Phots).**

c) Limicolous and limivorous Cicadallidae

A bio-ecological surprise was great, when we were able to observe and photograph for the first time, numerous Cicadellidae with the curious feeding habits found in some Cicadas frequenting the same places (*cf.* p. 284). First observed with large single-horned Leafhoppers of the genus ***Namsangia***, which revel in the black mud bordering the creeks emanating from the slow thermal springs common in northern Thailand. This behaviour, unusual for these insects, which have long been known to be opophagous, or sucivores, was soon shared by a multitude of Leafhoppers, all of which were "convivial" and took nutrients from the thermo-muddy fringes of the warm-water rus or ‘rivulets’ (*cf.* **Boulard, 2008d**). Hereafter eco-photos reproduced as examples:

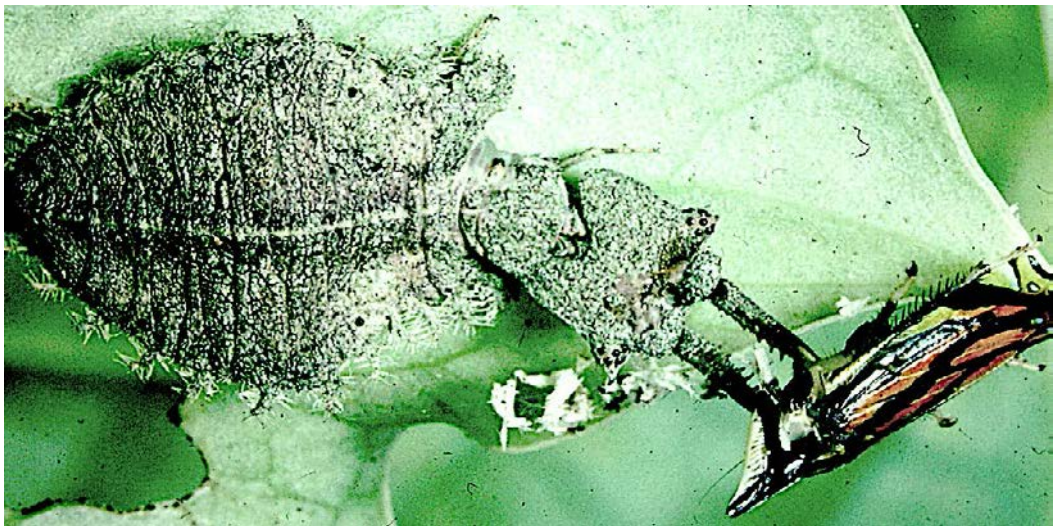


On the left, big and blue, the *Namsangia* near a small stream; above with a good size Red Leafhopper and many mini-Cicadelles, as on the video on the next page.

These documents and the previous ones, photographed as above with my 800 mm macro lens (and safe from ***Melipona***!), were passed on, along with others, to a colleague specialist in Cicadellidae.
Thailand, Chae Sorn N.P., May 2008 (MKB Phots).

d) Other ecological portraits of Leafhoppers

> Tragic end of a "memorable" Leafhopper sacrificed to the Food Chain:



Boulardus concinnus Nielson, 1975, just attacked by a larva of Ascalaphid which liquefies its interior before feeding on it. **Central Africa, La Maboké (MB phot).**

>Three exceptional leafhoppers

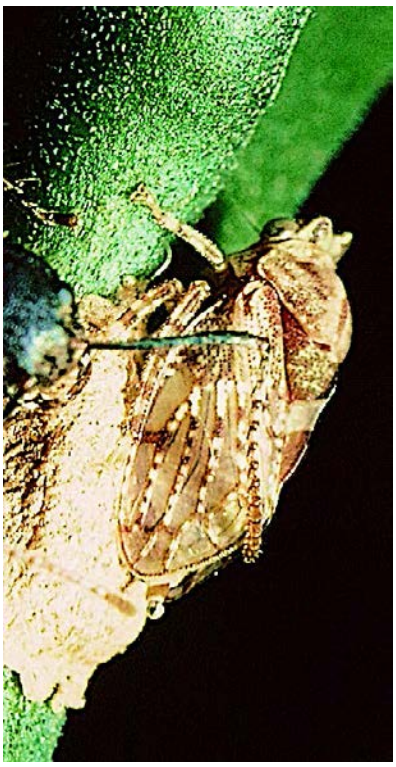
Ledra aurita L., laying female, **France**. Micturition of a ***Rhaphirhinus phosphoreus*** (L.), 'Insects also urinate'. **French Guiana** (**MB Phots**)

Listrophora evansi Boulard, feeding.
Central Africa, Bebe Savannah, November 1969 (**MB Phot**).

2.- Aethalionids and neighbours

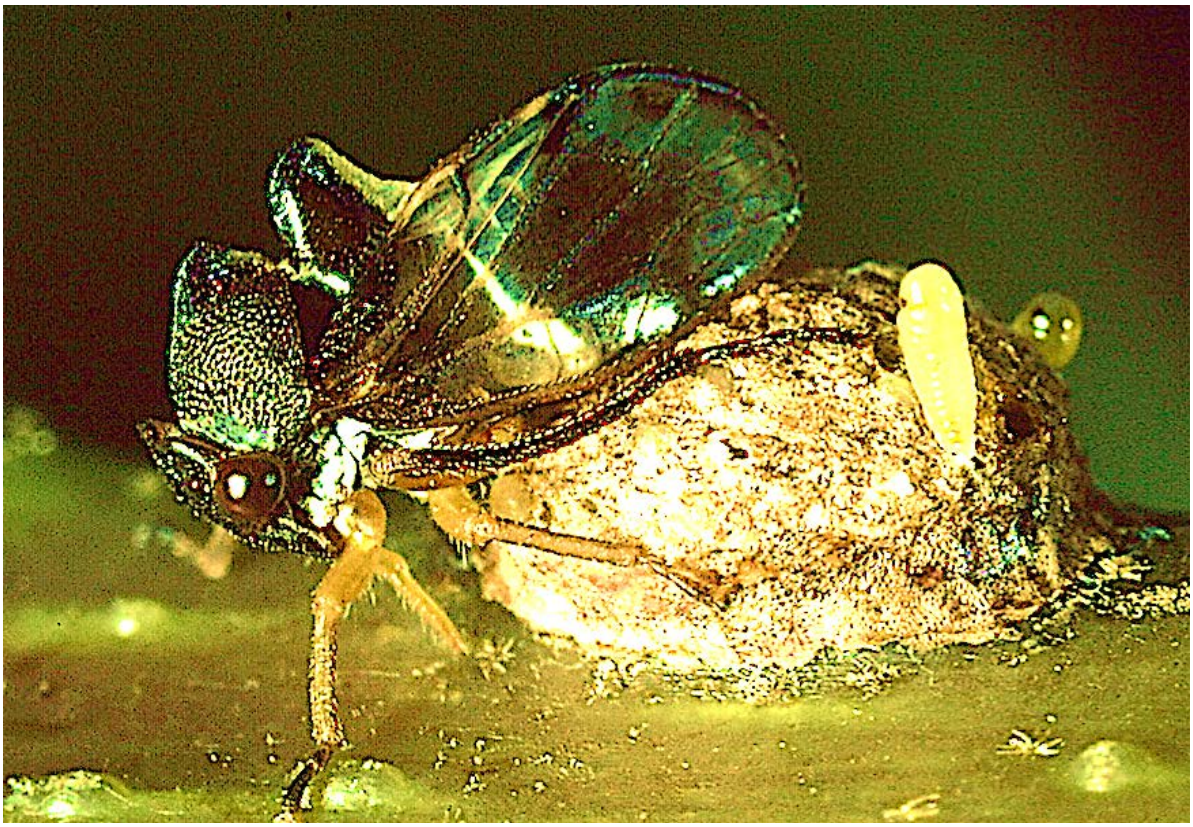
I have been able to gather some documents assuring a reality of little-known existences. The ***Aethalionids*** differ from the leafhopers by the fragmented nervation of the forewings, the flatness, sometimes slightly convex of the head, and from the Membracids, by the flat simplicity of the pronotum. This does not apply to the genera *Stictodepsa* and *Lophyraspis* in the eco-phots, p. 326.

Colony of ***Aethalion reticulatum*** (Linnaeus,1758), young and adults assisted by *Hypoclinea* Ants.
Brazil (RJ), Buzios, 1979 (MB Phot)



Two females of *Aethalion reticulatum*, the first with an ant *Dolichoderus* soliciting a drop of honeydew; the second is the founder of a future colony (Brazil, **MB Phots**). The third eco-photo is that of a female of an undetermined species on its egg-laying surface, possibly representing the genus *Lophyraspis* Stål, 1869.
Guyana, October 1979 (MB Phot).

In ***Stictodepsa***, with coriaceous pseudoelytra, the pronotum 'points' forward and lacks a posterior apophysis. Females on their oviposition. **Guyana, October 1979 (MB Phot).**

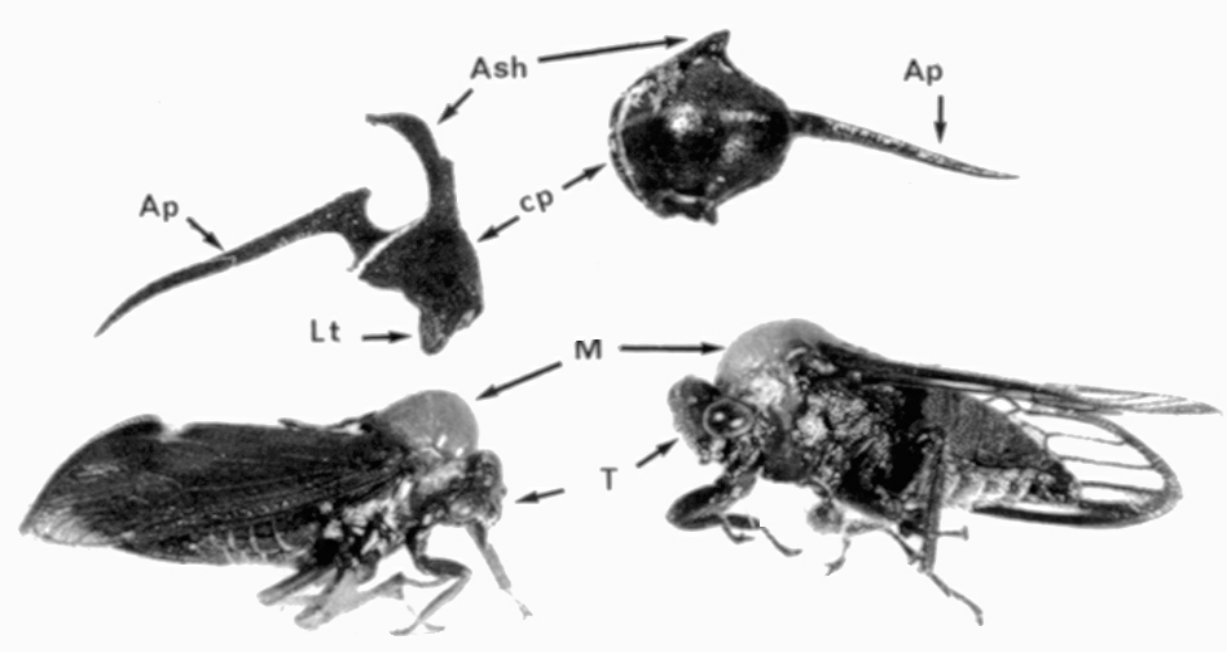


As for the ***Lophyraspis***: Triangular head, rounded pronotum, topped in parallel by two rounded vertices, a short, highly crested apophysis completes the characterization of this genus. Here Female of the species ***cristata*** (Stål, 1869, formerly mixed with *Biturritia*), watching, while feeding, over its developing offspring, of which two newborns already appear. **Guyana, October 1979 (MB Phot).**

3.- Membracidae or *Tree-hoppers*

a) Nature's extravagants

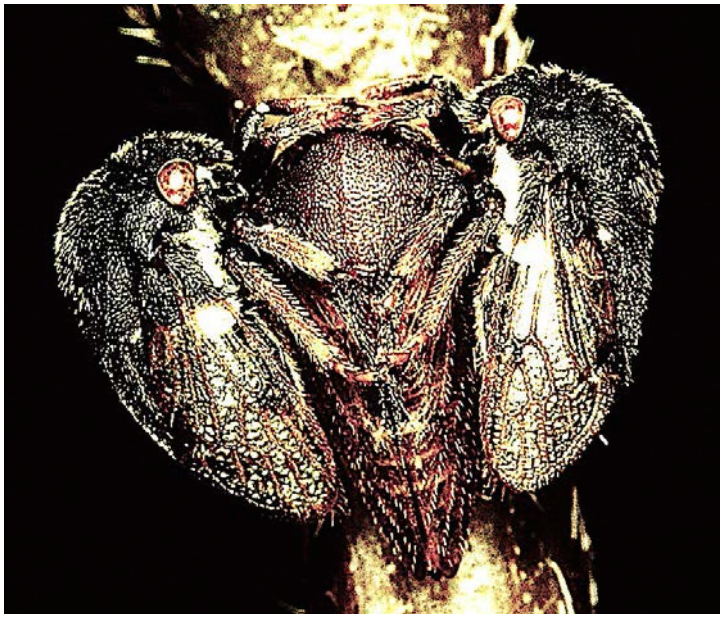
As for the Membracids, 'little devils' jumping as adults, they have become for me *'The Extravagants of Nature*' (1986a). These insects resemble bizarre leafhoppers because of the astonishing morphological drift that, in their case, affects the pronotum, the first dorsal part of the thorax about which superficial genetics seem to have been diverted. The pronotum of membracids covers the whole forebody with a kind of "antique (!)" helmet covering the head and thorax, if not the whole body. It can be a more or less important cap or a cone, with more or less strange expansions. Additional strangeness, one can, without too much difficulty, separate the pronotal helmet from the rest of the body, dissociating it from the muscular insertions of the forelegs. This was done illustration below, pronotal helmet artificially raised of the African ***Monocentrus carayoni*** Boulard, on the left, and ***Leptocentrus paganu***s Capener, on the right



Ap, Ash, cp and Lt, various parts of the pronotum; M, mesonotum; T, head (**Boulard, 1973f**).

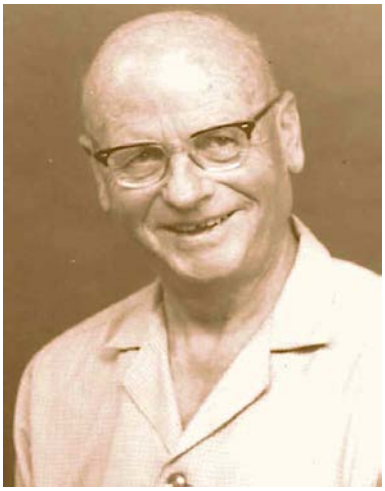
The pronotum always covers the head (which has usually become orthognathic, i.e. perpendicular to the axis of the body) and the entire mesonotum (M, above), whose cuticle, consequently not exposed, is depigmented. Most often, the helmet, as in the legionnaires of ancient Rome, bears protective and ornamental attributes of recognition, which we distinguish by the names of temporal lobes, suprahumeral horns or apophyses and posterior process or posterior apophysis. The overall conformation is a specific characteristic: no two species of membracids are identical in this respect. But there may be some differences between the sexes, as I was soon able to realize.

However, there are supposed "first" species, whose prothoracic attributes do not exceed the "reasonable", initiating only the protective function of pronotal scleritis. Two examples, one of a long known European species, the second of a recently discovered seychellian species, both representing the two closely related tribes of the ***Gargarini*** (Distant, 1908) and ***Madlinini*** (Boulard, 1995):



Gargara genistae (Fabricius, 1775), female undertaken by 2 males, '**Île de France' region** (**MB Phot**),
Madlinus sechellensis Boulard, 1995 (2 mm long!). **Mahé** (**MB Phot**).

As with the Cicadas, my first task was to develop a systematic approach and taxonomic mastery of this family of incomparable insects. Specialization was difficult for the young researcher I was, isolated in Central Africa, far from Museums and Libraries. But if for the Cicadas I had to forge myself on my own, my beginnings as a 'membracidologist' owe a lot to Dr **Lawrence Capener**, a fine specialist of the South African membracidofauna who was then working at the Plant Protection Research Institute in Pretoria. I owe to this old and late friend, a rapid progress in the recognition of genera and species, as well as in their methodical classification. Here is his portrait that he sent me in 1971, a few months before his "retirement", associated below with one of the first species, ***Kallicrates bellicornis*** Capener, 1968, which was a superb epistolary link.



The female, on the left, the only one known to my mentor, possesses strong supra-humeral horns oriented both forward and upward, while opposite the male, discovered at Boukoko, bears much weaker, lateral and slightly rearward oriented horns, not visible here in profile.
Centrafrique, Cahiers de La Maboké (**Boulard, 1968f**).

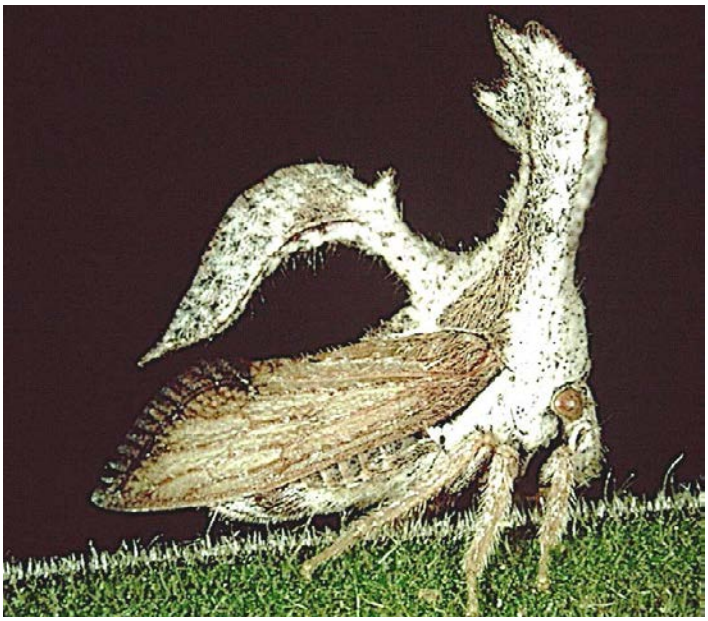
[Document chosen by our excellent colleague, Dr Werner Holzinger, as the internal design for the covers of the strong collective volume "ZIKADEN", which he published in March 2002].

The epistolary relations followed, from 1966 to 1972, with this admirable specialist of competence and kindness, greatly allowed me to recognize and often to discover new for science, some of the numerous specimens, of which I had the possibility to collect and to eco-photograph. Below, one of the first Central African species determined with the help of L. Capener; it is also an example of a membracid with a non monstrous pronotum.

Oxyrhachis pandata Distant, 1916; female and its 12-day old offspring, "*including a naughty little climber*". **Central African Republic, Boukoko** (**MB phot**).

b) Spectacular features

Membracids are built on the Cicadellian structural plan, but by modifying the port of the head, which became orthognathic, while the pronotum developed in a "demential" way... until growing and lengthening from the top of the head to the back of the body and, more often than not, while producing axial or symmetrically lateral outgrowths, thus leading to extraordinary patterns on the *path of hypertelism*. In addition, the anterior wings are more or less coriaceous, to such an extent that they are often called *pseudoelytra*. A few snapshots follow, the first two of Central African species:



Xiphopoeus phantasma (Signoret,1858) / ***Mitranotus albofascipennis*** Boulard,1983, CAR (**MB Phots**).

The membracidian family, widely represented in tropical Africa, reaches its physical and bionomic apogee in the neo-tropics. The most extravagant forms and particular behaviours developed there:

Membracis lunata Fabricius,1787 and ***Œda inflata*** (Gmelin,1789), both Guyano-Amazonian (**MB Phots**)

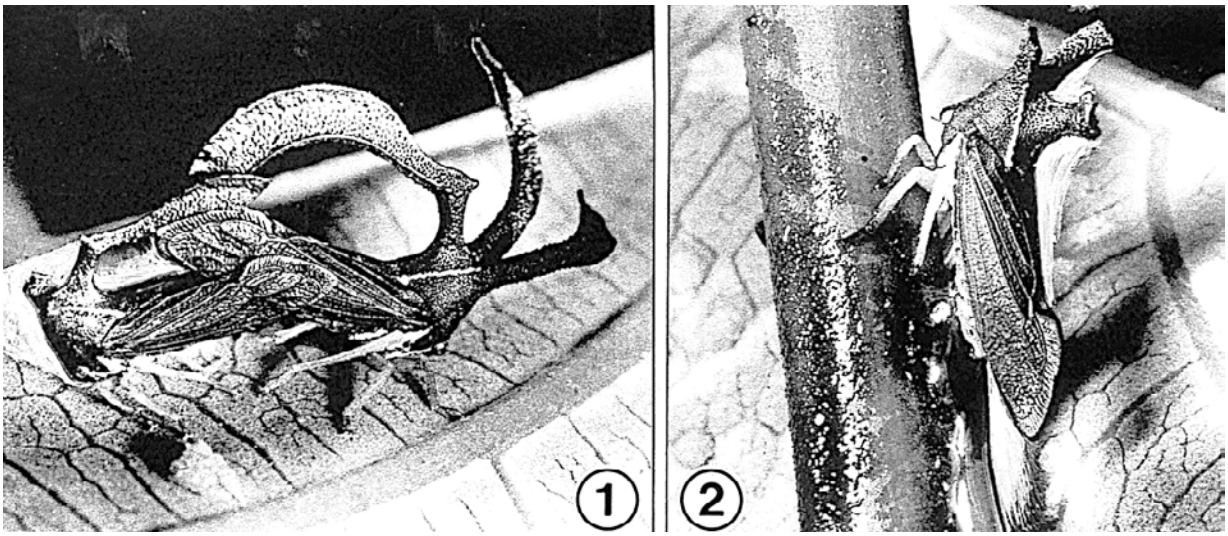
Aspona compacta Boulard, 2011, **Itany**, Guyane**.** ***Cyphonia clavigera*** (Fabricius, 1803), **Para**, Brésil. Both puncturing leaf juices (**MB Phots**)

Heteronotus delineatus Walker, 1858, female feeding. **Para**, Brazil (**MB Phot)**

Feeding too, ***Lallemandia nodosa*** Funkhouser, 1922. Brazil, Para (**MB Phot**)
Heteronotus vandamei Boulard, 1980. Guyana (**MB Phot**)

c) The excessive ness

As for the excessiveness of the prognostic apophyses and their biological role, the most posh African champion, ***Paraxyphopoeus gestroi***, all hypertelic apophyses outside, was submitted to the question. During my long stay in Central Africa, I was able to raise a few specimens. Several subjects were "apophysectomized", without these being durably disturbed:



Experimental mutilations in *Paraxiphopoeus gestroi* (Schmidt, 1911)
(1) Male, suprahumeral apophyses severed, mated with an intact female. **(2)** Female, all three pronotal processes cut, busy laying eggs normally, head upwards, in a vine of *Urticaceae Urera* camerounensis, the main host plant of the species. **Central Africa, Boulard, 1973, 1999e**

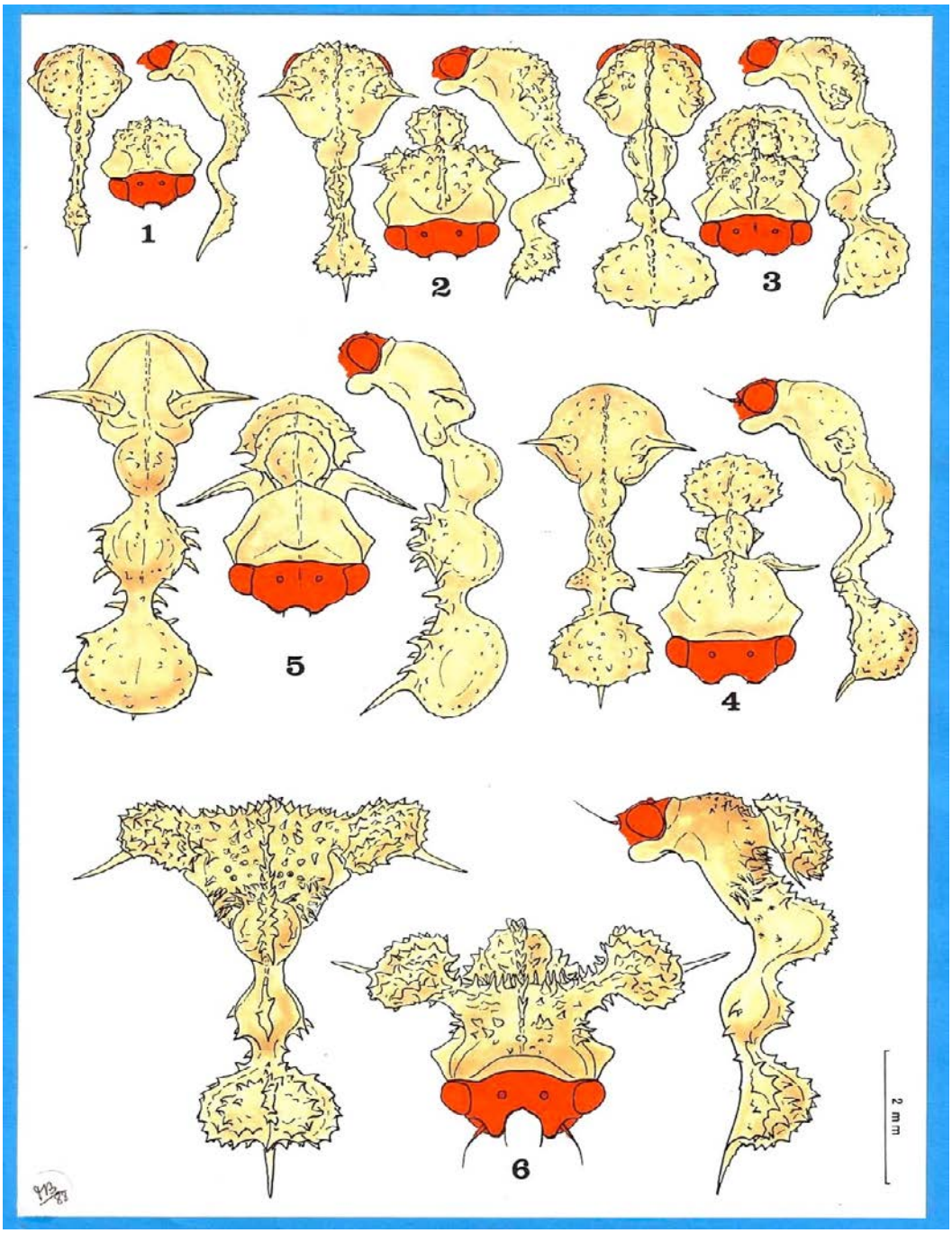
Apart from the fact that the hypertelic character was thus confirmed, I later had to integrate that Nature, itself, could experiment in the same way (*cf.* p. 333/334).

d) Pronotal specificity and Hypertelia law

1) Generic and species-creating news

She gave herself to heart joy, Nature (no doubt, she still does) with the pronotum of the limbs, superbly ingesting herself in the morphological exercise, fixing the fun at the generic and specific levels... The taxonomists thank. Apart from the fact that this is a bookish convenience, it is also an unexpected way of drawing some parallels with extinct fauna....

I was able to verify and specify, with the help of actual animals, the Membracids of the African genus ***Hamma***, the **famous Law of Hypertelia** discovered and formulated in the study of the fossils of large land mammals. Spectacularly with the Tertiary Titanotherus, dear to the paleontologist **H.R. Osborn**, equipped with cephalic accessories that became more and more bulky, even hypertelic, the size of these animals was getting bigger and bigger. Disregarding here the geological tempos and body heights, the law of hypertelia proved to be perfectly current, at least in my subjects at the generic level: one can order, gradually, the ***Hamma,*** from the ***simplex*** **species (1)**, the smallest with an insignificant pronotum, to the ***fabulosum*** **(6),** the largest and carrying a hyper charged pronotum.



Hypertelic orthogenesis highlighted with the genus ***Hamma*** and current species.
1) *H. simplex* Boulard,1968. **2)** *H. nodosum* Buckton, 1905. **3**) *H. brevicornis* Boulard, 1968. 4) H. heimi Boulard, 1968. **5)** *H. rectum* Vignon, 1930. **6)** *H. fabulosum* Boulard, 1968.
CAR, La Maboké, Boulard, 1969f /1973f.

2) Specific reality

Only one example, that of ***Bocydium globulare***, a Guyano-Amazonian mini-Membracid 4 mm high, the head surmounted, 2 mm higher, by a fantastic 'pronotal canopy', reproducible to infinity, it seems... Dependent on a not yet lethal hypertelia (**MB Phots)**:

Moreover, the spiny mini-balls of this still acceptable 'canopy' would not be appreciated by small birds, even though they have a wide-opening gullet... In any case, the more this pronotum will acquire hyper-generative proportions during copulations – as already observed in *Hamma heimi* and *H. rectum* – these mini monsters will disappear... *(Probably more quickly than expected by Nature, humanity helping...).*

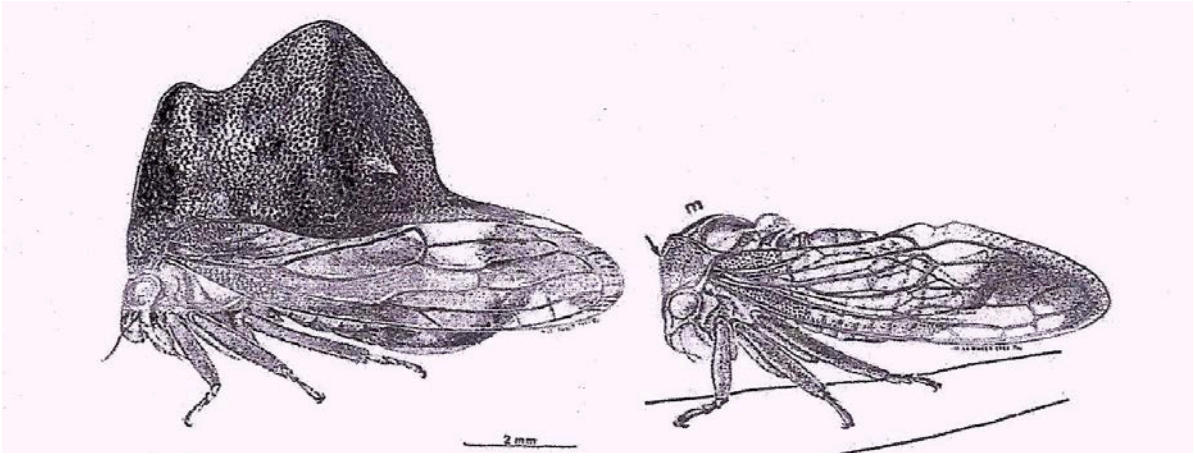
3) Accidental load shedding

It happens that limbs with a particularly heavy pronotum, such as some South American ***Anchistrotus***, well known in collections, their pronotum often swollen at the bottom of their box! I must take into account this type of remark which, not reviewed *in natura*, could have remained without interest. Pure luck, it happened to me to capture the "utopian", on a bank of the Middle Xingu in central Amazonia, during a beautiful fortnight of September 1975.

Pierre Jauffret and MB on the Middle-Xingu, near São Felix, paddling near the shore (PP phot)

Winning the shore and crawling a bit, thinking about a break and possible camping... **I still remember the superb glance** of having distinguished on the same branches of strongly humpbacked limbs mixed here and there with "leafhoppers"!? If they were indeed different, gregarious individuals... All of them were Anchistrotus, but some of them lacked their enormous dorsal ball, without being otherwise affected, but having "taken over", deceptively, the **jassidomorphic aspect!**

Back in my Parisian lab EPHE/MNHN, the *Anchistrotus* was then able to reveal its statutory specificity ... Unknown from the catalogues! So I had the exquisite duty to name it.



Anchistrotus amitteraglobus Boulard, 1983, with the enormous dorsal ball (original habitus), without the jassidomorphic appearance, while the mesonotum **(m)** is uncovered and then ± pigmented.
Drawings Hélène Le Ruyet-Tan.

Explanation: the cuticle-only bulbous excrescence can fall off at the slightest shock. A jump too abrupt, a shock of any kind during a jump hitting the foliage, a gust of wind animating leaves too close together, the too fast beak of a bird, definitively deprive *Anchistrotus* of a large part of themselves. This is the meaning of the nominative epithet *amitteraglobus* (from *amittere*, to lose in spite of oneself) given to this species. From the pronotum, only the short functional part (small arrow above) remains, called '*anterior pronotal plate*', which gives insertion to the muscles of the first pair of legs. Again, the break is extraordinary in that at the posterior end of the functional pronotal part, a sort of "dotted line" is formed, according to which the bubble can be mechanically lost... No doubt, later on, the mating of the "operated" animals was, or will be, only easier, and the species will benefit from continuing its cycle. (*Cf.* **Boulard, 1979h, p.114 and 1983g**)

e) Bionomic singularities

1) Gregariousness. Many membracids are gregarious, to the point of living in very tight colonies. Some, mimesians, blend under a colour similar to that of the host plant, such as, below, these ***Ochropepla pallens*** (Stål, 1869) eco-photographed in **French Guiana** (**MB phot**):

Others don't. Witness below, this Family of ***Membracis fasciata*** Fabricius, 1767, white juveniles, one of whom completes imagination, while two have completely finished it:

Surinamese bank of Itany, December 1975 (MB Phot)

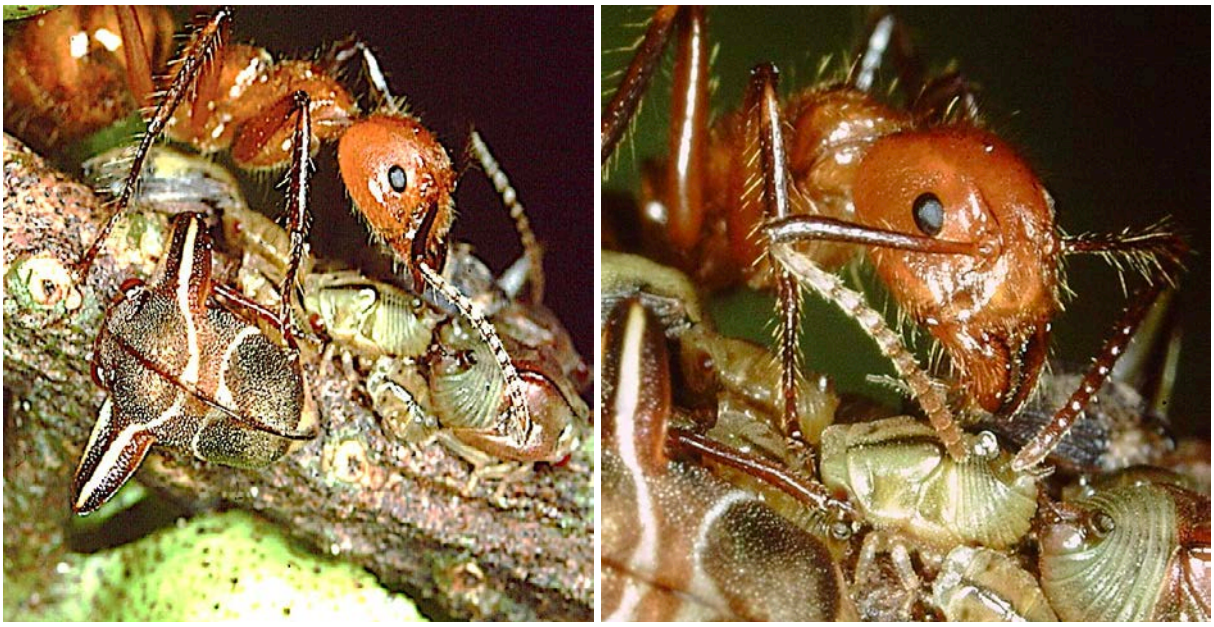
2) Myrmecophilia

In many cases, the association is closely maintained by ants eager for the "excremental honeydew" of the juvenile and adult limbs. From this point of view, the static families find a first future benefit: the honeydew, extemporaneously absorbed, excludes any development of white or black moulds on the stems and adjacent leaves, moulds which are sometimes lethal causes of the colonies. In addition, beggars and honeysuckers provide, to a relative extent, protection against predators and parasites. Many semi-regregarious and gregarious species are very myrmecophilic. The African ***Oxyrhachis*** are excellent examples:

Family of ***Oxyrhachis latipes*** Buckton,1903 and Ants. Eastern African Forest (**MB phot**)

Oxyrhachis lamborni Distant, 1916. Female and male in copula, "assisted" by ants.
Central Africa, Boukoko clear forest (MB phot)

Below, two precise flashes on the commensal relationships of ***Tropidolomia auriculata*** (Olivier, 1790), whose young and imagos live in stable colonies with the large ***Hypoclinea abrupta*** (Smith), more or less protective red ants:



An ant, after having, tapping antennas, solicited some young membracids, will receive a micro-drop of honeydew that one is just going to "offer" it. **Guyana (MB phots)**

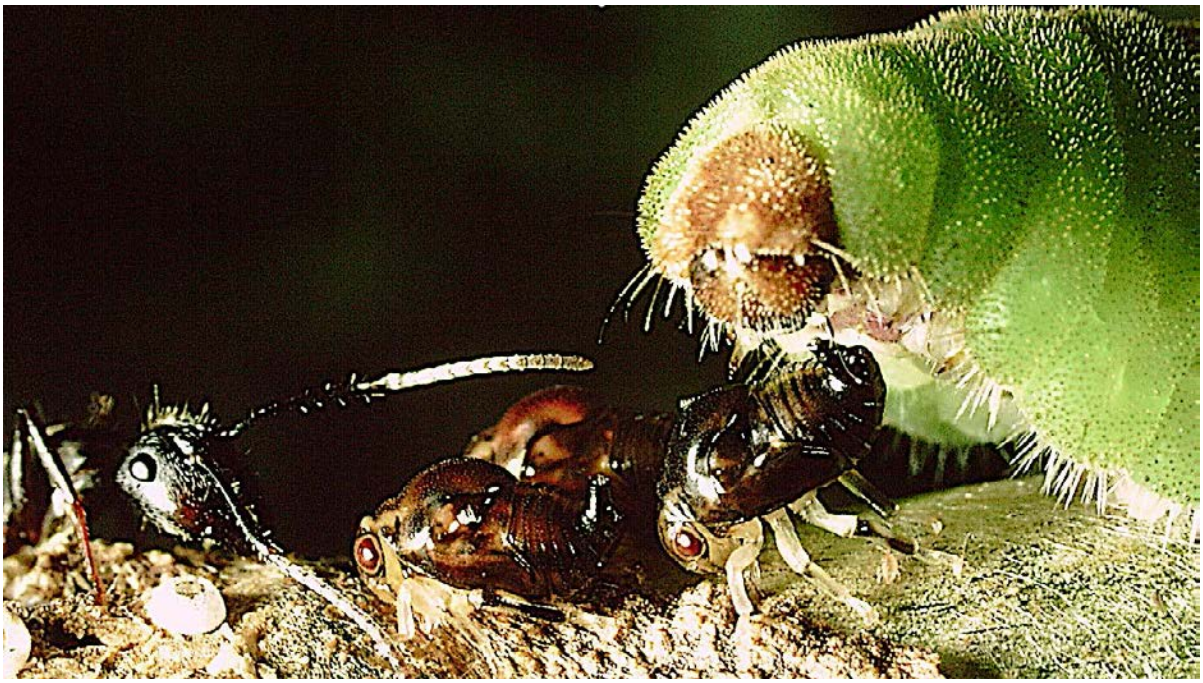
Most often, the consented association is in fact imposed by the Ants, whatever the chosen membracid, as long as it produces honeydew... Even if the association may "us" seem at a superfluous level. Such is the spectacular case reproduced next page.

The ***Erechtia sanguinolenta*** (Fairmaire, 1846) seem to display warning colours, war colours according to Alfred Russel Wallace and which, therefore, appear, true or false, inedible. Not concerned, many ants accompany these little jewels, tapping them with their antennas... The "warning colours" are not for them. **French Guiana (MB phot)**

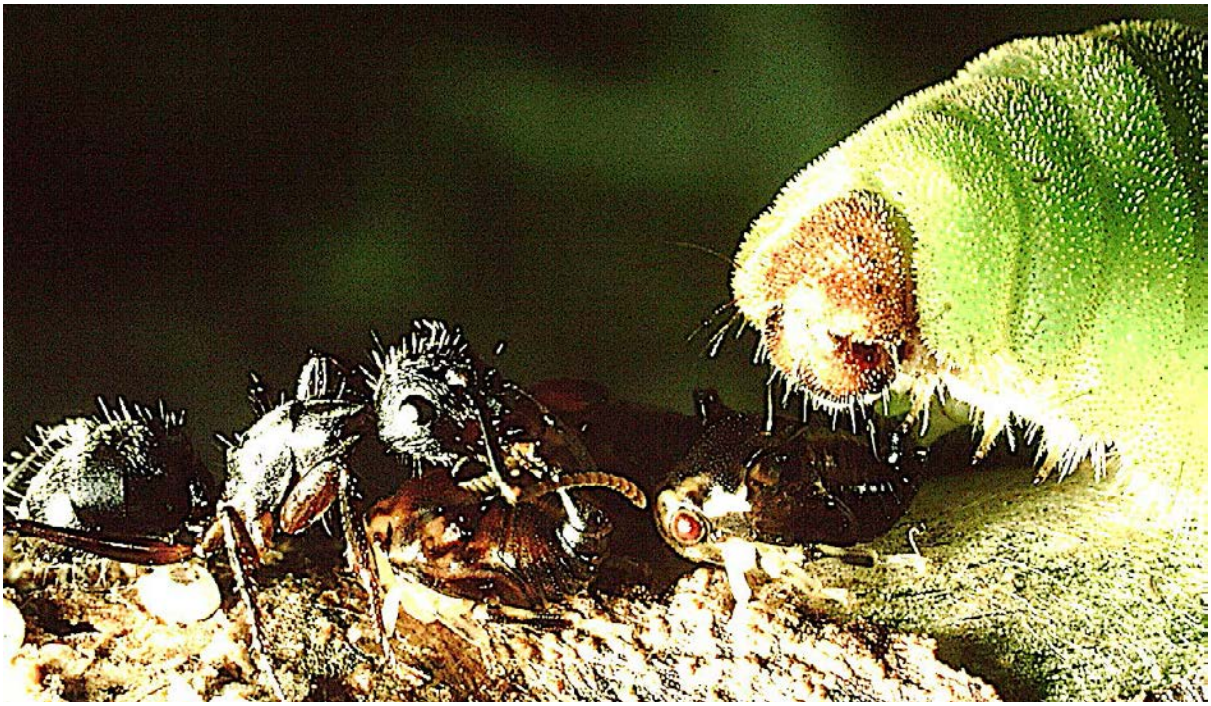
3) Other honeydew beggars, the case of the caterpillars of authentic Butterflies.

Many insects of various species, bees, flies and butterflies also seek honeydew and try to collect it at the source, which they are often only able to do without the ants' knowledge. The ants hunt them as soon as they detect them.

However, there is a category of competitors against which the ants can do nothing, the large caterpillars caparisoned by some Neely. The latter, unlike the vast majority of caterpillars, which feed on leaves, are mellivorous, or even carnivorous (*cf.* p. 395). One, which I was able to follow and photograph in Amazonia, had "appropriated" a small herd of juvenile membracids, despite the presence of guardian attendants.



Huge caterpillar of an indeterminate Neely preparing to swallow a drop of honeydew that a young ***Anobilia pilosa*** Tode, 1966 (Membracidae, Tragopinae) will offer it by lifting itself up on the tip of its legs. Once there, the Ant can only observe...



Nevertheless, from time to time, an ant would manage to grab a drop of honeydew, just before the caterpillar chased it away, or out of spite (?), it would crunch the herd...

Brazil, Para, October 1979 (MB Phots)

4) Non-myrmecophilic species

There are solitary and unaccompanied Membracids. It is the precise case of ***Umbonia pyramidalis***, a beautiful Guyano-Amazonian species with a highly sharp pronotum that ends in a wide ridge up to the apex of the wings... Forcing the insect to urinate, the anal tube diverted under one of the wing sides, action apparently badly seen by ants (!).

In addition, the female, which almost perfectly evokes a "*rose thorn*", shows the very interesting behaviour of "personally" monitoring its future offspring, showing the first signs of maternal instinct. I was able to bring a testimony, hereafter related.

The "rose thorn" females, *Umbonia pyramidalis* Fairmaire, 1846, are still in use. One close to its eggs, the second seeming to be watching its newborn offspring. The images show the last two phases of the procreative bionomy of this "big" solitary limb. After mating, the female *U. pyramidalis* will insert its eggs in 2+2 parallel lines into the sapwood of an already strong stem. Once this is done, it turns around and attaches itsself on all six legs, laying eggs under or in front

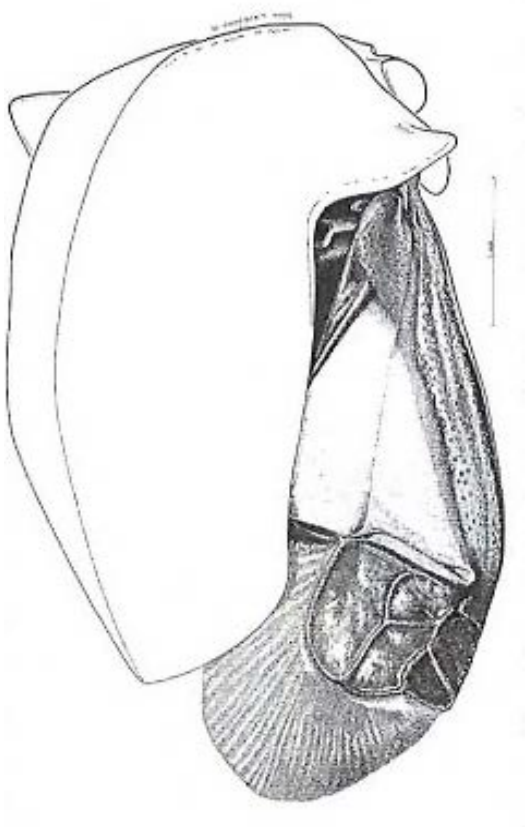
of it. It will thus remain for the whole time of embryogenesis, about a month. I say 'fixed', because it resists in this way to any event likely to frighten or flee... It seems not to be able to abandon its offspring, whatever the embryonic state: taking the thorn between thumb and forefinger, makes its cling more! **Para (MB phots. Boulard, 1999e)**

5) Foldable anterior wings

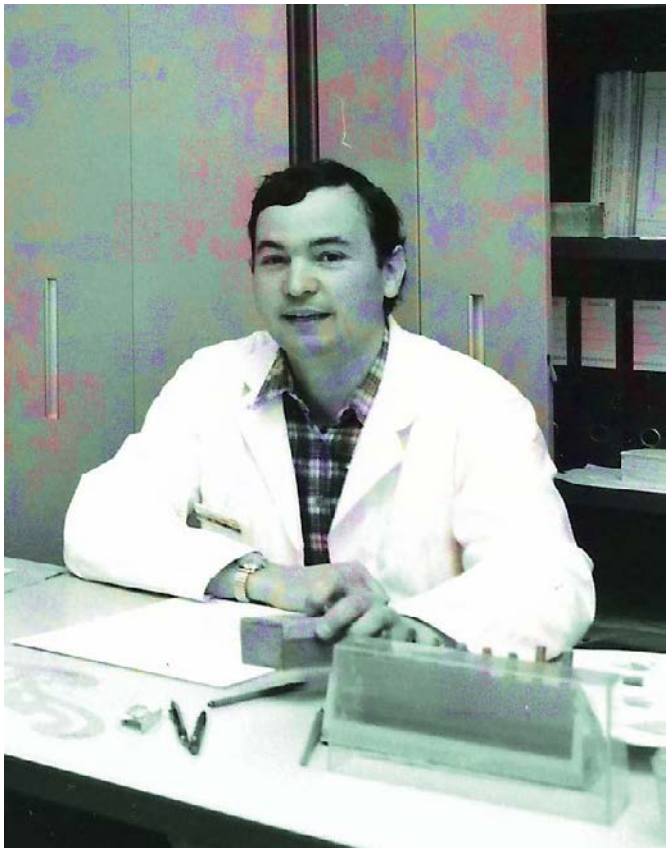
Note to the Academy *(with drawings due to the talent of Gilbert Hodebert, draftsman at the Paris Museum).*

In some minorities, including ***Tragopa*** and ***Tropidolomia***, the pronotum develops until it covers the entire body, including the wings. In collections, the wings of these membracids are not visible, except in the specimens prepared wings spread out for taxonomic research... Where they appear wide and elongated!

The study of these Tragopians in their environment, notably ***Tropidolomia auriculata*** (Olivier, 1790), ***Cheyloidia intermedia*** Tode, 1966, and several ***Horiola***, has revealed a morpho-dynamic particularity that has long remained unknown. Very good flyers, these limbs have the ability to fold transversely their forewings, which they have ample and long like one and a half times the abdomen, to store them thus and to make them disappear completely under their rounded pronotum, while upsetting the nervous topography of the wings... Possibility in them, if not vital obligation... Example in a *Tropidolomia auriculata* fixed at the moment when the folding of its pseudoelytra (tegminized anterior wings) begins under its pronotum testudiforme:



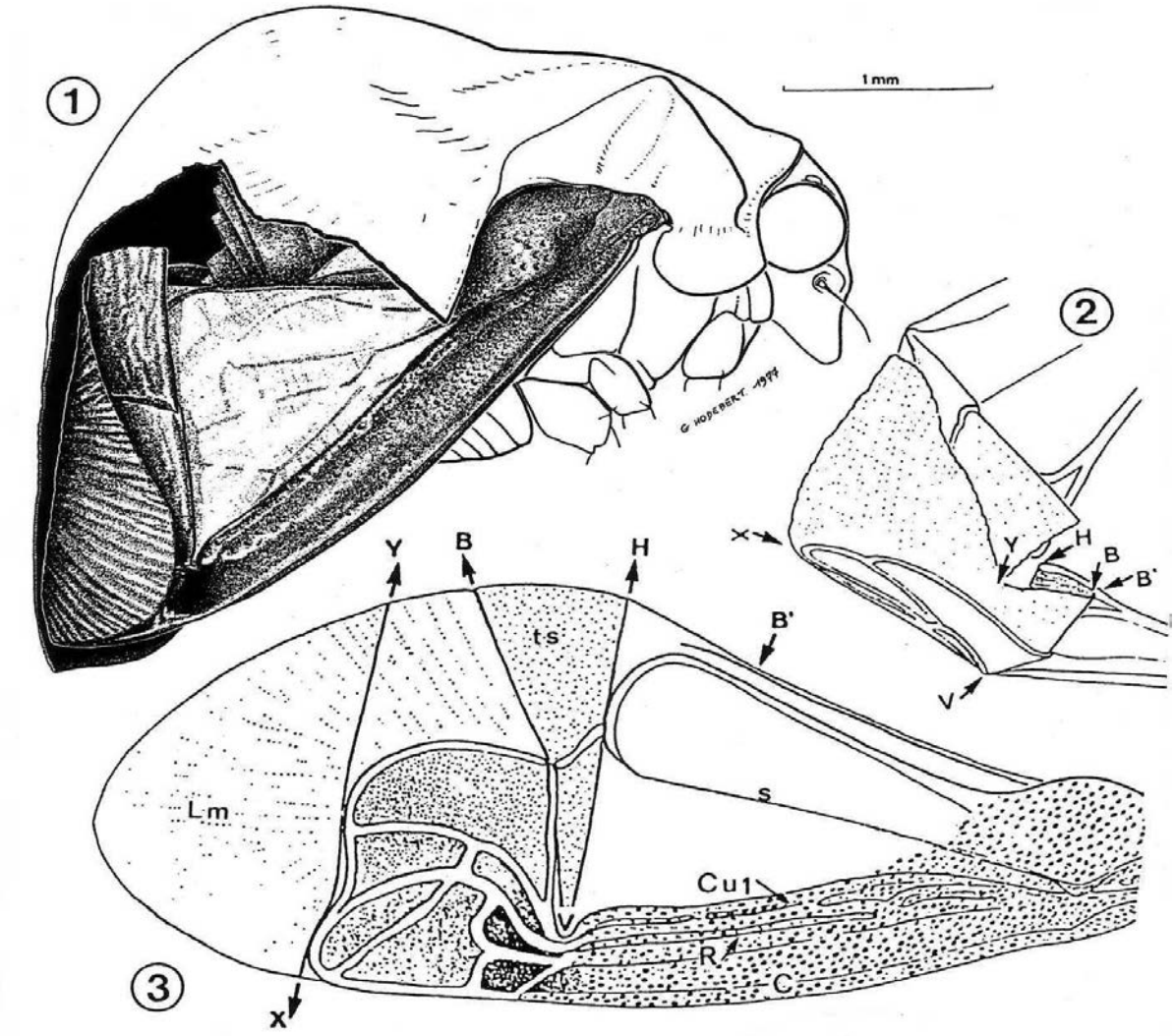
Drawing by Gilbert Hodebert *from a slide.*



Gilbert at his workstation at the MNHN, Paris. (Photo Georges Hodebert, 1988)

The observation, communicated to the Académie des Sciences de Paris (**Boulard, 1977e**) was all the more fascinating as nothing equivalent was known among Insects, except for the Plataspid Heteroptera, which also have a vast thoracic cap and long forewings to be stored underneath. However, the comparison ends there. The Plataspidian cap is of mesonotal origin, while the folding of the wings is not the same in both groups: single, not very pronounced plicature for the Plataspids, triple plicature, completely or largely closed for the Tragopians. The

convergence, however, remains surprising and interesting: the former has mostly representatives in the Old World, while the latter are exclusively neo-tropical.



Tropidolomia auriculata (Olivier,1790), Tree-hoppers with folding wings

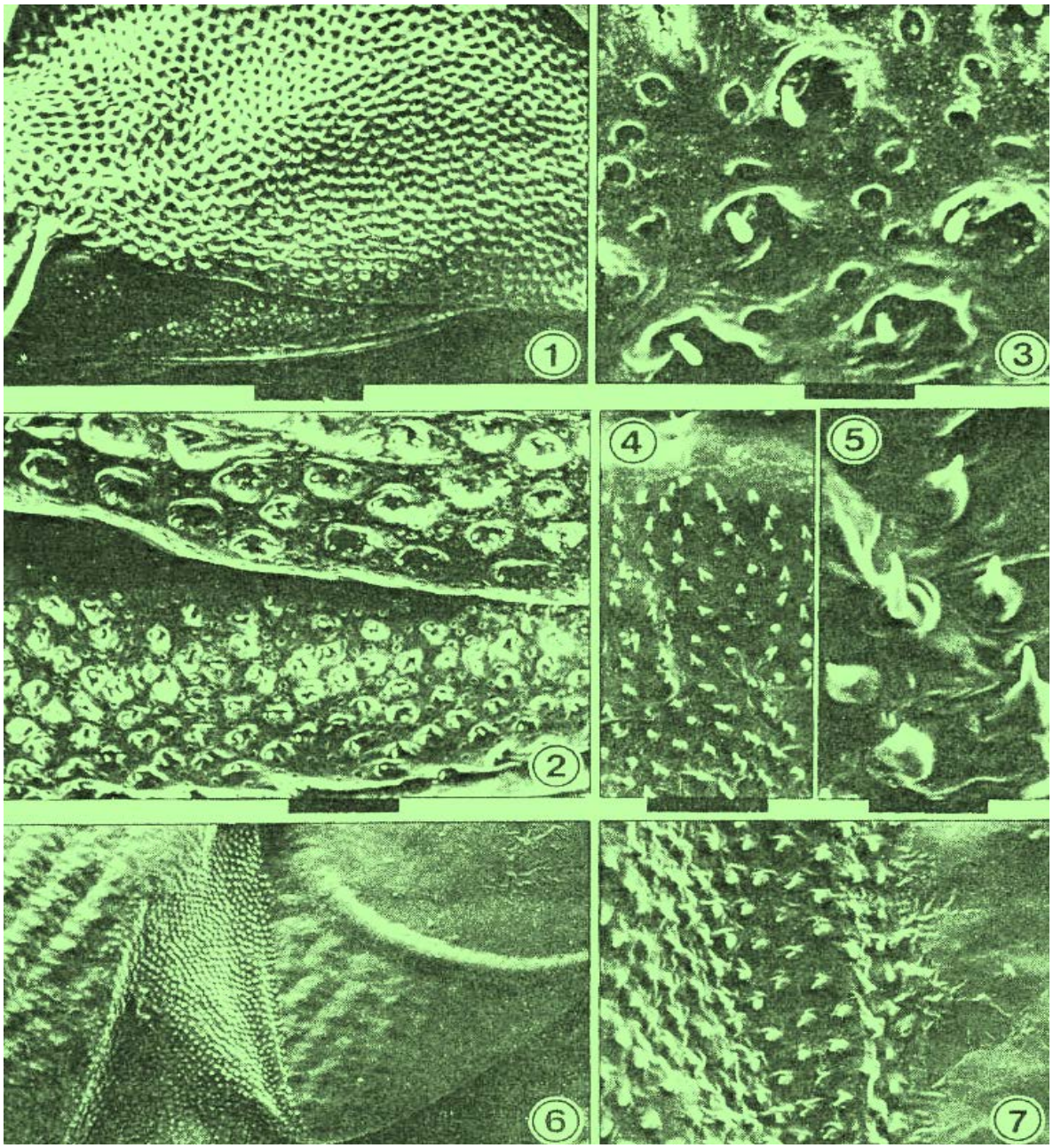
(1) Side view and view of the folding of the wings at rest, protuberant shell burst (G. Hodebert Pict.)
(2) Top view after pronotum-ectomy, wings in situ three times folded.
(3) Right forewing unfolded and seen from the inner side, only one side having retained the trace of veins in the coriaceous costo-cubital area (MB pict.).
Explanation of the letters: **a1, a5** = first and last apical cells. **BVB'** = triangle delimited by the 'double corner fold', **B** coming on **B'** at the fold. **C** = costa. **cCu** = ulnar cell. **cor** = coriaceous costo-radial part of the pseudoelytra. **Cu1** = ulnar rib. **V** = corner of the double fold. **VH, VB** = anterior and posterior components of this double plicature. **XY** = subapical single plicature. **Lm** = limbus. md = pseudo-discoidal medial cell. **M** = median rib. **R** = radial midrib. rd = radiodiscal medial cell. **s** = clavical fold or suture. **ts** = spiculosensory triangle BVH foldable over **HVB'**. (**Extract from Boulard 1977e, 1999e**)

It remains to elucidate the dynamics of the complex but determined folding that characterizes the *pseudoelytra* of Tragopian. Since no muscle intervenes directly, how is this perfectly established and reproducible multipartite folding carried out and under what control?

The precondition is the habit that many Insects, and precisely the Cicadaires, have of placing their wings on top of the body (the so-called stegoptera position). As a result, combined with a hyper-development of the pronotum in the testuform shell, which is an obstacle to the usual storage of the wings, a strong mechanical stress results, leading the wings to "crease" in one or more folds.

This can be seen in the apico-limbal fold forced by the storage of the vast limbus under the pronotal apex. Immediately afterwards, under the same physical constraint and as a backlash, a

double plicature is initiated, then finalized immediately below the pronotum. A beginning of explanation of the control of the operation can be found in the very heterogeneous constitution of the tragopian wings in forced friction with the underside of the pronotal carapace, whose very complex ultrastructures have been evoked by the **S**canning **E**lectron **M**icroscope.



***Tropidolomia auriculata*. Integument of pronotum and forewings passed to the SEM.**
(1) and **(2)** Outer appearance guilloche pattern pronounced left flank and part of the coriaceous area of the corresponding forewing. (Scale: black rectangle 1: - = 400µm, then 2: - = 100µm). **(3)** Portion of integument showing that the main guilloches correspond to "sensory craters" each occupied by a clavicle rod most often eccentrically implanted (3: - = 20µm). **(4)** and **(5)** Internal face of the pronotum (4: - = 40µm) and its microspicular carpet (5: - = 10µm) containing some senses**. (6)** and **(7)** Highlighting the great ultrastructural heterogeneity of the membranous part of the pseudoelytes of these Membracids and the singularity of the **BVH triangle** of the double plicature [cf. drawing above], which is very regularly and densely planted with sensory spicules (6: - = 200µm; 7: - = 40µm **Micrographs made with the technical assistance of Jacques Boudinot, Museum (*cf.* Boulard, 1986d & 1999e)**

Thus, there is a regular implantation of "sensitive cones" on the **whole triangular folding wing range and only on it.** The same process has made it possible to perceive other

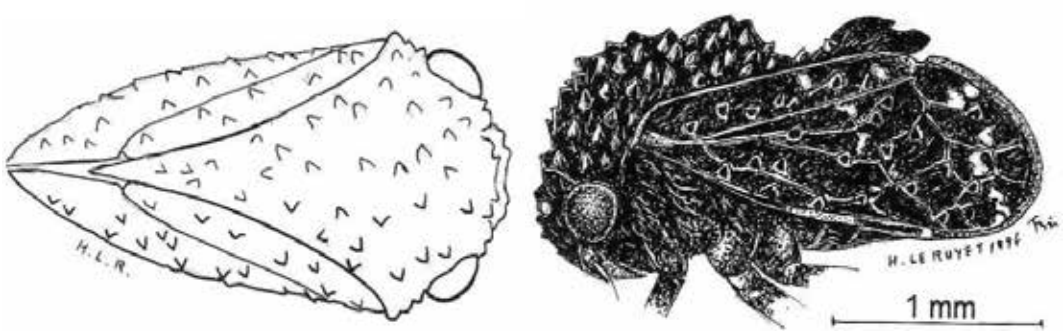
senses that dot the inner side of the vast pronotal expansion. It could therefore be that a cybernetic circuit controls the mechanical, pseudoelytral folding that characterizes these insects and comes into play during the "stegopterous movement" of the wings depending on this pronotal shell...

f) Faunistics

> **In the Seychelles** two species were encountered, a new *Leptocentrus*, of African origin, ***Leptocentrus madli*** Boulard, 1995 and a tiny species (2/2.3 mm total length) of genus and species then unknown, ***Madlinus seychellensis*** Boulard, 1995:

Madlinus seychellensis and ***Leptocentrus madli*** Boulard, 1995g, females.
Mahé Island, Montagne brûlée, herbaceous environment, October 1991 (MB Phot)

The genus **Madlinus** proved to be the progeny of an unpublished tribe, the **Madlinini** tribe, forcing the completion of the higher taxonomy of the Membracidae of the Ethiopian Region. These tiny membracids are mainly differentiated at the level of the scutellum: in the Gargarini, it is perfectly observed from the sides and the top, not in the Madlinini where it is entirely hidden by the base, which is wider at the posterior apophysis, as shown in the drawings below:



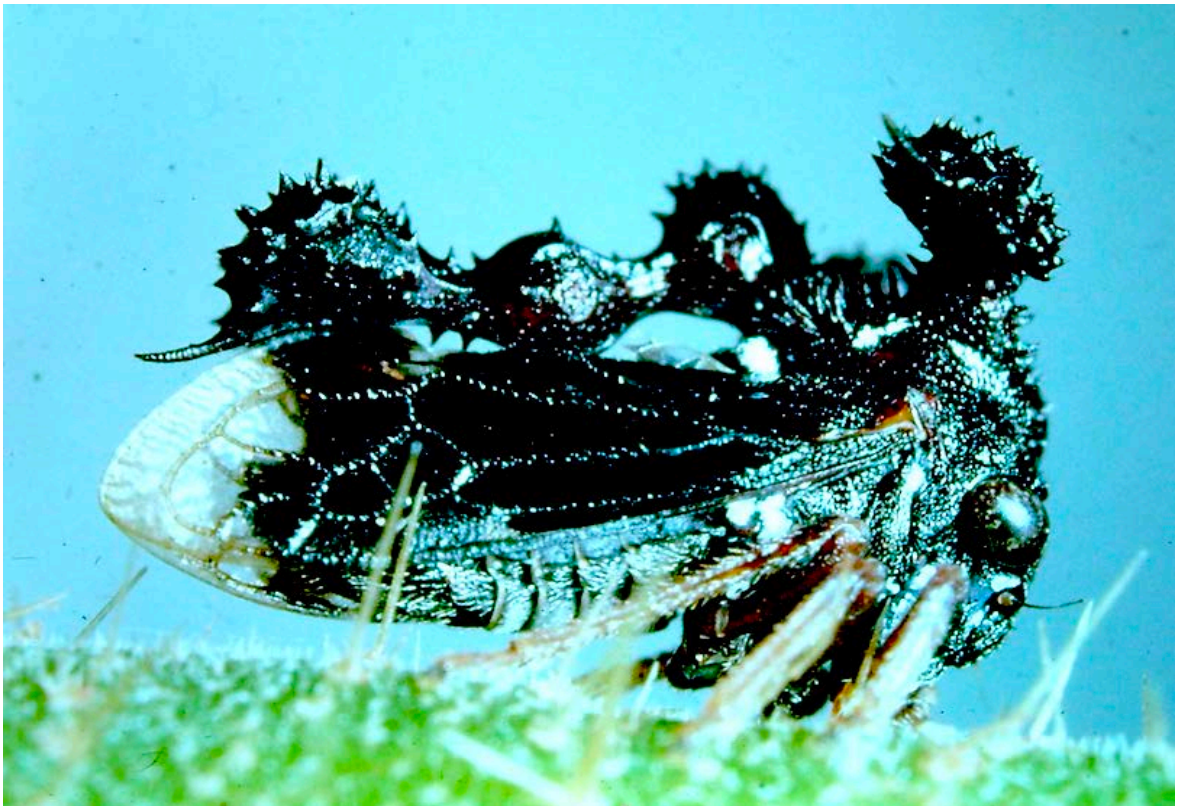
Madlinus seychellensis Boulard, 1995, male. Purpure and drawing by Hélène LR-Tan.
***in* Boulard, 1995g**

> **In Guyano-Amazonian environments**: ***cf.* MB,** 1980b, 1981g, 1991j, 2011a, some eco-photographed examples in previous pages.

> **In Intertropical Africa:** ***cf.*** **MB,** 1966a, 1968a, 1968d, 1968f, 1969c, 1971a, 1971d, 1977k, 1979c, 1979j, 1983d, 1984e. Some examples:

Eumonocetrus rostratus B. and ***Flatyperphyma flavocristatus*** B., the only African species with **an entirely foliate posterior apophysis**, known as the *apophyseal plate* (**Boulard, 1976a**)

Foliatrotus elephas Capener and ***Leptocentrus macarangae*** Boulard;

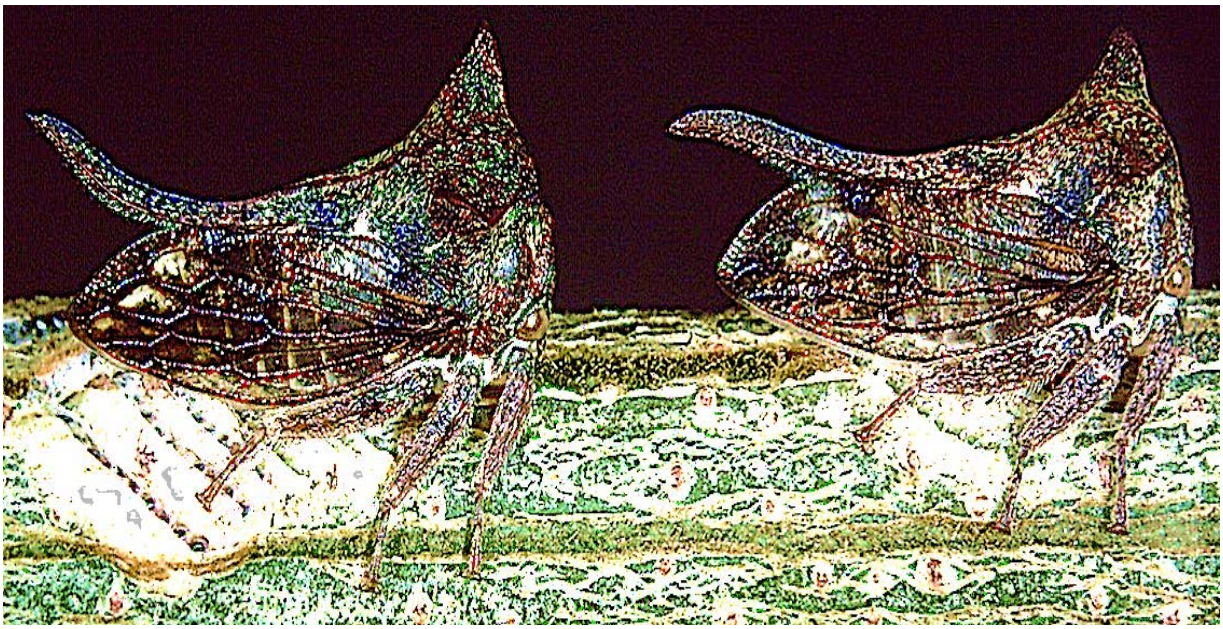


Hamma fabulosum Boulard,

Monocentrus hyalinipennis Capener
Central African Republic, Lobaye Forest (**MB Phots**)

Either in my descriptive escarcelle: **11 genera and 91 previously unknown species** of Membracids, all added to the diversity of ***Auchenorhyncha*** **Cicadomorphs** under my name.

Concluding the Membracidae Chapter, two selected eco-photographs:



Oxyrhachis pandata Distant, 1916. Two females - somewhat different - on their broods (body length = 10 mm). **Centrafrique, La Maboké, December 1968** (**MB Phot**)

Couple of ***Heteronotus flavolineatus*** Laporte, 1832. Male on the left (pronotum length = 12/13 mm; see eco-photo n°120, p. 439).

Buzios, Brazil (RJ), February 1980 (MB Phot; see also *Heterotus pompanoni*, p. 181).

IV - Fulgoroidea

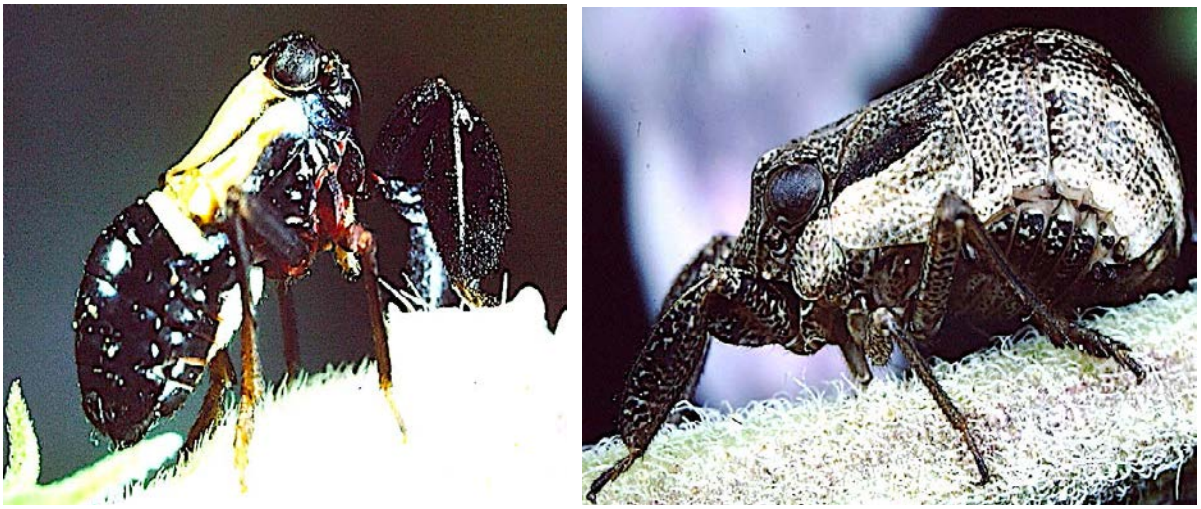
The Fulgoroidea or Fulgoroids make up a vast and interesting taxonomic sector, known to systematists as Fulgoromorpha, the second side of the Auchenorhynchus, as opposed to the Cicadomorpha, the first side, which is partly discussed above.

Two morphological features immediately distinguish Fulgorids: the **tegula** (small scale more or less covering the attachment of the forewings to the thorax) and the insertion of the antennae under the eyes, often somewhat forward. All have the sap-sucking rostrum, or leaf juices, and are excellent jumpers.

a) Morphological diversity

Even more so than the Cicadomorphs, Fulgoromorphs are essentially tropical, the European fauna being represented by only a small number of species, rather small in size and generally nicknamed *Fulgorelles.* Three examples of common species in France:

Cixius nervosus **(Linné) et** ***Asiraca clavicornis*** **(Fabricius) (MB Phot)**

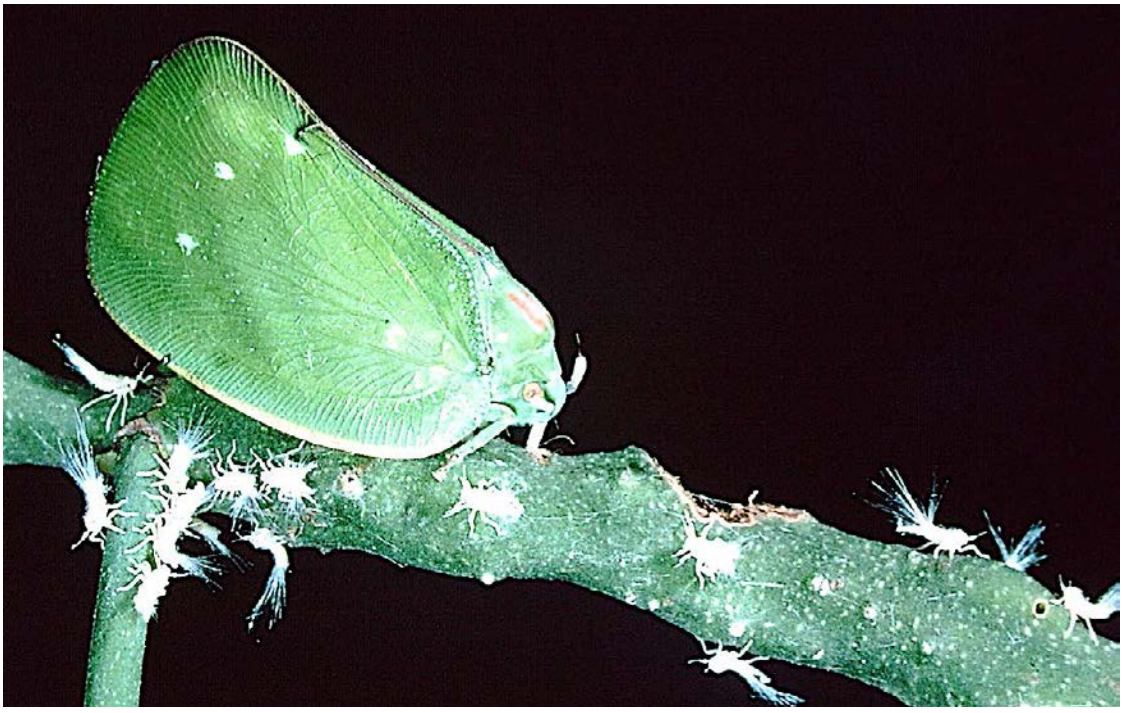


Caliscelis bonelli Latreille, **heterochrome** male and female, both **brachypterous (MB Phots)**

Morphologies offered by the Fulgores, some eco-portraits of African species

Philotheria nexa Melichar.

Harmosma bivulneratum Fennah.



Flatina rubrocincta Haglund and some emancipated newborns.

Trienopa viridis Melichar.

Mesoricania ordinata Melichar. (**MB Phots**)

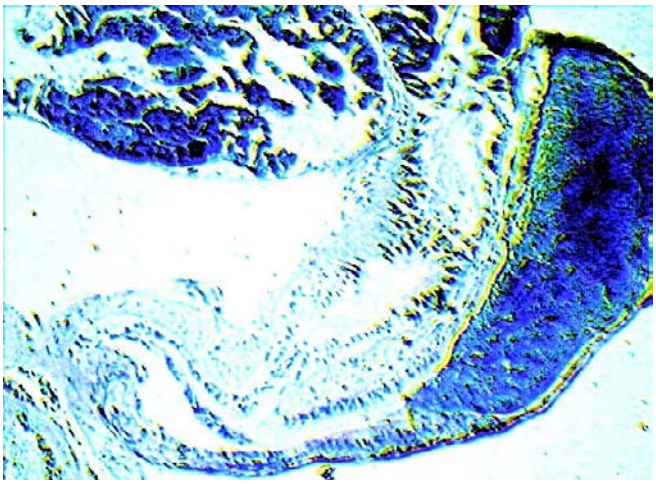
b) Histological investigations

During the investigations carried out on the genital tract of females, in a generalised trial in Auchenorhynchous, during the preparation of my thesis (*cf.* **Boulard, 1966**), several species were subjected to the scalpel and then to the microtome. The results obtained were particularly significant with the European ***Ditropis pteridis*** (Spinola, 1839) and the African ***Uysanus faecicarius*** (Stål, 1866). The striking interest lies in the fact that:

1) the role of the seminal ampulla, as defined in Cicadas, is held by a strong annular dilatation of the common oviduct located at the base of the ovaries;

2) the vast diverticulum from the genital crossroads is also in a spermo-destructive role. This is shown in the following histological sections, placed next to a slide of each of the subjects treated.

a) ***Ditropis pteridis*** (Spinola, 1839), female, very enlarged, feeding on Fern. Para-axial histological section of the reproductive tract of a pregnant female. From top to bottom: base of the ovaries, the lateral oviductes arriving in the strong oblong dilatation of the common oviduct; adjoining the latter, the '*pera spermadelens*', filled with decomposing spermatozoa, joining the genital crossroads:



b) ***Uysanus faecicarius*** (Sål, 1866); on the left, an adult; on the right, histological section also para-axial in a pregnant female showing, in spite of the convolutions of a larger and thicker tract than the previous one: the stretched connection of the spermo-destructive pouch with the common oviduct then, two transverse sections of its duct and a longitudinal section of a fold of the same organ:

(**MB**, Unpublished Documents)

c) Bionomic investigations

1) Tettigometridae

In fact, Fulgoroids took up very little of my time, apart from my photographic penchant for their often astonish habitus. Intriguing too, leading me nevertheless to spend some time with some of those, very present in **J.-H. Fabre's Harmas**. They were first of all juvenile Tettigometers living in tight colonies on the winged and spiniferous sticks of the ***Onopordons***, these great thistles of the south of France. In the summer, many of these "majestic" support one or more families of these **fulgorelles**, which is shown in the following three documents:

The above example was offered by ***Tettigometra sulfurea*** Mulsant & Rey. Newborns emerge en masse, clump together and feed, developing in close rows, more or less accompanied by ants. The last slide isolates a juvenile in the pre-imaginal phase and an extremely rare adult (bicoloured phenotype). **Sérignan-du-Comtat, Harmas, July-August 1976-1980 (MB Phots)**

The Tettigometridae family is also very well represented in tropical environments. In Ivory Coast, the following species is a particularly chosen example to take place here:

Hilda undata Walker, 1851. Afro-tropical tettigometer (*T. Bourgoin*[22] *det.*).
Female (myrmecophile) and its egg-laying, eggs individually glued to the plant support.
Ivory Coast, Taï forest, April 1986 (MB Phot)

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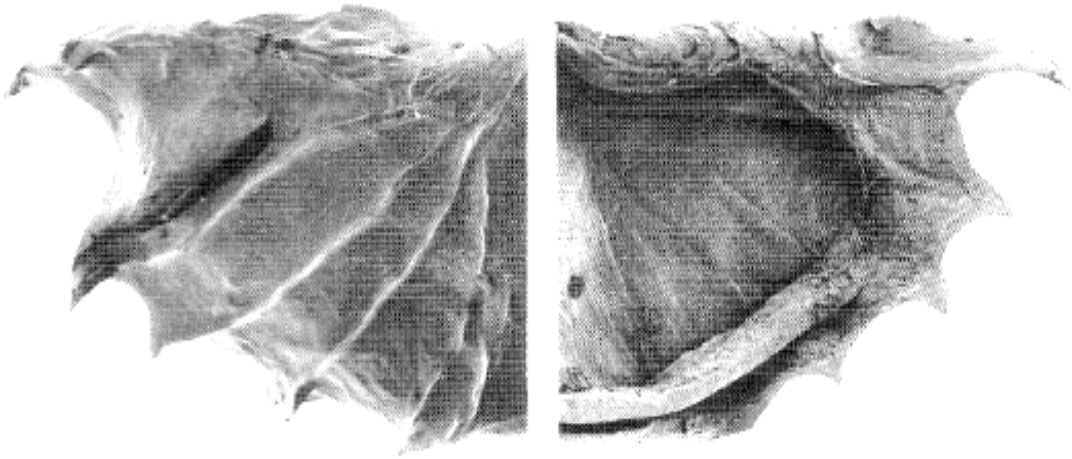
22) In the 1980s, the poor bibliography on Fulgoroidea, not only in terms of their bionomy, but even more so in terms of their morpho-anatomy (especially cephalic) and their systematic position, prompted me to propose an in-depth study of these insects to one of my first pupils, **Mr Thierry Bourgoin**. The results doubled my expectations. A brilliantly elaborated and presented thesis, Thierry became a professional entomologist, extending his first subject to Biodiversity in Fulgoromorphs. Today, at the MNHN, he holds one of the leading positions in French and international Entomology.

2) An amazing Issidae

Another Provençal "Fulgorelle" attracted my attention even more, that of the ***Agalmatium bilobum*** (Fieber, 1877) which are endowed with an out of the ordinary, but captivating reproductive bionomy. *Agalmatium* are small Auchenorhynchous of the family **Issidae**, 6/7 mm long, which colonise more or less Mediterranean trees and shrubs without causing any real damage.

In Auchenorhynchus, oviposition most often consists of intra-linear oviposition using a strong vulnar or sharp, gonapophyseal, anatomically speaking, Cicada or Leafhopper-type auger (*cf.* Boulard, 1966d). However, in many Fulgorids, the 'gonapophyses' are highly modified to the extent that the ovipositor has lost its primary, bulking function. Having become ovi-protective, it is also an incredible tool for both grasping and mixing. The anterior gonapophyses show the most profound modifications; they are divided into two longitudinal reams, the external of which is sclerified, detaching several spikes (*cf.* Muller, 1942; Boulard, 1987f), while the internal is presented as a retention attribute. The posterior gonapophyses are also separated into two longitudinal oars, the wider internal one being rich in sensory elements. In many of the females so equipped and observed laying eggs, the eggs are deposited in or on a plant nesting box and then covered with a lacquered, or cottony wax.

In the *Agalmatium* females of the Harmas, the anterolateral gonapophyses are shaped like perfect micro excavators armed with strong scrapers:

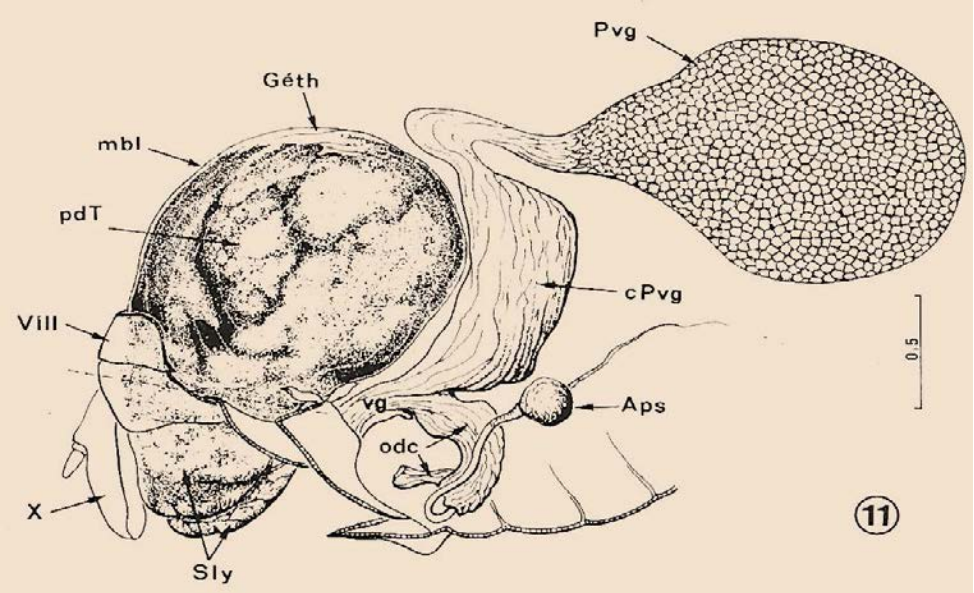


Outer and inner sides of the right gonapophyseal excavator (G x 180, MB Phot)

The females deal with it, but by demonstrating an unexpected "psyche", initiated according to one of the primordial Biological Rules: "Every egg laid must be protected", **applied to the aerial oviposition of this phytophile auchenorhynchus.**

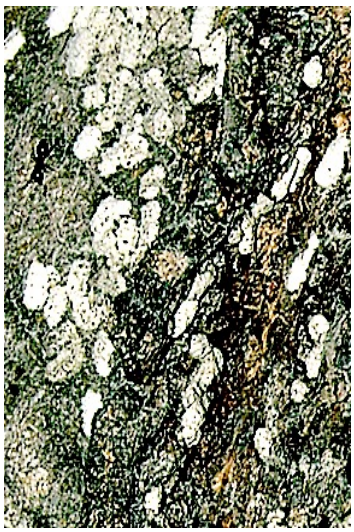
Once the mating has been consumed, the females, **before laying**, descend or jump to the feet of trees. There, directly on the ground, **they scrape and shovel earthy powder that they store** in one or two abdominal pockets, known as " Geotheques ", which are characteristic and infrequently seen elsewhere for all I know. *Please, see, on the next page, the explanatory drawing of an "exploded" abdomen showing the voluminous place of the main geotheca full.*

Then the females, heavy to be unable to jump or fly, will go up, **pedestrians**, on the trunks... When they reach a good height, they lay eggs in small packets which, each time the gonapophyses helping, they surround with a wasted mixture of soil mixed with a vaginal secretion. Thus they make up whitish **ootheca**, which they stick on the bark and which will solidify on the spot, **offspring assured.**



Agalmatium bilobum (Fieber, 1877), "(**11**) burst" from the abdomen in a female captured before spawning and showing the ectodermal genital tract (vg, odc, Pvg, cPvg, Aps), the geotheca (**Géth**) and the styloidal ante-chamber (**Sly**) filled with compacted earth (**pdT**).

From **MB and HLRT**; scale in millimetres, **Boulard, 1987f.**



Agalmatium bilobum mated, male is on the left. Ootheca in place.

France, the Harmas of J.-H. Fabre (MB Phots)

In *Agalmatium*, the usual egg-laying, made impossible by the deviated structure of the gonapophysa transformed into excavators, has been updated by:

1) The existence of internal bags that can receive a substantial load of powder (up to being much heavier than the insect itself), **powder that will be progressively drawn off on purpose,** during the making of each ootheca.

2) The superimposition, with the simple instinct of laying, of a **programmed ovipositional psyche leading** the females to go downstairs to stock up with earth (**foreign material!**), then go upstairs to **amalgamate** their eggs with muddy envelopes **that they will finally place on the bark.** By drying in the open air, the amalgams will give as many aerial ootheques. Prodigious **!**

France, l'Harmas de J.-H. Fabre June-July 1972 (Boulard, 1987f).

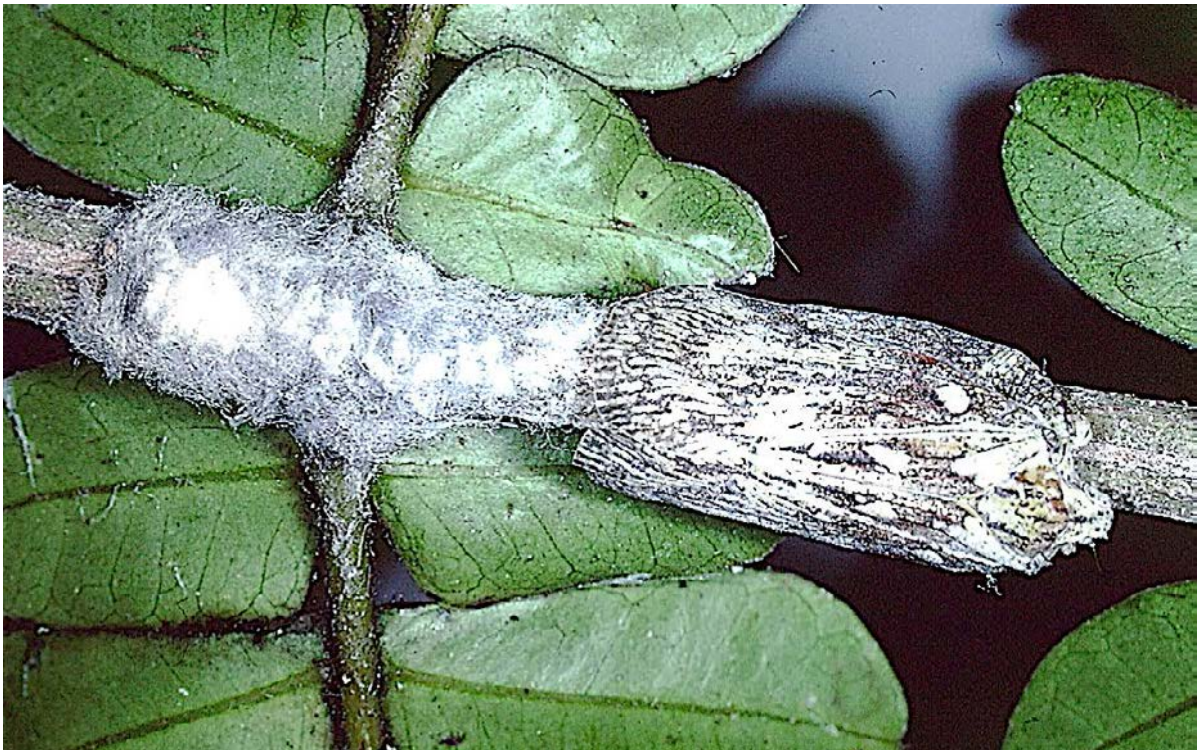
Entomology is thus accountable for random mutations subjected to evolutionary tests, with uncertain starting points and disconcerting finishes; but splendid and so questioning.

3) Fulgorids of Central Africa in spawning, that is to say:

> "Normal"

***Pochasia fasciata* (Ricaniidae),** oviposition introduced with an efficient auger into the main vein of a cocoa leaf attacked from the underside. In a box, the appearance of the eggs.

> Glued and laid on a branch



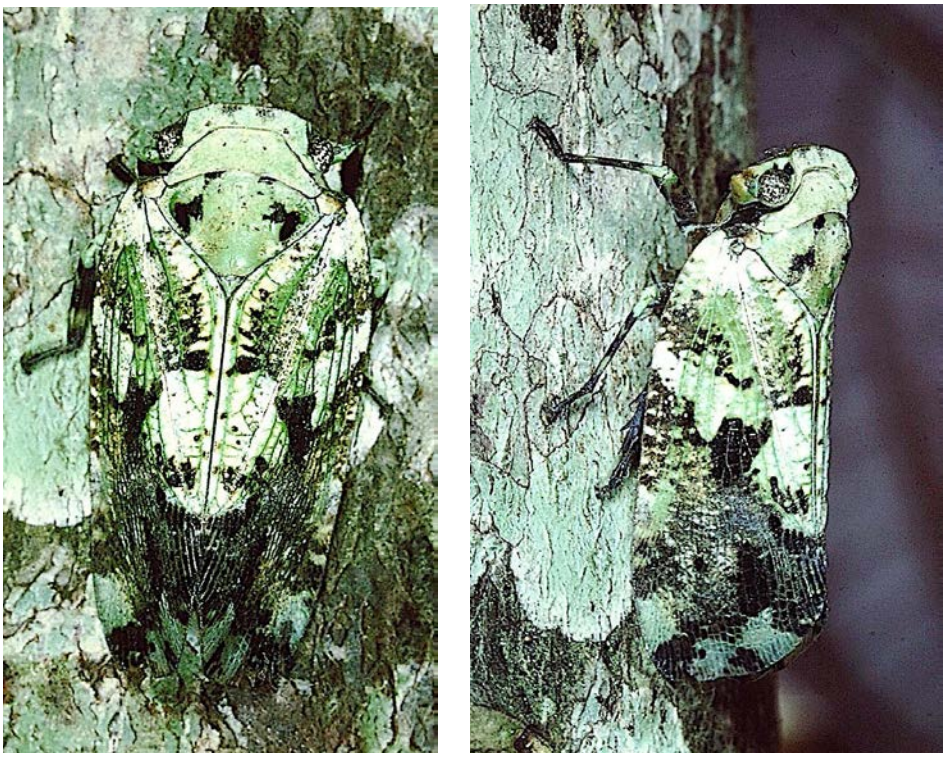
***Uysanus faecicarius* (**Flatidae**),** eggs laid and covered with more or less pulpy wax.
Central African Republic, Boukoko-La Maboké (MB Phots)

d) Fulgorian mimetology

Many Fulgores develop the **mimesian function**. Some use the plural form, notably in the thallomorphic Flatids, such as these:

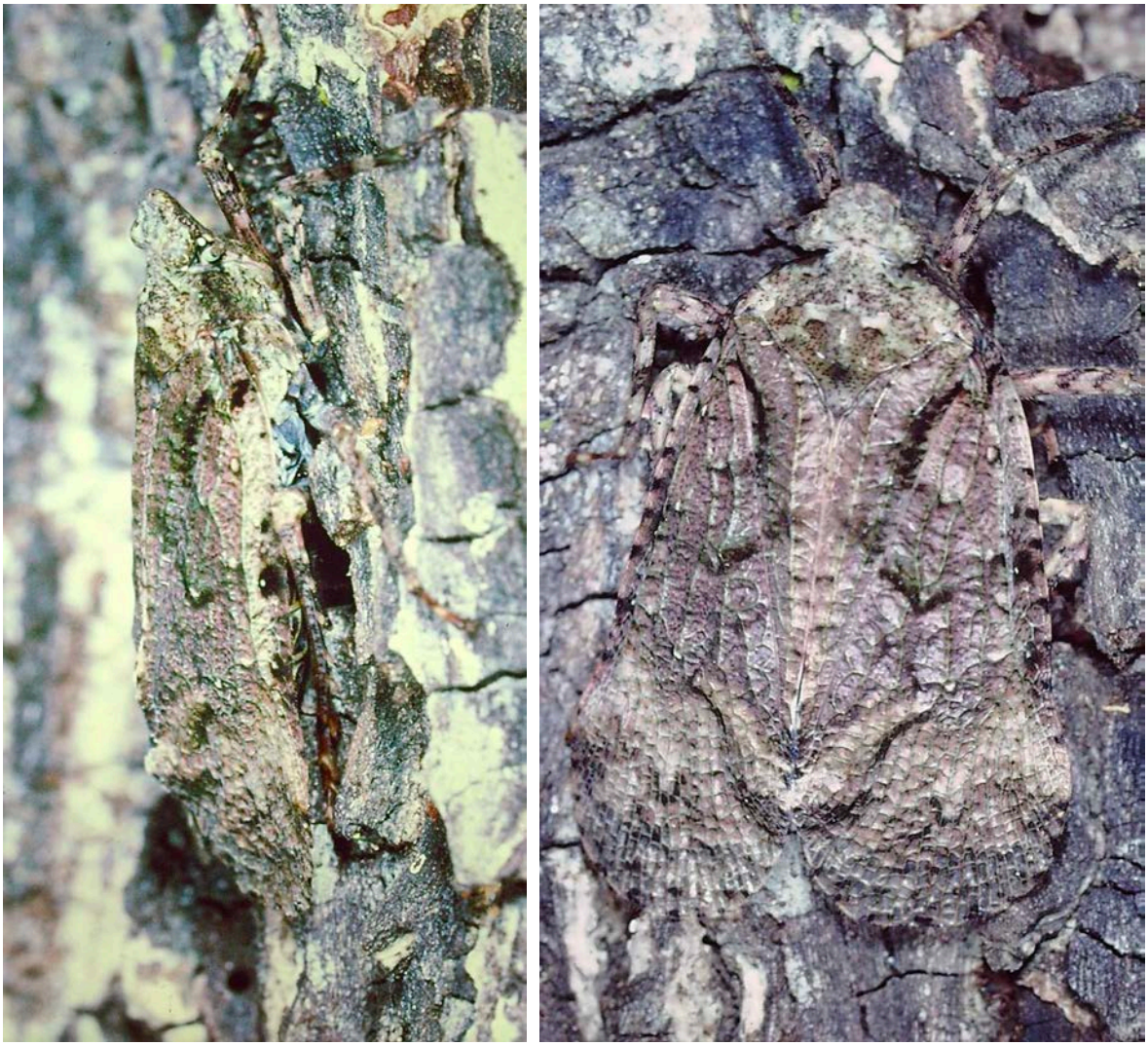
Colony of ***Uysanus fescicarius*** (Stål) adapted to the tone of a more or less imitated bark depending on the presence or absence of tallophytes. Perfect examples of mimesis *(cf.* **Boulard 2007b** and **2012c)**.
Lobaye Forest, April 1966 (MB Phot)

Number of fulgores adorned with disparate colors, ranging from light green to black, but specifically assembled, and in such a way that the insect merges with its substrate, if not its environment. Thus, the Eurybrachide-lichen common in the thick forest of La Maboké.



Mesonytis taeniata, **Rainforest of Boukoko-La Maboké, December 1969 (MB Phots).**

Corticolous Fulgores living in the savannah trees periodically burned, have the ability to perfectly mix their body appearance, protection added to the reserve of their movements in situ before resorting to the gush of a flight, if necessary ... Demonstrate by two specimens belonging to the same species, one, in profile on a greyish trunk, the second, plated on a perfectly burnt bark:



Ricnophloea corticina Germar has adapted perfectly to the more or less regularly burned Central African clear forests. Neighbours of *Soudaniella* (*cf.* p. 93), but silent, they are difficult to detect on blackened trunks, another great example of mimesis.

Mbouma savannah, Central African Republic, January 1970 (MB Phots)

A very peculiar Fulgore, as far as the subject matter is concerned, caused some problems during my stay in the CAR. It was however, in the meagre Collection of the centre, one of the first to attract my attention. An extraordinary subject with an excellent corticiform outfit, but with, in addition, the head extended as if by a broken twig (!). With my Boukokois Observers, it was almost impossible to detect it in situ, apparently evolving towards the foliage, out of immediate reach. Captures with light traps, followed by breeding in ecological cages, allowed to satisfy at best the natural shots as desired for this nature's amusement.

The Fulgorid "Broken twig door", ***Zanna intricata*** (Walker, 1858), caged.
Boukoko-La Maboké, March 1968 (**MB Phot**)

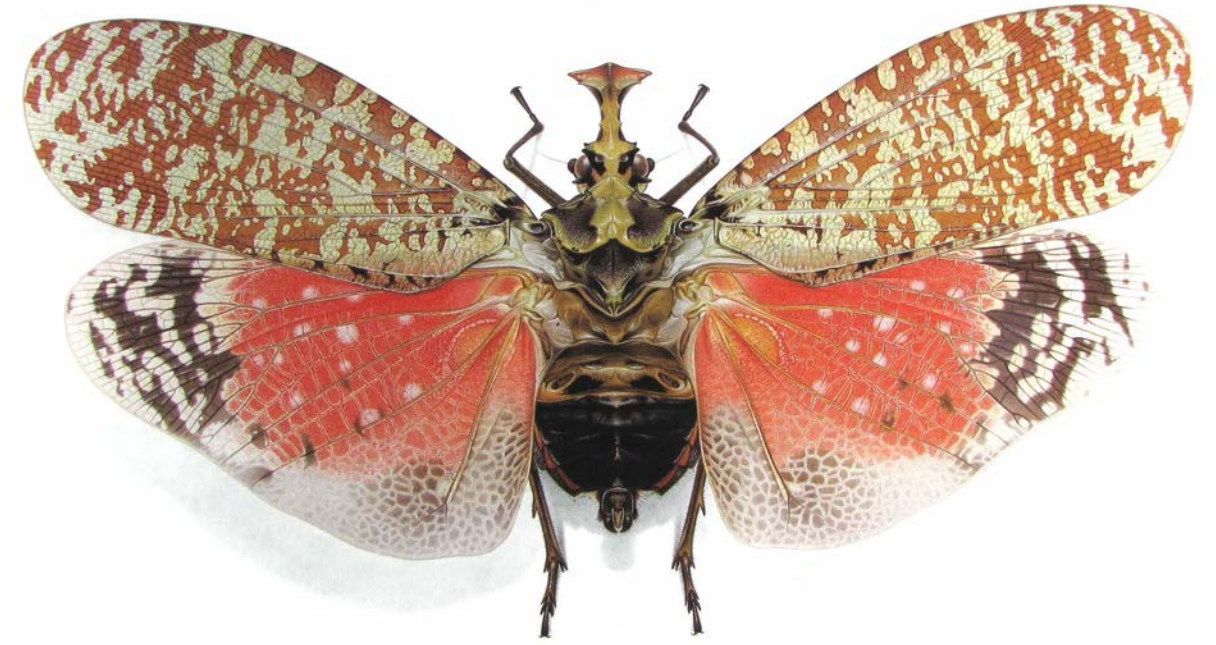
Note: *I found and photographed the same "twig holder" in Lower Ivory Coast in April 1986.*

Other lineages seem to have determined to "copy" the leaves, without however competing with the Orthopterans or some Dictyopterans. Nevertheless, here is one of the most beautiful successes to be credited to the Fulgorids in respect of **phyllomimesis:**

The morphology of ***Odontoptera carrenoi*** Signoret imitates rather well a more or less petiolate leaf... A glance, somewhat distant, perfect "the false identity".

French Guiana, December 1975 (MB Phot)

To finish my professional review on the cicadas and some other Auchenorhynchus, the first part of this biography, I choose, not a photograph, but the magnificent watercolor of Fulgore from the MNHN entomological collection that we owe to the glances and the prodigious brushes of **Bernard Durin,** dear friend too soon gone (*cf.* p. 154).

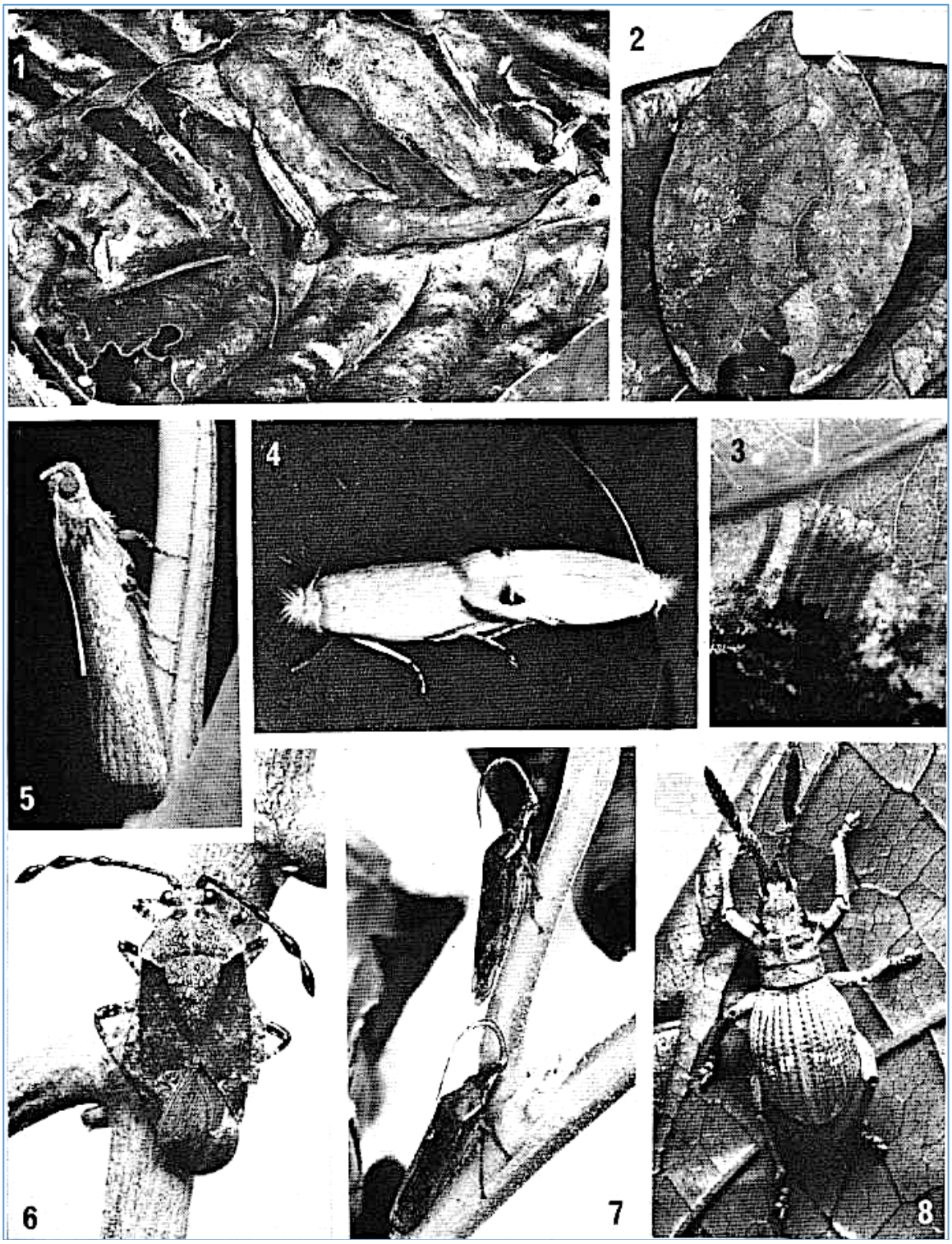


Phrictus diadema (Linné, 1767). Amazonie. **(B. Durin pict.)**

V.- Research on insect pests in Central Africa

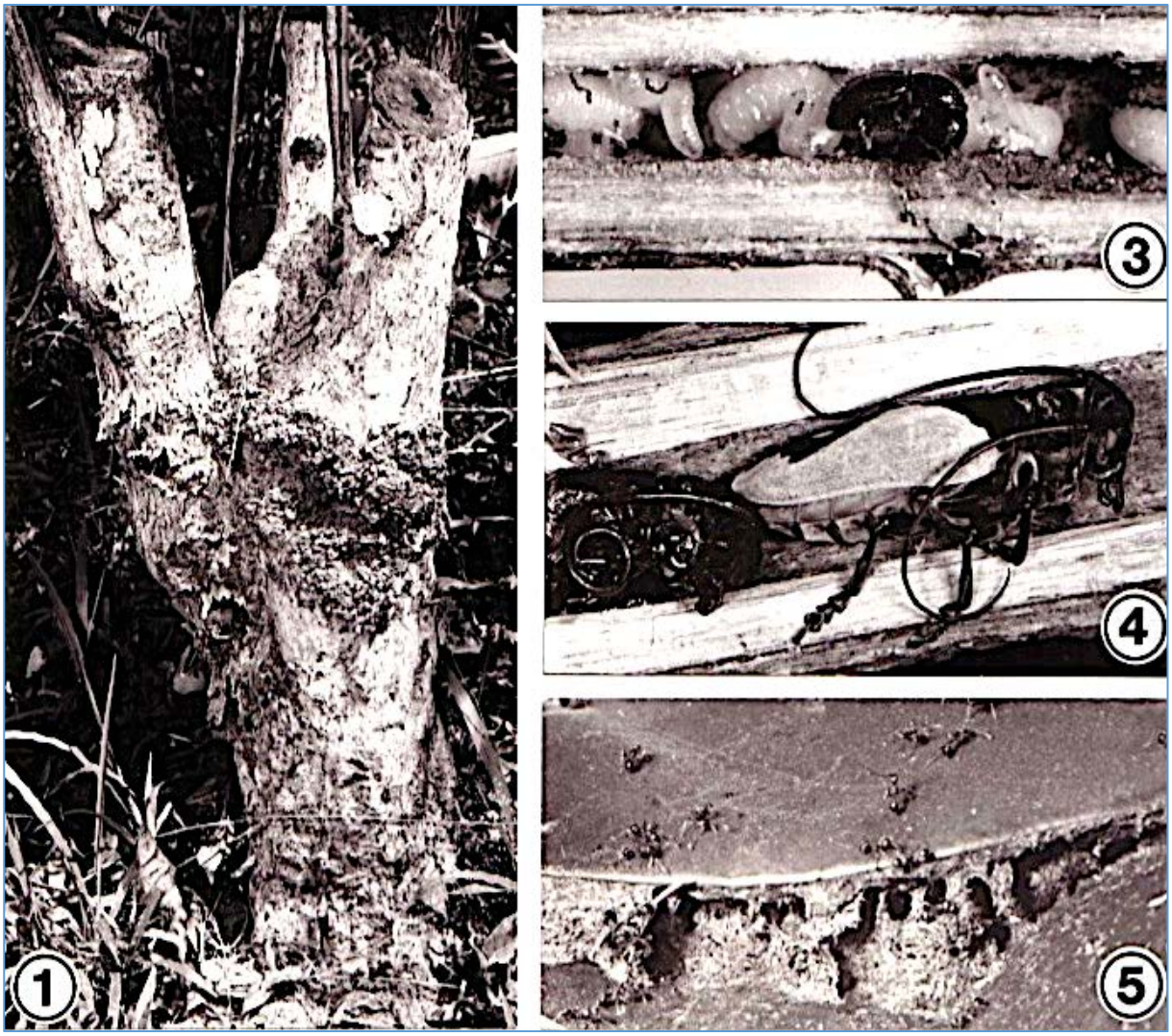
In the **C**entral **A**frican **R**epublic (CAR), perennial crops include three so-called "stimulant" plants: coffee, cocoa and cola trees, to which in CAR pepper was added. Many insects hinder, more or less, the normal fruit production of these plants.

a) Indicative illustration: harmful species on Coffee, Cocoa and Pepper trees

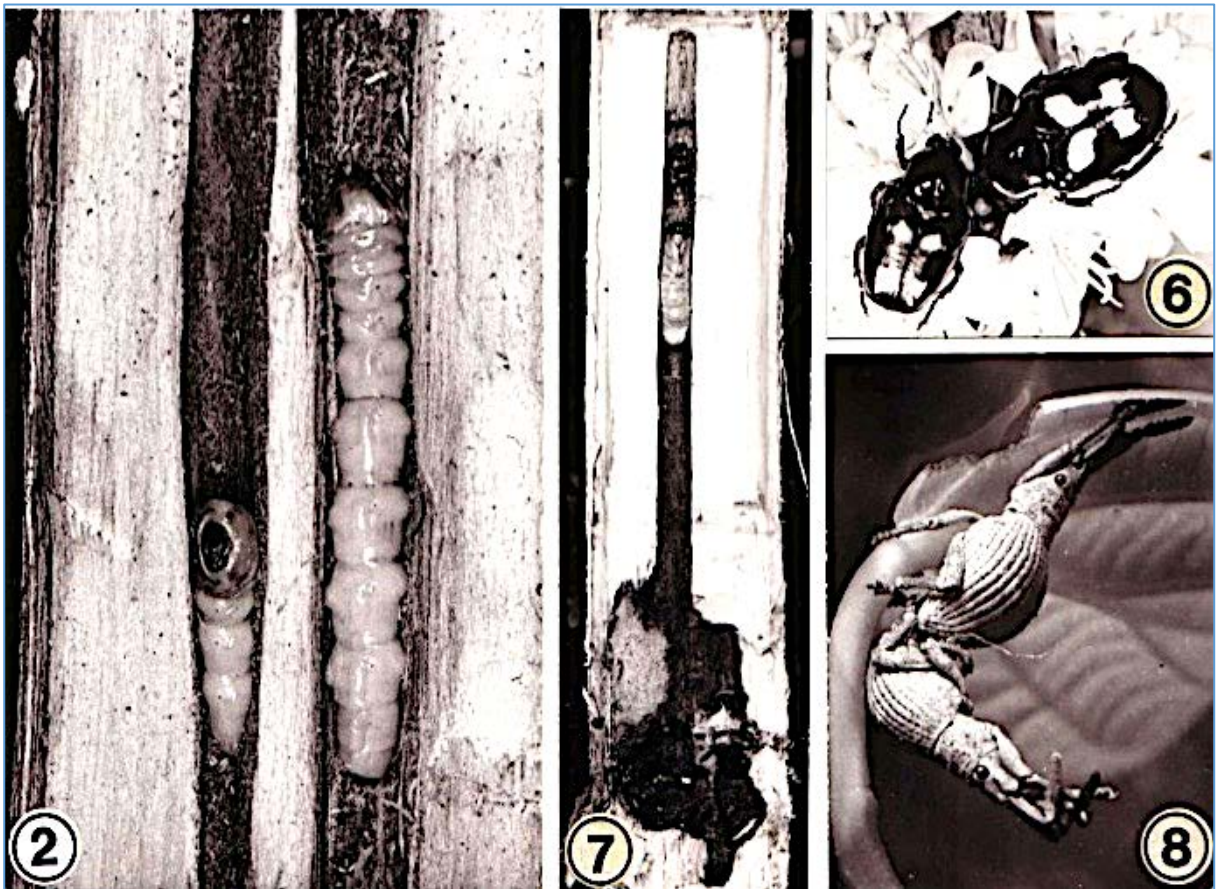


PL. I, No. 1 and 2) Lepidoptera Drepanidae *Epicampoptera marantica* Tams, 1925. **1)** Cluster of caterpillars during the dry season; they were sheltered between two superimposed coffee leaves joined by silky threads

which they secreted with their salivary glands. **2)** Imagos in copula; started at night, mating continues throughout the following day.
(3 and **4)** Lepidoptera Lyonetidae *Leucoptera coma* Ghesquière, 1940. **3)** Front of microscopic scales undermining the palisading parenchyma in the thickness of a robusta coffee leaf and photographed, in situ, by transparency. **4)** Habitus and nocturnal mating of imagos.
(5) Lepidoptera Pyralidae *Anonæpestis tamsi* Bradley, 1965. Nocturnal butterfly whose caterpillar is very harmful to cultivated pepper plants. Attitude taken by the imago when resting during the day.
(6) Heteroptera Miridae *Salhbergella singularis* Haglund, 1895. Habitus characteristic of the adult. Bugs harmful to cocoa trees and cola bushes in both juvenile and adult stages.
(**7)** Homoptera Hilicidae *Wolfella krameri* Boulard, 1969. Two adults of this curious leafhopper "on a hook", drawing sap from a young cocoa twig.
(8) Curculionidae beetle *Bryochaeta quadrimaculata* Faust, 1898. Habitus of the weevil which is phyllophagous on cocoa and pepper trees.



II, No. **1)** Beetle Cerambycidae *Bixadus sierricola* White, 1858. An old robusta coffee plant showing both old attacks of the Longicorn beetle in the main branches (at the level of re-growth, or regeneration pruning) and recent attacks (subannular blisters in the bark and sapwood). (2) See next page. **(3)** Beetle Scolytidae *Xylosandrus compactus* (Eichhoff, 1875), the Branch Beetle. Young plagiotropic twig of robusta coffee, showing the entire central part destroyed and colonized by the parasite, of which one adult and several larvae are seen. **(4)** Beetle Cerambycidae *Phosphorus virescens* (Olivier, 1795), morphe *gabonator* (Thomson, 1865); beetle branch exposed longitudinally to show an adult which has just hatched (colour p. 401). **(5)** Hymenoptera *Myrmicidae Tetramorium* africanum (Mayr, 1866), venomous ants (known as Macro-mischoides) which install nests between two coffee leaves and are a major nuisance during the maintenance of plantations and the harvesting of drupes.



(2) Beetle Cerambycidae *Bixadus sierricola*: Portion of a longitudinally split main branch, showing two B.s.W. larvae of the same age in their respective sub-axial galleries and independent of each other.
(6) Beetles Cetoniidae *Charadonata sorer* Kraatz, 1883, devouring coffee flowers.
(7) Lepidoptera Cossidae *Eulophonotus myrmeleon* Felder, 1874. Trunk of a young cocoa tree open longitudially showing the gallery dug in the axis by the caterpillar of the parasite, before giving birth to the chrysalis that can be seen in the upper third of the gallery. Bottom: accumulation of waste produced by the driller.
(8) Beetles Curculionidae *Bryochaeta quadrimaculata* Faust, 1898. Male and female mated; phyllo-phages on coffee, cola, pepper and cocoa trees (in colours p. 438).

Plates from Boulard, 1989f, Boukoko, Central African Republic (MB Phots, 1965-70).

b) Control of pests of coffee trees, 1965-70

When I started at the IFCC Research Centre in CAR, I had to conduct trials of chemical insecticides to reduce, if not eliminate, insect pests on coffee, cocoa and pepper trees. This was to preserve the yield of small family plantations or those of larger settlers. About ten Central African Observers were entrusted to me to help me carry out this work. The trials were carried out both in insectariums and in the open field, according to the programmed guidelines.

The exact determination of treatment dates in plantations, the possibility of acting at the right time with the plant protection equipment proved to be rather random, while none of the pesticides used were sufficiently selective in spraying to respect all the useful or harmless insectofauna. As justifiable as the types of treatments were, I had to recognize and make it known that extensive insecticide spraying is a repetitive, pernicious and very expensive way to deal with the problem. A biological nonsense that can have various undesired consequences for the environment, including humans and especially in family plantations, forests. Convinced of the validity of these remarks, which came to the point of consolidating the teachings received a few years earlier, different approaches were conducted in parallel with the unsatisfactory methods in force.

As far as coffee trees were concerned, three avenues were explored:

-> Use *Bacillus thuringiensis*, the erucid bacterium then recommended by the I.N.R.A. against the caterpillars of *Epicampoptera*.

-> Select the best organophosphorus products with marked endotherapeutic properties while being well tolerated by coffee trees.

-> Detect among the natural parasites, the one or those that would best meet the requirements of biological control. There, I trained two of my observers, **Ambroise Mondziaou** and **Paul Kombo**, to search, with me and in the field, for small Hymenoptera that could parasitize the caterpillars, if not the adults of the targeted pests, or their eggs.

From the 1967/68/69 exercises, we were able to learn that:

1) Trials with *Bacillus thuringiensis*, despite the very promising results obtained in the greenhouse with "Bactospein", then "Thuricide 90 TS", were short-lived because of their thermolability in an equatorial environment.

2) At the end of the 1968 campaign, preliminary trials favouring systemic insecticides led to the selection of azodrin, an organophosphorus compound, which was new at the time. Applied as a whitewash to the trunks and base of strong stems, *azodrin* penetrated the robusta coffee plant in a few hours and persisted there for about a month up to the level of the leaves. Highly effective as an insecta-rium against caterpillars of Epicampoptera and Leucoptera fed on treated coffee tree limbs, *azodrin confirmed its real effectiveness in small family plantations* during the 1969 and early 1970 campaigns. Product without danger for the growers, with the respect of the precautions of use.

Concerning the staining of trunks and strong stems, I found in my notes a forgotten information: the impossibility of carrying out this type of treatment in Lobaye, in certain family plantations. These plantations are invaded by mini ants known as fire ants, or electric ants, "mini-furies" that are unbearable for the planters, also attacked at harvest time. From the MNHN then contacted, my colleague ***Miss Claude Richard*** told me that it was *Wasmannia auropunctata*, an invasive neo-tropical Myrmicidae, already reported in Central Africa, where it is trying to establish itself as a commensal of colonies of Homoptera mellifera. As a gesture of friendship, Claude entrusted me with a magnificent MEB print, which I am happy to transcribe here in his memory:

Wasmannia auropunctata (Roger, 1863), Miss **Claude Richard** micrography

3) Concerning ***Leucoptera coma*** Ghesquière, the main parasite detected was a micro-Hymenoptera Encyrtidae, which was responsible for nearly 70% of the natural mortality of phyllophagus in untreated coffee plots. The O.I.L.B. identification centre in Geneva was able to recognize this Encyrtidae as belonging to a genus not yet described, but very close to the ***Ageniaspis*** (Charles Ferrière, det., O.I.L.B., Geneva, 1966).

Leucoptera coma, pupated larva protected under an astonishing silky nest *(8 mm)* woven under a coffee tree leaf **(MB Phot).**

4) In parallel and concerning the Epicampoptera, whose adult emergence was systematically collected in light traps*) we obtained other Encyrtidae. Oophagous which destroy egg-laying (in 80% of greenhouse farms). The most frequent of these small parasites represented a new species at the time, but belonging to the genus ***Ooencyrtus*** (Ch. Ferrière det., 1968).

In 1970, I concluded my last I.F.C.C. report as follows: "Although it is premature to give an assured opinion (the main question is whether the ripe beans do not contain harmful residues: samples were sent [on 20. II.1970] to the I.F.C.C. Paris for analysis), it may be thought that Azodrin provides a new, rational means of protection for family coffee growing. The "Azodrin-badigeon" method could be divulged to African coffee growers; it is easy, not very dangerous in terms of basic precautions for use and does not require expensive equipment or fuel: a simple brush and a pair of gloves are sufficient. Moreover, it respects the useful insectofauna and it can be applied at the right time, two major conditions, yet too often neglected, of phytosanitary treatments.

Trials to propagate Encyrtidae ***Ooencyrtus*** (micro-Hymenoptera not exceeding 3 mm), started in 1969, could not be carried out successfully". After my departure from the station at the end of March 1970, the search for a breeding technique and the storage of the auxiliaries obtained was interrupted. The political events were such that the IFCC had to close the Boukoko Centre one year later. One can only regret, as ***Ooencyrtus*** [figs. 3 & 4, PL. III of the report] can be valuable beneficials, nip-killing one of the main pests of coffee cultivation in Central Africa.

Hymenoptera Encyrtidae, *Ooencyrtus sp*. female (just 3 mm long) **parasitizing the eggs of the egg-laying columns of *Epicampoptera strandi,*** whose caterpillars feed on the leaves of the **robusta** coffee trees **in Central Africa**
See also p. 370
(MB Phot. Boukoko, 1969e**).**

*) **Lighted traps.** Arranged in various points precisely chosen from the plantations to be effective each night with one or two observers, collectors of emerging Sickle-cells to carry out counts... Sometimes, especially at the end of twilight and stormy nights, this work was totally supplanted by the mass hatching of sexed Termites which made the white webs of the traps black! Counting was impossible, but the villagers, wives and children, who would hurry to the traps to feast on mini-prey "chubby" prey captured by the wings and eaten raw! I can repeat here, the excellent flavour of these insects, so consumed.

c) Insects harmful to pepper plants

At the time of my arrival at the Boukoko Research Centre, the most worrying entomological problems for the recently introduced pipemaking in Central Africa were posed, or were likely to be posed first by a a creeper leafminer, then, to a lesser but not negligible degree, by a Membracid deforming the main stems. Bugs feeding on leaf juices were also a concern.

1) The mining caterpillar Is that of a Lepidoptera Pyralidae, discovered by my predecessor and friend from Boukoko, **Raymond Pujol**, who became Professor of Ethno-zoology at the MNHN. The species had just (1965) been described as ***Anonæpestis tamsi*** by **Dr J. D. Bradley**, of the Commonwealth Institute of Entomology (London), from specimens sent by Raymond. Known as the number one enemy of the pepper plant grown in Central Africa, this moth was one of my main concerns in Applied Entomology. It was indeed necessary to know at least the broad outlines of its life cycle to be able to fight effectively against it. ***Anonæpestis tamsi***, now classified in the subfamily **Phyticinae** (**Joël Minet, 1982**), is a small greyish-brown moth about 16 mm long.

The females lay their eggs, small oval and embossed patties, in the axils of leaves when still young. Incubation takes about 15 days and the newborn caterpillar enters the creeper at an axillary bud. During its growth, this larva digs a long and wide gallery in the axis of the liana to feed, which causes the death of the entire upper part of the plant. After 4 to 5 months of larval life, chrysalidation takes place inside the necrotic part of the plant and always at a node. Under natural environmental conditions, metamorphosis requires 12 to 15 days.

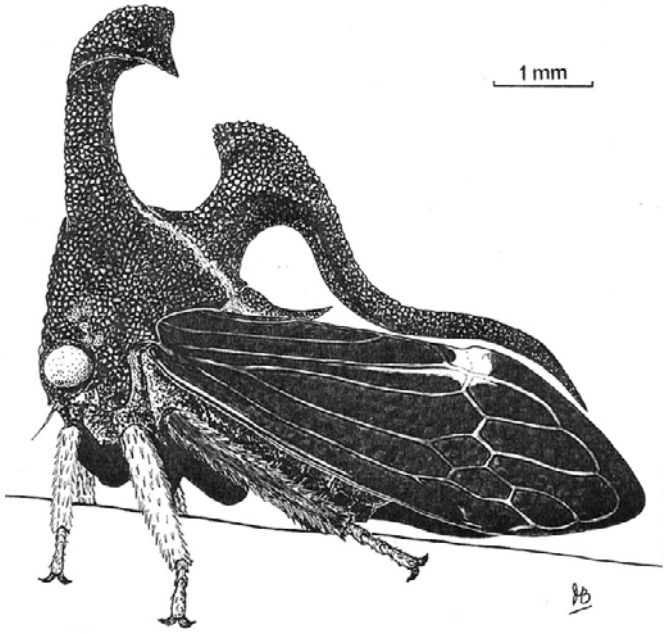
Light trap catches and plantation counts of "pyraleated lianas" have shown that the maximum adult population density is in December-January. Control trials, conducted from the outset with systemic insecticides, were set up in September and November 1968 and 1969. Bidrin, a similar product to azodrin, applied as a whitewash on the base of the vines, gave the best results and could be recommended to growers... Without yet having had time to know whether traces of the systemic insecticide were found in the peppercorns.

2) The Mirides of the foliage

Two species of these bedbugs were found in Boukoko, both monitored but somewhat neglected, as their foliar juice intake was never worrying. These were ***Helopeltis***, or "Mosquito Pins" below left and, on the right, an ***Odoniella,*** which is similar to the Ivorian species ***O. rubra*** (**MB Phots**).

3) The Membracid of the Pepper Tree

Homoptera Auchenorhynchus, this pest of the pepper tree grown in Boukoko was the object of particular attention. It was a ***Monocentrus*** of a then new species, which I was able to draw, then describe, dedicating it to Mr. Carayon, happy to thank my "Teacher" for his constant attachment, which he kindly honoured me. In its adult state, ***Monocentrus carayoni*** is a small blackish-brown insect with sometimes bluish reflections and a powerful jump. It can be easily recognized by its head, which has a conical pronotum topped by lateral and curved cuticle expansions and a strong sinuous posterior apophysis:



Monocentrus carayoni Boulard, 1966. **RCA forestière (MB pict.)**

The young are different, not jumping, but spiniform and with disruptive colours, preferably standing on the lianas, which they leave only for the imagination on the underside of the leaves. Quite abundant in plots planted under forest cover where it forms small colonies, where one can surprise the sexes copulating in opposition (*cf.* p.436/, n°117a+b). This *Monocentrus* is responsible, on the one hand, for the spoliation of sap leading to young shoots dropping and, on the other hand, for the large deformations inflicted on the lianas due to the incisions made by the female's auger to lay eggs.

Applications of Bibrin as a whitewash on lianas proved to be the most appropriate to limit membracid populations, which are most abundant at the end of the rainy season (September-November). Other insects were recorded on the lianas. In particular two weevils (fig. 8, page 360), a *Chrysomela* and two Mirids, none of which seemed, at the time, to be able to depreciate the Boukokan pipericulture.

The main part of the observations and results was the subject of a relatively important note since it was the first of its kind. It appeared in the 1967(11) from "Agronomie Tropicale" under the title: **"Premières données sur les Insectes nuisibles au Poivrier cultivé en République Centrafricaine"** including twelve of my first photographs of representatives of the entomic fauna of Central Africa having adapted to Piper nigrum (article obligingly co-signed by E.M. Lavabre, then coordinator of the Entomological Services of the I.F.C.C. Overseas). From this research, guidelines were drawn for cultural methods: the dense forest environment, favourable to the three main predators, was advised against, the elimination of Piper umbellatum, recognized as the primary host of the webworm, was recommended, as well as the use of appropriate insecticides.

Drama in the " Boukokoise Poivrière ", a Fourth Type Encounter[23]

A mini-spider from the Salticidae family has just intercepted a *Monocentrus carayoni* (cumulative lengths of the belligerent: 17 mm!)
Centrafrique, IFCC, Boukoko, 1968 (MB Phot)

d) Insects harmful to Cocoa trees

Cocoa tree cultivation was still of very secondary importance in CAR. However, within the framework of the agronomic and rural development of this country, it seemed to have a real future in the ombrophilous departments of Lobaye and Haute-Sangha where climatic and edaphic conditions are favourable.

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23) Encounter of the Fourth Type, "Prey-Predator". See, page **475**, the "Cardboard Flag Bearer of the First Entomological Exhibition for the General Public through Photography". *Commissaire,* ***Francis Delvert,*** *ami de toujours***.** See the second flash on the acrobatic capture, the spider having ensured the capture of its prey
Galerie photographique Olympus, Forum des Halles, Paris, novembre 1980.

Our programme concerning this crop was mainly, if not exclusively, to draw up an inventory of the species that had more or less become dependent on - or simply passing through - **this plant recently introduced to the station of Boukoko.** General experience having shown that the presence of certain insects, notably Hemiptera and Lepidoptera, can be detrimental to a cocoa farm (especially in its early years), it was the responsibility of the entomological service of Boukoko to draw up the inventory and to examine the spatio-temporal distribution of the insects in place, harmful or likely to become harmful to this crop. This is what I undertook with my team of Central African technical assistants as early as November 1965, following (without knowing it) in the footsteps of a certain "Mr. Boulard" who had been involved in the cultivation of the cacao tree in the Belgian Congo, in the first quarter of the last century (ancestral homonym? in: *Revue de Botanique appliquée et d'Agriculture Coloniale, April 1927, Bulletin n° 68, p. 241* (in future research?). In addition to the initial investigations supported by visual hunting, the collections were mainly aimed at detecting the possible presence of pests previously confirmed in Ivory Coast and Cameroon. This was precisely the case of the Mirids, biting-sucking and depreciating pests on pods, causing rotting and of a caterpillar of the stem miner moth. Nevertheless, new products had to be added, including defoliators and several types of cocoa-sucking biting insects in nurseries and on young family plantations. **(*cf.*, Blrd, 1967a; 1968a; 1969b & d);**

1) Sap suckers

The first group, represented by the Hemipteroids, proved to be by far the most pernicious, so I first took an interest in it. We noted the presence of Punaises Mirides, of the ***Sahlbergella*** genus:

Sahlbergella singularis, a colony of juveniles in residence and their characteristic damage.
Caterpillars and damage from the Noctuid *Characoma stictigrapta* moth on young cocoa pods.
(Boukoko, under shade, MB Phot).

The serious threat to cultivated Sterculiaceae posed by these biting-sucking insects is known. By their multiple bites and especially by their mode of nutrition involving the prior injection of "histolysing" saliva into plant tissues, they cause deformation and dieback of shoots, twigs and fruits. Efforts should therefore be made to keep them away from young plantations. Although they are not the only hemipteroid insects that can adapt to cocoa trees, their high economic impact has mobilized and is mobilizing most of the energies in the search for the best means of combating them.

Then came and counted, a whole host of suckers considered more or less worrying: ***Afropeltis*** (Helopeltis), Sternorhynchus, including among others, the Tyora, ***Psylla (Mesohomotoma) tessmanni*** (Aulmann, 1912), the ***Toxoptera aurantii*** Aphid (Boyer de Fonscolombe, 1841) and various Scale

insects, including ***Stictococcus formicarius*** Newstead, 1908, ***Ferrisia virgata*** (Cockerell, 1893), ***Planococcus lamabokensis*** Balachowsky and Ferrero, 1966 and ***Planococcoides njalensis*** (Laing, 1929), the latter most often hidden in shelters fashioned by *Crematogaster* ants.

Research on these pests has largely overlooked the many representatives of the neighbouring suborder Auchenorhynchous, which are intrinsically much less harmful, it is true, but whose traumatic and destructive actions are far from negligible. Certain groups, such as the very numerous **Cicadelloidea**, sometimes become a cause for concern. Usual hosts of evergreen forests (ombrophiles) and semi-deciduous forests, the Auchenorhynchous are rather polyphagous and they have adapted very quickly to cocoa trees, plants newly introduced in their environment.

For many, the imago is known, but not all are described, and in the vast majority of cases, the juveniles or larvoids (depending on the groups involved) remain unknown, as do their bionomies. Among them, **Cicadids** and **Membracids** were more the focus of my concerns. However, although representatives of the former are known - in South America, Madagascar and South-East Asia - to be harmful to sugar cane and coffee trees in particular, no species, including ***Ugada giovanninae*** Boulard, 1973 - a large Cicada most often found in the Upper Shanga cocoa fields - has proved to be of real economic importance in tropical Africa.

Ugada giovaninae Boulard, 1973.
This species is so beautiful that the famous watercolorist Bernard Durin drew it in 1986 from one of my specimens.

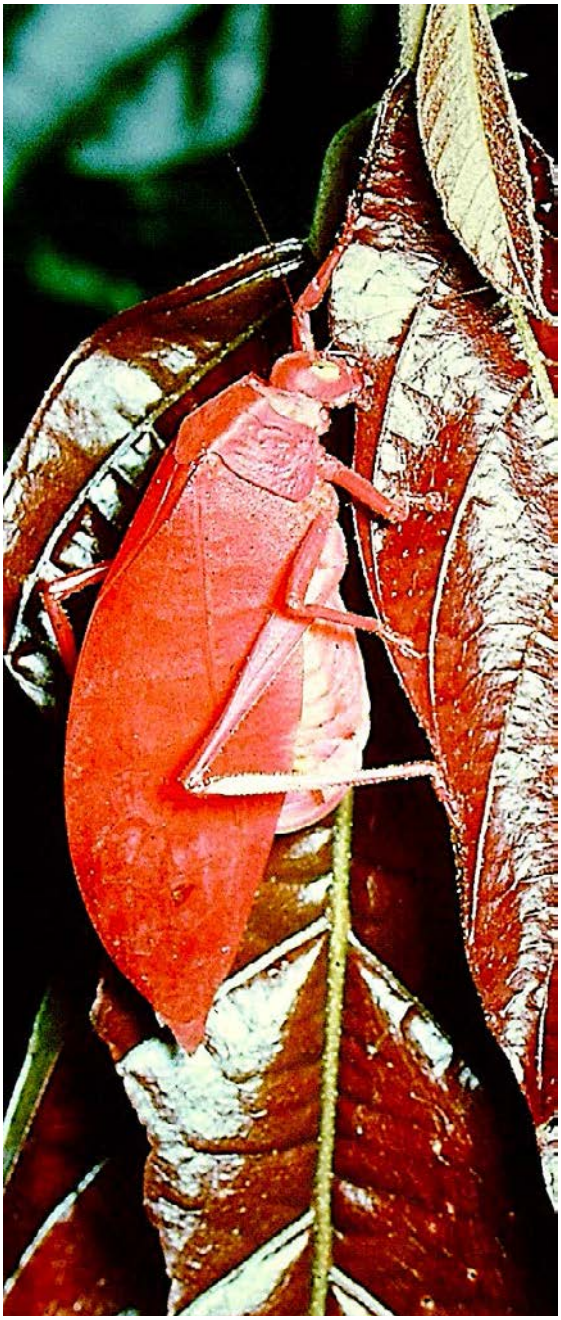
Some Central African Membracids are harmful to the young shoots of Sterculiaceae, including cultivated Sterculiaceae. On the one hand, all by puncturing elaborate sap and, on the other hand, the females, by introducing their eggs into the plant tissue with a sharp auger, leave large and deep wounds. These wounds, most of which are deformable, are also open pathways for pathogenic Cryptogams. This is the case with ***Eumonocentrus erectus*** Schmidt, 1911, which is the subject of a special investigation but has remained unfinished (see eco-photo on next page) and eight other species, new to science, of which I have given the first descriptions [1968a, 1969b, 1983d, 1984e].

Other Auchenorhynchous, which are pests or recently associated with cocoa trees, were studied and included in three articles [1969b, 1969d, 1975f], which also include descriptions of two previously unpublished species of a very remarkable genus of Leafhoppers: ***Wolfella krameri*** Boulard, 1969 and ***W. benjamini*** Boulard, 1975. To this should be added the immense and very poorly known cohort of Fulgoroidea, examples of which are given in several chapters of this biography.

2) Defoliators

They are mainly Chrysomelidae beetles, ***Menius parvulus*** Jacobi, 1903, which feed on the young leaves, which are still purplish in colour, leaving many holes in them. Caterpillars of Lymantriidae and Noctuidae of various species are frequently found in plantations, but most often in small numbers and without any real economic impact. Except during sudden invasions, as is the case of some noctuidae, notably ***Achaea catocaloides*** Guénée, 1852, whose very elongated and semi-arboreal caterpillars, having reached the last larval stage, fall from the forest foliage onto cocoa trees, which they then enjoy and strip of their leaves, before finally descending to pupate in the soil.

Below are eco-photographs of two other insects that attack cocoa trees grown in CRA
Examples of interesting adaptations, as the tree did not originally exist in Africa



>*Vossia obesa* Brunner, large Afro-tropical phaneropteran grasshopper. Defoliator of young leaves, while assimilating colour (nutritional homochromia). Interesting example of adaptation, as the tree did not originally exist in Africa. **Cameroon, IFCC, August 1967** (**MB Phot**);

>*Eumonocentrus erectus* Schmidt, Membracidae Centrotinae having also adopted the cocoa tree, of which juveniles and adults suck the young twigs, which moreover the females deeply injure with their augers and the embryogenesis of the offspring. **Central African Republic, Boukoko, 1968** (**MB Phot**).

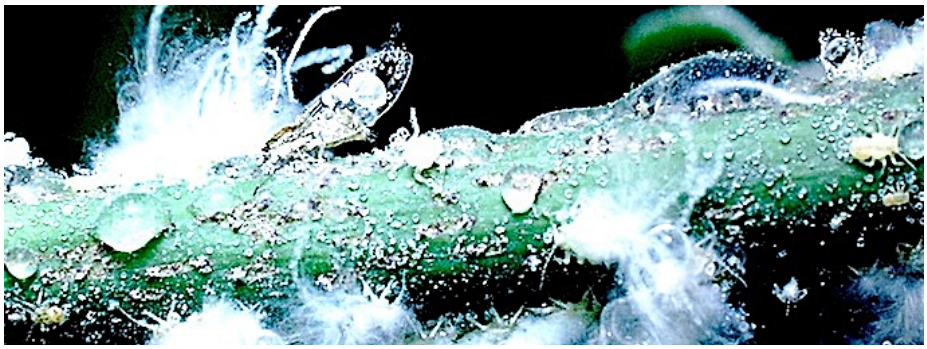
3) The Drillers

In Central Africa., this category is mainly represented by Lepidoptera whose caterpillars are either wood-eating or frugivorous. Among the first, a Noctuelle, ***Earias biplaga*** Walker, 1866, burrows into the apex of young shoots and can do great damage, especially in nurseries. Two Cossidae, ***Eulophonotus myrmeleon*** Felder, 1874, and an unknown ***Metarbela*** attack: one attacks the trunks of young trees by making a long and wide ascending gallery (fig. 7, PL. II, p. 360), the other attacks young branches that are already well lignified and which are doomed to mortal decay. For the latter, it is essentially ***Characoma strictigrapta*** Hampson, 1914, which develops at the expense of the pulp of the pods; see the caterpillars on p. 366.

e) Other insect pests found in tropical Africa

Scale insect ***Icerya sulfurea*** : female and family colony under Cocoa leaf ;

Icerya, the male.



Mesohomotoma tessmani, Psylla of the Cocoa and Kolatiers, adult and immature

Macropulvinaria jacksoni (Newstead, 1908), Cotton Scale; a winged male has just hatched, a second one coming out, backwards, from its pupa. **Ivory Coast and Mali (MB Phots).**

To conclude this chapter of Applied Entomology, I would like to express my regret and satisfaction. Regret is that of having, in my boxes, in my notes and on my photos, still a lot of material that circumstances did not allow to be exploited, either because of lack of time, or especially because my research was incomplete when political events led me to leave this magnificent Central African Republic and that no long-term mission could be set up afterwards, in particular to develop our first biological control trials against Sickle-cell Disease.

Micro-Hymenoptera of the genus ***Ooencyrtus*** parasitizing eggs admirably laid in columns by a female of the Drepanidae ***Epicampoptera strandi*** (**MB Phot**).

The satisfaction is that of having seen most of my data published or reported, and included in new works, including first of all: Two manuals by **E. M. Lavabre.** **Insectes nuisibles des Cultures tropicales** *(Maisonneuve et Larose éd. Paris, 1970)* and **Les Mirides du Cacaoyer** *(Maisonneuve et Larose éd. Paris, 1977).* Then the books, by **Jean Forestier,** Culture du Caféier robusta en Afrique centrale *(I.F.C.C. éd. Paris,1969)*, by **J. Braudeau**, **Le Cacaoyer** *(Maisonneuve et Larose éd. Paris,1969)* and by **P. F. Entwistle**, **Pests of Cocoa** *(Longman éd., London, 1972),* which also include photographic documents taken from my publications, or reports.

VI - Personal works

-> ***L'appareil génital des Cigales femelles.3*** Thèse, Faculté des Sciences de l'Université de Paris, 3e Cycle, soutenue le 28 juin 1966, 57p., 79 fig. avec *Félicitations du Jury*.

-> ***Les Cicadaires (Homoptères Auchénorhynques), 1) Cicadoidea.*** Revue EPHE, *Travaux du Laboratoire Biologie et Evolution des Insectes,* **3**, Janvier **1990** : 55-245, Pl. 5-26 (2 en couleurs) et 41 fig. dans le texte. ISSN : 0993-4332. [Premier *Vade-mecum* du cicadologiste].

-> ***Vies et mémoires de Cigales.*** Barbentane, éditions Équinoxe, **1995**, **réédité 1996, modifié et augmenté** : 160 p., 336 fig. + 1 CD [avec B. Mondon pour la partie « Cigales et Symboles]. Préface de **Jacques Carayon**, Directeur à l'EPHE et Professeur au Muséum. ISBN : 2-84135-033-X. Analyse de **Catherine & Philippe Magnien**, membres de la Société Entomologique de France : *"First work of entomology in three dimensions, scientific, cultural and sound".* Bulletin de la SEF, **101** (5), 1996 : 533-534.

-> ***Métamorphoses et Transformations animales, Oblitérations évolutives.*** Paris, juin 2000, aux éditions Boubée, Paris. ISBN : 2-85004-092-4. Préface de **Maxime Lamotte,** postface de **Michel Delsol** *Remarkable synthesis. In the past, Michel Boulard's book would have been called "Philosophy of Metamorphosis" in the same way that Lamarck called "Zoological Philosophy" the fundamental work that we all know today // Very well-documented book of synthesis, deserves to figure prominently in the library of any entomologist,* **Roger Roy** *// Work giving a precise vision of the modalities of the phenomena, while keeping a certain hindsight allowing to apprehend the concept as a whole. It contains a very lively history, remarkable illustrations and an essential "Applied Vocabulary.* **INSECTES**, 2001, N°120 // *Michel Boulard signs there a work which, certainly, will makedatein the study of the post-embryogeny,* **José Alberto Quartau,** *Lisbon University***.**

-> Facultés acoustiques, éthologie sonore des Cigales, entomophonateurs par excellence / **Acoustic faculties and sonic ethology of cicadas, entomophonators par excellence**. Revue EPHE, *Biologie et Evolution des Insectes*, **16**, (octobre 2006 [including 1 audio CD with the tymbalizations emitted by 99 species recorded by the author] 152p, 117 fig., 1 planche en couleurs. ISBN 2-9502395-2-8 / ISSN1257-5496. [Second *Vade-mecum* du cicadologiste].

-> ***Être ou ne pas être, les facettes du mimétisme***. Revue EPHE, *Biologie et Evolution des Insectes*, **17** (avril 2007) 152p + 1 CD réunissant la reproduction de 275 diapositives écologiques. ISBN 2-9502395-3-6 ; ISSN : 1257-5496. Analyse de **Jacques Pierre**, *Professeur au Muséum et miméticien* : Bulletin de la Société Entomologique de France, 112 (2), 2007 : 178/182).

-> ***The Cicadas of Thailand. Volume 1 General and particular Characteristics***. Bangkok, White Lotus Publisher, 2007 01: i-xvi, 1-103, 53 Text-fig., 46 colours Plates + 1 Audio CD: tracks 1- 40. ISBN 978-974-480-080-0. *The first volume on Thai cicadas, the most fascinating and also little know representatives of a family of sonorous insects. It is accompagnied by a CD comprising forty cicadas sound productions, or tymbalizations, in an ID and ethological card, which form an original feature of this pioneering study,* **Diethard Ande**, Editor.

-> ***Mimétisme. Usages biologiques du paraître.*** Boubée, Paris, mai 2012 : 229 p., 47 Planches H.T. en A4 couleurs ; Glossaire français/anglais ; 1 carte mémoire. Préface de **Georges Bernardi** : *Un précis de mimétologie.* Postface de **Patrick Tort** : *La fonction d'apparence.*

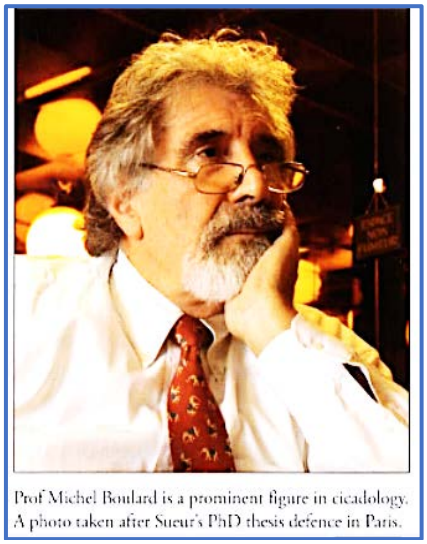
Patrick Tort, Directeur de l'*Institut Charles Darwin International:"To our knowledge, this work is the first treatise or manual to carry out a rigorous codification of the science of mimetology through its concepts and contemporary terminological uses. The exceptional richness of the macrophotographic documentation is not the least of the qualities of this book."*

-> ***The Cicadas of Thailand. Volume 2. Taxonomy and Sonic Ethology***. Siri Scientific Press, Nov. 2013: 436p., 487 B & W figures, 96 colour Plates + 111 **Audio tracks [**dont CD MB 5 et 6**] available in line**. ISBN: 78-0-9567795-9-5.

"*A comprehensive and very impressive book devoted to the cicadas of Thailand. Despite the book contains lots of taxonomic, ecological and ethological information on cicadas of Thailand only, there is no doubt that it will be useful for anyone studying cicadas of the entire SE Asia. It is indeed a useful reference volume to have both in a private library and in the library of any natural history museum or university.*" **Antenna, 2014.**

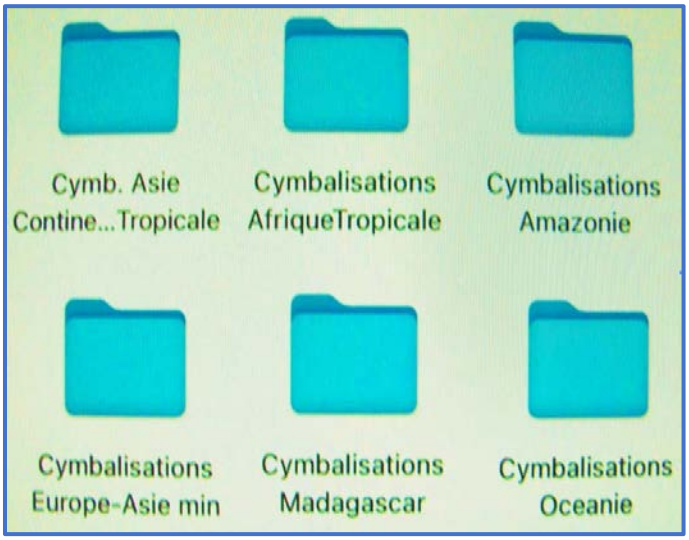
-> ***Michel Boulard, Entomologiste, éco-éthologiste, photographe.*** EPHE/MNHN, Paris/Chiang-Mai, avril 2017, 1-353. **Seconde édition,** février 2018, 1-426. "*Book browsed with great interest... The photos fascinated me by their originality and beauty*." **Hubert Bost**, Président de l'EPHE.

1



Prof Michel Boulard is a prominent figure in cicadology. A photo taken after Sueur's PhD thesis defence in Paris.

Photo Pr Matja Gogala 21/06/2002



MB Acoustic files from **Insect sounds** Taylor & Francis, 2006

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16

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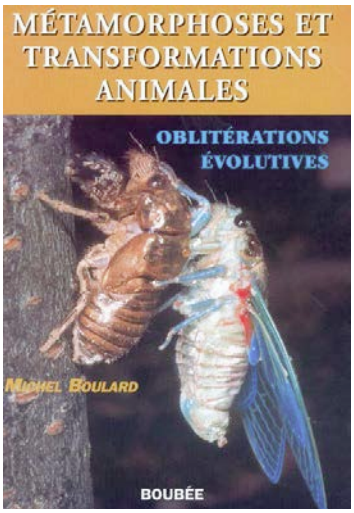
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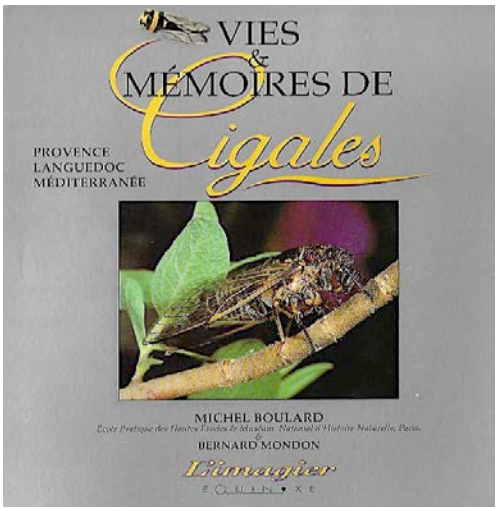
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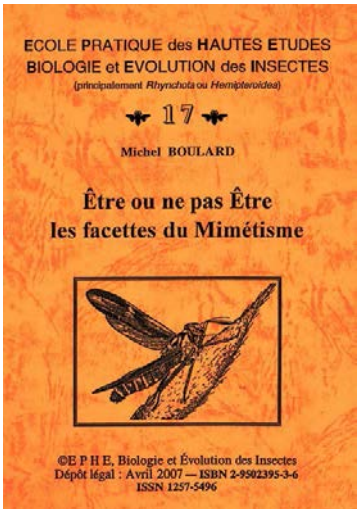
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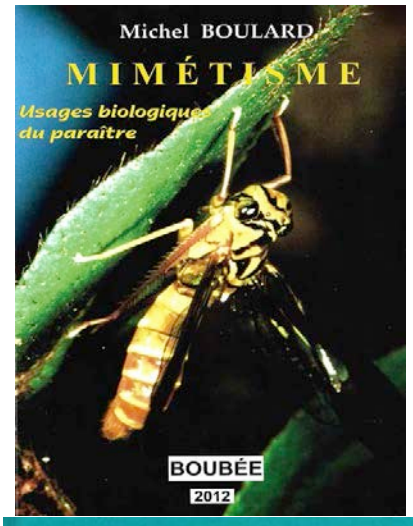
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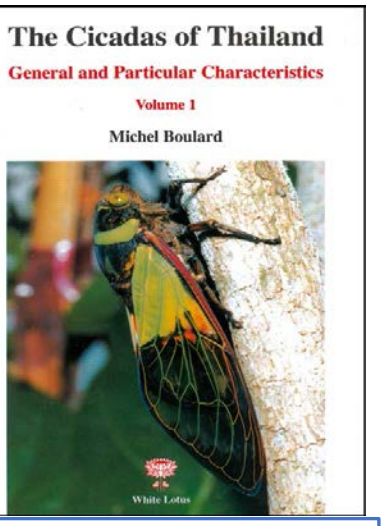
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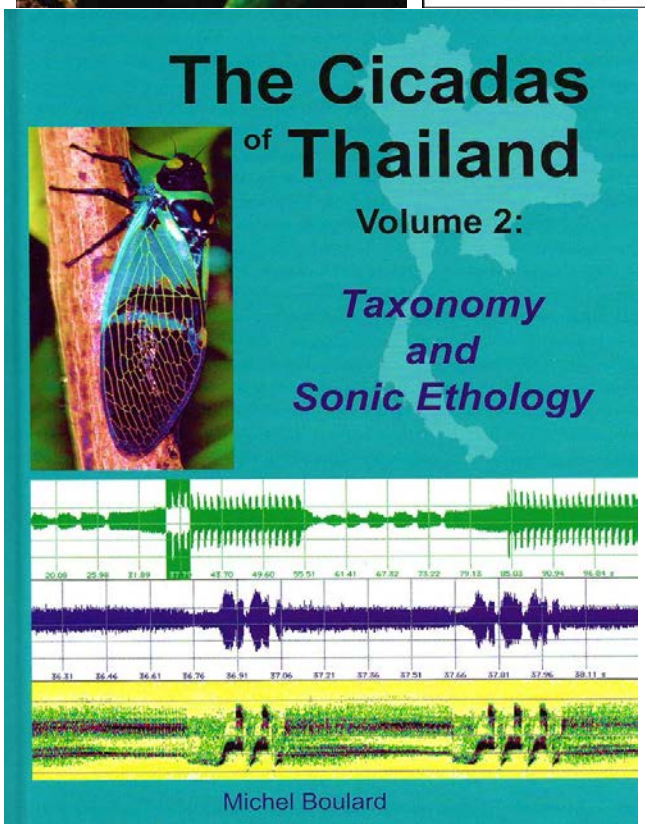
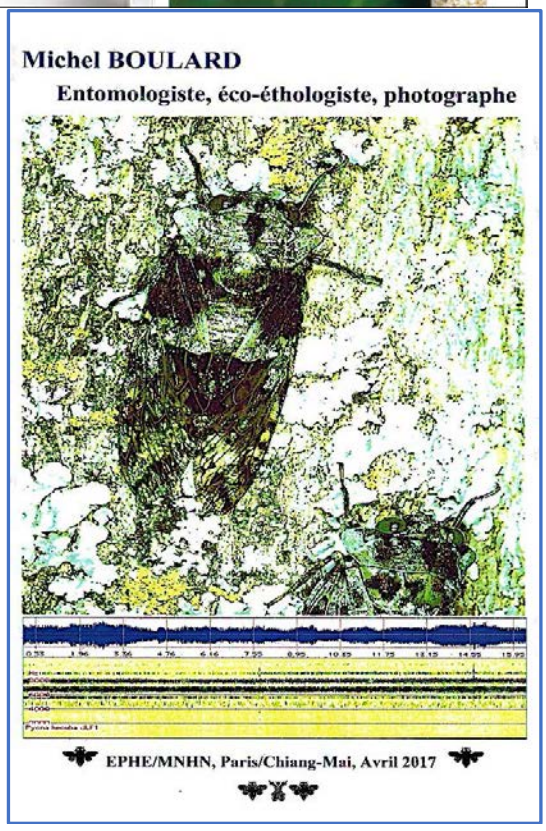
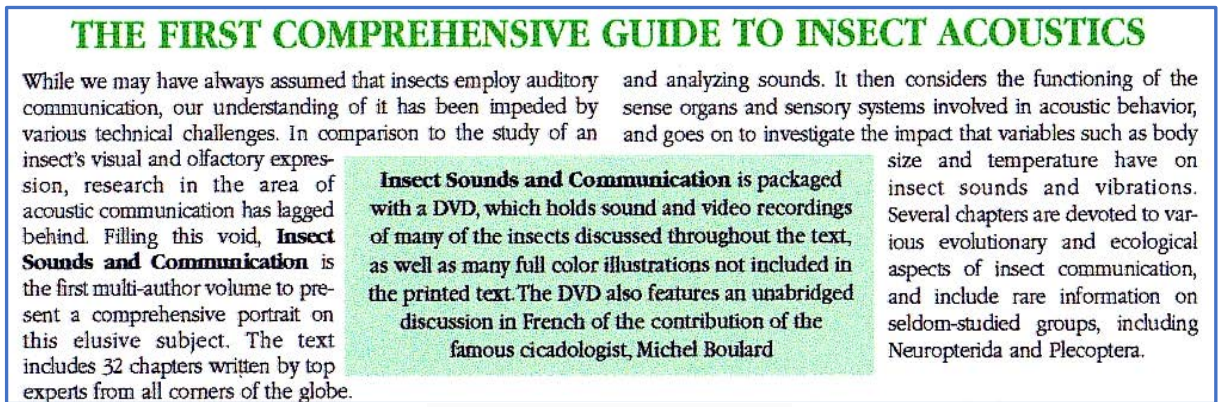
Michel Boulard
White Lotus


The Cicadas of Thailand
Volume 2:
Taxonomy and Sonic Ethology
Michel Boulard


Michel BOULARD
Entomologiste, éco-éthologiste, photographe
EPHE/MNHN, Paris/Chiang-Mai, Avril 2017

VII - Participations in collective works

1-> Les Insectes : dont les Dictyoptères, Orthoptères, Embioptères, Psocoptères, Mallophages, Anoploures, Homoptères, Thysanoptères, Strepsiptères et Hyménoptères. *Grande Encyclopédie Alpha Sciences et Techniques.* Grange Batelière éd., Paris, Zool. II (34) : 58p, 88 diapos.
2-> Homoptères. Dans : P**.C. Rougeot**, *Missions entomologiques en Ethiopie 1973-1975*.- Mémoires du Muséum, N.S., sér. A, Zoologie, 1977 : 105 [120-121].
3-> Cigales. Dans : "*Les Amours des Petites bêtes*". MNHN, p. 14, F. Nathan éd. 1978.
4-> [Membracides]. "Douze photographies en couleurs de Michel Boulard, texte japonais de **Masami Hayashi** (Fac. Biol., Tokyo)".- In : Newton Graphic Sciences Magazine, 8, Tokyo, Aug. 1983: 118-125.
5-> Les Homoptères. Dans : "*Les Insectes de Rösel von Rosenhof*". Mazenod éd. 1988.
6-> Le petit monde des Arthropodes. Dans : **Oberlé Ph.** "*Sénégal, la Nature, le Pays, les Hommes*", S.A.E.P. éd., Colmar, 1989 : 23-24, 1 fig. (n° ISBN : 2-7372-567).
7-> **Les Métamorphoses animales**.- Dans : **P. Tort**, Dictionnaire du darwinisme et de l'évolution, Presses Universitaires de France, janvier 1996 : 2872-2912.
8-> **Le Mimétisme**.- Dans : **P. Tort**, Dictionnaire du darwinisme et de l'évolution, Presses Universitaires de France, janvier 1996 : 2961-2986.
9-> Diversité des Auchénorhynques Cicadomorphes. Forme, couleurs et comportements. In : **W.E. Holzinger** "*Zikaden, Leafhoppers, Planthoppers and Cicadas*", Denisa 04, 2002: i-vii & 1-556 [Nr. 176: 171-214, 59 fig.] ISSN: 1608-8700.
10-> [Membracidés, Insectes étonnants]. *In* Newton collection (Ouvrage japonais consacré à la photo animalière). Kyoikusha ed.: 1-222 [100-107] ISBN: 4-315-50211-1.
11-> Le mimétisme ou la comédie biologique. Dans : **Véronique Chabert**, "*Ni vu ni connu",* Camouflages. Lyon, 2005, Département du Rhône et Biro (Paris) éd.: 1-231p. [12-29, 13 fig.] ISBN: 2-35119-010-6.
12-> Acoustic Signals, Diversity and Behaviour of Cicadas. *In* **Drosopoulos, S. & Claridge, M.F.,** Insects Sounds and Communication, Chapter 25.- Taylor & Francis Publ., Boca Raton, USA, Nov. 2005: 331-349. ISBN:0-8493-2060-7. ***Booklet presenting the work:***


THE FIRST COMPREHENSIVE GUIDE TO INSECT ACOUSTICS

While we may have always assumed that insects employ auditory communication, our understanding of it has been impeded by various technical challenges. In comparison to the study of an insect's visual and olfactory expression, research in the area of acoustic communication has lagged behind. Filling this void, **Insect Sounds and Communication** is the first multi-author volume to present a comprehensive portrait on this elusive subject. The text includes 32 chapters written by top experts from all corners of the globe.

Insect Sounds and Communication is packaged with a DVD, which holds sound and video recordings of many of the insects discussed throughout the text, as well as many full color illustrations not included in the printed text. The DVD also features an unabridged discussion in French of the contribution of the famous cicadologist, Michel Boulard

and analyzing sounds. It then considers the functioning of the sense organs and sensory systems involved in acoustic behavior, and goes on to investigate the impact that variables such as body size and temperature have on insect sounds and vibrations. Several chapters are devoted to various evolutionary and ecological aspects of insect communication, and include rare information on seldom-studied groups, including Neuropterida and Plecoptera.

VIII- Personal, entomological and miscellaneous iconographies

a) Participation à des manifestations cinémato- et photographiques :

-> Cigales de France, *Mostra Cinematografica Internazionale*, Museo LEONARDO DA VINCI, Milan, décembre 1973.

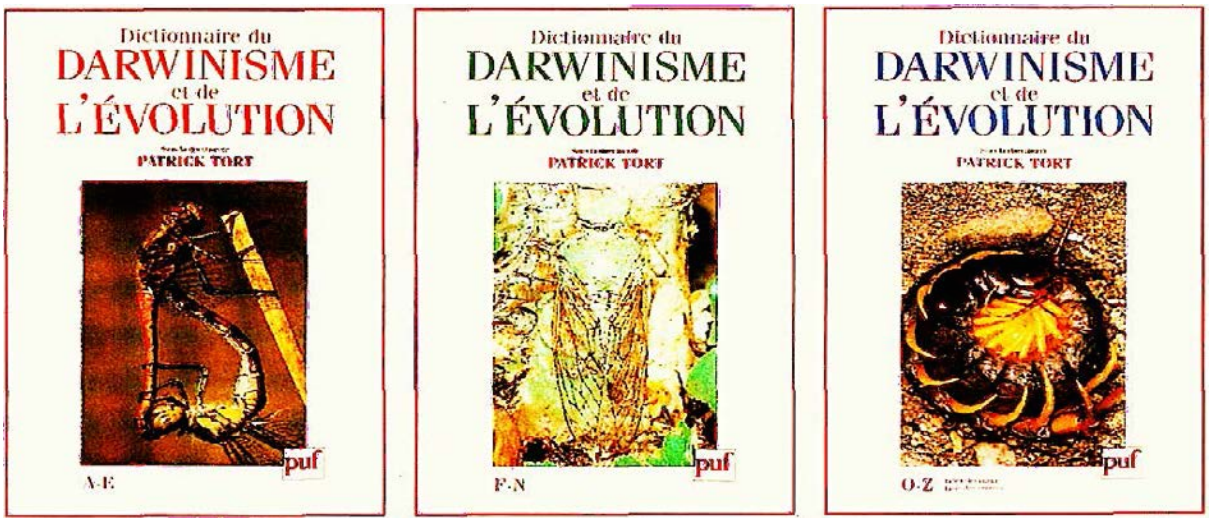
-> Entomological photography : ***Blending Aestheticism with Biology* / Lorsque l'esthétique et la biologie se confondent.** Boulard, M., 1990e, *VisionAge,* Tokyo, **13**: 41-44, **26 slides** (bilingue).
-> "International Photo Contes": ***Olympus 70th Anniversary*, Tokyo, 1990**. Section "***Award for Excellence***" for my eco-photograph here reproduced "**Melipona**" **(Centrafrican mini-bees) returning to the nest (endophytic hive) laden with pollen":**

b) MB Photo Library for everyone's use

It is indeed in my "photographic collection of Le Vivant", reflections of animal history that:

-> Le Professeur **Pierre Paul Grassé**, one of my 'Old Masters', found 25 unpublished eco-photographs of European and African fauna to illustrate his masterful work ***Vie des animaux*** (Paris, Larousse éd., 1969). A copy in my Library, autographed.
-> Le Professeur **Guy Marchal** includes, in "L'art du camouflage", Vuibert éd. 1977, the reproduction of 7 eco-photographs from my mimetic collection. A copy in my Library, autographed.
-> The International Centre of Myriapodology chooses the eco-photo of a European Scolopendre coiled around its young people for the Cover of the List of its 1977 Works.
-> Psychologist **Tobie Nathan** selected the 10 photos illustrating his book *Psychoanalysis and Copulation of Insects*. La pensée sauvage ed, 1979. A copy in my Library / New revised edition: 1983.
-> Les Drs J-C **Fischer et D. Gouget** to illustrate the Motta/MNHN brochure ***Le Film de la Vie***, they chose 7 eco-photographs, including the "wink of an Owl" for the cover.
-> Le Professeur **Jean-Marie Demange** found "superb" the eco-photographs of the Scolopendre curled up around its eggs, then its young offspring, as well as 3 other original documents to illustrate his fundamental work on the Myriapods, Paris, Boubée, ed., 1981. A copy in my Library, autographed.
-> Editions Bordas selected 3 eco-photographs to complete the iconography of a textbook for CM1 students; Paris, 1982.
-> Editions Boubée found the photo on the first cover of the book of the **Dr S.M. Iablokoff-Khnzorian** on ***Les Coccinelles***, Paris, 1982. A copy in my Library, autographed.
-> The French Federation of Natural Science Societies found the extremely rare cliché of the *Copium teucrii* emerging from its gall to illustrate the cover of the big book by **Jean Péricart** on the ***Tingides euro-méditerranéens*** (Paris, 1983). A copy in my Library, autographed.
-> **Sciences & Avenir** et **Martine Allain-Régnault**, in "Coup de Pub pour les insectes" selected 5 of my entomological paintings exhibited at the Palais de la Découverte during the first ***Insectimages*** (MB, name) in May 1984.
-> ***Découverte***, the monthly review of the Palais de la Découverte, chose 7 slides (including the covern Moro-Sphinx butinant en vol) to illustrate the theme ***Insectimages*** of its issue 118, May 1984.
-> The **S**ociété **E**ntomologique de **F**rance selected the document **'Moro-Sphinx foraging in flight'** (see below, p. **508**) for the poster celebrating the days of the first **'Insectimages'** Paris, Palais de la Découverte, May 22-27, 1984 *(and wink to my daughter Christine who, as a child, held a metal box bottom to reflect lumens back to the underside of the insect* **(MCB Phot).**
-> Professor **Masami Hayashi** (University of Saitama) selected 12 slides to illustrate his highly popular text on [The Strange Membracids] in *Newton Graphic Sciences Magasine*, Tokyo, August 1983: 118-125 (in japan). Text and documents that were reproduced in a fascicle of the prestigious Japanese photographic magazine "***New Collection***", 1985, **2**: 100-107].

-> Professor **Okumuto** integrated 5 of the previous eco-photographs in the "**Japanese Encyclopaedic Series "Wide Color"**, issue 46, which appeared the same year 1985.
-> Professor **Pierre Douzou** used 3 of my slides on the Longicornes in June 1985.
-> The Magazine Picsou dispatched a page Cigale in its monthly magazine N°179, March 1987.
-> La Revue Découverte, N° 151, October 1987 put on the cover my eco-photo of the Membracid *Bocydium globulare*, seen from the front, feeding on the leaf that supports it.
-> Professor and Rector Renaud Paulian, found
> new 24x36s to make 9 of the 12 plates illustrating his large work on ***Biologie des Coléoptères***, Paris, Lechevalier, 1988. A copy in my Library, autographed.
> the original photo illustrating the cover, as well as the plates composing 8 of the 16 plates of his book on ***Les Insectes de Tahiti*** published in 1998 (Boubée éd.). A copy in my Library, autographed.
-> **Dr. J.P. Duffels** reproduced my photo of **Moana's homelytro-scutelar stridulatory device expansa,** in his book **"*Cicadas of the Fiji, Samoa and Tonga Islands*" (1988).** A copy in my Library, autographed.
-> In 1989, celebrating its 20th anniversary, "L'Office Pour l'Information Entomologique" distributed an illustrated leaflet including, among other things, the reproduction of 4 of my eco-photos.
-> Naturalist **Patrice Leraut** includes 9 MB slides in **Les insectes dans leur milieu**, Bordas 1990. A copy in my Library, autographed.
-> Dr **Simon Tillier** and the editors of ***L'Encyclopédie du Règne animal de A à Z*** incorporated **71** of my slides into their work. Paris, ed. Bordas, 1992.
-> **Mr M. Baraud**, author of the 78th volume of La Faune de France, found the right photo to illustrate the cover of his fundamental work on the ***Coléoptères Scarabaeoidea***, Lyon, Société Linnéenne, ed. 1992. A copy in my Library, autographed.
-> **Mrs Janine Casevits-Weulersse**, for her book ***Les fourmis, des insectes très organisés***, found the eco-photo she was missing: the "trophalactic exchange" between female workers.
-> The authors of **ENTOMOPHONIA**, **André-Jacques Andrieu** and **Bernard Dumortier**, were able to glean the 8 slides to complete the iconography of a beautiful and very useful work. Versailles, INRA, 1994. A copy in my Library, autographed.
-> **The Presses Universitaires de France** selected the slides illustrating the covers of the three large volumes of the ***Dictionnaire du Darwinisme et de l'Évolution*** published under the direction of **Patrick Tort** (01. 1996): *Sympetrum striolatum* (Carpenter) mated in '**D**', a document alas presented by mistake in 'verso-recto'; *Oxypleura spoerryae* Boulard, corticicolous cicada; *Scolopendra cingulata* Latreille (Myriapode), a female curled up around its eggs. A copy in my Library, autographed.

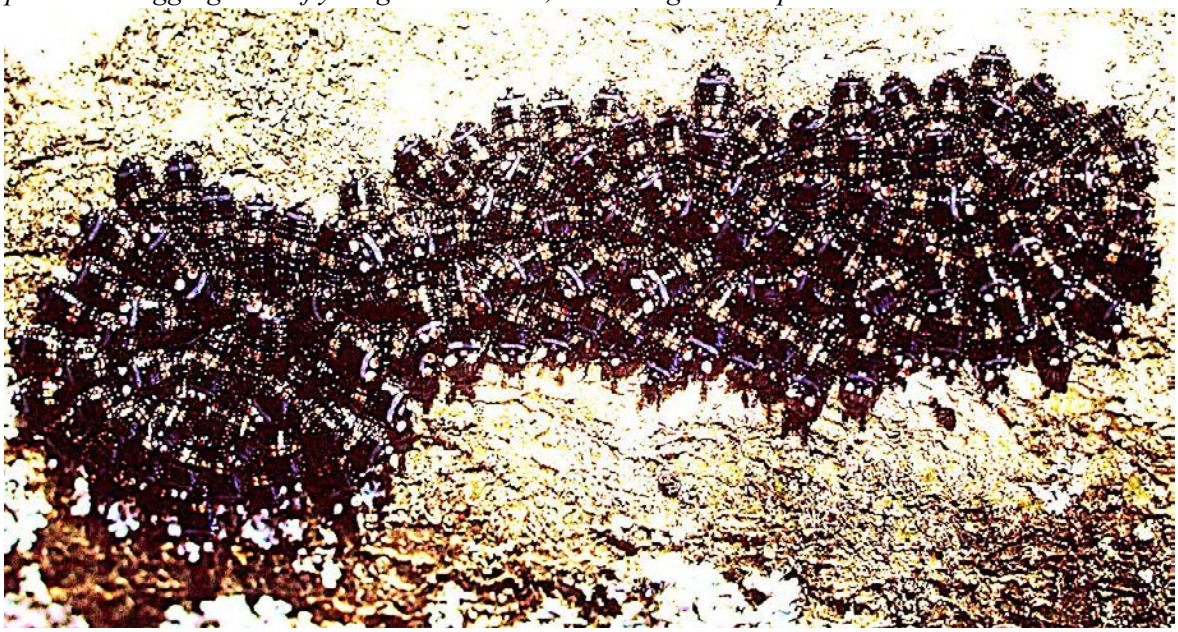


-> The magazine ***Acta Myriapodologica*** selected one of my photos of Centipedes for the cover of its voluminous Volume 169 published in 1996.
-> La Revue ***L'Infirmière*** found the 3 slides needed to illustrate an article on wasp stings (04 1996).
-> **Pr Patrick Tort,** Director of the Charles Darwin International Institute (ICDI):
> took the eco-photograph illustrating the cover of the translation of one of Charles Darwin's masterpieces, ***La Filiation de l'Homme*** (ed. Syllepse, 1999). A copy in my Library, autographed.

> has chosen two eco-photographs illustrating the mimetic function... as well as a third one related to maternal instinct for his book ***Darwin and the Science of Evolution*.** Paris, Galimard éd. 2000.
-> The President of the Association Roussillonnaise d'Entomologie, **M. Peslier** chooses, for the cover of the Revue R.A.R.E., fasc. X(1), 2001, partly devoted to the Ascalaphides of the South of France, the exceptional eco-photograph of the ***Puer maculatus*** Olivier, 1789:

Bédarieux, Hérault, juillet 1990 (**MB Phot**).

-> **Dr W. E. Holzinger** and the editors of the Germanic Review ***"Denisa"*** selected the cliché of the *Kallicrates* (Membracidae, male and female facing each other) as the motif for the inner pages of the covers of the voluminous number 176 devoted to the **"ZIKADEN"** published in March 2002 (see the reproduction of the original document, p. 328). A copy in my Library, autographed.
-> **Pr Patrick Tort** found the 26 slides justifying the creation of the 16 portfolios incorporated in his book ***Fabre, le Miroir aux Insectes***, Paris, éd. Vuibert, May 2002). A copy in my Library, autographed.
-> Le Mensuel du Palais de la Découverte selected 10 slides for the article "***Prédateurs-Proies, Combattre pour survivre***", main theme of issue 317, May 2004.
-> **Dr Jérôme Constant** selected, to illustrate his article published in 2005, on *the Eurybrachid Fulgores of the Metoponitys genus,* 3 eco-photos taken in Central Africa.
> The arachnologists **Alain Canard** and **Christine Rollard** found the eco-photos they needed to finalize their very useful manual ***À la découverte des Araignées***, Dunod, March 2015.
-> **Dr. W.J. Bell, L.M. Roth and Christine Nalepa** found the eco-photography to complement their book "***Cockroaches: Behavior, Ecology and Evolution***" J. Hopkins University press, 2006: a *"spectacular aggregation of young cockroaches, exsertile glands exposed":*



***Cartoblatta pulchra*, Kenya, Namara, novembre 1972** (**MB Phot**).

c) Exhibitions. Numerous remain my eco-photographs several times main or complementary objects of Exhibitions devoted to the "living":
-> **Voluntary participation,** as a scientist and photographer, solicited since 1970 by the MNHN to most of its its "Great Exhibitions" (**Geneviève Meurgues, Commissaire**).
-> **Natural History of Sexuality. MNHN, 1976. André Langaney, author and curator,** selected the eco-document of a couple of Mantis religiosa, whose female was "tasting" a cricket, without paying attention to the male who was mating it... **(Les Eyzies-de-Tayak, 1959, MB Phot).**
-> **Rencontre of the Fourth Type (prey-predator encounters),** was the first general public exhibition devoted to Insects, which presented exclusively insect portraits and entomological eco-photographs by **Michel Boulard.** - Olympus Gallery, Forum des Halles, Paris, autumn 1980. **Francis Delvert, Commissaire** *(Cf.* p. 475).
-> **Trips and Discoveries from naturalist travelers to scientific researchers,** MNHN, Paris, 1981.
-> **"Insectimages",** the first of the name. Paris, Palais de la découverte, 22-27 mai 1984.- *Société Entomologique de France*, MM. Jacques Chassain et Claude Caussanel (Présidents 1983 et 1984), Michel Boulard (Secrétaire général), organizers.
-> **Cicadas, life and symbol. MB slides, Musée des Alpilles**, Saint-Rémy-de-Provence, mars-décembre 1995. **Evelyne Duret, Commissaire.**
-> **La Cigale et l'Olivier, *MB slides in free projection,*** Camaret-sur-Aygues, 4 août-15 septembre 1995.
-> **La Cigale in all its states. August 1998. 200 MB slides in free projection. *Postcards and stickers with the effigy of the most common Provencal Cicadas, on sale for the benefit of the Maison du Parc du Luberon.***
-> "Jean-Henri Fabre" exhibition in Japan in April 1989, organized by the major daily newspaper "Mainichi". *M.B., entomologist delegate of the MNHN and the Harmas de Fabre.* Inauguration in the company of the writer Yves Delange and Mrs Paule Rassa, faithful friends of the Harmas:

「J・H・ファーブル展」きょう開幕

十五日から、横浜市中区南仲通五の六〇の神奈川県立博物館で開かれる「J・H・ファーブル展」（同博物館、毎日新聞社主催、外務省、文化庁、フランス大使館などが後援）のオープニングセレモニーが十四日夕、同博物館エントランスホールで行われた。

開会式にはフランスからミッシェル・ブラール・フランス国立自然史博物館館長代理ら八十人が出席、岩野館長は「今の日本は暮らしの中にも心の中にも自然が失われていく。この展覧会を通じて、失われつつあるものを取り戻し、二十一世紀に向けて良い遺産を残したい」とあいさつを切っておとされた。

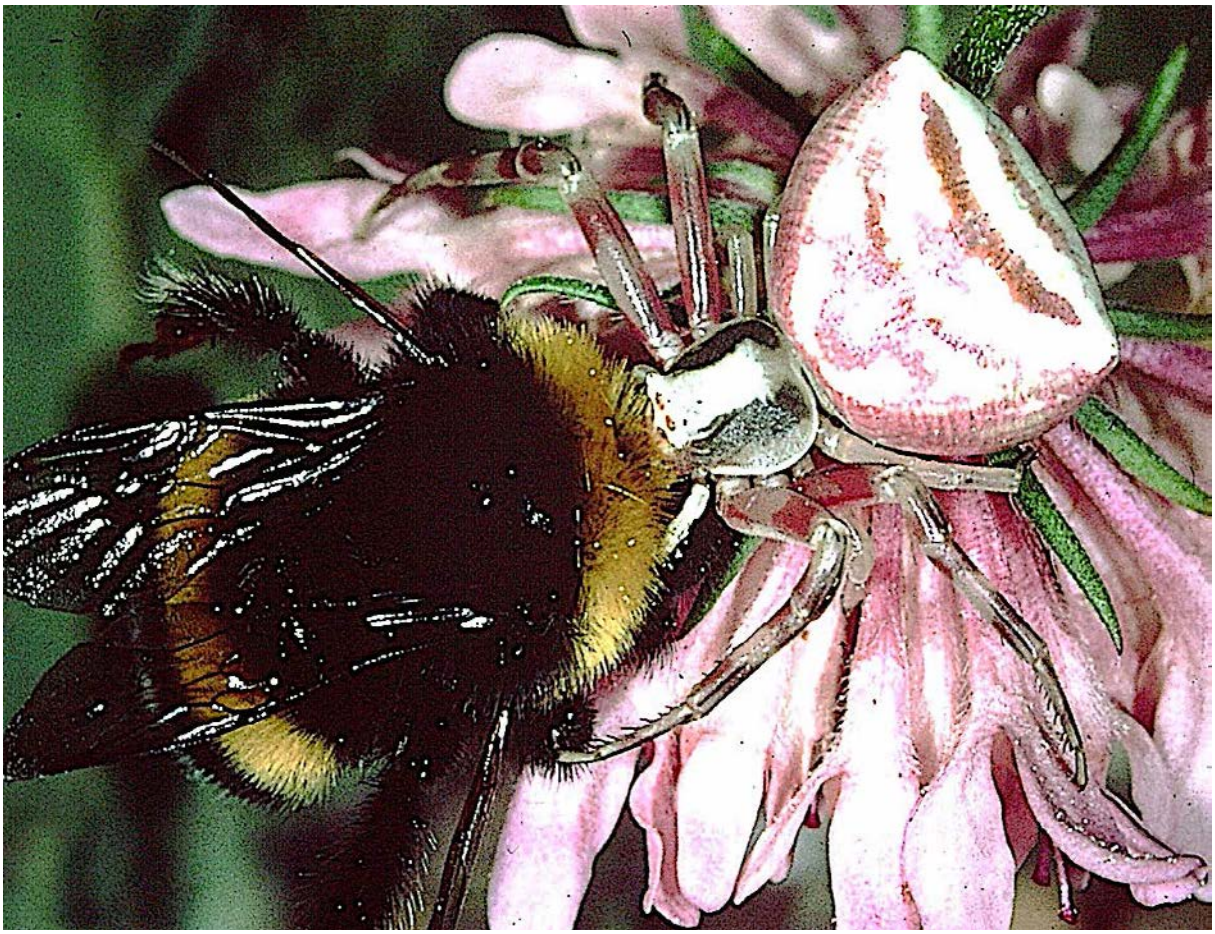
開会式には、日本昆虫学会評議員の長谷川仁さん、仏文学者の奥本大三郎さんほか、国内の昆虫学者、昆虫愛好家など八十人が出席、岩野館長は「今の日本は暮らしの中にも心の中にも自然が失われていく。この展覧会を通じて、失われつつあるものを取り戻し、二十一世紀に向けて良い遺産を残したい」とあいさつ

オープニングセレモニーでテープカットする関係者

80人が出席、

-> **Cicadas from France and elsewhere. Diversity of species and lifestyles.** *Montier-en-Der, November 1998,* ***30 M.B. Portfolios 50x100cm. Jean-Pierre Baux, Curator.***

-> Participation in the ***Darwin Exhibition***, April-May 2000, *Institut Charles Darwin International*, Romainville, **Patrick Tort, Commissaire.** Where it was question, among other things, of mimicry, proof of Darwinism in action, eco-photos in support, among which that of the "Bumblebee of the meadows, ***Bombus pratorum*** Linnaeus, captured by ***Thomisus onustus*** Walckenaer, the large Spider-crab of Europe. The livery of the predator mimicking to perfection, the mauve nuances of the flowering capitulum of a Scabious:



Disruptive analochromia and offensive mimicry. ***Ruins of Paestum, Italy*****, 07.1976 (MB Phot).**

-> **The Museum of Millau** (Aveyron) requested the loan of 33 eco-photographs to complete its exhibition "The most beautiful insects in the world", October 25, 1997 to February 8, 1998.

-> **Dr Didier Drugmand** (University of Gembloux, Belgium) borrowed 32 original documents concerning the '**imaginaison'** (or *imagination), which is not a metamorphosis, but the bodily completion delivering the adult in the hemimetaboles* of the Cicadas, as shown in *Lyristes plebejus* (Scopoli), **MB** explained.

d) Foreign photo libraries

-> In November 2001, during their stay at the Paris Museum, my colleagues **Lewis L. Deitz** and **Matthew S. Wallace** of North Carolina University, Raleigh, selected 45 of my eco-slides of African and South American Membracids to be incorporated, free of rights, in the photo library of the Department of Entomology of their University.

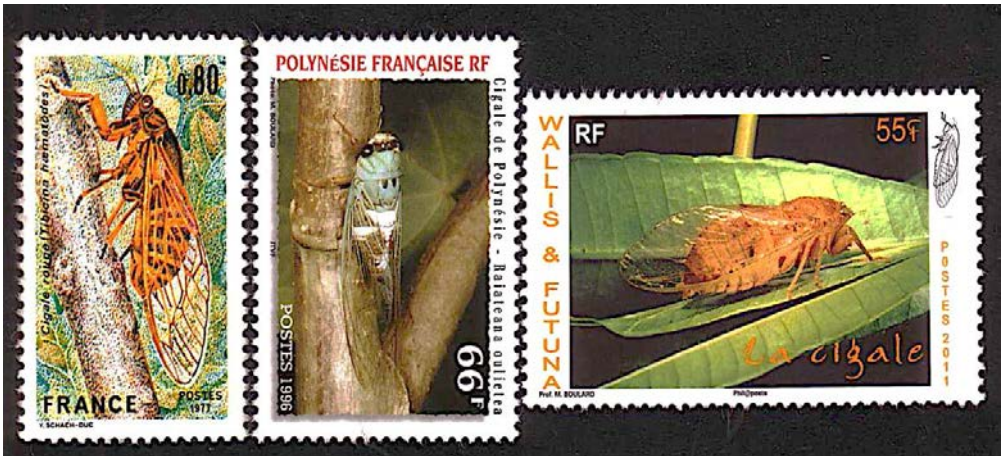
e) Cicadidaean philately

It is also from my photo library that the Metropolitan Post Office, the Polynesian Post Office and the Wallisian Post Office have drawn the documents used to manufacture and issue the first stamps (and associated philatelic souvenirs) dedicated to Cicadidae from France and overseas:

-> the first (September 1977) to the Red Cicada, *Tibicina haematodes* (Scopoli), an engraving by Yvonne Schach-Duc based on a slide of a female cicada laying eggs (**MB Phot**).

-> the second (August 1996) to the exceptional *Raiateana oulietea* Boulard, the only cicada existing in the Society Archipelago (Central Pacific). On a **MB slide**.

-> the third (January 2011) to *Baeturia uveaiensis* Boulard, a small species discovered at Uvéa (Wallis Islands, Western Pacific). Also on a **MB slide**.



f) Acoustics

Creation of a "Cymbalotheca" gathering all the sound recordings captured during my research on the Cicadas. Fifteen magnetic tapes with a diameter of 16cm, about fifty Mac floppy disks and about fifteen DAT 60 cassettes, intended to be incorporated into the "Sonothèque" of the MNHN. In addition, about thirty video-cassettes, films camcorded about the Thai Cicadas.

Recto/Verso au Soleil de Provence, *Tibicina corcica fairmairei* Boulard, 1984 (**MB Phots**)

IX.- Journalist's Faith!

INSECTS, SHOW YOURSELVES!

NATURALISTE ET PHOTOGRAPHE : LE POIDS DES SCIENCES, LE CHOC DES PHOTOS

Michel Boulard est à la fois un éminent spécialiste des cigales et un étonnant photographe d'insectes. Il plaide pour cette double casquette qui voudrait que tout naturaliste pense la photo et le cinéma comme des outils de recherche, de démonstration et d'archives, sortes d'aide-mémoire qui prolongent la vue. Mais il plaide aussi pour que tout photographe soit un peu naturaliste, respecte l'aspect naturel des choses et ne crée pas d'hérésies entomologiques au nom d'une belle photo ou d'un beau film. Il peut y avoir, dit-il, conflit entre les impératifs techniques et l'histoire naturelle de l'animal : c'est le cas d'une pose de lumière artificielle forte. Il faut d'évidence en tenir compte. Il faut aussi bannir les effets spéciaux s'ils ne respectent pas la vie originale.

On peut reconstituer une ruche en appartement, mais on ne doit pas, pour la commodité d'une belle photo, placer un insecte sur une plante où il ne se pose jamais naturellement et évidemment encore moins détruire une niche écologique pour réussir un cliché. L'image, dit M. Boulard, est si indispensable que tout étudiant naturaliste devrait apprendre le maniement d'un appareil photo ou d'une caméra, comme celui d'une loupe binoculaire. Mais, scientifique avant tout, il ajoute que, quelle que soit la qualité d'un instantané extraordinaire, il ne sera rien sans la science, sans la connaissance de l'insecte fixé

sur la pellicule, et qu'il faut capturer pour l'identifier et l'étudier.

L'idéal, dit-il, c'est une tête bien documentée avec deux mains : dans l'une, un filet pour la chasse ; dans l'autre, un appareil photo pour l'image. « Insectimages » devrait être l'occasion de sensibiliser les chercheurs à la photo et les amateurs à la science.

Les amateurs d'insectes et de photos d'insectes peuvent justement, dans une association comme la Société entomologique de France, bénéficier de conseils et d'aide pour devenir des photographes entomologiques « éclairés ».

Martine Allain-Régnault, ***in ScienceS &Avenir***, n° 447, May 1984.
(Pierre Jauffret Phot., Brésil, Amapá, XII 1975)

X.- New eco-ethological Snapshots

Supporting what appeared in the scientific press, the last chapter of this biography dedicates the groups of Insects and neighbors who, alongside the Cicadas, led me to publish some notes and eco-photographs reproduced here in color. Promising opportunity, will be joined to it **unpublished works from my photo library "du Vivant",** mixed in a kind of **figurative impromptus** (around privileged themes), overflights with no respect for Systematics, nor for Museums, even holders of the most 'beautiful corpses', with a few exceptions... Finally, at the whim of **the animal photographer** that I was.

A > Lepidoptera and Hymenoptera at a Glance

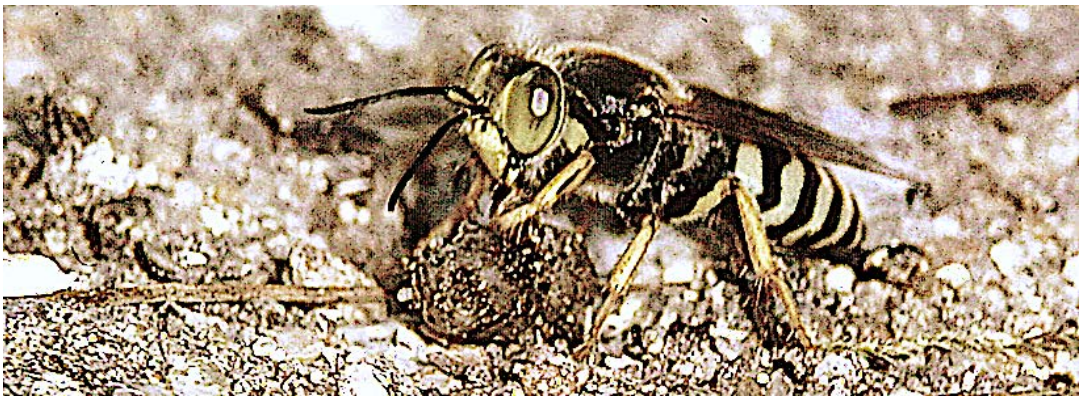
1) One of the jewels of southern France, *Papilio alexanor*, male foraging.
Forested heights south of Mont Ventoux, July (MB Phot)

2) Pair of ***Danaus chrysippus***, morph ***petili***a (Stoll, 1790), male and female (right) in opposition.
Western Australia, Wittenoom (grassy savannah), July 1988 (MB Phot).
Document illustrating the cover of the French translation of Charles Darwin's book,
The Descent of Man, **La Filiation** de l'Homme, **Patrick Tort, Syllepse, 1999**.

3) Founder of the common wasp, ***Vespula germanica*** (Fabricius), in hibernation, mandibles clipped on a vertical board of a garden shed, wings tucked under the body (**Boulard, 1979m**).

4) ***Polistes gallicus*** (L.), drinking, legs resting on a pond! **Provence, July (MB Phot)**

a)



b)

5a+b) Pictures of two ***Bembix rostrata*** L., muscid hunters. One pulls a pebble out of its burrow, the second returns to its nest loaded with a Fly kept alive under its abdomen with its medium legs, fresh feed for the larvae. **Noirmoutier, July 1974 (MB Phots)**

6a+b+c) ***Crabro (Solenius) vagus*** (L.), another small muscivorous wasp that nests in the axial stem of the Donkey Thistle. From left to right: **a**) Hunting; **b**) Returning to the nest, loaded with a larger fly, a *Hemipenthes morio* (L.), paralysed by a sting. **c**) The remains of the same captures cover the stalls of each of the mature larvae in black. **L'Harmas, 08/1975** (MB Phots);

7) *Scolia flavifrons* F., Imposing (4 cm long), splendid, this non-belligerent Hymenoptera, revealed unexpected habits. If the adults forage the flowers, their larvae live as ectoparasites of those of the *Orictes nasicornis*, the famous unicorn beetle! **France, Vaucluse, août 1972** (MB Phot).

8) ***Tachysphex panzeri*** (Vander Linden, 1829), scouring the ground and finding its nest.
Environs de Vallouise, Hautes-Alpes, août 1978 (MB Phot)

9) *Philanthus triangulum* (L.), qualified as an apivore, and rightly so! **Vaucluse, juillet 1974** (MB Phot)

10a) The European Hornet, ***Vespa (Vespa) crabro*** (Linnaeus) respects neighbouring Bees. It also makes staggered nests but, cleverly, it often uses the sheltered spaces in the hollows of old trees. Above, one of the workers is working on the almost total closure of a nest thus installed. Sometime later, guards seem to filter the arrivals … **10b)** Guards seem to be filtering the arrivals:**"Stop! *Password* ??"**
J-H Fabre's Harmas, July 1982 (MB Phots).

11) *Bombus variabilis,* nest detected in forest litter, uncovered. Ardèche, IX 1980 **(MB Phot).**

B > A forgiving look at Bugs (Heteroptera)

12) Many are these Punaises, popularly called "gendarmes", ***Pyrrochoris apterus*** L., (here variety with complete hemelytra), that in summer can be seen like this, mated in opposition.

L'Harmas, July 1978 (MB phot)

13) Mini-bug with strong antennae, the interesting ***Copium teucrii*** and its embryogenic gall produced in reaction to the egg that a female genitor has laid in the peduncle of a floral calyx of a *Teucrium montanum* thus locally parasitized. Here, a new adult on its way out, just finished imagining:

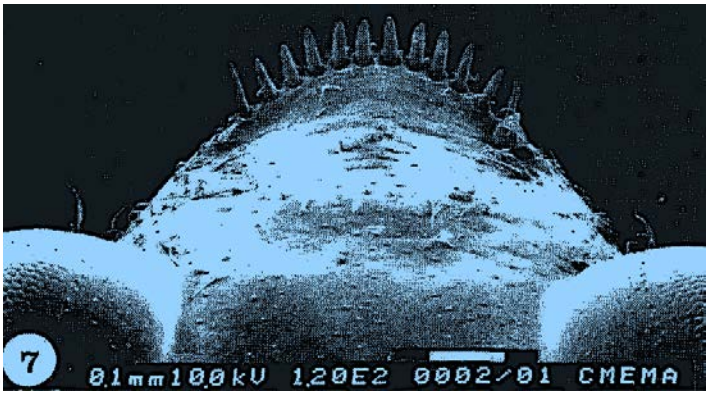
A unique document produced thanks to and in the company of my late heteropterist colleague **Jean Péricart**, and illustrating his masterly book on the European Tingids.

French Federation of Natural Science Societies, Paris, 1983 (JP and MB Phot)

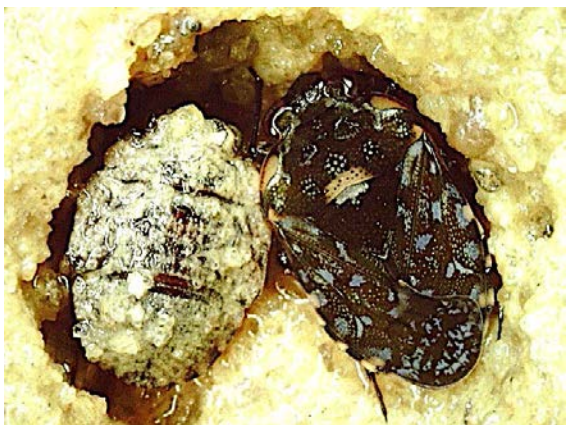
14a) ***Ochterus marginatus*** (Latreille), a mini-bug (6 mm) which is abundant near rivers in south-eastern France, but whose juveniles are very difficult to detect.

a)

They scatter in the sandy waters, or run on mini-beaches, hiding under grains of sand collected thanks to a kind of micro-shovel they have, arranged on the forefront of the head, in front of the eyes ... Well seen with a scanning electron microscope:

b) 

14b) Cephalic micro excavator seen at the M.E.B. With the cephalic excavator filled, the young move their load to the back using the front legs and then the hind legs. The young ***Ochterus*** then become invisible ... Especially since at the slightest alert, "they flatten out, immobile":



15a+b**)** Shortly before imagining, each one locks himself in a stall ecdysial raised on the spot, a sort of micro-igloo built of wet grains of sand and inside which it will perform its imaginary transformation, revealing an adult dorsally colored in dark blue, no burrower at all, but jumping and flying excellently.

France, Vaucluse (**JC** and **MB Phots**. **M. Boulard and J. Coffin, EPHE, 1991i**).

I owe this captivating discovery to my old friend from Orange, **Jacques Coffin**, known as '*Coffinus'*, an excellent neighbour, alas too soon disappeared, fellow researcher, pillar of J.-H. Fabre's Harmas. **Jacques** was preparing a Diploma of Doctoral Studies at the **University of Aix-Marseille**, focusing on *the zooecology of the riparian population of the Lower Aygues Valley in Vaucluse.* Diploma brilliantly defended on 30 October 1992. Gadeau de Kerville Prize, 1993 from the Entomological Society of France. A copy in my Library, autographed.

16) With my friend '*Coffinus*', Sérignan-du-Comtat, July 1995 (JB Phot)

17a+b) *Gelastocoris vandamepompanoni* Boulard & Jauffret, 1984c.

-> Mini-Punaises sabulicoles and mimésiennes of the genus ***Gelastocoris*** wearing costumes, apparement according to the beach they are exploring. **On the banks of the Xingu, on "clean" sand, the *Gelastocoris* are sand-coloured:**

On beaches soiled with decaying plant debris: see two actors dressed differently in bluish black.

Middle Xingu, 1975 (MB Phots. See also Boulard & Jauffret, 1984c).

-> Other examples

18) Group of ***Antiteucus piceus*** (Palisot de Beauvois, (*J. Carayon det.*): one female (near a recent oviposition and whose young are emancipating), adjacent to two other females.

French Guiana, September 1979 (MB Phot)

a)

b)

19a+b) Pochard bug, ***Antestiopsis lineaticollis intricata*** Ghesquière & Carayon. Hatching of its eggs with a strong chorion, glued in groups on leaves. Bug being one of the most formidable parasites on **arabica coffee** trees in the lower strata of the mountains of tropical Africa and South-East Asia. **Cameroon, IFCC coffee bush, August 1967 (MB Phots).**

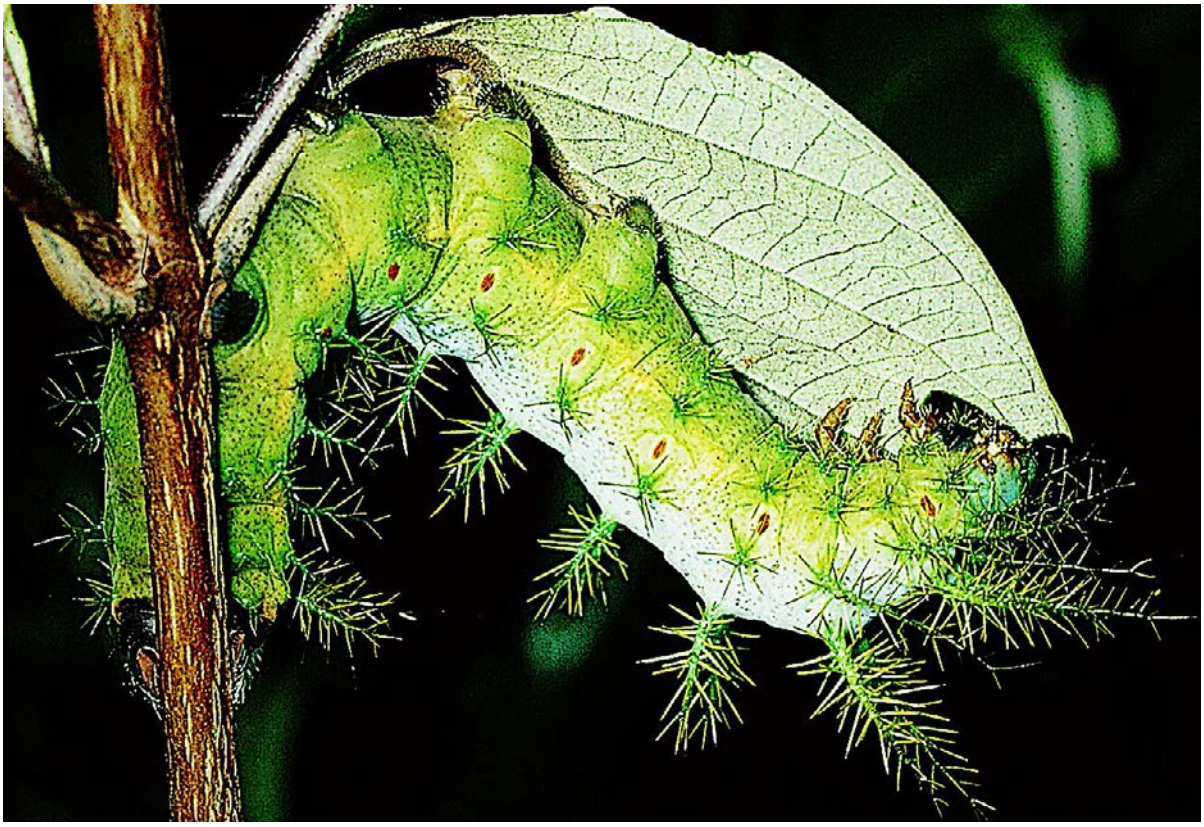
C > Caterpillars. Banal, contrary, prodigious life. False caterpillars...

-> On the erucciform aspect that can be completed by various attributes:

20) From the vast group of eruciforms, these ***Yponomeute cagnagella*** Hübner, devour, in tight rows and sometimes jostling each other, a charcoal leaf. **L'Harmas, June 1978 (MB Phot)**

21) Mature caterpillar of ***Dasychira pudibunda*** Linné. Tufted with yellow, the caudal brush fuchsia. One of my very first macrophotographs! **Les Eyzies-de-Tayac, September 1959 (MB Phot)**

22) Caterpillar of the large Attacide ***Saturnia pyri***, having just completed its last growth spurt. **L'Harmas, June 1978 (MB Phot)**



23) The close view of the caterpillars highlights the magnificence of their tegument and its attributes. Above, that of **a neotropical** Attacid attests to the fading role of colours; the greenish grey of its back is equivalent to that of the underside of the leaves which it is accustomed to graze from below. It is partly protected by a mimicry, but is reinforced by one firts prickly ramparts.

Brazil, Para, Santo Antônio do Tauá, December 1980 (MB Phot; *cf.* Boulard, 2012c)

24) That of the Sickle Cell Sickle ***Epicampoptera tamsi***, makes us appreciate the nicknames 'Hammer Caterpillar' and 'Rat Tail Caterpillar' attributed to family coffee growing.

Central African Republic, August 1966 (MB Phot)

25) Surveyor's caterpillar. **Val de Marne, May 1979 (MB Phot)**

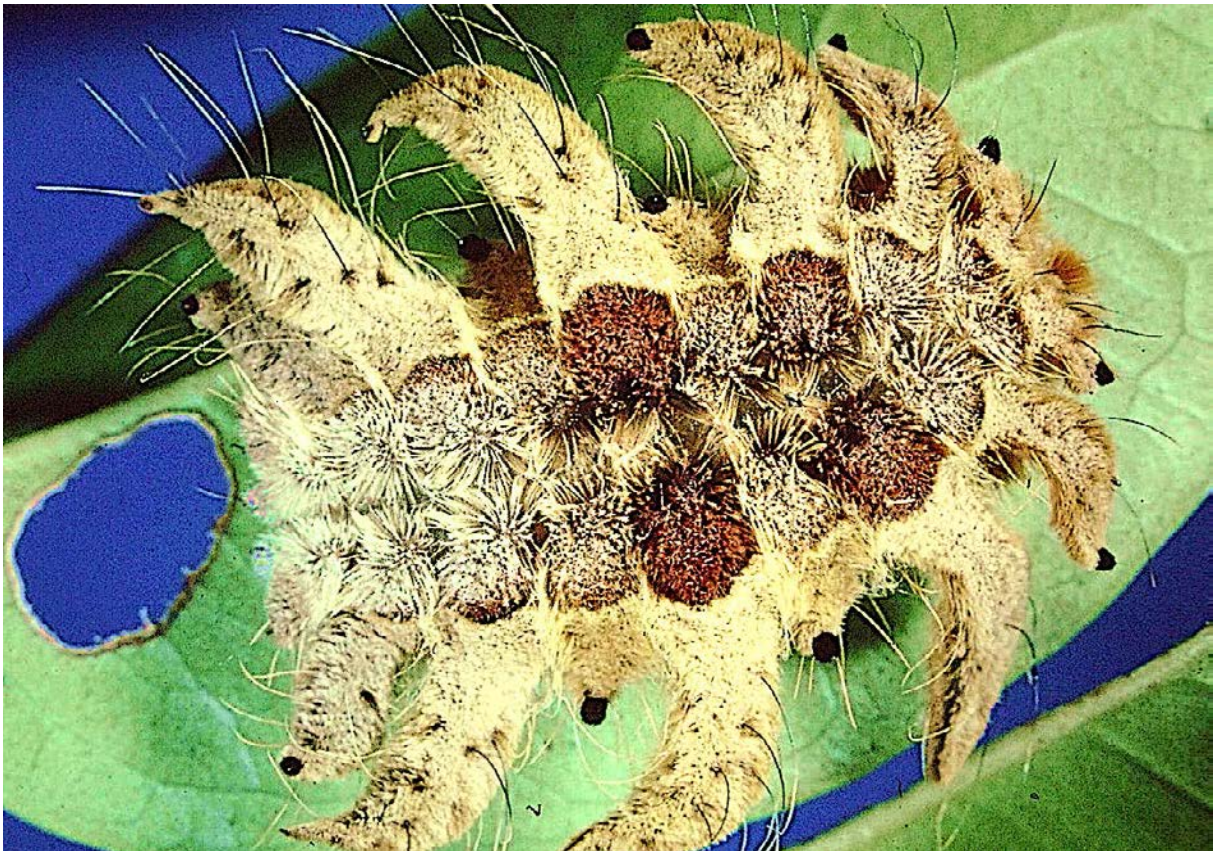
26) Caterpillar of ***Papilio demodocus*** L. parasitized by ***Apenteles*** (Hymenoptera). When excited, it becomes a 'Sphinx', stinging its fuchsia and smelly osmetic fork. **RCA, Boukoko** (**MB Phot**).

-> ? "False Caterpillars"

27) This polypode larva of ***Cimbex quadrimaculata*** (Symphytic Hymenoptera) looks like a **fake caterpillar!** **France, Vaucluse, August 1976 (MB Phot)**

28) Colony of "false caterpillars", larvae of ***Neurotoma flaviventris***, a pest on cherry trees.
Vaucluse, July 1978 **(MB Phot)**

-> Very strange 'caterpillar':



29) "Arachnid with thick legs? »... No! Caterpillar of a Limacodid of the genus *Phoebetron*, no more?
Brazil, Santo Antônio do Tauá, December 1979 **(MB Phot)**

-> A Caterpillar very concerned about its future, psycho-entomological enigma:

30a) Just before entering into chrysalidation, the cremaster ready (post-abdominal fixation mucron, first foresighted action) this mature caterpillar of Machaon (***Papilio machaon*** L., one of the most beautiful European Butterflies, once common) takes care to spin a silk encompassing its body somewhat behind the pedigree thorax, "silk-belt", of which it fixes the extremities *on either side* of its support.

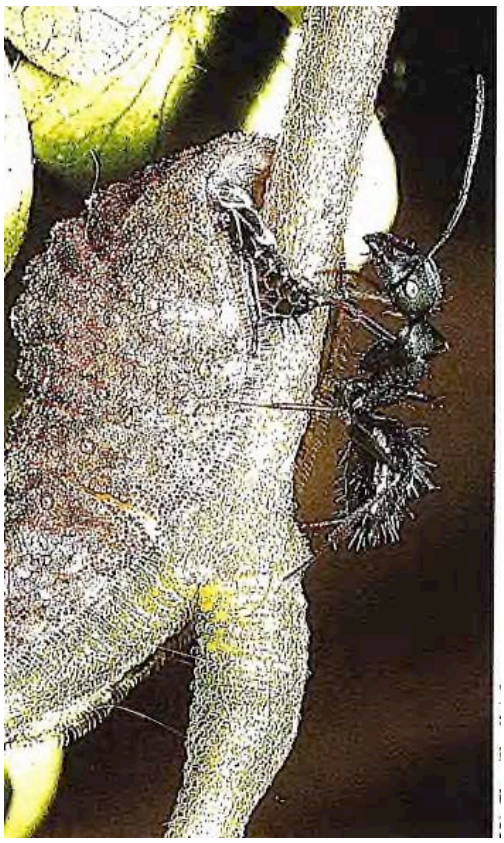
30b) By this *second precaution*, little seen elsewhere than in Papilionidae with aerial metamorphosis, the pupa of the Machaon, *apodic shaped* (on the *mucronal attachment* common to many caterpillars) will have, it, the forebody supported all the time required by its conversion ... The latter will thus be carried out, maintained in the open air, *protected* from untimely rainy gusts.

A strap supporting its future forebody! It was necessary to think about its 'for' a relatively large, heavy and airy chrysalis, having to undergo, more or less heckled, a long winter season.

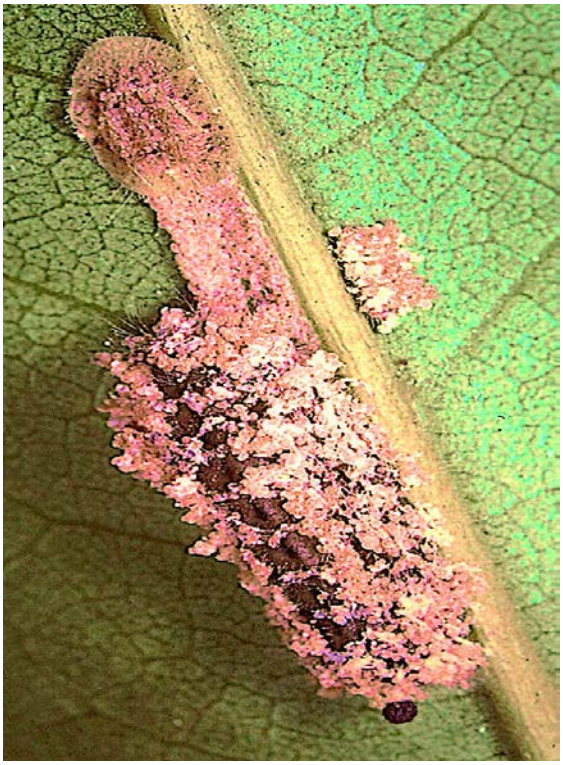
This larva of *Machaon* thus carries out some ethological actions mysteriously acquired… It "knows" that, advanced chrysalidation, its thoracic legs will be dissolved... And, before the end of the season, it puts in place an anterior cord that is logically fastened twice!

A Caterpillar concerned about its programmed future, but far from metamorphosed... Inouïe, incroyable! Isnot it? **Sérignan-du-Comtat Hill, September 1980 (MB Phots)**

-> Carnivorous caterpillars

a  b

31a+b) Lonely monsters engulfing sap-sucking families, in spite of the ants in charge of security, powerless against these bulimic "bulldozers". Here, 2 Lycenidae caterpillars in front of ants, amazed! **a)** The grey-brownish one is from *Aslauga pupurascens*, an African (*cf.* Boulard 1968e, 1981f). **b)** The green one is an indeterminate Amazonian, completing a small population of young Membracids (**MB Phots**, *cf.* p. 337/338)

a  b

32a+b) Caterpillar of ***Spalgis lemolea*** (Lepidoptera Lycenidae): **a)** at table devouring the ovisac of a Pulvinaire (Cochineal). Then, **b)** the laying hen too! **RCA, Boukoko, mai 1966** (**MB Phots**).

D > Instantaneous among the Beetles

a) Very rich fauna, indicative portraits:

33) Goliathus orientalis, Great Scarab of Central Africa (MB Phot)

34) *Homoderus mellyi*, Central African Lucan.

35) *Chrysodroa fulgens*, Bupreste from Thailand **(MB Phots)**

36) ***Lonchophorus sp.*****, Cuculionide amazonien (MB Phot)**

37) Large (6.5 cm) "Glow Green" Guyanese indeterminate (MB Phot)

38) ***Potosia speciosissima*** Scop. Freshly hatched ketone, leaving its larval cocoon. Breeding specimen and slide that I owe to my old friend from the SEF, **Jacques Chassain**. **France (MB Phot)**

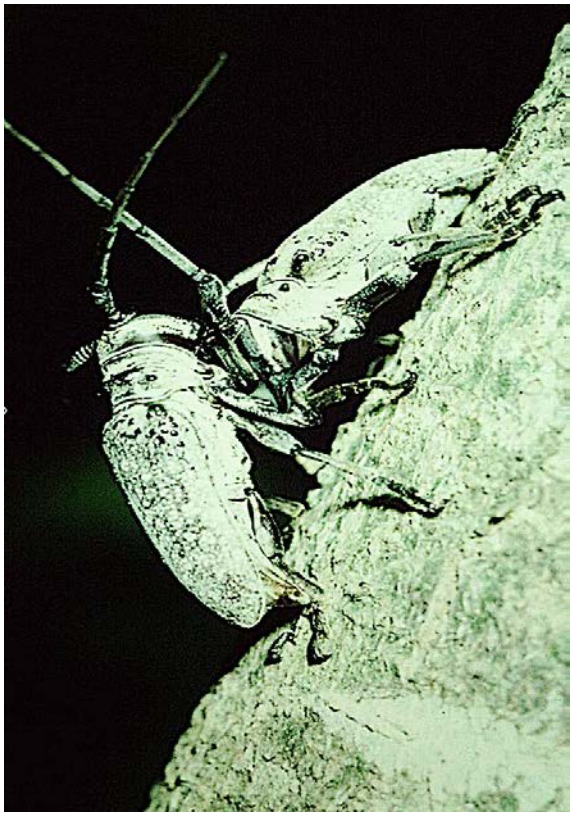
b) Cerambycids, applied ethology, pre-generation

-> Female working, males fighting:

a)

39a) First signalling of pre-copulatory fighting (Boulard, 1982a) between males in an Amazonian Lamiaria, ***Oncideres saga*** Dalman (*A. Villiers det.*). While a female is working on its annular decortication, mortifying the section of branch intended to receive its eggs, a fine psychological demonstration (!), two males, attracted by the ambient odours, fight each other, biting their legs and antennae...

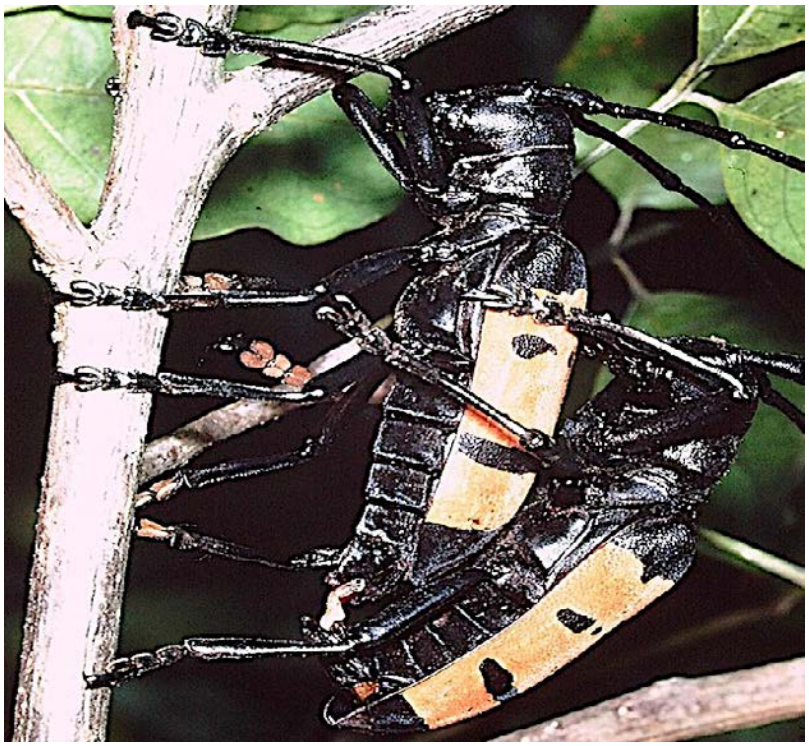
b)



c)

39b+c) One of them will end up mating the female... This one, work not yet finished!
State of Rio de Janeiro, Buzios. November 1979 (MB phots)

-> Coupling and laying, banalities

a) 

40a+b) New illustrated data on ***Analeptes trifasciata*****,** common long-horned beetle in Central Africa. After making a strong crown incision on a branch and mating, the female laid eggs in the sap-deprived plant part (where, again, it can be inseminated):

b)

Centrafrique, La Maboké (MB Phots. *cf.* Boulard and Teocchi*, 1973)

***)** Colleague too soon disappeared. **Companion of the Harmas**, renowned coleopterist, **Pierre Téocchi** succeeded, MNHN Stage Manager, first to Raymond Pujol at La Maboké in Central Africa, then to Lucien Gérin at J-H Fabre's Harmas. He was doing a big (and expected) work on African Cerambycids, for which he had about thirty Longicornian shots made for him in Boukoko. I don't know the consequences given to his manuscript, as to his precious Collections, **Provençal heritage**!

41) ***Petrognata gigas***, the largest longhorned beetle in West Africa. **Ivory Coast, 1986 (MB Phot)**

-> "Conjugal" assistance:

42a+b) In ***Monochamus spectabilis***, mating is consummate, the male does not leave the female. Two new paintings: The male accompanies the female, holding it with its front legs, while with its mandibles the latter digs a hole in the bark of the supporting trunk. Then, together they turn around and the female will introduce a pink egg *(visible here)* in the prepared nest, the male embracing the female as well. Then the couple moves somewhat for the next oviposition. **Kenya, Gedi forest, XI. 1972 (MB Phots)**

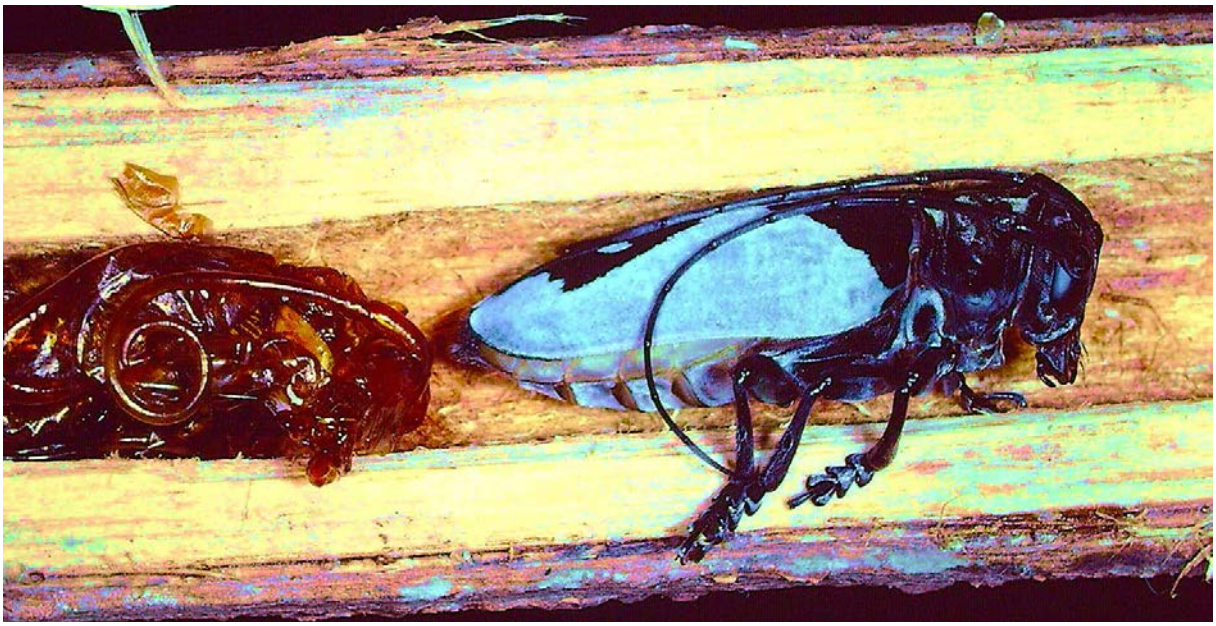
-> "Imprisoned" Nymphs and immature Aduldt

43a) *Chromalizus* sp, nymph enclosed in a closed box with a thick fibrous partition, not only sealed but reinforced by an astonishing column opposite to other debris!

43b) Autre nymphe de ***Chromalizus*** hyperparasited by a Hymenoptera larvae.

RCA, La Maboké, janvier 1970 (PT & MB phots)

->Immature, its elytra are a wonderful blue.



44) *Phosphorus virescens*, morphe ***gabonator*** (Thomson, 1865, *P. Teocchi det.).* Young imago with still bluish elytra, which, outside, will turn to the definitive golden yellow tint.

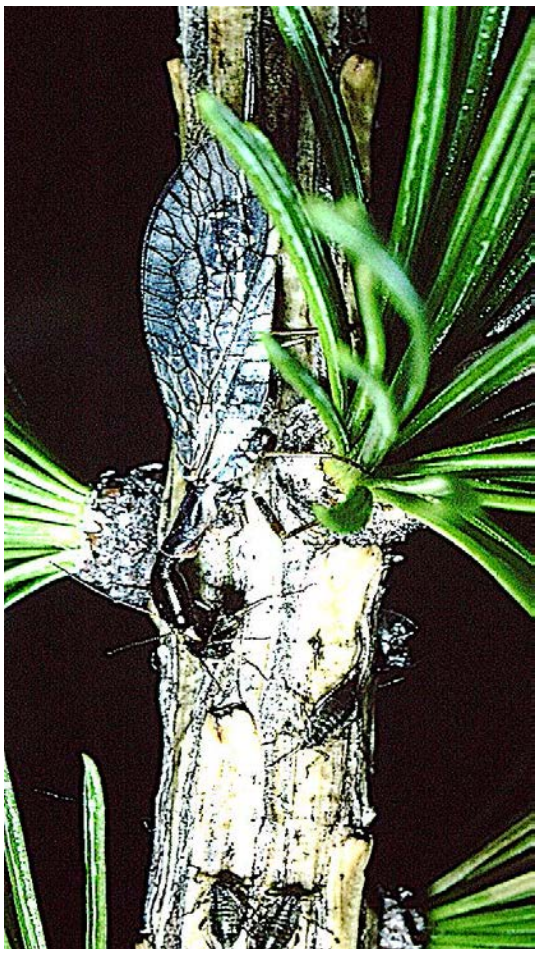
RCA, Boukoko-La Maboké forest, December 1969 (MB phot).

E > Predators without clothing precautions, or in disguise

Review and see, pages 365/475, the jumping Spider, the flag bearer of the theme!

-> to the strength of the mandibles

45) A small snail, "favourite dish" of the Glow Worm, ***Lampyris noctiluca*** L. **Noirmoutier (MB Phot)**



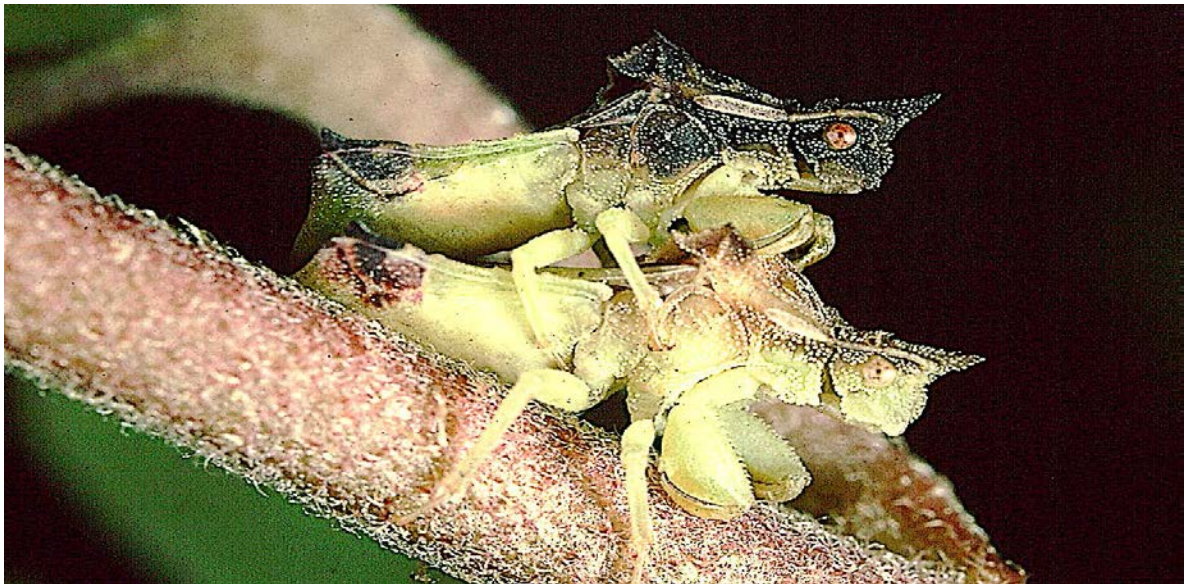
46) Another snail predator, ***Carabus coriaceus*** L. **Noirmoutier, July 1979 (MB Phot)**

47) ***Raphidia notata***, polyphagous predator of many host in the alpine forests here, including aphids. **France, Les Écrins, August 1977 (MB Phot).**

48) Big Malagasy Sphex having knocked down a ***Yanga***, Cicada of important size.
Madagascar, Maroantsetra, January 1997 (MB Phot)

49) The larvae of the Dytic, ***Dytiscus marginalis*** L. are formidable predators in still waters. This one attacked a large Toad tadpole. **L'Harmas, June 1964 (MB Phot)**

-> Kidnapping paws

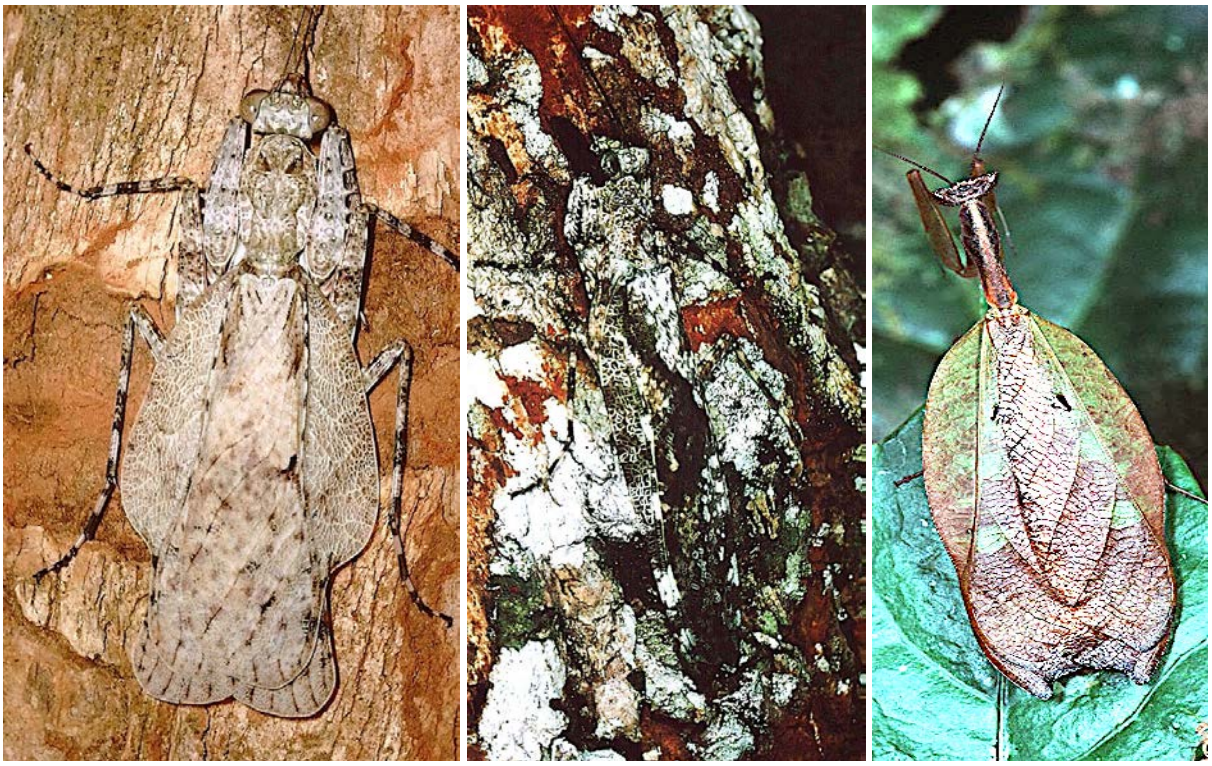


50) Pair of ***Phymata erosa*** Linnaeus, with hooked legs. **Amazonian Sylva, 1975 (MB Phot)**

51) Young ***Ranatra linearis*** **L.,** a water bug with hooked legs, has just captured a caddisfly larva. **France, Aleyrac, August 1977 (MB Phot)**

The "praying" Mantises, so called because of their first legs, abducting, folded up as if in prayer (!) In fact, they are '*de fieffées mimésiennes* = proud mimesis' playing with their livery adapted to the immediate environment of their imagination

52) Male of ***Mantis religiosa*** having captured a ***Cicada orni*** just before it flew away.
Vaucluse, Coteau de Beaume-de-Venise, in August (MB Phot)

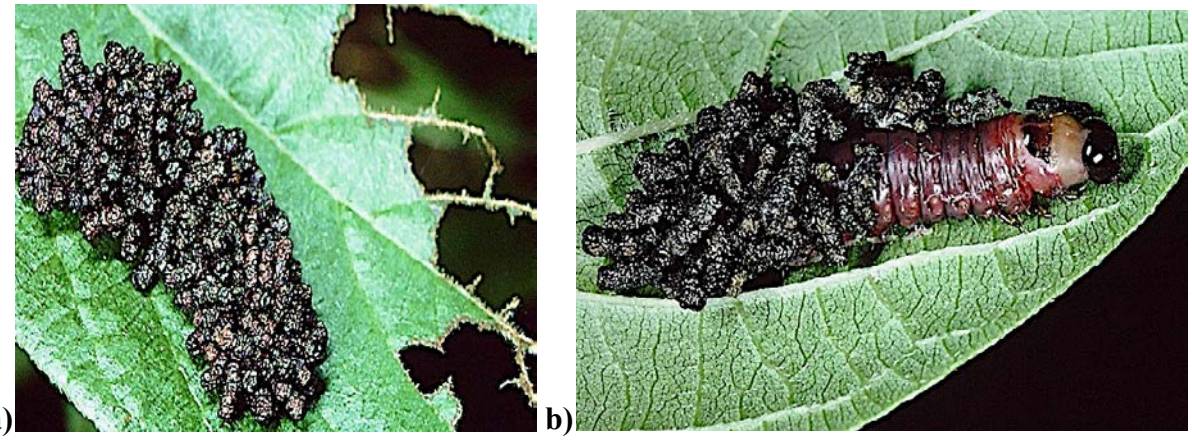


53a+b) ***Theopompella aurivillii*** (Sjöstedt), specimens on the lookout: **b)** of a brown tint not very different from the bark and flattened as much as possible, likewise the specimen **c)** of the same species, almost invisible on the bark of a trunk, of which it appears to be only a copy of the corticole camaieu! Both are from Central Africa **(MB Phots**)

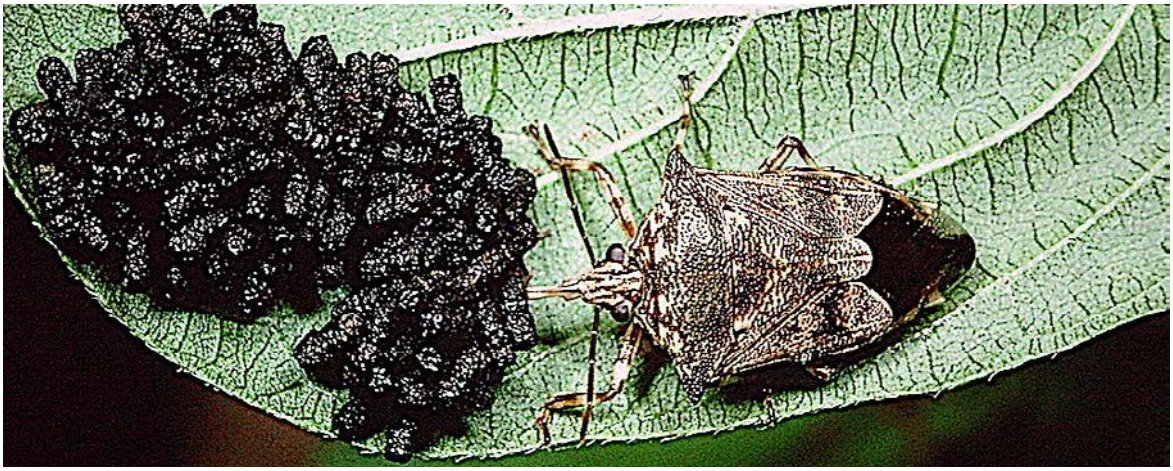
54) And the third, ***Metilia integrates*** Stål, a Guyano-Amazonian quite different, also at prayer, legs folded under the thorax. All three are demonstrative examples of Phytomimesis, respectively Dendro and Protective-Aggressive Phyllomimesis (**MB Phot**)

There is even better with the mimetic ethology of the Mantis, see page 473, the all-round champion, which I also chose as an example of hypertelism! While, on page 474, a very well-known elegant Mantis, denied, in the eyes of a young naturalist photographer, the gossip too often peddled about her... And always discussed. See, please.

-> Camouflage thwarted



55a+b) On and under the leaves there are sometimes small clumps of tiny droppings connected to each other by fine silk threads and forming a kind of canvas, both coarse and unpalatable. These piles are made of caterpillars of Noctuelle under which they remain covered during the day. At night, they come out more or less partially to feed...



56) Nevertheless, not all predators are fooled. Under one of the leaves was, an eruccivorous Bug, ***Macroraphis acuta*** Dallas (Heteroptera Pentatomidae), knows how to find, under the "repulsive" mantle or without attraction to others, the plump caterpillar and revel in it.
Malawi, April, 1988 (MB Phots; *cf.*, Boulard, 2007b).

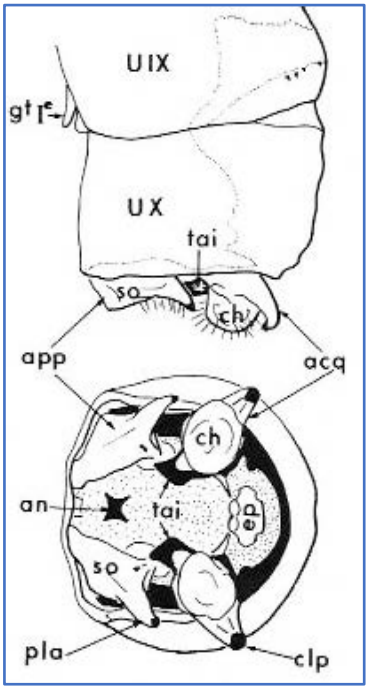
F > Snapshots on the Odonates

In Odonates, damselflies and dragonflies, the tandem coupling that precedes copulation, then possibly egg laying, composes an astonishing "poetic graphic", at the same time as a biological enigma. The male possesses, at the apex of the abdomen, singular coaptative grasping organelles allowing, in the sexual phase, to be firmly attached to or just behind the head of a female.

-> In Zygoptera

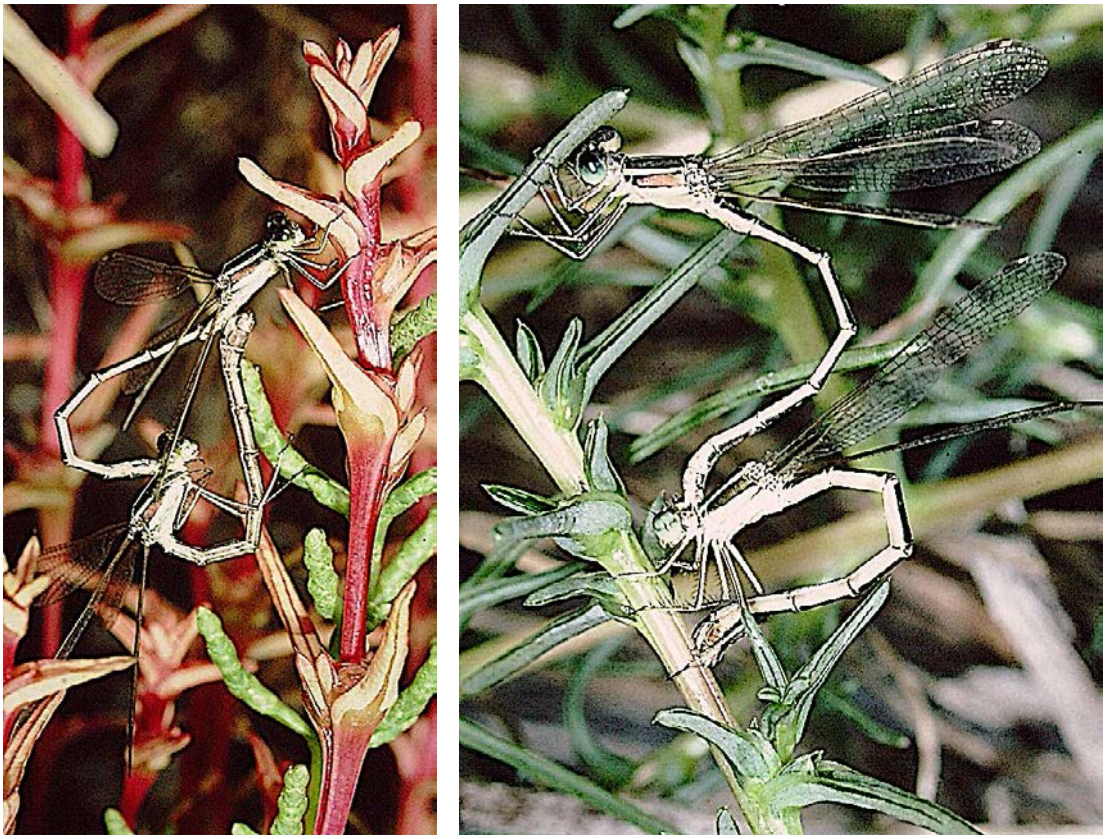
The Zygopterans (*Vulgo*, damselflies), quite easy to approach, were first of all my "companions" in the field (hence, for example, the 3 eco-photographs on the next page, specific to the ***Lestes***, or to the ***Caenagrion,*** just as below. Then objects of dissections under binoculars. To know how, during the necessary sexual junctions, the fixation of the abdominal apex of the male on the neck of the female could be realized.

a)

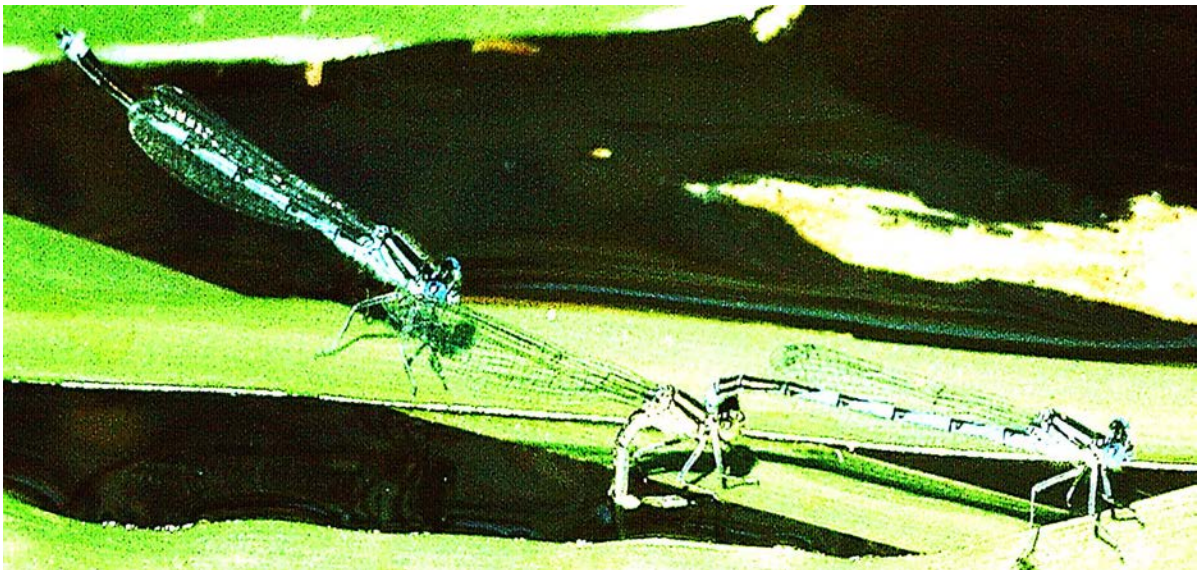
b) 

57a) Close-up view of the pre-sexual coupling of a male ***Lestes barbarous***. **Noirmoutier, 09 1981,** MB Phot**;**
57b) *Terminalia* seen from the side, then from below with highlighting of the coaptative elements of the abdominal end of a male of ***Caenagrillon scitulum***. **Sérignan-du-Comtat, 07 1978,** MB Pict.)

During insemination accepted, if not "wanted" by the female, the abdominal and genital apex of the female "must" join and hook the copulator and inseminator apparatus of the male, surprisingly differentiated in its abdominal base. More than has been done before, I have endeavoured to examine the differentiated anato-morphological bases in the two sexes, whose genital elements occupy, in the respective abdomens, exceptionally opposite places. The tandems observed, in natura, are strong because they are part of a coaptative attachment system (*cf.* **Boulard, 1982b**).



58a) Evocative graphic design composed by a first couple of the 'Lestes sauvage' (***Lestes barbarus***).
58b) Spectacular tandem laying of a second, whose male does not leave the female.
France, Noirmoutier, September 1981 (MB Phots)



59) ***Caenagrion lindeni*** (Selys, 1840). Frustrated male (?) watching one loving couple while laying eggs...
Sérignan-du-Comtat quarry, July 1984 (Boulard, 1985h)

-> In Anizoptera

> Laying females

60) ***Anax imperator*** (Leach, 1815), wings vibrating, laying under submerged plant fragments.

61a) ***Aeschna cyanea*** (Müller, 1764), calmly, in mosses. **France, Vaucluse (MB Phots)**

61b) ***Aeschna cyanea***, final phase of its aerial birth from the naiad emerged, then abandoned:

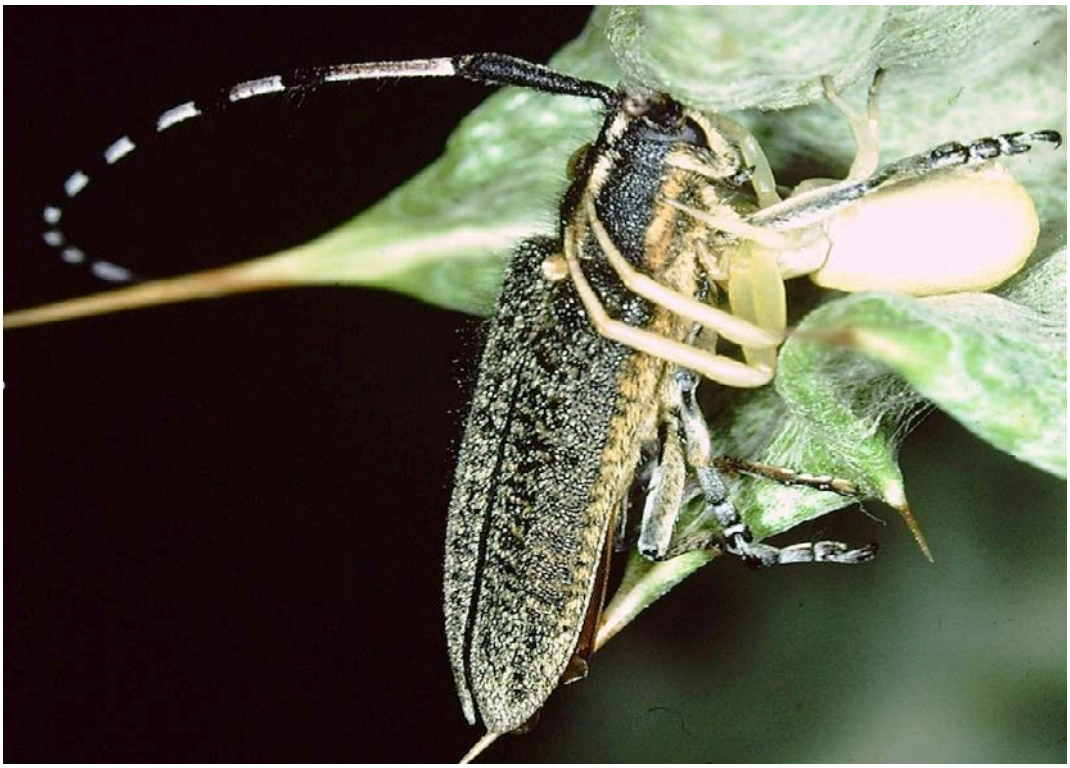
Only the exoskeleton of the naiad remains attached to the support, like the 'exuvie' of the Cicadas. France, Forest and Ponds of Fontainebleau, June 1978 (MB Phot).

62) Aeschnidea and other Dragonflies, some Cicadas also pay heavy tribes to the Bee-eater, *Merops apiaster*, coming to nest each year in the cliffs of Provence. (MB Phot, Jully 1993).

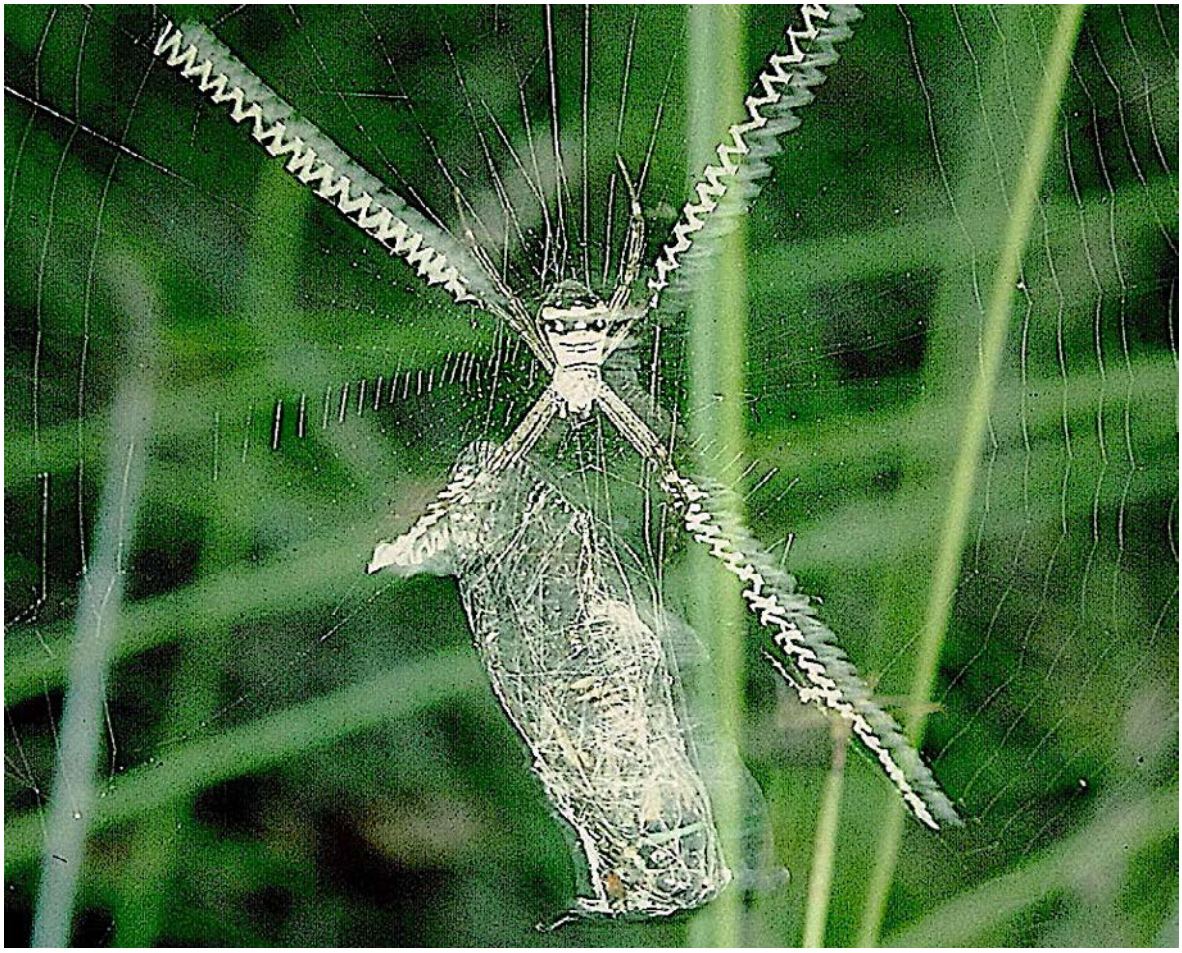
G > Arachnids, eclectic panoply

-> The Spiders

63) ***Runcinia grammatica*** having captured a ***Bombylius major*** (Diptera) during a hover.
France, Drôme, Aleyrac, June 1977 (MB phot)

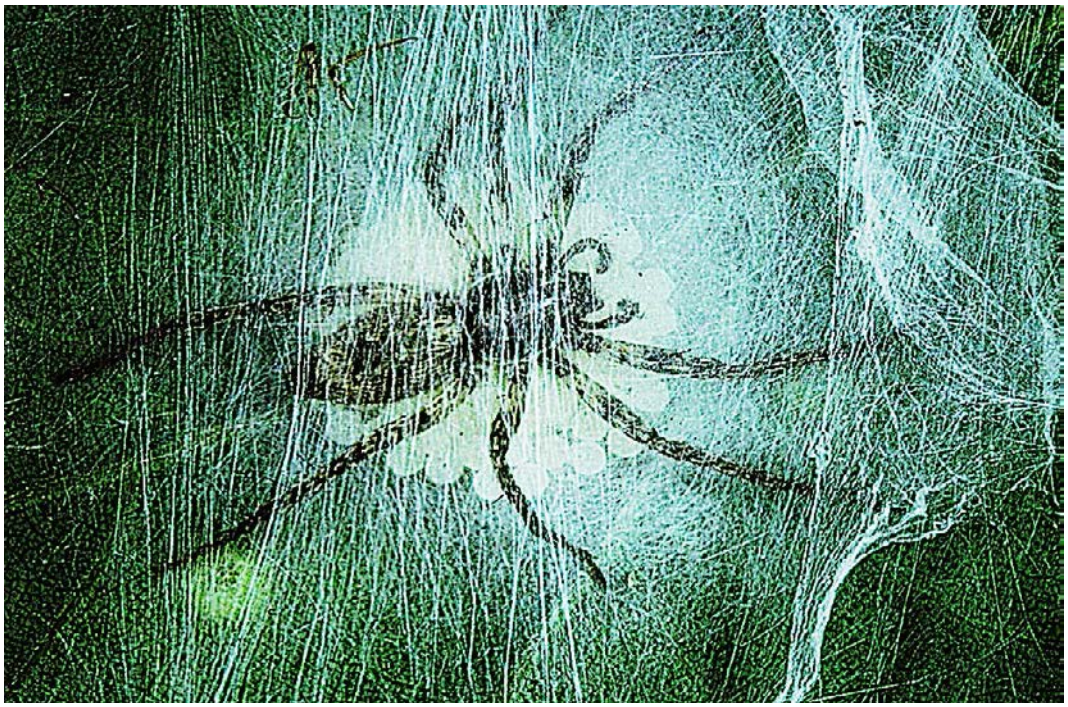


64) ***Misumina vatia*****,** another crab spider, having captured an ***Agapanthia*** robust long-horned beetle.
Provence, Colline Sérignanaise, July 1974 (MB Phot).

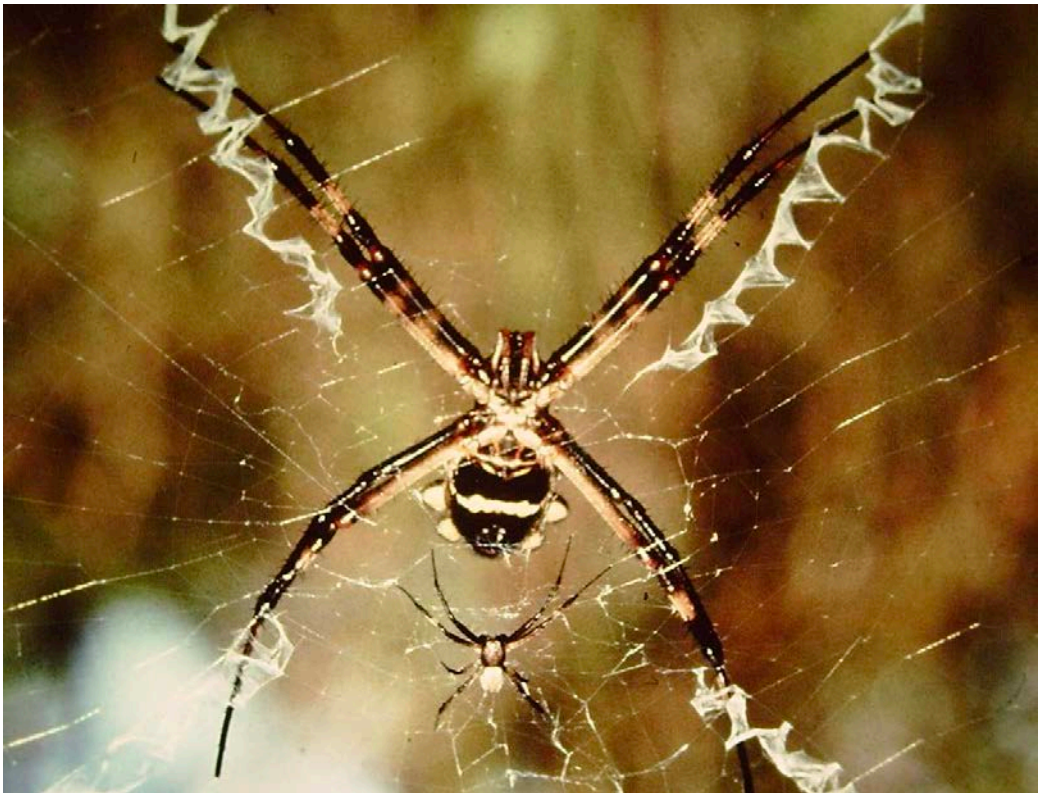


65) The Orbitles in their works... Follow an everlasting admirer! And more in the painting above where a soft breeze rocks the canvas of a juvenile Argiope having captured, then packed a small Cicada of the ***Myersalna*** Boulard kind, in spite of the nets of air moving its canvas.

New Caledonia, February 1993 (MB Phot)



66) ***Anyphaena accentuata*** (Family Anyphaenidae) had just laid a packet of eggs in its canvassed shelter under a leaf. **France, Fontainebleau Forest, June 1974 (MB phot)**



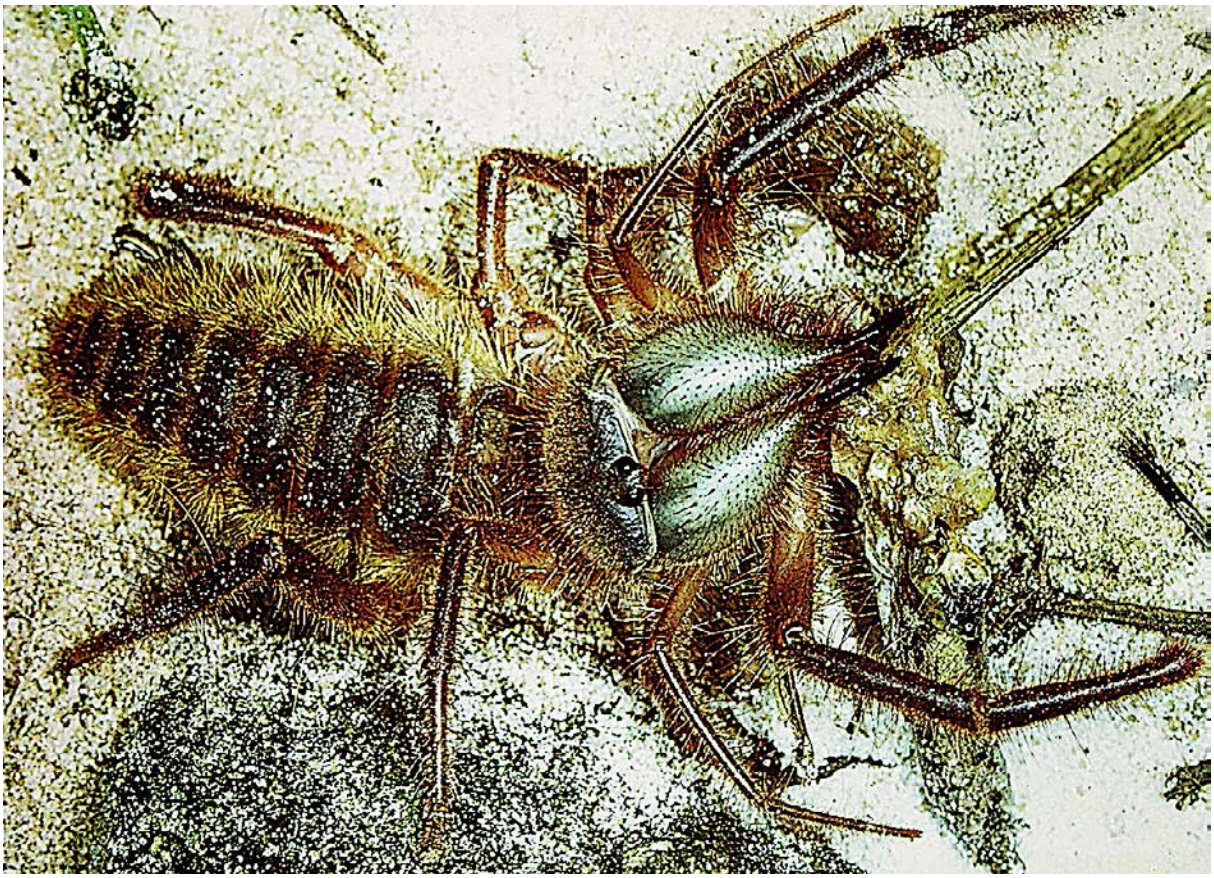
67) Argiopes sp., prelude to the couple, perhaps the death of the copulator... **N-Thailand, 03 2007 (MB Phot)**

68) *Lycosa ruricola* Latreille. Unrecognizable female, in charge of the heap of offspring in disorder and having placed itself after two small snails of a brilliant white. Deliberate situation? Allocryptic de facto, but family in danger!? **Garrigue provençale (in Boulard, 2012c)**

69) *Lycosa radiata* Latreille, carrying its cocoon of budding offspring...
France, Sérignan-du-Comtat hill, August 1977 (MB phots)

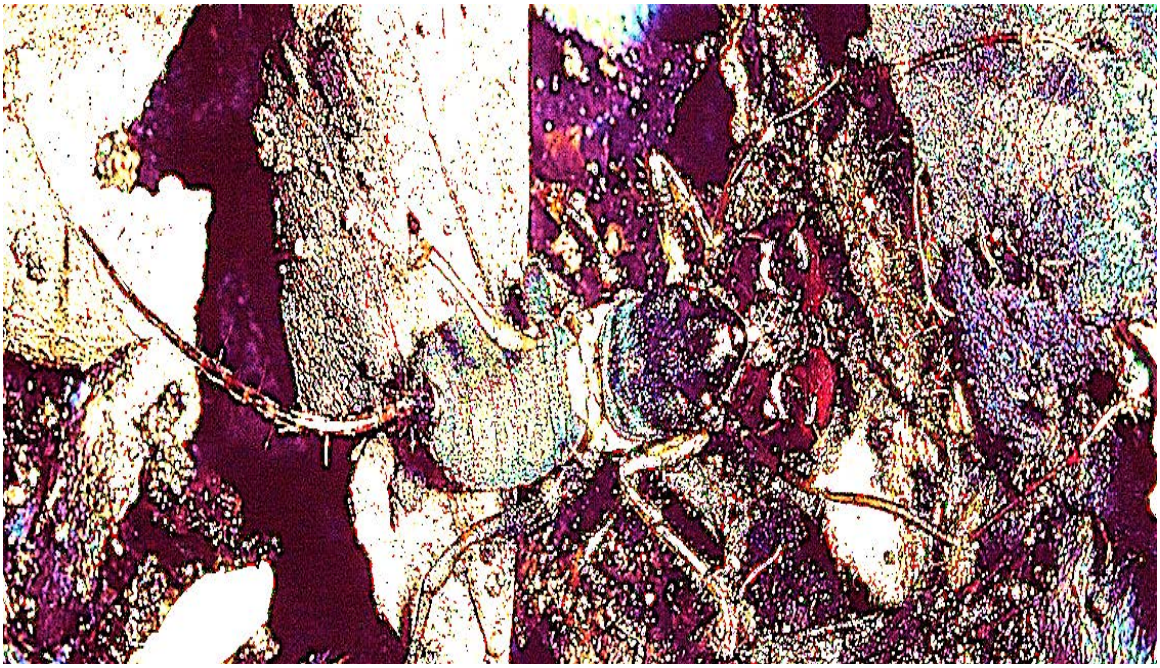
-> Spectacular Chelicerates, somewhat disquieting...

70) Here is a Phryne or Amblypyge, a most peculiar arachnid, sometimes encountered after the traps are extinguished. **Kenya, Gedi forest, XI 1972 (MB Phot)**



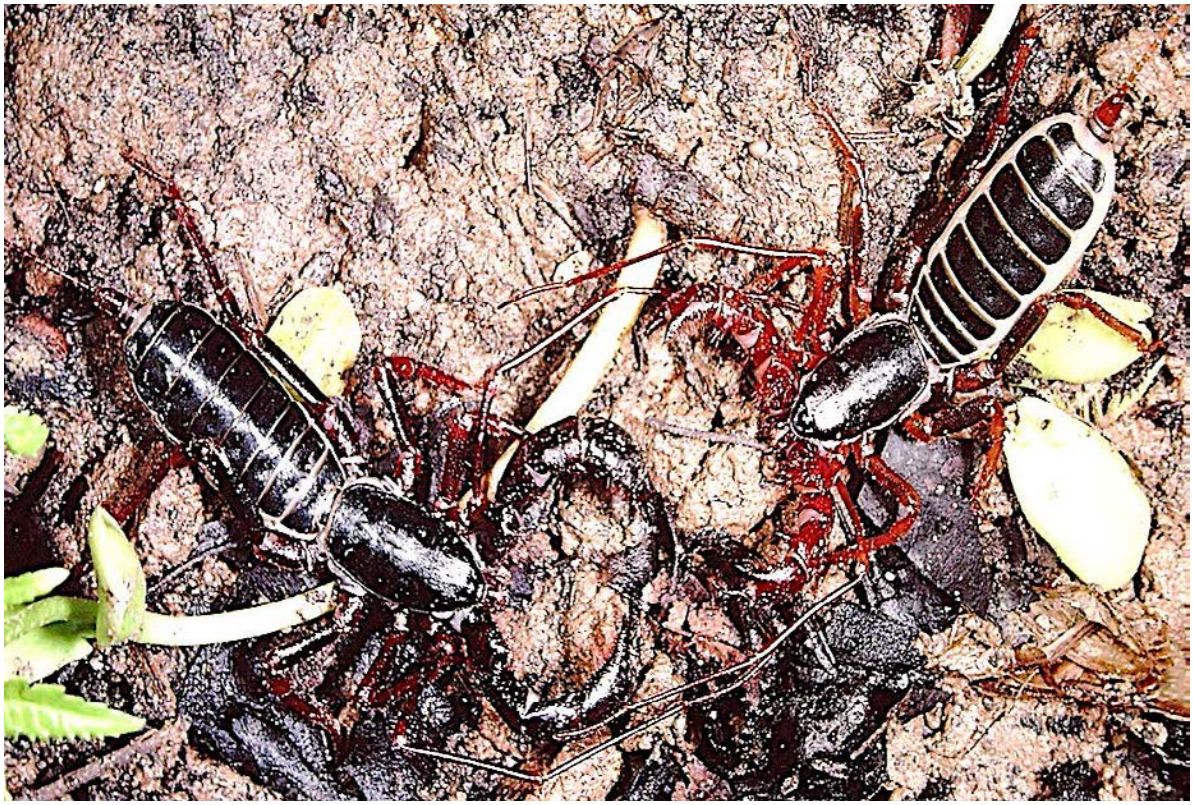
71) Great East African Solifuge, ***Galeodes arabs*** Koch, 1842. Pedipalps at rest, it finishes kneading and absorbing a large Cricket. I appreciated, from above (!) its visual acuity, the fulguracy of the attack, the chewing speed of its enormous chelicerae... Fabulous animal!

Kenya, Bush of Isiolo, November 1972 (Boulard, 2000a)



72) Meeting of an Uropygi. Jaws not heavily armed, Uropygida resemble Scorpions, caudal sting replaced by a flagellum provided at its base with glands emitting noxious odours. From these curious wandering predators, I had the chance to photograph ***Thelyphonella amazonicus*** (Butler).

Guyana, near the banks of the Arataye River, March 1981 (MB Phot)



73) There is also a recently known African species, ***Etienneus africanus*** Heurtault, 1984, discovered in Lower Casamance by **Jean Etienne**, a colleague of the Museum, to whom I owe a series of documents on his farms in August 1981. **(MB & JE Phot.** *Cf.* **Boulard, 2000a**).

(Scorpions, Mygales and others, *cf.* p. 451).

H > Surprising arachnophilous midges

-> Cicada and Nephile

Discovery and capture (MB, 1986) of tiny midges associated with West African Nephiles of the species ***turner***i Blackwall. Anecdotal discovery, as it should be, due to the tragic end of a Cicada, which in memory of it, I have to report here.

Place of the drama: the Taï Forest Reserve in Lower Ivory Coast where, in April 1986, Cicadas and Membracids were keeping me very busy. One day, around 3:30 pm, while a little ***Trismarch***a was amusing me with its sap catches punctuated by a metronome with vigorous mictions on the left side... I was literally frozen by the **distress tymbalizations of an *Ugada***, the great Forest Cicada of the place.

I abandoned the "epicurean" and went to the "Help !!! »…

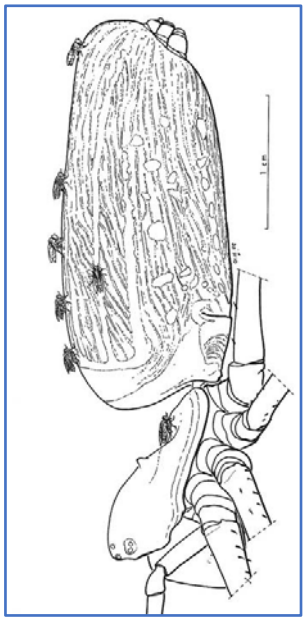
74) Failing to strike me in a vast web where despair was entangled, the chelicerae of a sprawling Nephile planted upon the head of a male ***Ugada taiensis***... already silent, not moving, dying. The Nephile too was motionless, continuing to poison its prey, or starting a meal. A large tear in the sticky net was evidence of the agony of capture. I took pictures... Spying through my 135 macro, the smallest facts and gestures of the spider... Then, even more, the curious merry-go-round of tiny gnats, which flew above the scene, going as far as landing on the spider's back and moving around more or less smoothly. Surprised, not having yet seen such a coming and going... **All the more interesting as the tiny flies, totally disdaining the prey, were only attracted by the predator's back.**

-> Nephile and Midges

75) A small mouth vacuum cleaner enabled me to extract, in several times, a collection of these gnats, thinking immediately of my fellow dipterists, while photographing myself

Ivory Coast, Taï Forest, April 1986 (MB Phots)

Good for me. These midges turned out to be Chloropides belonging to two unrecorded species of the genus ***Pseudogaurax*** Malloch, ***P. brevifacialis*** and ***P. taiensis***, which the diptera specialist, the Welshman **John Deeming**, described **(*cf.* Boulard, Deeming & Matile 1989e).**

a)  **b)**

76a+b) a) Explicit sketch by **Gilbert Hodebert** (MNHN), based on the previous slide.
b) Sub binocular, some of the captured ***Pseudogaurax*** **(MB Phots).**

Additive: In 1988, in Malawi, I was also able to observe the attraction of mini-diptera of the genus ***Anomoeceros*** to a brightly coloured, armoured spider with strong spines, ***Gasteracantha mucronata*** (Walker).

I > Fable carriers, interlude with the Insects

77) "The Persevering Cicada and the Music-loving Spider". Two worlds that ignore each other... The extras in this eco-photo were apprehended this way. The Cicada, ***Salvazana mirabilis***, wings spread, the abdominal apex raised, tymbalized with ardour... The Spider, probably ***Hetropoda venatoria*** (Christine Rollard det.), frozen, as if in ecstasy! Eyes reflecting the brightness of my flash. Remained such as, more than 2 hours... Was gone before the Cicada flew away, or the spider reacted...

Northern Thailand (Boulard, 2009b)

About Fable, this one: "The Cicada, the Wasp and the Ants."

For Cicadas, imagination is the crucial stage of the life cycle. During the required time (8/ 15 hours), they are helpless, none. Most moult at night, with limited visual predation. A well-known exception is the large Mediterranean species, ***Lyristes plebejus***, whose nymphoids emerge from the ground in the early morning hours. Also, some are prey without recourse to vagrant predators. I have witnessed many times the wasps and ants that can be dispatched, or even compete with each other, as described below:

78) It was first the attack of a Wasp of the group of the Polistes, ***Polistes gallicus***, which had brought down to earth a large *Lyristes* before it had completed its imagination, and on which the Hymenoptera, a methodical knacker, cut up and flew away again and again bringing a beautiful piece to its larvae, and each time coming back... Tough job! (*cf.* p. 55/56).

79a+b) But on the ground, ***Pheidoles palluda***, mini carnivorous ants, spotted the fodder falling from the trees... Soon, many well-informed Lilliputian came to attack not only the Cicada, but also the ***Poliste***! Wings and legs seized by an implacable moving and clinging troop, the winged Hymenoptera, quickly submerged, could not fly away and, in the same way, succumbed:

a) b)

Myrmecophilian maxim "**How to kill two wasps with one stone!**"
France, Parc National de Port-Cros (Boulard, 1983a).

J > Place to Centipedes and Myriapodes

-> **The Centipedes**

80a+b+c) Female of ***Scolopendra cingulata*** Latreille, 1829 "brooding", head seen from the front:

80a) 'Sleeping', coiled tightly around its eggs, invisible here (**MB phot**)

80b) Rolled up on its side, letting the laying of eggs be seen, then **80c)** the young hatching.
L'Harmas de Fabre, end of May 1974 (MB phots)

Documents selected by my colleague and friend, *Jean-Marie Demange*, for his fundamental book on Myriapods (Paris, Boubée, 1981).

Eco-photo 80b appears on the dust jacket of the third volume of the Dictionary of Darwinism and Evolution. PUF, Paris, 1996.

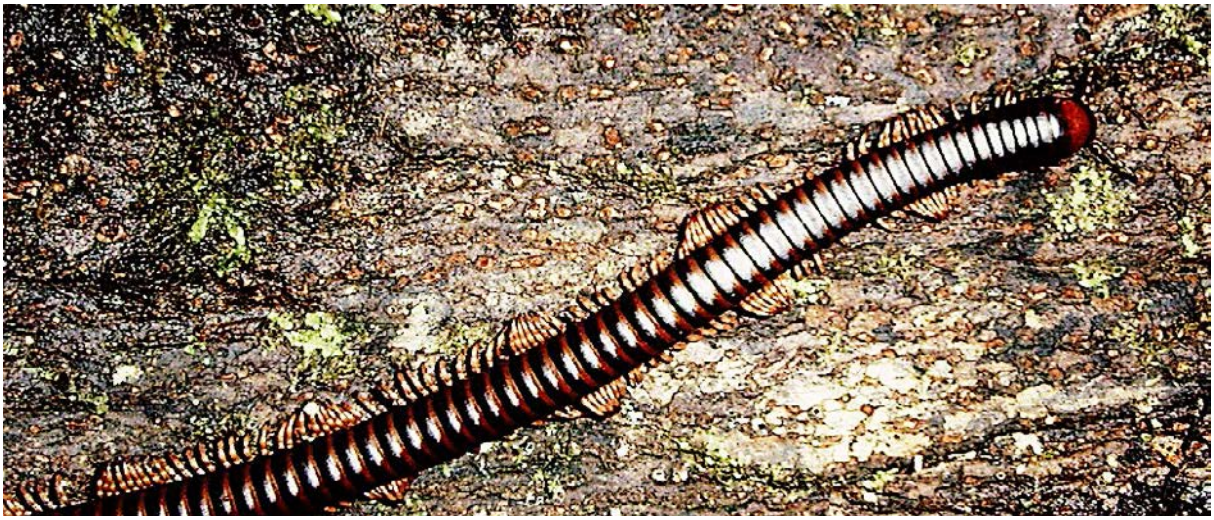
Eco-photo 80c, which specifically features the young people just born, illustrates the cover of the 1978 edition of the World Myriapodology Yearbook.

-> Les Iules

81) Striving to respect a popular designation, **the Iules** or "Mille-pattes", long cylinders with n(2+2 legs). Witness this pair of Iules incarnates, ***Schizophyllum aimatopodus*** (Risso, 1826) in action. The copulating parts are located in the segments shortly after those following the head, a disposition that could be recorded, **arguing a phylogenetic jumping to Insects** (*cf.* **Boulard, 1993d** and **2000a**, p. 183):

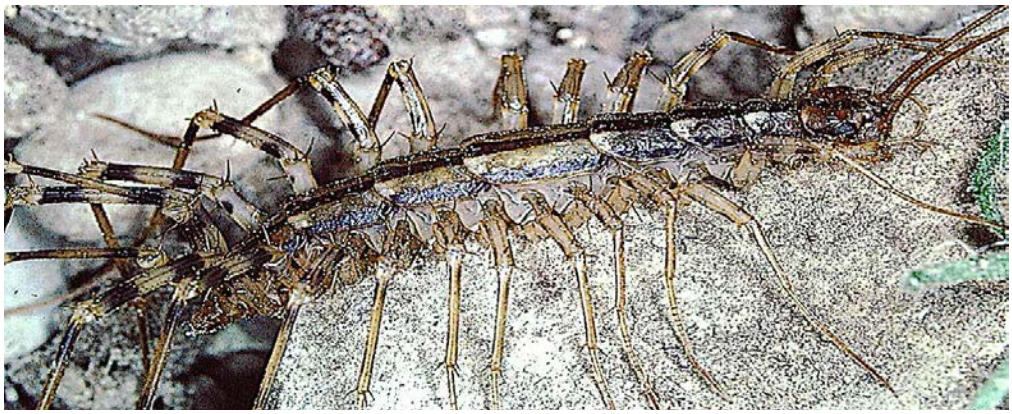
Derboux, Vaucluse, july 1977 (MB phot)

82) Short Diplopods caught thus in Thailand; the male smaller than the female (**MB phot**);



83) Neo-tropical Diplopod, ***Orchoporus lomonti*** Brolemann. The way of progress, literally "implemented" by the Iules, forces admiration. They move along in a harmonious wave, called metachronic (*J.M. Demange*), propelling the body forward, without the legs ever getting tangled, fantastic! **French Guiana, on the banks of the Arataye (MB phot)**

84) Which, on the other hand, can happen to the very long legs, however few (!) of the Scutigères during a hasty escape. ***Scutigera coleoptrata***, at rest on its twenty long legs.



France, l'Harmas, july 1977 (**MB phot**).

K > Dermaptera, Formafula or Earwigs

The life of the Dermaptères was magnificently elucidated by my colleague at the MNHN, **Claude Caussanel**, an excellent 'friend of Fac' who was carried away, in full activity by the disease. I owe it to him to have carried out, thanks to his breeding, photographs, initially wished to illustrate a book on these insects, book which he produced in collaboration with **Vincent Albouy**, another dermapterist friend.

Claude worked especially with ***Labidura riparia*** (Pallas), an earwig from the coastal sands.

85a) Male (right, clamps in action) and female, mated in opposition.

85b) Female nursing her eggs, from which a young 'all white' has just emerged.

85c*) Labidura riparia* (Pallas), attack and predation.

86) Less well know arboreal mountain forest, ***Apterygida albipennis*** (Megerlé), male and female.
Laboratoire d'Entomologie, Faculté des Sciences de Paris, February-March 1985 (MB & CC Phots).

L > Back to Hymenoptera, curiosities

-> No "head up": Apidae at rest, inactive legs, mandibles clipped on a stem…

(snorings? inaudible!)

87) ***Biastes brevicornis*** Panzer.

88) ***Anthidium laterale*** Latreille. **Provence (MB Phots)**

-> Tempered, refrigerated, the antennas hanging ...

89) This male of ***Anthidium manicatum*** L., surprised by a rainstorm, closed its mandibles on the first possible support... Only regained its senses when the sun came back.

France, l'Harmas by J.-H. Fabre, July 1977 (MB Phot)

-> Foragers

90) Forager of *Antidium manicatum* L. (Hymenoptera Apoidea) at work (MB Phot)

-> Raped, without recourse

91) Large ***Anthidium*** males mate abruptly and briefly. With these bees, rape is "normalized", at the expense of foragers... Always *surprises!*

France, J.-H. Fabre's Harmas, July (MB Phots)

-> Trapped! For a good cause"

92)*Xylocopa violacea* (L.), foraging for a sage flower... Waiting for its visit. The big bee is thus one of the obligatory vectors of the plant's pollen.

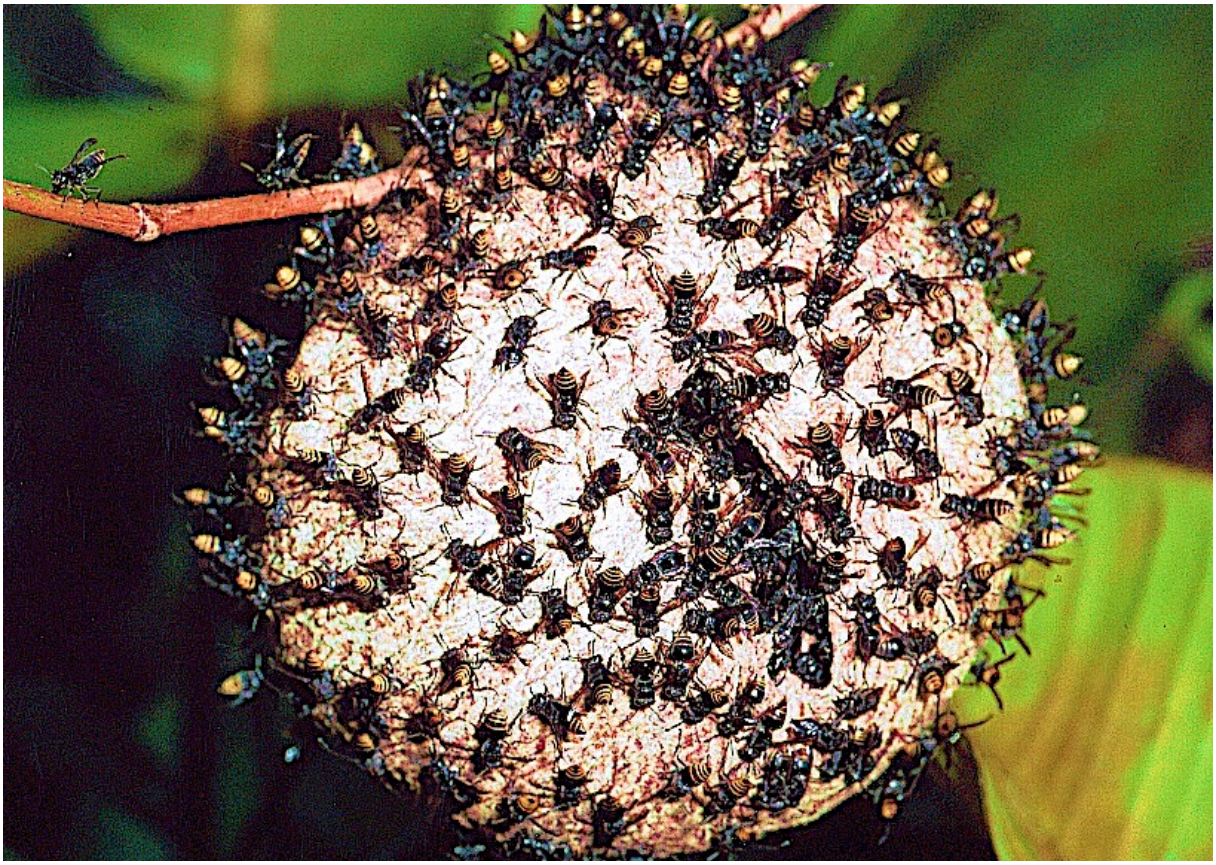
Vaucluse, La Boulardière 2, July 1977 (MB Phot)

-> Other particularly interesting Hymenoptera.

93) Wild hive of honey bees huddled together, headwind

RCA, Grande Savane de Saint Floris, April 1969 (MB Phot)

94) ***Dinoponera gigantea*** worker, bringing back to its colony a little Tabanid, a prey stolen from one of my night traps! *(The dorsal apex of its abdomen carries 2 eggs of an ectoparasite).*
Brazil, Para, Santo Antônio do Tauá, November 1979 (MB Phot)



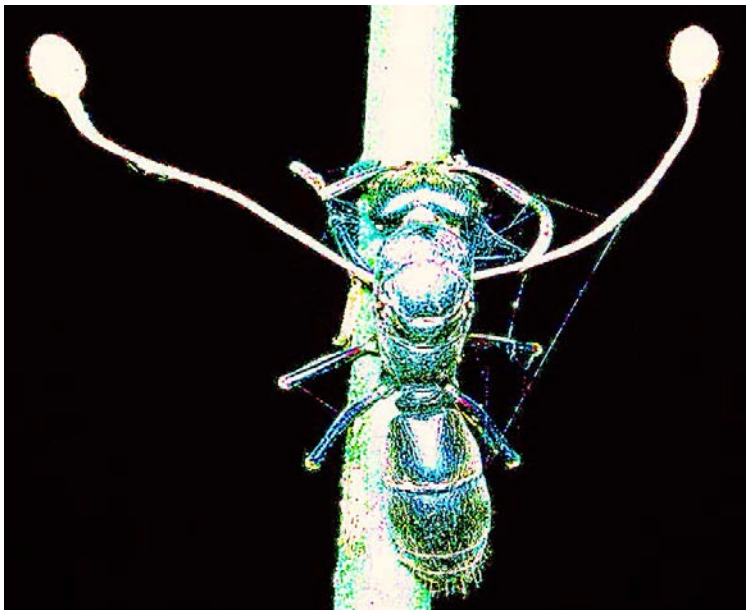
95) 'Alert All'! Wasps Polybies on their bee-eater (10/12 cm in diameter). Just glimpsed, retreated very slowly, admiring anxiety ... **Para, Amazonia (MB Phot. *Cf.* Boulard, 2012c)**

96) 'HLM en brochette' due to undetermined Amazonian masonic mini wasps.

Para, Santo Antônio do Tauá, January 1980 (MB Phot)

97) Curious dormitory of *Halictus maculatus*. Threatening twilight, the males of this small alpine flower bee gather more or less like this and, side by side, spend the night.

Alps, at the foot of the Ecrins, August 1978 (MB Phot)

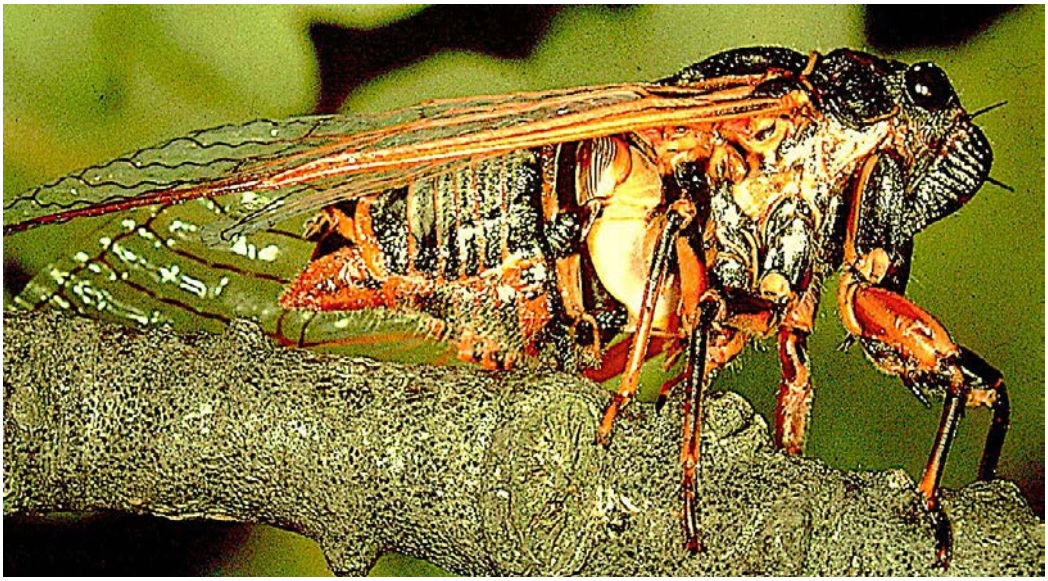


98) To close the 'Hymeno', this astonishing painting of a ***Psaltotlyreus tarsatus*** ant contaminated, killed, and thus fixed by an "artist" of the genre **Cordyceps...**

Central African Republic, January 1970 (MB Phot).

M > Aubades and attractants, promising effects

-> The Tymbalizers



99) Male of ***Tibicina haematodes*** (Scopoli), the vibrating cymbals, visible from the side by the stable lifting of the wing bases; photo of ¾ underneath**.** **Provence, July (MB Phot)**

100) ***Antankaria signoreti*** Metcalf, 1955. Typical posture taken by a male cymbalizing.
Madagascar, Massif de l'Itrème, December 1996 (MB Phot)

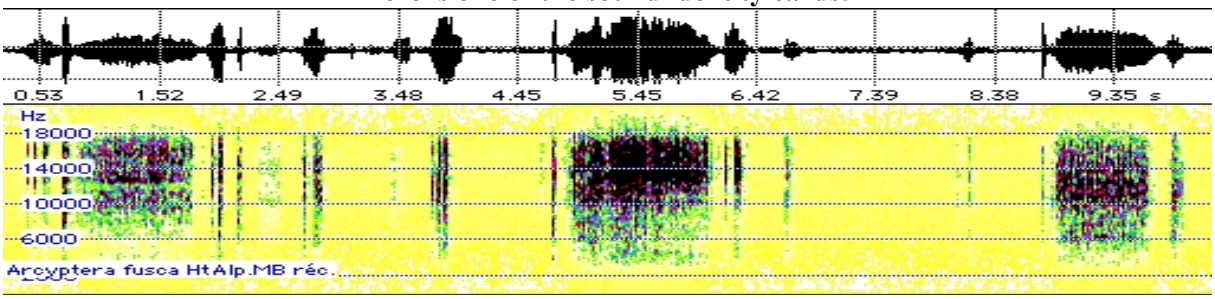
101) ***Cicadalna takensis*** Boulard, 2006, a small Asian species with a curiously "metal " appearance, whose males, like this one, often tymbalize upside down.
Thailand, Tak Province, November 2005 (Blrd, 2013c)

-> The Sridulators

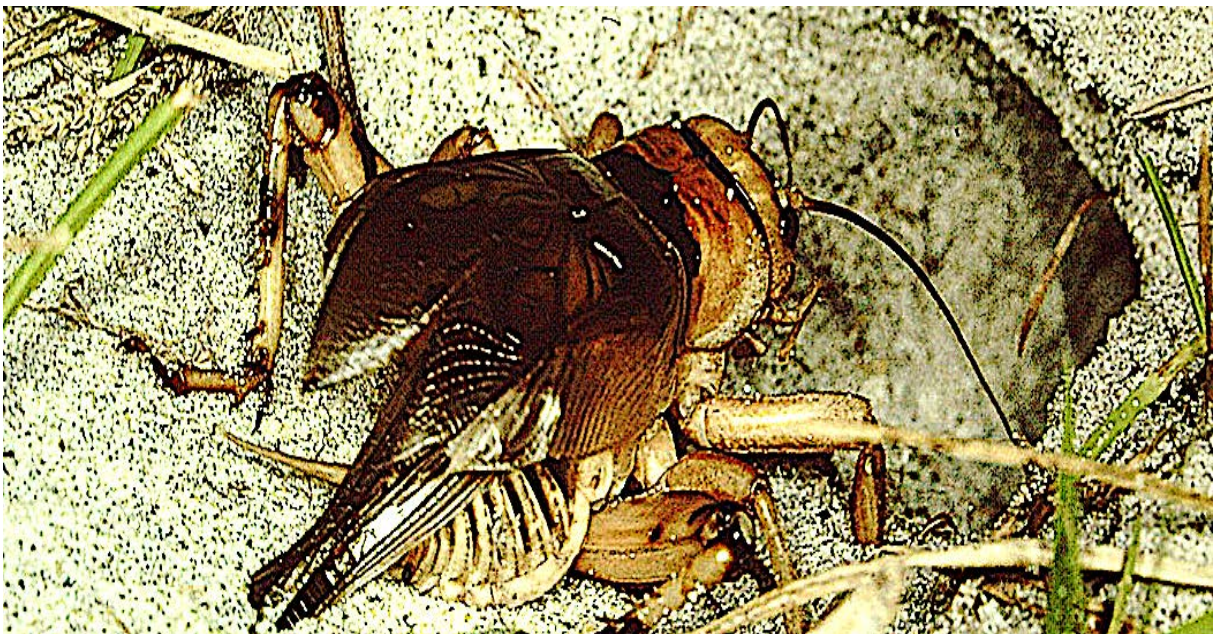
➔ Well-known examples: **Locusts, Crickets and Mole-Crickets**

102) About *Arcyptera fusca* (Pallas) scrapes very quickly and in turn its posterior femurs on its elytra just raised in roof, composing then a dorsal space, amplifier. **Vallouise, Hautes-Alpes, 07.1977 (MB Phot. & son)**

Here is one of the sound identity cards:



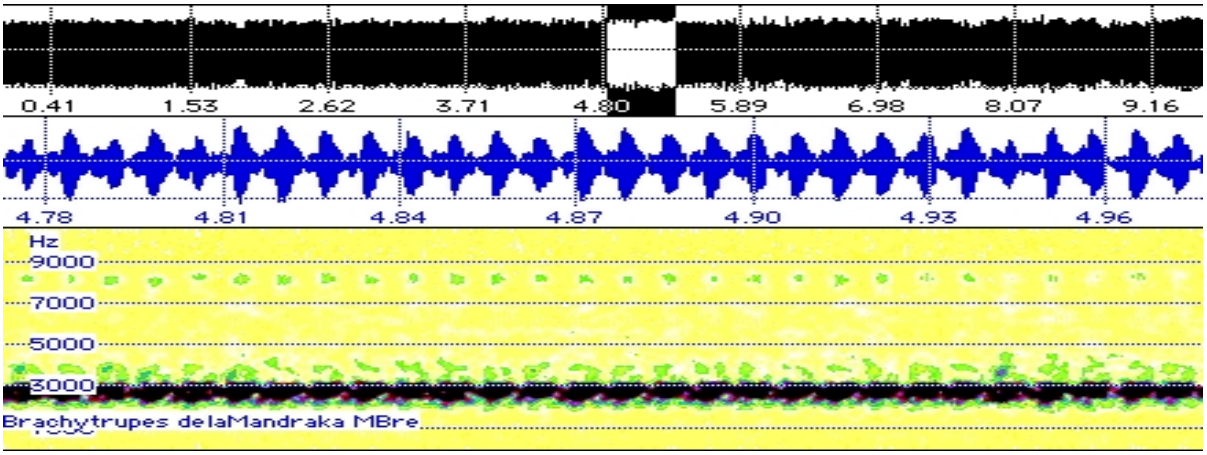
About of the big Afro-Malagasy cricket



103) *Brachytrupes membranaceus.* From the threshold of its burrow, it stridule with its wings somewhat raised imperatives and resounding messages... To the females of the surroundings.

Eco-photographed male in Malawi, August 1988 (MB Phot)

99b) AIC, Acoustic Identity Card of a Malagasy specimen

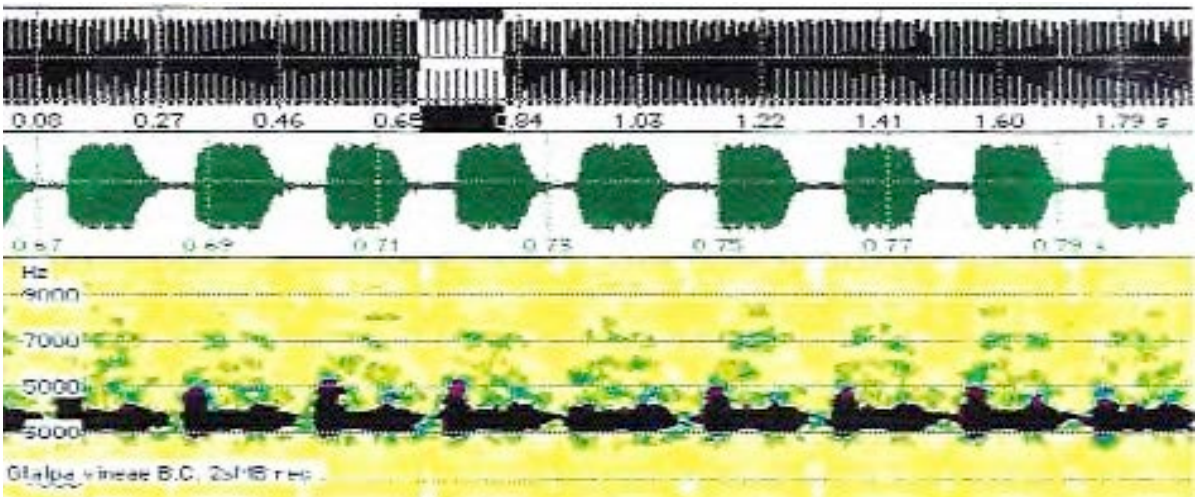


Mandraka Domain, vast clearing, January 1997 (MB, CIA sur *Signalyze 3.12*).

About the vineyard Mole-cricket

104a) *Gryllotalpa vineae* B-C, 1970 and, hereafter, the double opening of its burrow

104b) This large burrowing insect was only discovered in 1969, by my excellent British colleague **Henry Bennet-Clark**, who spotted it and distinguished it in our wine-producing Provence, revealing that its call stridulation is different from that of the long-time *G. gryllotalpa* known in France (Linné, 1758) and with which it may have been, until recently, confused**. Henry** was one of those pioneers who took into account acoustics, a possible taxonomic dimension. Here is my first **AIC**:



100c) The statutory stridulation of this mole-cricket, twin of *G. grillotalpa* L., was recorded by my care in Uchaux (Vaucluse), in May 1992 and presented, illustrated, listened to, then explained to the Harmas of J-H Fabre. In support: the above AIC, here capitalized using Signalyse 3.12 software**.** From top to bottom **-> Fragment of the Time Signal; -> Inverted developed piece; -> Spectrogram,** the RMS frequencies are somewhat above 3000 Hz. **Vaucluse, Uchaux and Sérignan-du-Comtat, August 1992 (MB Phots).**

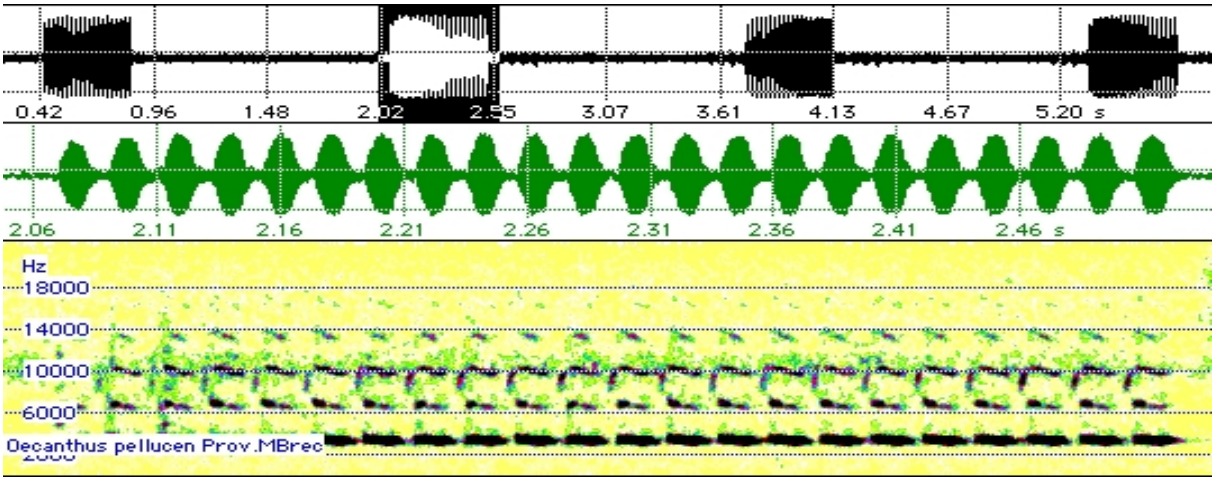
(*in* Boulard 2000e, AIC of two ethospecies, *G. gryllotalpa* et *G. vineae* are compared).

-> The encounter of the sexes. Two demonstrative examples, then some operational couples

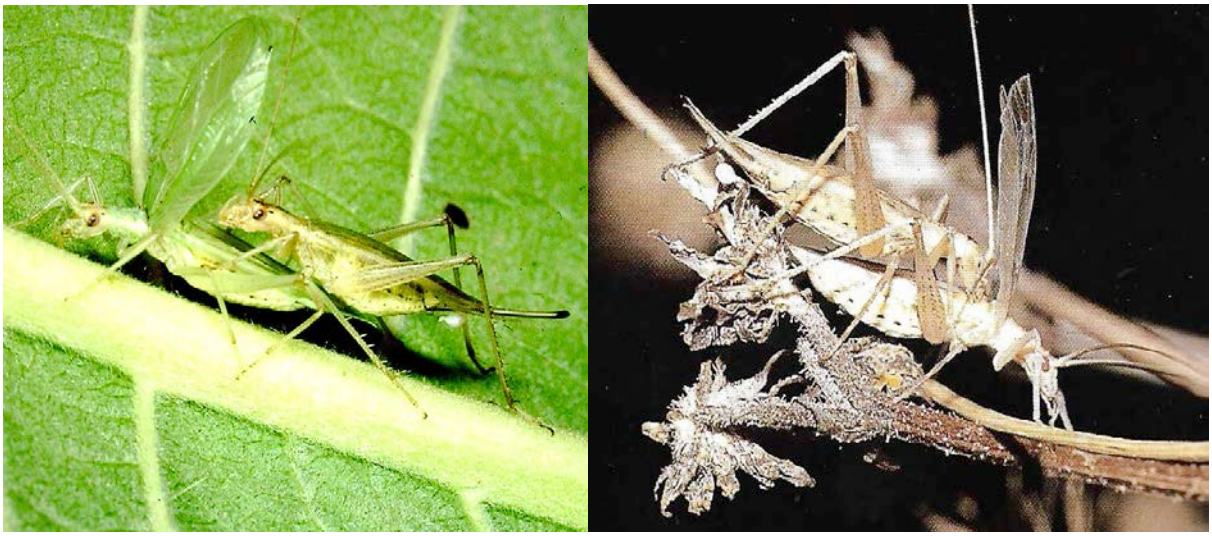
105a+b+c) Encounter at the Cricket of Italy, *Oecanthus pellucens* Scopoli:

a) Prelude. The hot summer nights, the male, by rapid and reciprocal rubbing of its erect elytra, strikes a 'delicate stridulation' to the opposite sex ...

Here is the **AIC** established in the Harmas de Fabre in August 1992 **(MB Phot & rec.)**



b) 'Sonoguided' by the music, a female will join it and will start by licking the secretion emitted by some thoraco-dorsal glands of its partner... Then the union is accomplished:



c) The end of mating. The females carrying benefit (scientifically said spermatophore), small white pear-shaped purse, which one can locate affixed to their genital parts, while they are going to lick during one or more additional minutes the back of the males, these ones maintaining purposely the wings with the vertical. **L'Harmas, 09. 1991** (**MB Phot**).

106) Pariade of the blue Sylvain, *Azuritis reducta* (Staudinger, 1901), Nymphalidae.

The eco-photo was taken as soon as after a nuptial flight with numerous twists, then falls to the ground, where two accomplices are facing each other: '**Elle**', wings wide open and extended, the antennas slanted towards the male...

'Lui', wings raised, quivering, lowering its antennas until touching those waiting in front of it, then raising them. And this several times... "***Dans un espoir nuptial, le beau Sylvain adressait son compliment".*** **Vaucluse, Colline de Sérignan-du-Contat, juin 1984 (***Cf.* Boulard, 1988b**)**
(***MB Phots**, *in* **Patrick Tort**, '**Fabre, *le miroir aux Insectes'***,** Vuibert éd. 2002).

The odoriferous sexual attraction, long demonstrated by the Bombyx*)

107) *Bombyx mori*, female "silkworm butterfly" with pheromonal attraction...

108) Copulation of *Bombyx mori* in breeding. Harmas small greenhouse, June 1974 (MB Phots)

109) Receiving antennas of an unknown *Bombyx*. Lamto, Ivory Coast, April 1986 (MB Phot).

)** Thought to **Roger-Honoré Noailles** who made a first 'photo-book' on ***Le Ver à Soie **(1950).**

Special exhalations, …

110) In all conviviality... ***Scatophaga stercoraria*** L., collective copulation on cow dung... The females, darker under the bulky males that mate them, hope there to capture midges and other coprophiles, whose larvae develop in an excremental environment.

France, Noirmoutier, April 1977 (MB Phot)

111) It's a long way for dung beetles... Here, ***Scarabeus semipunctatus*** in full effort, in the sandy ruins of Paestum... A new harvest, still shapeless, is very difficult to transport! **Italy, July 1976 (MB Phot)**

a)

b)

112a+b) Although alone, this Malagasy ***Carabaeus*****,** an expert it seems, has finished making a new conventional manna of provisions... On its ball, "it rolls easily" meter after meter, between grassy obstacles.

Madagascar, sub-mountain grasslands southwest of Andrigitra, December 1997 (MB Phots)

Conventional copulations, or in opposition

113) ***Tibicina garricola*** **B., garrigue cicadas (MB Phot)**

114) ***Podisma alpina*** **K., Alpine microfly locusts (MB Phot)**

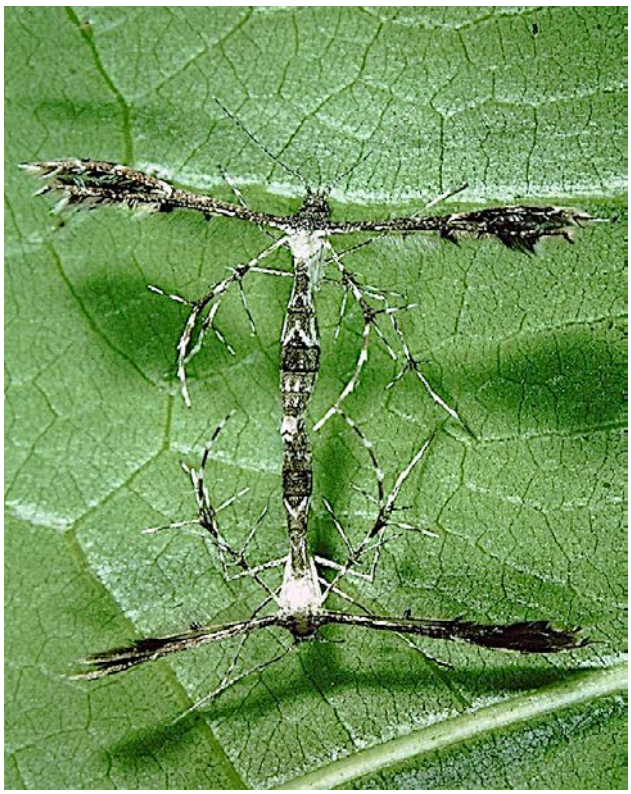
115) Accused sexual dimorphism, banal copulation (!), in *Augosoma centaurus*, large Scarabaeidae from tropical Africa. **Boukoko, November 1969 (MB Phot)**

a)

116) Beetles Chrysomelidae ***Arima marginata*** (Fabricius). **France, Mont Ventoux (MB Phot)**

117a) Membracide ***Monocentrus carayoni*****,** female appended to male**. Boukoko, 1968;**

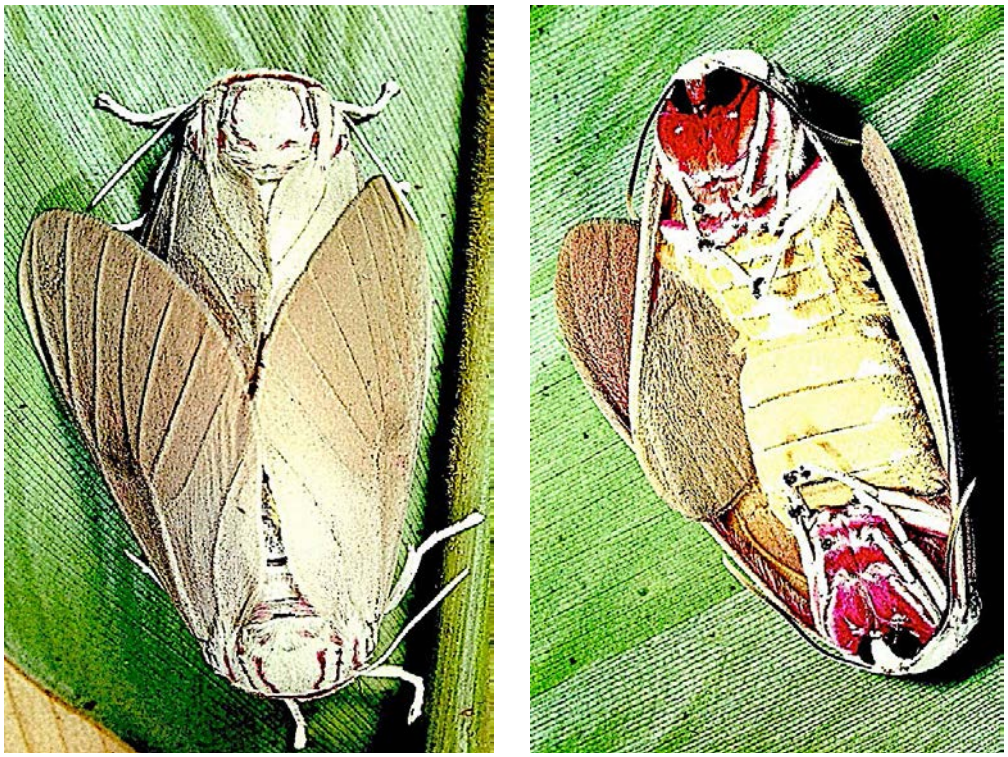
b)



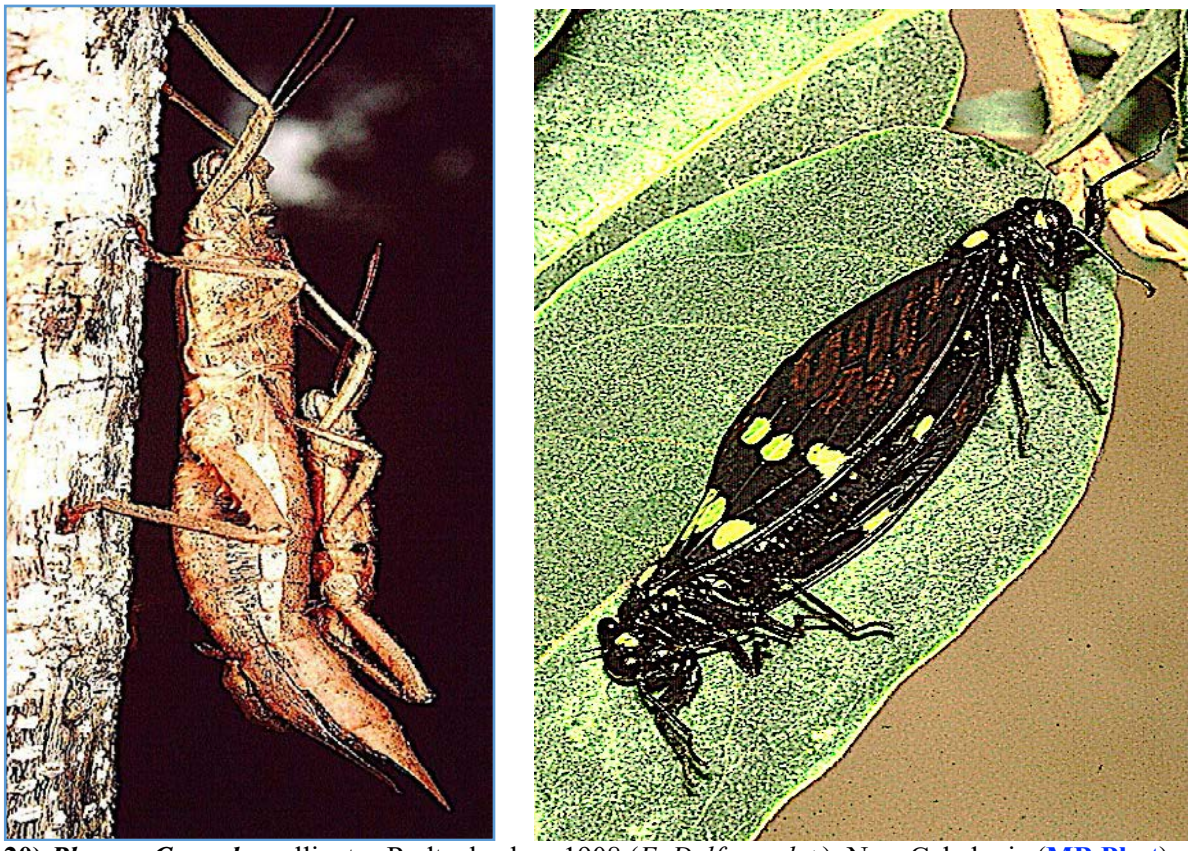
117b) ***Anchon honoratus*** Capener. In these Membracids, once mating is assured, often the male remains for some time attached to the female's sex, legs folded (sexually contrary to previous ***Monocentrus*****, without any reference). La Maboké, January (MB Phots)**

118) Mini-Pterophoridae Butterflies, couple in opposition. Central African (MB Phot)

Fusion: the front side less expressive than the back side...



119a+b) Demonstrated by this couple of moths, ***Balacra herona*** **(Druce),** Lepidoptera Thyrididae (male above). **Central Africa, Boukoko, May 1968 (MB Phots)**



120) ***Phasms Canachus*** alligator Redtenbacher, 1908 (*E. Delfosse det.*). New Caledonia (**MB Phot**)

121) ***Gaeana cheni*** Chou & Yaho, male and female mated that a gust of wind dropped on the V-shaped surface of a low leaf; were "dead" for 4 or 5 minutes. **Thailand, April** (**MB Phot**)

122) Couples of the Haneton ***Anoxa villosa*** "on the run!" **France, Gard, July 1984 (MB Phot)**

123) Small Central African weevils, ***Bryochaeta quadrimaculata***, which are harmful to robusta coffee, mainly grazing on the leaf periphery**. IFCC, Boukoko, October 1966 (MB Phot)**

124) Flies *Sarcophaga carnaria* (Diptera). France, Vendée, July 1977 (MB Phot)

125) Couple of ***Nyctophila reichei***, whose female is "the Shining Worm". **France, July** (**MB Phot**)
126) The image of this couple of ***Sympetrum striolatum*** was chosen to illustrate the cover of the first volume of the Dictionnaire du **D**arwinisme et de L'Evolution, PUF, 1996 (**MB Phots**, France, July).

127) In these ***Heteronotus flavolineatus***, highly endimanched Membracids (by hypertelic of pronotum!) mating is problematic. Nevertheless, some time they are succeeding!
Buzios, Brazil (RJ), February 1980 (MB Phot)

128) Comical as well as strange, this couple from *Proscopia scabra*, a Guyano-Amazonian "cricket-stick", offers an example of sexual dimorphism with a small tapered male.
Brazil, Para, October 1979 (MB Phot)

Never mind the extraordinary body stretches imposed by a seemingly tyrannical over-evolution. The reproductive instinct is always stronger, while sexual dimorphism only reduces males...

129) A good example of sex-linked dimorphism in these phasms of the genus *Achrioptera*, attributed to the species ***madagascariensis*.** The male, tiny, clutched and mated on the right side of the female. **East Madagascar, La Mandraka, February 1997 (MB Phot)**

N > Laying and similar, flowing from source

-> Without auger

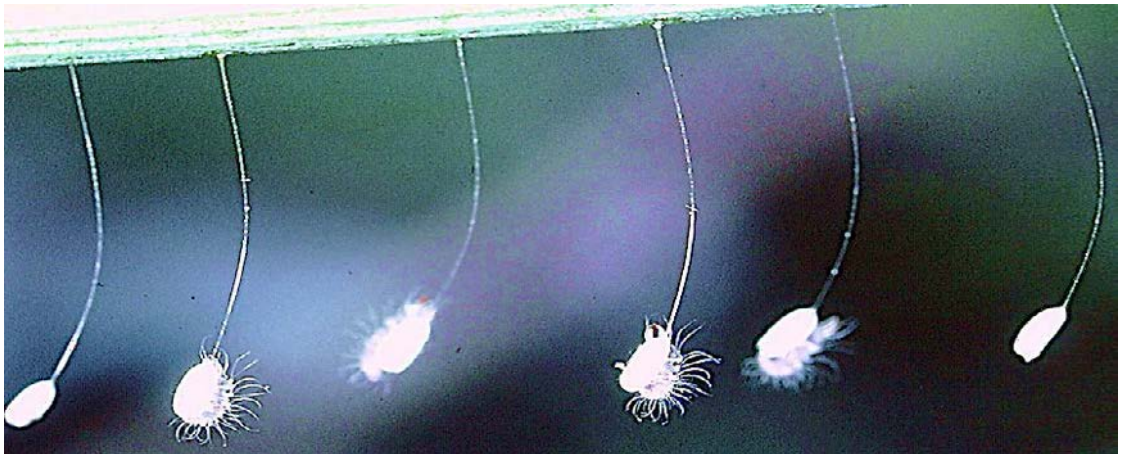
130) Diptera ***Stratiomyia longicornis*** sticking its eggs in a packet on a Gramineae stem.
Vaucluse, July 1977(MB Phot)

131) Crown-laying **of *Aleyrodes sp.* on *Imperata*. Central African Savannah (MB Phot)**

132) ***Acanthaspis iracunda*** (Hemiptera Reduviidae, *Villiers det.*), female and its oviposition.
Central African Republic, Boukoko-La Maboké, April 1967 (MB Phot)

133) Founding ***Ecophyllum*** and the first eggs of a future Ant Hill. **Centrafrique, June 1968** (MB Phot).
134) ***Macrosiphum rosae*** L. Parturient winged female, founder of a new colony.
France (Val de Marne), May 1974 (MB Phot).

135a) ***Chrysopa*** (Neuroptera Planipennia)**. Hautes-Alpes, Les Ecrins, juillet 1978 (MB Phot)**

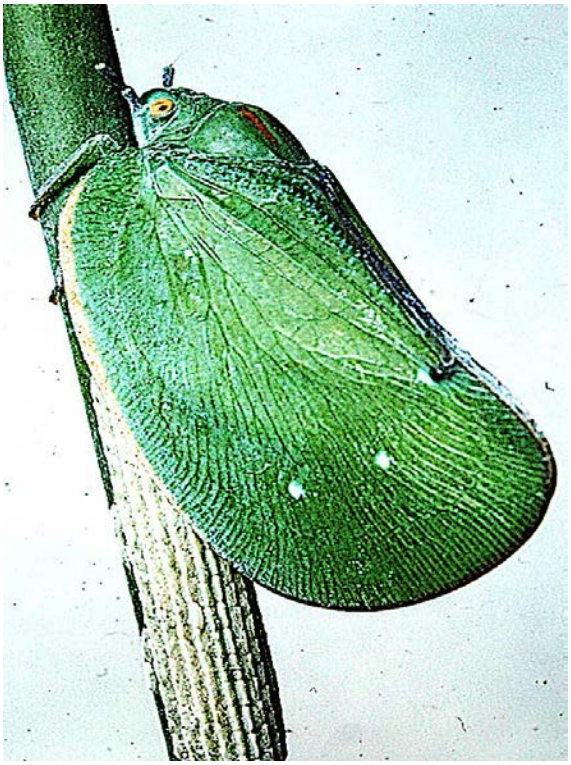


135b) Chrysope larvae just hatched from their eggshells

135(c) Larva leaving the egg by following the egg-laying suspensory filament (MB Phots).

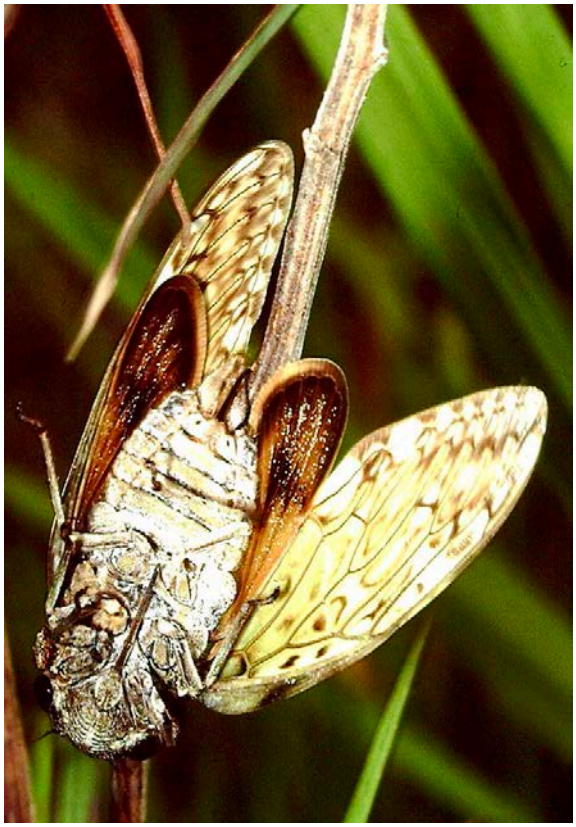
-> With auger

136) The Chalcidian *Syntomaspis apicalis* (3 mm long), **here in honor!** Super-parasite of ***Biorhiza pallida*** triggering the formation of large spherical galls on oak leaves. Its very long white borer, released in a line from its black sheath held upright, is already well embedded in the "ball" induced by the parasite. **France, Fontainebleau Forest, May 1975 (MB Phot).**



137) The Ephippigera has a strong, long and sharp auger for introducing the eggs into the earth, close to the roots where the embryogenesis of future offspring will take place. **Aude (MB Phot)**

138) Flatide depositing its eggs in tight rows on the receiving stem. **RCA, August 1965 (MB Phot).**

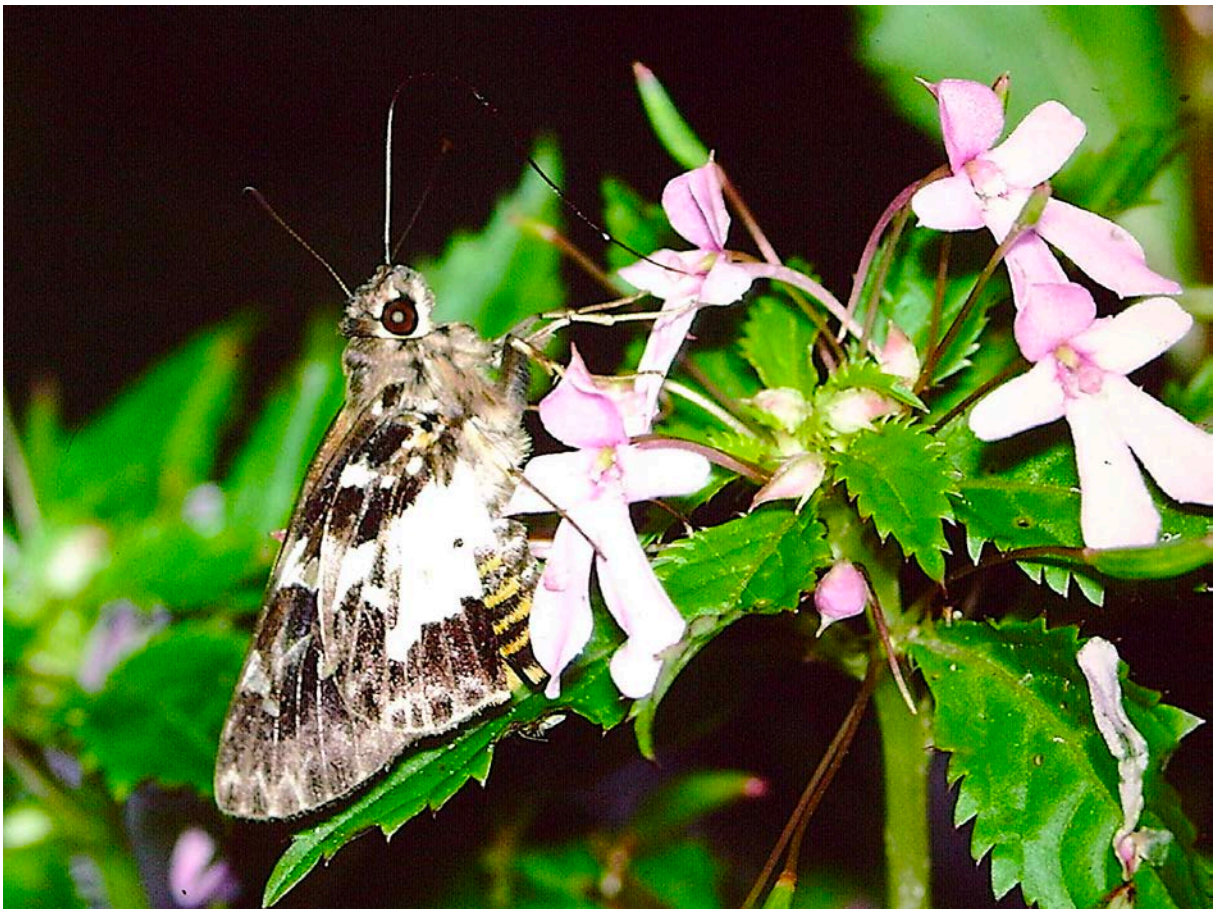


139) ***Cicadatra atra*** (Olivier, 1790) feeding while laying eggs upside down. Provence (*cf. Boulard, 1992*).

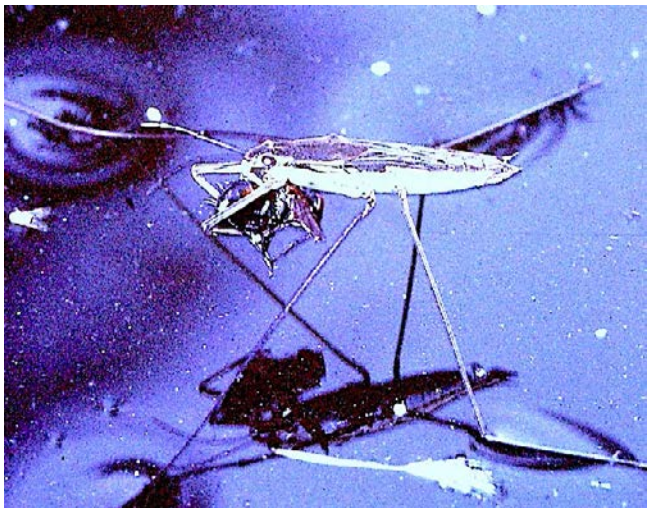
140) ***Pycna madagascariensis*** Distant, 1879; female "dead in bed!", auger stuck in hard wood of ovigerous twig. **Madagascar, southern Andrigitra, January 1997 (MB Phots).**

O > Entomic life. Additional scenes

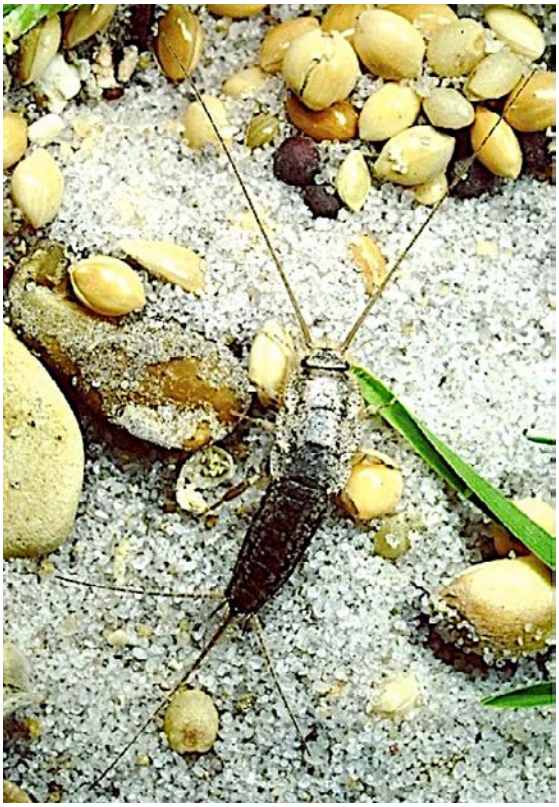
-> All of it, a little bit



141) No matter how deep the coroles visited, the long trunk of this Hesperiid will defy any flower holding certain 'promises' in such a way... **Malawi, April 1988 (MB Phot)**



142a) The Gyrins (***Gyrinus substriatus***), virtuoso skaters on calm waters.
142b) Also on calm water, ***Gerris lacustris***, more elegant and equally virtuoso skater, it is a surface predator as shown, mirroired on the slide. **Bassin de l'Harmas, July 1964 (MB Phots).**



143) ***Lepism saccharina*** **L.** or "Silver Fish", quiet, in breeding.

144) Bug ***Rhinocoris erytropus***, killing and sucking a ***Tettigetta pygmea*****,** Provencal mini-cicada**. Vaucluse Lafare, (MB Phots)**

145) Pair of the Aphid ***Euceraphus punctipennis*** Z. A convincing example of the sexual dimorphism existing in this group of mini-insects. **France, Vaucluse (MB Phot).**

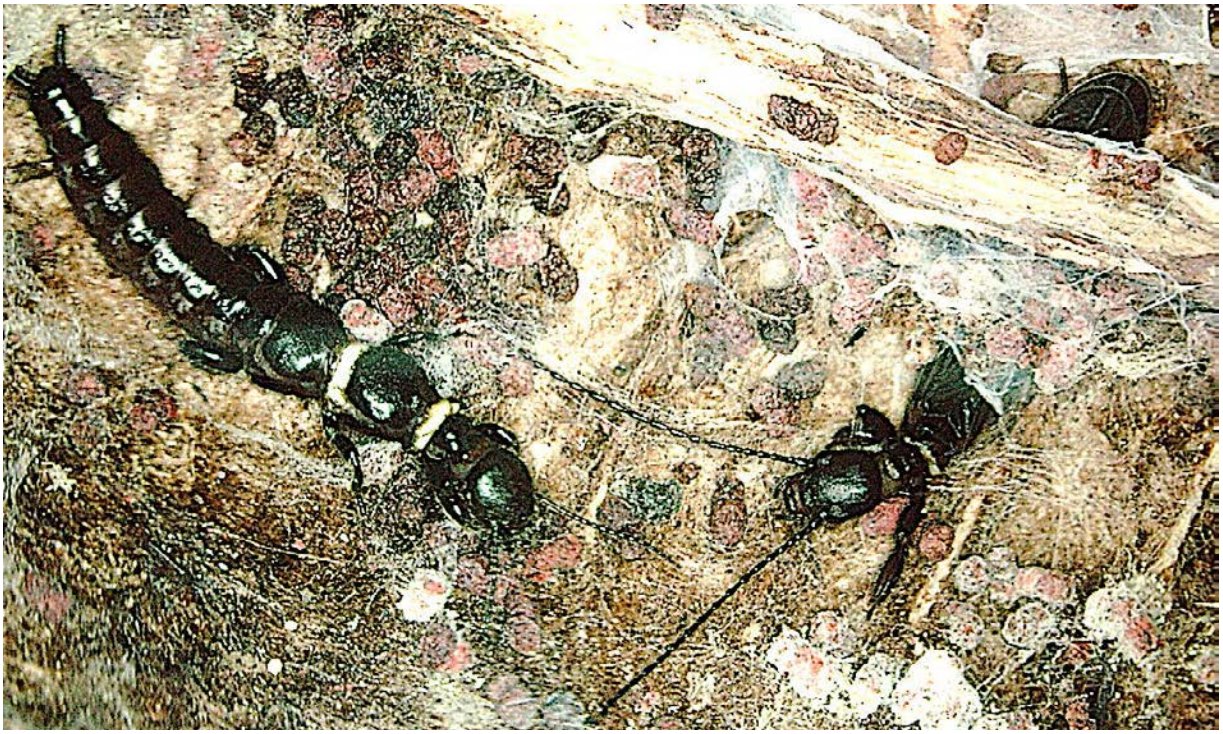
146) Cicada ***Cicadetta brevipennis*** busy laying eggs, while a mite, resplendent in red, punctures the tip of its rostrum. **France, base of Mont Ventoux, June 1976 (MB Phot).**

147) ***Wolfella benjamini*** **Boulard, 1975. Unicorn leafhoppers of the high ferns of Mount Cameroon, August 1967 (MB Phot)**

148) ***Stegaspis fronditia*** **(L.), Heteromorphic Membraces, male above. Guyana XI.75 (MB Phot)**

149) ***Huechys beata*** **Chou, 1997,** one of the small Asian Cicadas, here a female and a male in the final stages of imagination. **Northern Thailand, Ban Mae Kwang, April 2003 (MB Phot)**

150) In the bottom of its funnel trap is the larva of the Lion Ant *Euroleon nostras*, its terrible jaw wide open. L'Harmas, June 1977 (MB Phot).

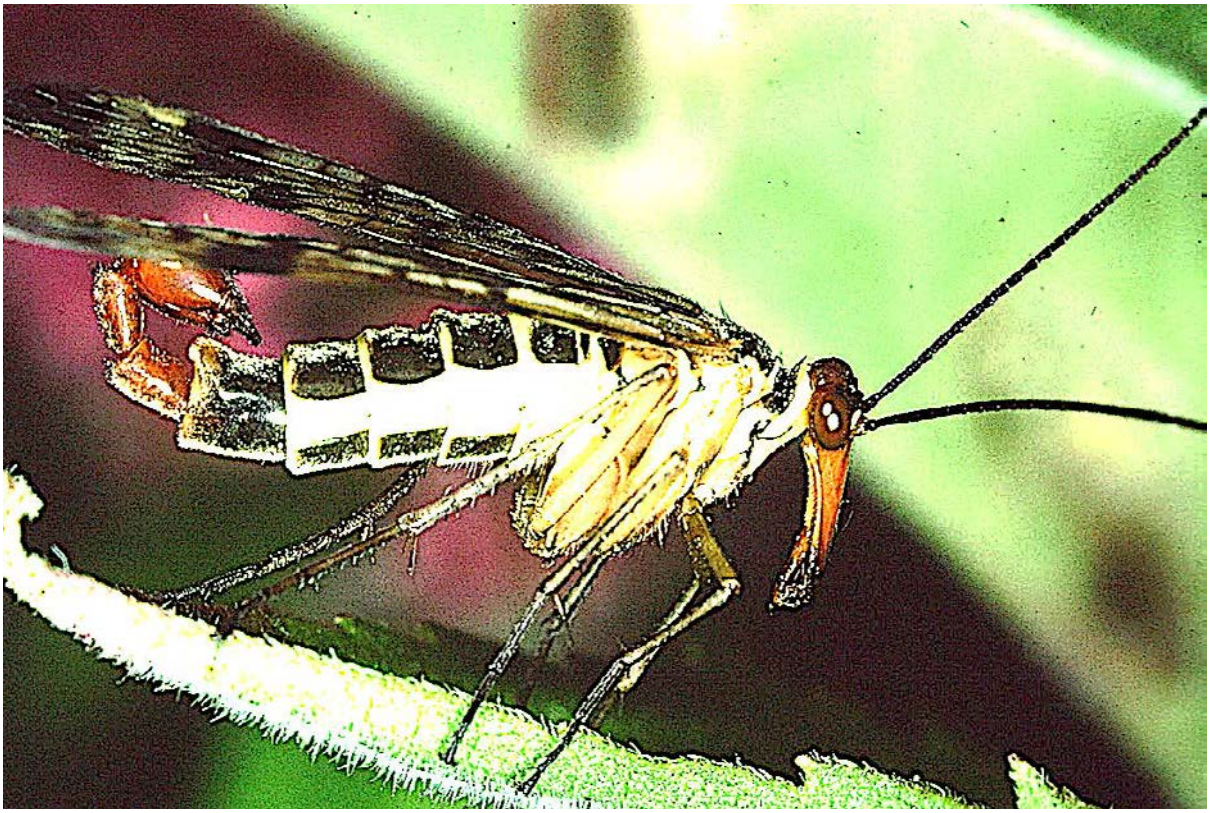


151) Pair of Guyanese ***Embia*,** apterous female and winged male, with long antennae. Macro-photography on a breeding farm taken care of by Jeanine at the MNHN, laboratory of Hemiptera then directed by our late Professor and friend, Jacques Carayon. **March 1979 (MJB Phot).**

152) ***Galerucella luteola*.** Chrysomela that can cause very spectacular leaf damage on elm trees in the main alleys and streets of European cities, as in **Paris in September 1976** **(MB Phot)**.

153) Female ***Dundubia spiculata*,** large Thai Cicada, ectoparasitized by several larvae of an undetermined ***Epipyrops*** (Nocturnal Lepidoptera)**. Nord Thailand, November 2005** **(MB Phot)**.

154) ***Ephemera danica*** **Müller.** **France, Drôme, May 1980 (MB Phot)**



155) The strange "Scorpion Fly", ***Pornapa comunis*****,** European Megaloptera.
Provence, August 1977 (MB Phot)

P > Back to the neighboring world, its giants, its dwarves, multi-view, low or high

-> Scorpions

156) Forest Scorpion of Brazil, ***Tityus cambridgei***, skidded, attentive...
San Antonio do Taua (Para), November 1979 (MB photo)

157) *Pandinus imperator*, the mega-Scorpion of the West African savannas.
Ivory Coast, Panya, May 1986 (MB phot)

-> Mygales

158a) African tarantula with tiny eyes, which you can hardly see... But functional....

158b) Its cocoon, incised, shows a mess of newborns.

Central African Republic, Boukoko, April 1970 (MB Phots)

159) Pink-footed tarantula; still juvenile on its silken layer.
Guyana, St. Elias trail, August 1975 (MB Phot)

160) In contrast to the previous ones, Salticides are jumping mini-spiders, with disproportionate eyes, which guarantee their hunting method. This little indeterminate marvel, mounted on 6 legs *(! the first pair of legs being devoted to predation),* was photographed with a macro lens on a grove at the edge of the Arataye. **French Guiana, March 1981 (MB Phot).**

Q > Circumtropical phase of a mythological insect

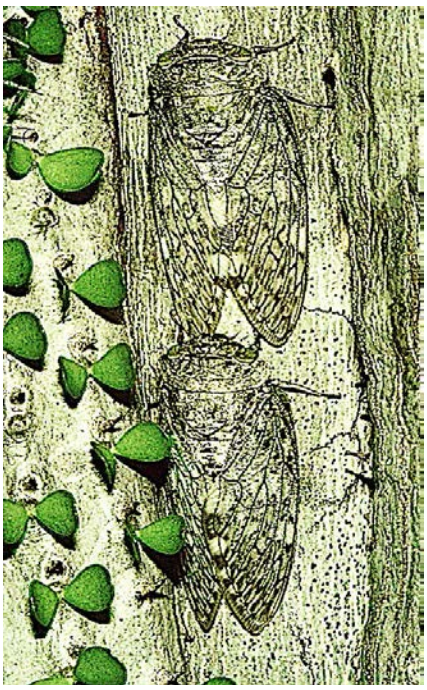
The Desert Locust *Shistocerca gregaria*, caught migrating to New Caledonia…

161a+b) *Schistocerca gregaria*, by sky and earth...

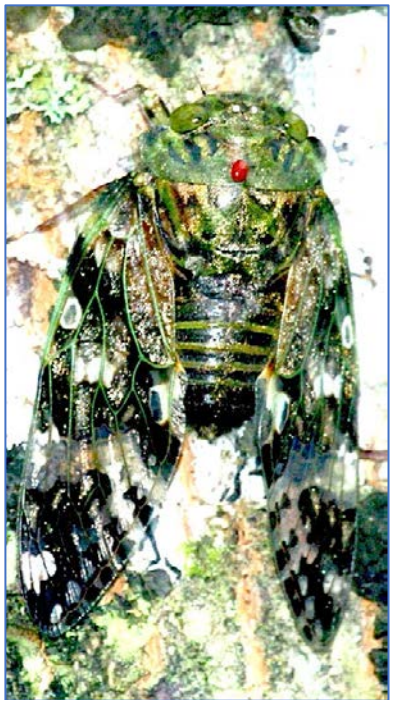
162) Bargain for Mantis and other acridophagus.

N-C, Nepoui Peninsula, March 1995 (MB Phots).

R > Cicadas chosen for some of their exposed peculiarities



163) ***Yanga andriana*** (Distant, 1899), two specimens resting, or feeding on ***Alluaudia ascendens***, a thorny, short-leaved tree or shrub typical of the Malagasy xeric south/southwest
Madagascar, 2 km north of Ambovombé, December 1995 (MB Phot).
164) ***Trismarcha excludens*** (Walker, 1858). Male of a smaller, medium-sized species, but with large, finely striated tymbals. Host of the dense forest. **Lower Ivory Coast, May 1986 (MB Phot)**
165) ***Yanga grandidieri*** (Dist.), male in its **mimetic colours**, revealed by its tymbalization.
South-East Madagascar, Anosyenne Range, evergreen forest, January 1997 (MB Phot).



166: ***Lemuriana flavocostata*** Distant, 1905. Alive, this **Malagasy canopian** has **a green costal** venation!
167: ***Oxypleura spoerryae*** Boulard, 1980, mimesian female. **Kenya Tana gallery forest, Nov. 1972**
168) ***Eopycna concina*** (Boulard, 2005), **montagnard species tymbalizing at ± 6°C!**
Nord-Thailand (1400m), October 2004 (MB phots)

169) ***Yanga pulverea*** (Dist.), *aggrégat corticicole*. **Madagascar, Périnet, Febrary 1997** (**MB phot**).

170*) Kongota* (*ankaratrensis* n.sp.) **Massif volcanique de l'Ankaratra, January 1997** (**MB phot**).

S > A step with some amazing builders

Termite mounds, astonishing, unheard of, under the ferrule of "fabulous Master builders"...
Starting with strange "mega-mushrooms" with occupants often very "tasty"...

a) b)

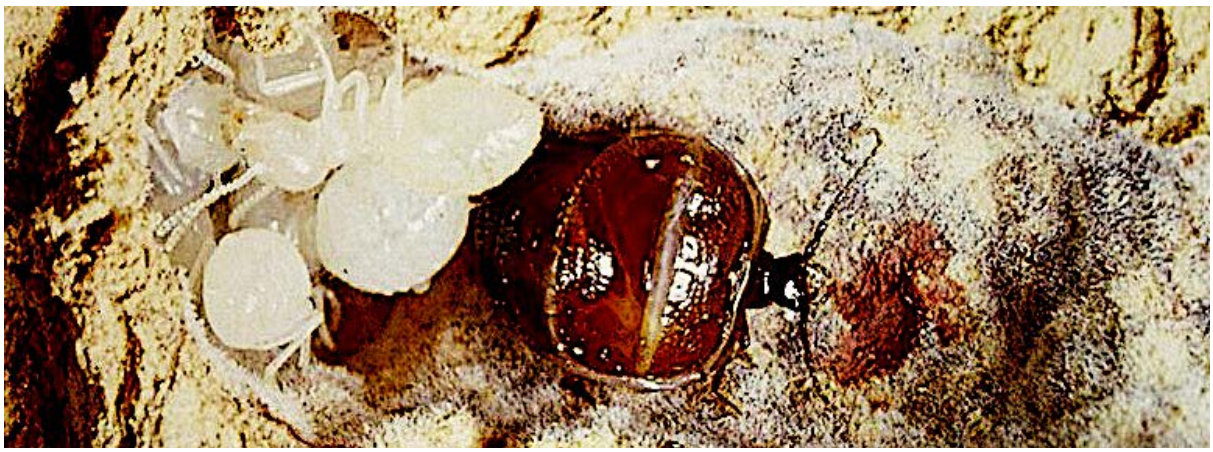
171a) Termite mounds attributed **to *Cubitermes fungifaber*,** or a related species.
Senegal, Niokolo Koba National Park, April 1986 (MB Phot)

171b) Hat cut 'revealed structure', and entomic food. In Boukoko, from time to time, with two of my observers, we would go to the neighbouring savannah to "harvest" a dozen of these "mushrooms" and, on our return, break them in the henhouse, thus rewarding our chickens. They enjoyed the termites that were released.
RCA, Boda savannah, April 1966 (MB Phot)

Termite mound, which was probably built by a *Cephalotermes*, on the banks of this Ivorian river.
April 1986 (MB Phot)

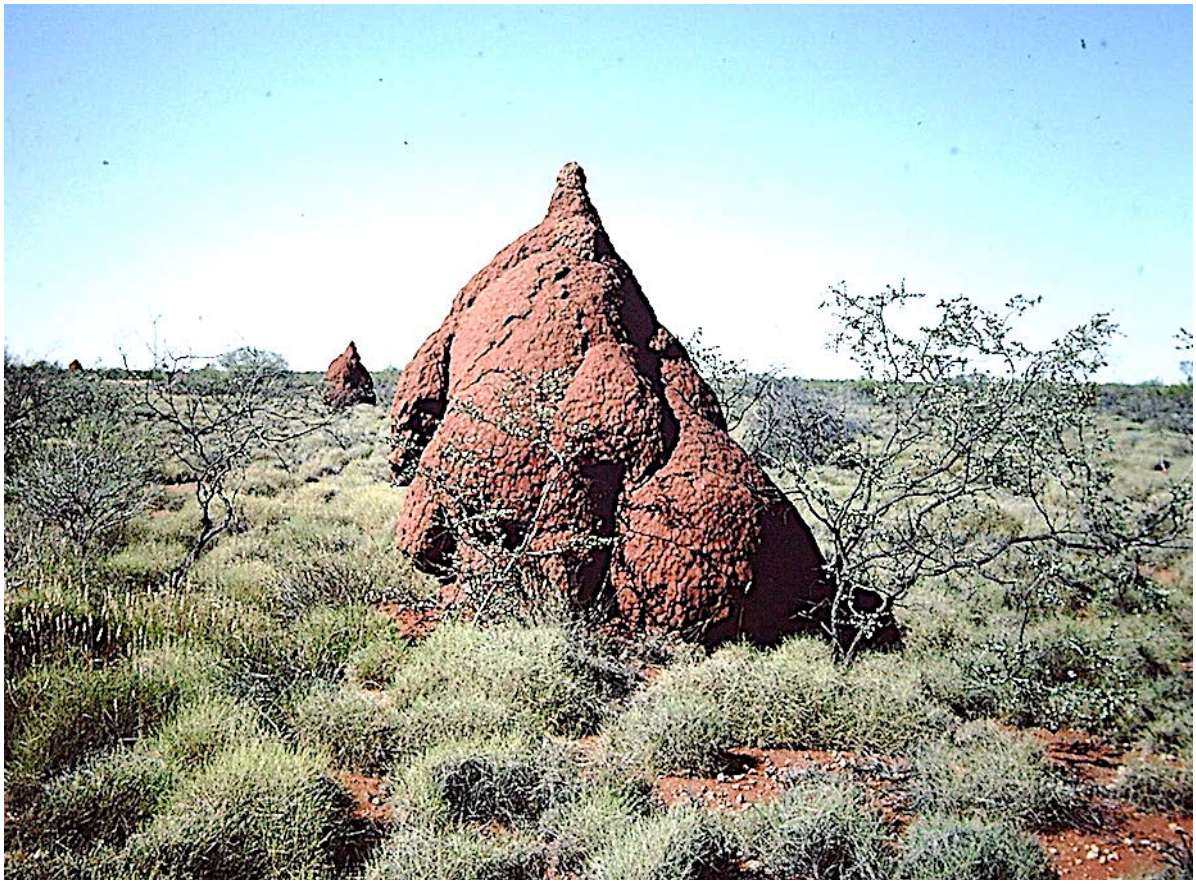
172) Termite mounds attributed to *Bellicositermes bellicosus*. Here, a recent building, then an old one taken over as a raised support by *Cubitermes* and others.

Ivory Coast, May 1964 (MB Phot)



173) Termitophile beetle installed in one of the central crypts of an equivocal cathedral, open in Central Africa.

RCA, Savannah trees, October 1967 (MB Phot)



174a) Giant termite mounds with ***Nasutitermes triodae*** (Froggatt, 1898), morphe nigerrimus settled in the Great Red Desert, this one also belonging to many locusts and many others ...

174b) A little further north, in shrubby savannah with some Baobabs, identical giants, but on another ground (*cf.* p.190). **Western Australia, July 1988 (MB Phots, Blrd 1989)**

175a) Incredible "field" of curiously flat termite mounds, all similarly oriented, attributed to the Compass Termite, ***Amitermes meridionalis*****,** or a related species.

Western Australia, Vast plain east of Broome, July 1988 (MB Phot)

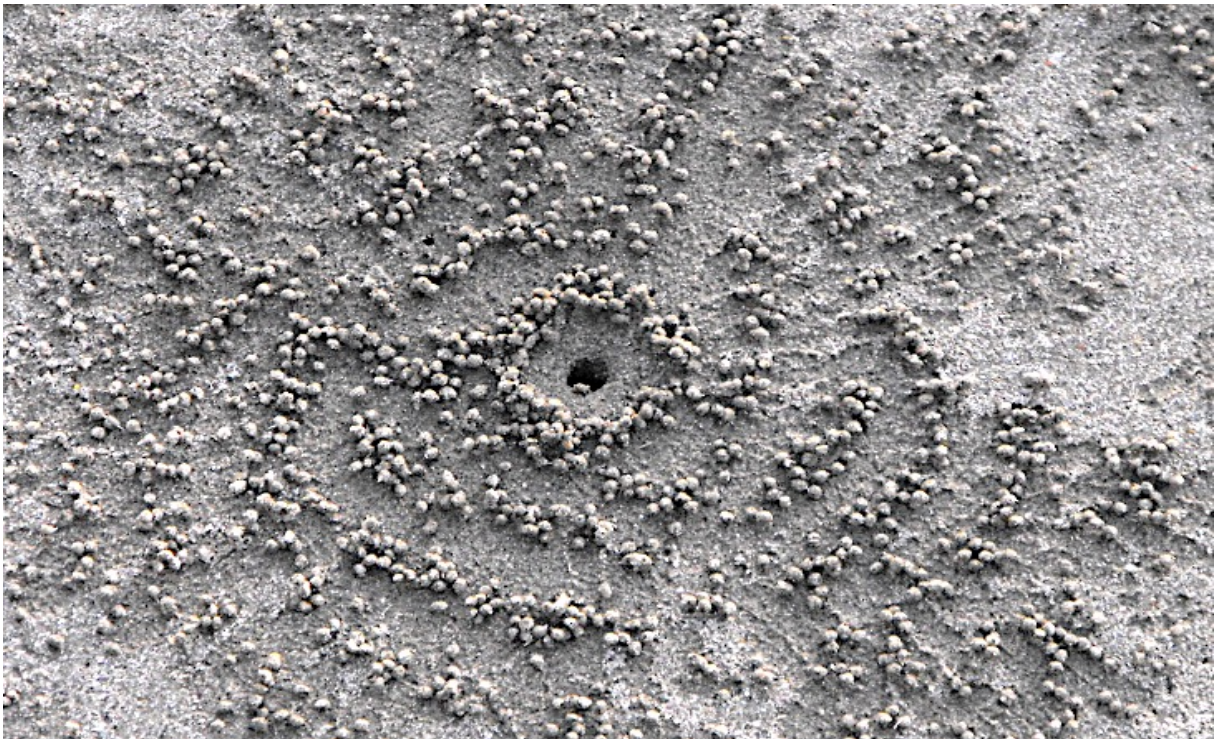
175b) Other oriented constructions, probably due to ***Amitermes vitiosus*****.**

Western Australia, Meda River Region, July 1988 (MB Phot).

T > The Sabulicoles of the Andaman Sea Estrans

The thick sandy layer discovered at low tides is home to many inhabitants. I was able to admire astonishing Mini Crabs and improbable flat sea urchins without prickles, all burrowing:

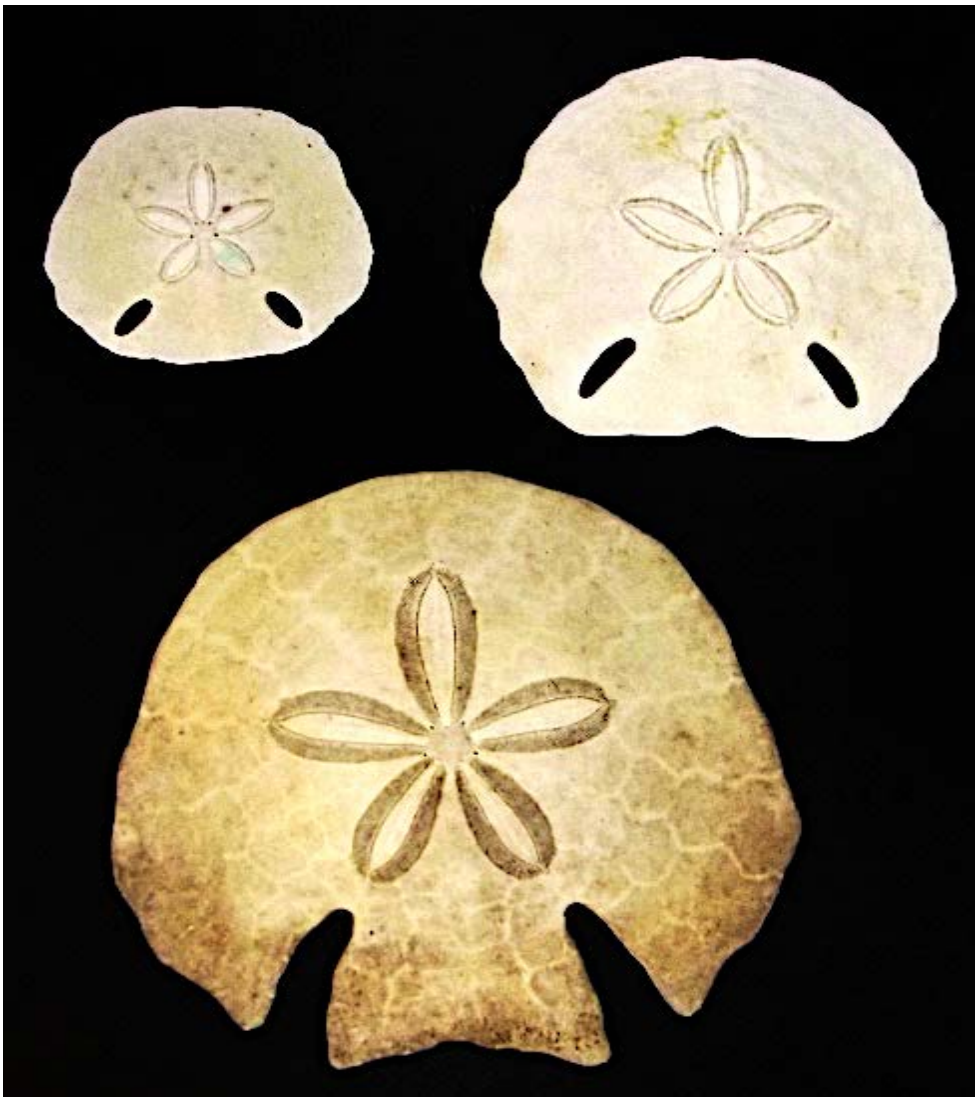
176a+b) On each foreshore, a number of **mini-Crab surveyors deposit,** in concentric circles, hundreds of mini-balls of fine sand extracted from the depths. The one, **magnified on the right**, sunset, seems to return to the burrow, empty legs.



176c) As for the host of the above places, distracted or tired (last load abandoned on the threshold!), it has nevertheless blurred the entrance track and closed the first circle. The sea can rise...

Southern Thailand, Phang Nga Province, Prapa Beach, November (MB Phots. Boulard, 2013c)

177a) Young Sea urchin, exhibited, of the genus ***Encope***. They are amazing sea urchins, numerous in the Andamanian foreshores; flat and hairless, they progress horizontally on or between the silty strata, filtering their food. Below are three tests of the same undetermined species.



177b) Two juveniles and one adult, as flat as a macro-organism can be, or 3 to 7 millimetres thick at the level of Aristotle's lantern.
Thailand, Kapoe Forest Coast, February (MB Phots. Blrd, 2013c).

U > Other singular and colourful jewels of Nature

-> Australians

178) ***Clisuthum formosum*****,** creeping stem exposing exclamatory flowers on stems;

179) ***Anigozanthos sp.*** Emblem of Western Australia, popularly known as "***Kangaroo paw***!".
Western Australia, July 1988 (MB Phots).

-> of tropical Asia

180) ***Angamiana floridula*** **Distant, 1904,** nominal habitus.

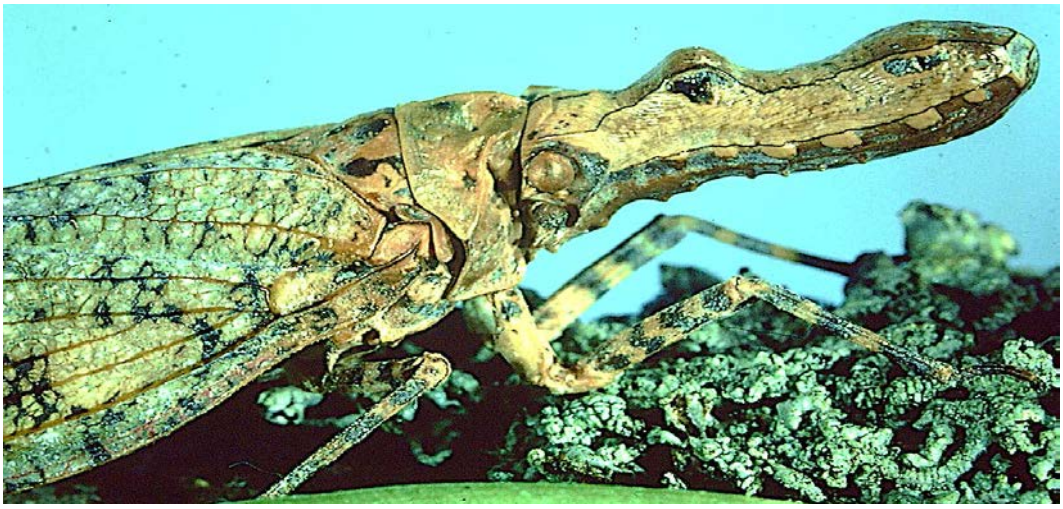
181) ***Salvazana mirabilis mirabilis*** **(Distant, 1918),** *the latter "support of a small Mandarin, topped by a sort of tricorn".* **Northern Thailand (MB Phots. Blrd 2013c).**

-> Central African

182) Golden mole**,** ***Chrysocloris leucorhina*****. Small, almost blind, hypogean insectivore with tiny ears hidden by its thick and beautiful coat. Long and powerful front paw claws.**

La Maboké, April 1967 (MB Phot).

V > When Entomic Nature has fun... And disturbs us



183) The large ***Fulgora lucifera*** Germar and its strangely corticiform habitus, characterized by a large cephalic excrescence of the most surprising ... Top view "piece of wood"; side view: "tiny copy of a crocodilian head": false nostrils and false eyes surmounted in good place, a few false upper teeth bordering, outside, a false lower jaw as it should be or almost. Mimicry? Imaginary, no doubt, but troubling all the same, great Saurians are not far away! What do the little Amazonian Monkeys think?

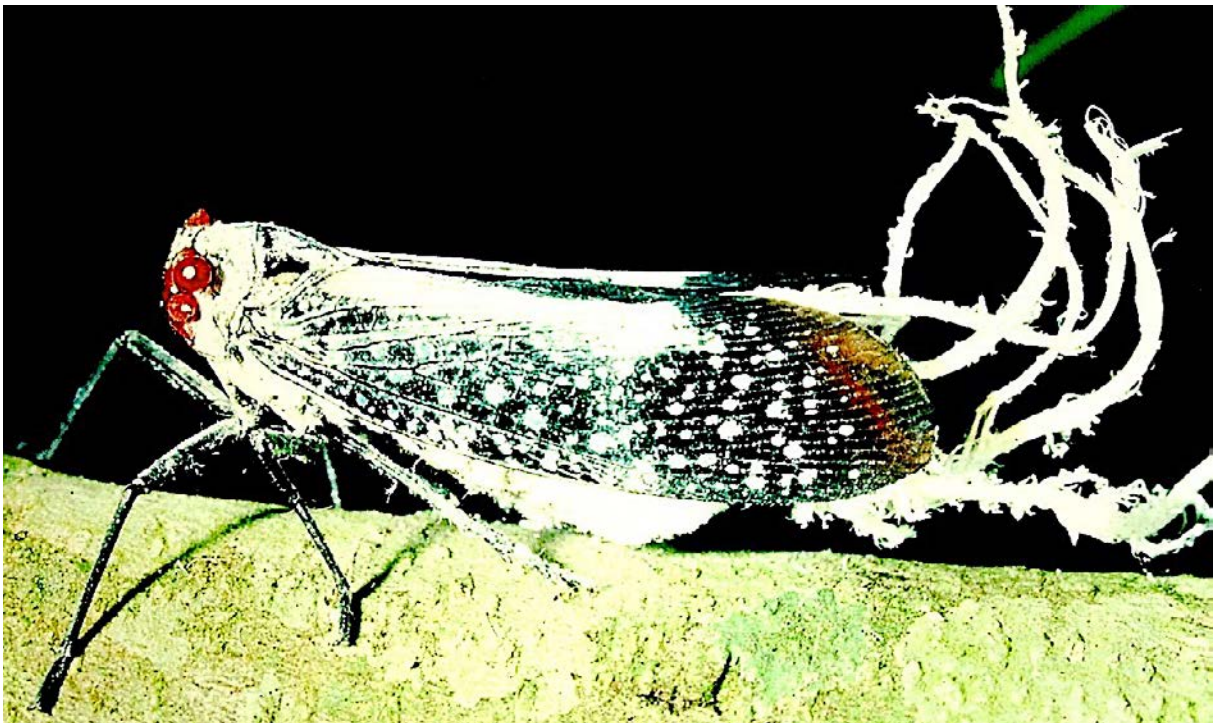
Specimen of the National Collections, MNHN, entomology, Paris (MB Phot)

184) So, just for fun, here is its neighbour, the extraordinary ***Fulgora laternaria*** Linneus, the 'Lantern-carrier' of Mademoiselle De Mérian, of Réaumur and of the Natural History Cabinets of yesteryear... And which was later called the 'Peanut Carrier' (MB, 1988). Never again fundamentally luminous... Moreover, with all wings open, wouldn't it offer, consoling during a famous pirouette some disowned old Ancients, two symmetrical images of a **'flat-Cosmos'** centered on the Earth and the moon?

Conceding to it anyway, wings closed, to give the change, like a dendro-corticiform copy.

Specimen captured in French Guiana, November 1975 (**MB Phot**).

-> Other Fulgores added to the strange natural



185) ***Lystra lanata*** **L.** Fulgore whose abdominal threads continuously produce "cumbersome" white wax cords, uneatable, 'sticky', protective? **Brazil, Amapa, March 1981 (MB Phot)**

186) Beast of Carnival, the Candelabra Bearer... ***Pyrops spinolae*** **(**Westwood, 1842), another Fulgore defying the imaginable.

Southern Thailand, Ranong Forest Mountain, February 2002 (MB Phot).

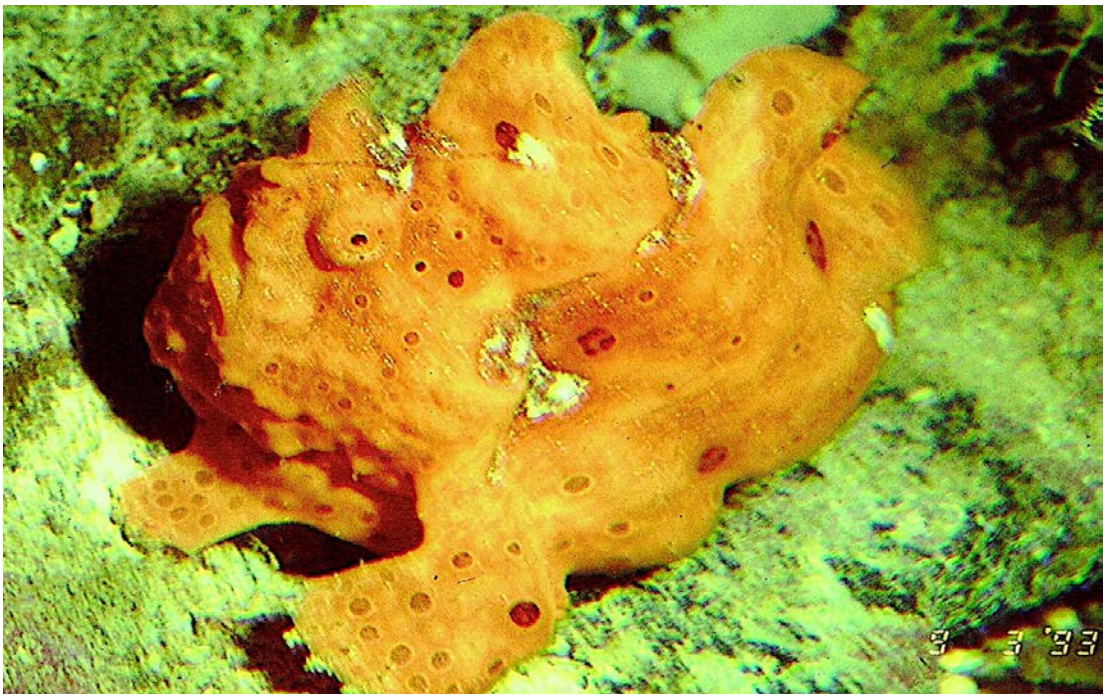
W > As for the Pisces, some of them are very strange

in New Caledonian Great Lagoon and Polynesian atolls

Some are traps dressed with green algae and ± buried in the coastal sands

187) Stone fish of the genus ***Synanceja***, a monster about 40 cm long, with an oversized mouth and an integument imitating the sandy-algal environment where, buried three-quarters to four-fifths, it lurks, lying in wait. In profile but here, only the arch of the enormous mouth that is ready to swallow (!) and the left eye can be identified. Algae, abused (?) develop on the falsely rocky back of the animal, completing its camouflage. ***See page 213, the same somewhat clear and in front view.***

Others are "curious rock fragments with legs", but dangerous!



188) The non-pisciform morphology of the ***Antennarius*** (here ***A. pictus***) is that of some bizarre fragment, fitted with a fishing line with lure... Capable of attracting prey within mouth reach.

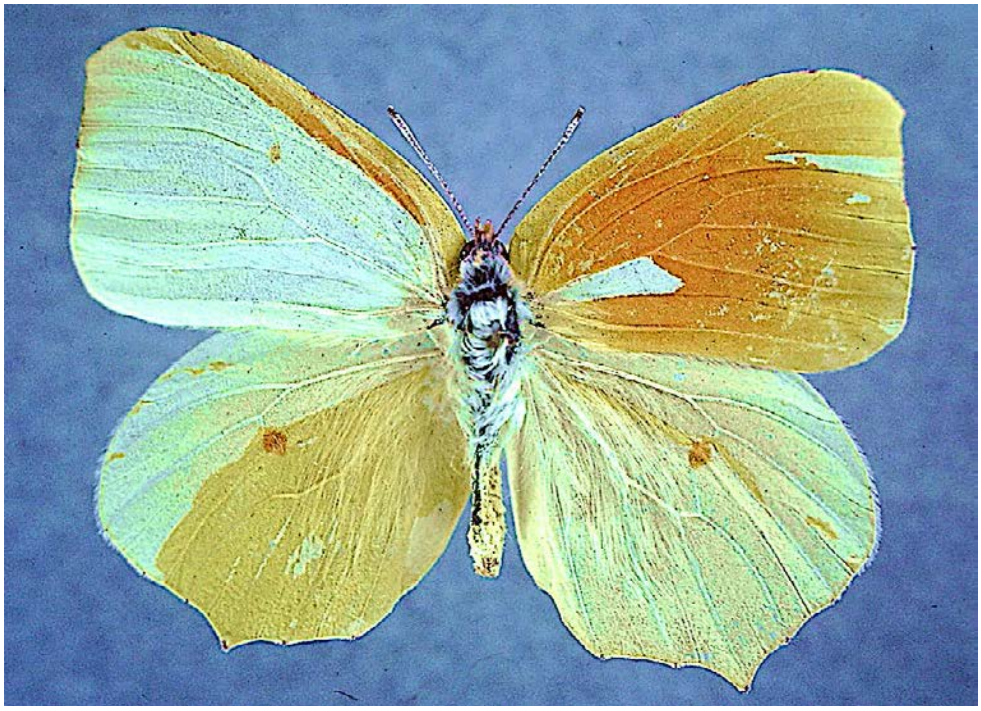
Noumea Aquarium, with Alain Gerbault, in March 1993 (MB Phots, 2007b, 2012c)

While some intrepid ones try to climb trees!

189a+b+c) At the Seychelles, in the Mangrove of Mahé, these Periophtalmes. The first two, photographed in the effort (!), manage not to be quite in the water anymore. As for the third one, well installed on an aerial branch, it doesn't have eyes big enough to evaluate the new surroundings... **January 1996 (MB Phots).**

X > Confirmed or new teratologies

> **Minor:** Numerous cases in the wing veins of Cicadas (Boulard, 1988a, 1989d).
> **Gimp:** A spider with two crow's-feet (Boulard, 1980h).
> **Spectacular** by gynandromorphy or chimaerism in Butterflies:



190) In mosaic at this pretty ***Gonopterix cleopatra*** **L. France, April 1977 (MB Phot)**

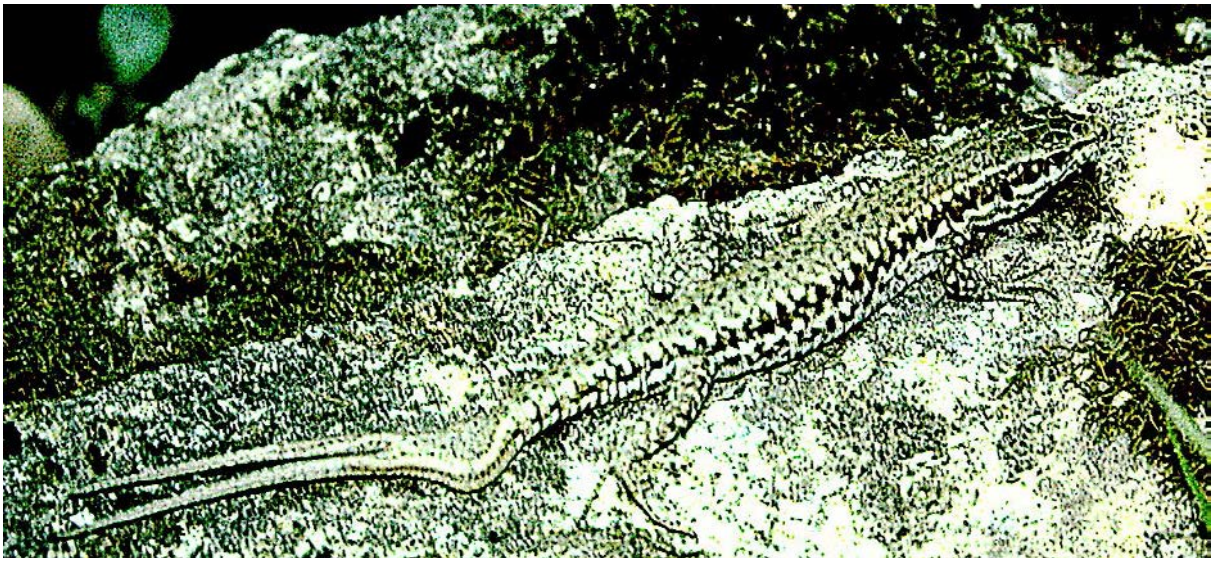
191) By bipartism, male-female, for this ***Cymothoe caenis*** Drury.
Central African Republic, October 1967 (MB Phot)

>**By omission**, **192)** ***Ephippiger provincialis***, born uni-antennated. **Var, June** (**Blrd, 1987g**)

>By abusive symmetry

> Perfect: 193) with *the bicauda* aberration in ***Euscorpius flavicaudis*** (Degeer), the Black Scorpion, with an exemplary double tail! **Harmas by J.-H. Fabre, August 1998 (Blrd, 2000d)**

> Mal controlled: 194) in this Grey Lizard**, *Podarcis muralis.***

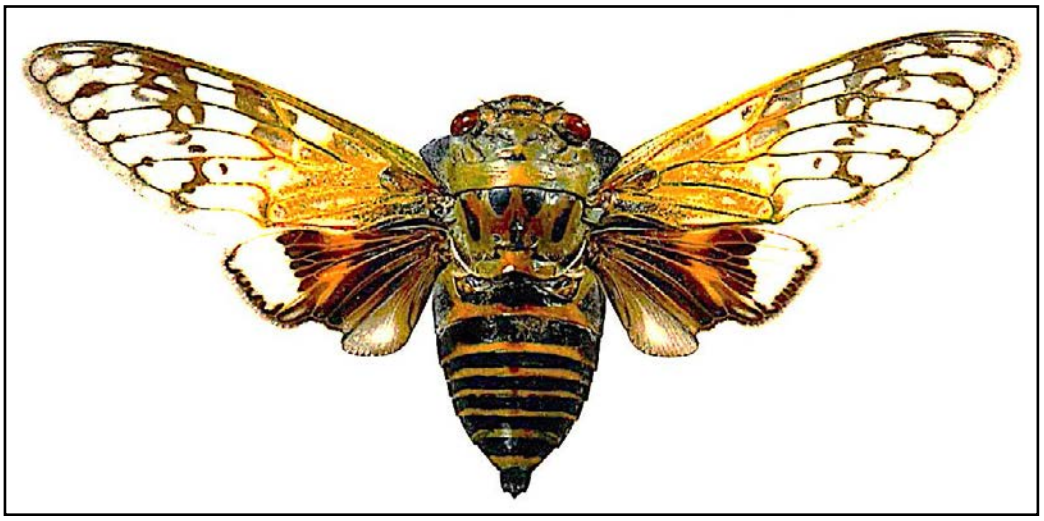


Bad handyman, this Vertebrate... **Harmas by J.-H. Fabre, June 2001 (MB Phot)**

> Negative, non-regeneration, when imagining a Cicada, ***Tibicina haematodes***, of which a **stage V juvenile** had its left antennae accidentally cut off, during its capture and rearing.
France, Hérault, Villemagne-l'Argentière, July 1987 (Boulard, 1989d).

Y > My favorites:

To the many slides that have already taken place, I add the following eight



195) ***Muansa clypealis*** (Karsch, 1890), magnificent and unusual Cicada.
Its fascinated me by **its juvenile, underwater ethology!**
Central African Republic, Boukoko, September 1968 (MB Phot)

196) ***Cicadmalleus micheli*** **Boulard & Puissant, 2013.** Unexpected, but in time revealed!
Thailand, Pak Chong (MB Phot)

197) ***Spoerryana llewellyni*** Boulard,1974. Females, brachypterans, cannot fly. Another singularity, they invariably lay their eggs upside down (see the shavings)!

Top meadows of Mount Kenya (MB Phot)

198) Champion of mimetology, this dendro-tallomorphic praying mantis, *Chrisomantis speciosa* Gilio-Tos, upside down, in a false bifurcation stance, like a perfect suckerous twig with the licheniferous trunk serving as a support.

Central African (MB Phot. Boulard 2007h, 2012c).

Occupied female, spared male!

199) One of my very first observations, followed and captured in the field, prompting me not to generalize the "devouring matron" tendency occasionally followed by this beautiful but terrible insect, ***The Praying Mantis!***

France, Dordogne, Les Ézies-de-Tayac, September 1959 (MB Phot).

(*Cf. :* André Langaney, *Histoire naturelle de la Sexualité*, Nathan, éd., 1976)

200) Cardboard of the "First Entomological Photomacrography Exhibition! And explicit slide

« Rencontres du Quatrième Type... »

Exposition de photomacrographies en couleurs de

Michel BOULARD

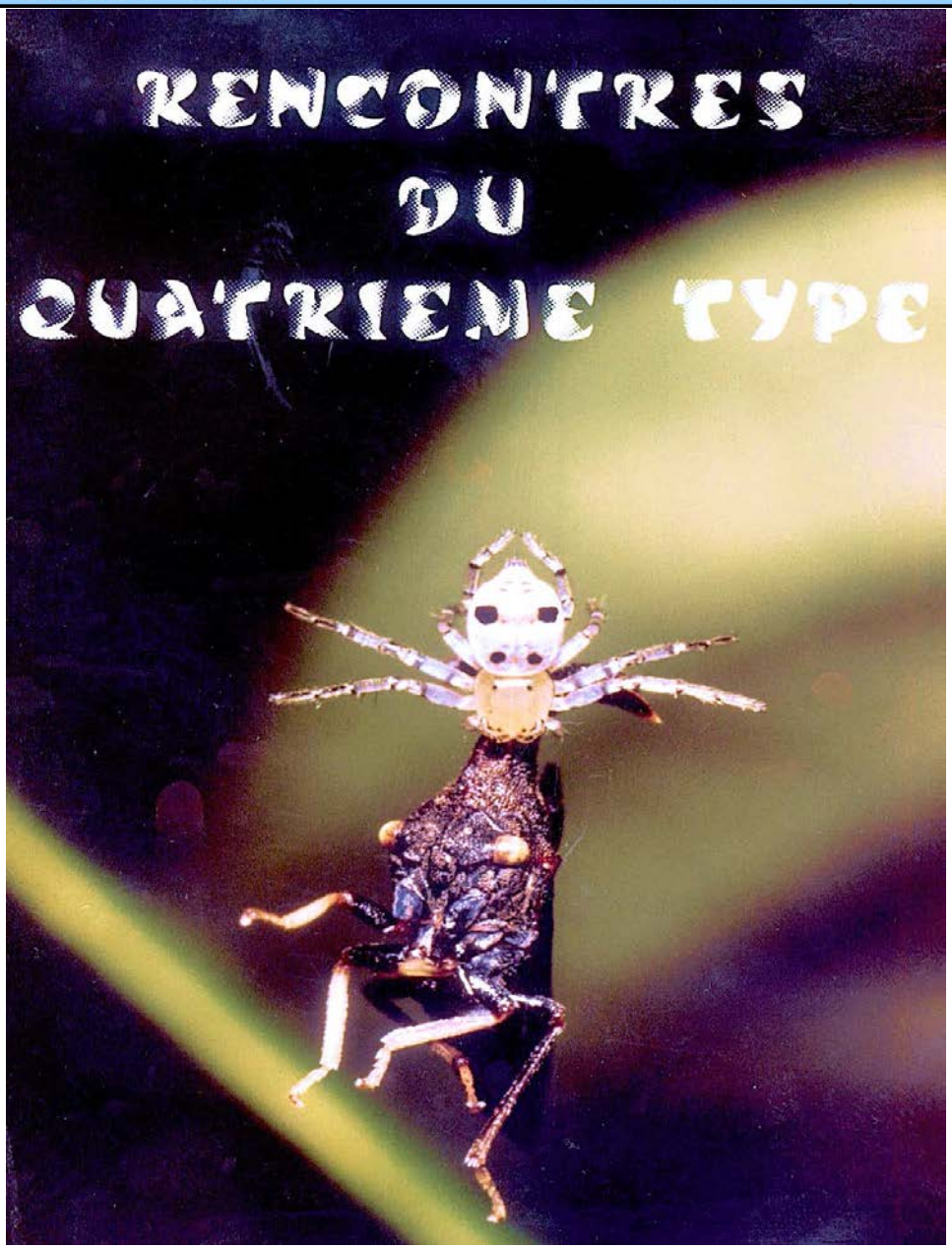
Avec le parrainage historique des travaux de

Louis ROUSSEAU

(1811-1874)

Auteur des premières photographies d'identification des espèces animales.
(Muséum d'Histoire Naturelle de Paris 1852)

À LA GALERIE "OLYMPUS" FORUM DES HALLES (PARIS 1ER)



On page 365 is the MB eco-photo just preceding this one.

At the Forum des Halles, the following photographic exhibition was proposed by the famous volcanologist **Haroun Tazieff** and his flamboyant subjects of which, out of friendship, I could "*approach from afar*" some fantastic volcanoes.

201a+b+c) Three Thai Cicadas having more surprised the photographer

a) ***Maua 4-tuberculata tavoyana*** (Ollenback,1929) **supporting 2+2 black ventral tubers...**
b) ***Dundubia oopaga*** (Distant, 1881) under its young (?) blue coat...
c) ***Becquartina electa*** (Jacobi, 1902), a good-sized cicada (42 mm total length) in its usual orange and black outfit, which makes it particularly visible from afar! Ethological strategies?
Northern Thailand (MB Phots).

And also, for their impromptu visits to the "*Boulardière boukokoise*" in 1965/1970

202) The lovely little Kingfisher ***Ispidina picta picta***, champion of diving, often in demonstrations in the children's pool. Here at rest on one of the *Aframomums* close to the varangue whose edge was used as a diving board. **February 1968 (MB Phot)**

203) Long-tailed Pangolin, ***Manis tetradactyla***, an amazing arboreal mammal covered with scales. Typical of the Central African and Congolese great sylva. Reviewed only once. Now in danger of extinction... Cause, the unspeakable human bullshit. **May 1966 (MB Phot).**

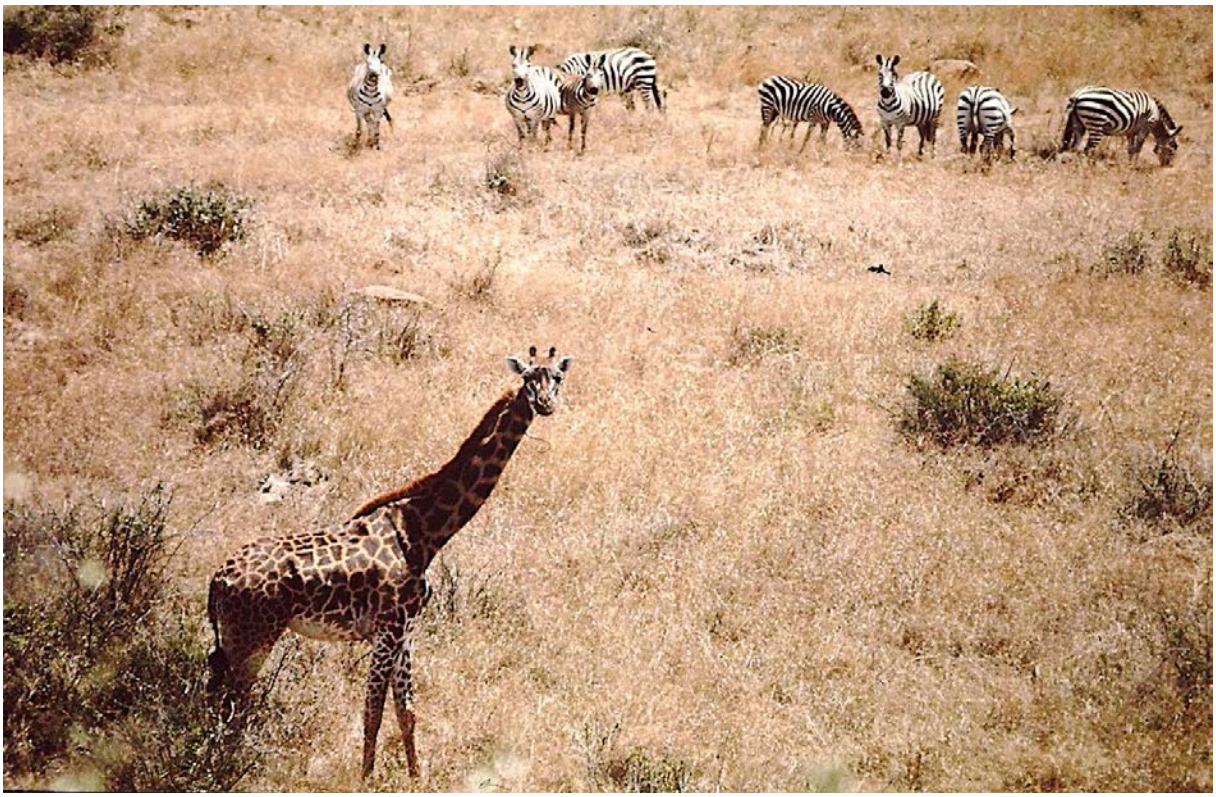
Z_1 > Instantanés préoccupants/Snapshots of concern:

The following slides, all of which show a harmonious megadiversity, but...

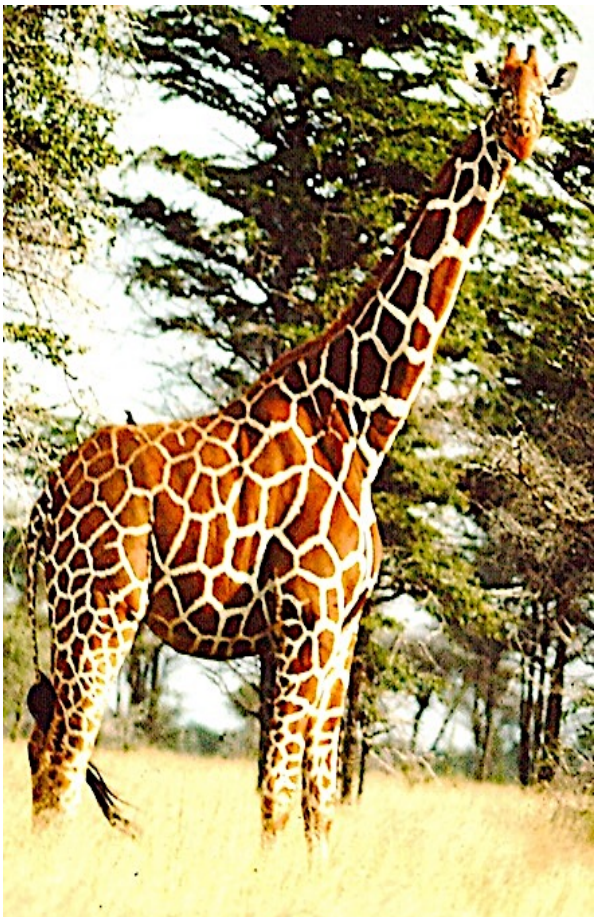
Of a world today trampled, poached, condemned (?).

Humanity, its crowds and raging fires... Calamity!

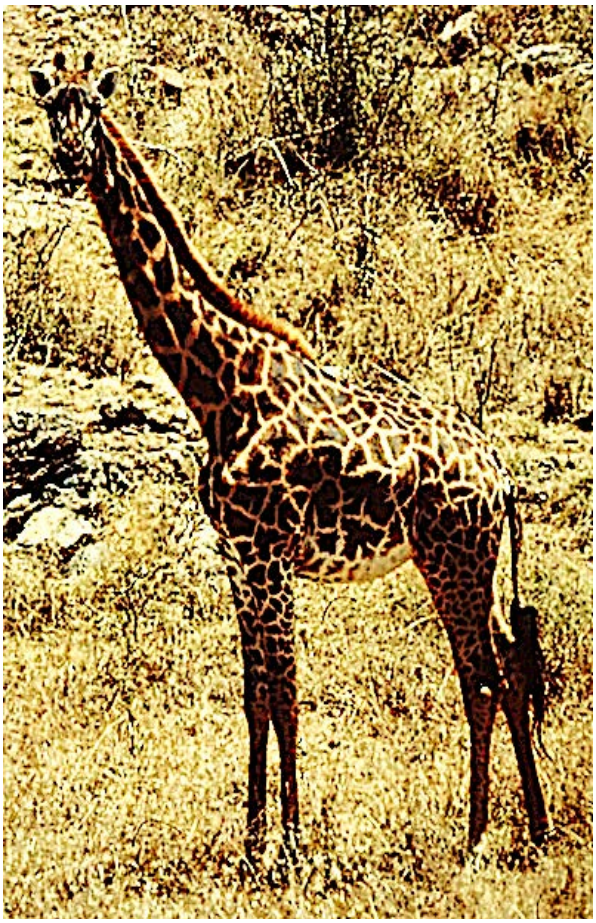
Masterpieces in peril



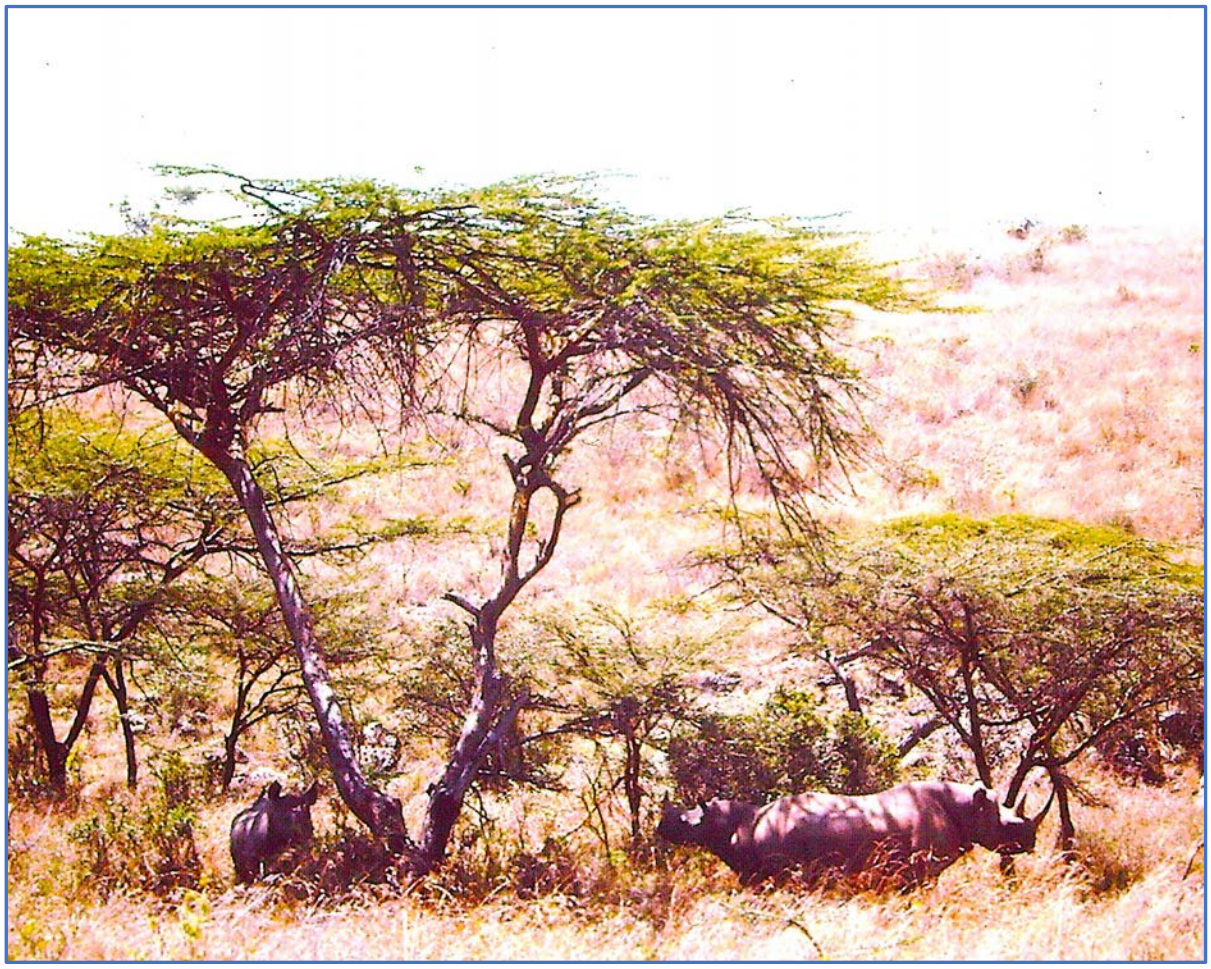
204) Great avane, first glances, unforgettable, engraved! (MB Phot)



205a) Reticulated Giraffe…



205b) Masai Giraffe (MB Phots)



206) Black Rhinoceros, slaughtered by human vermin... Kenya (MB Phots)

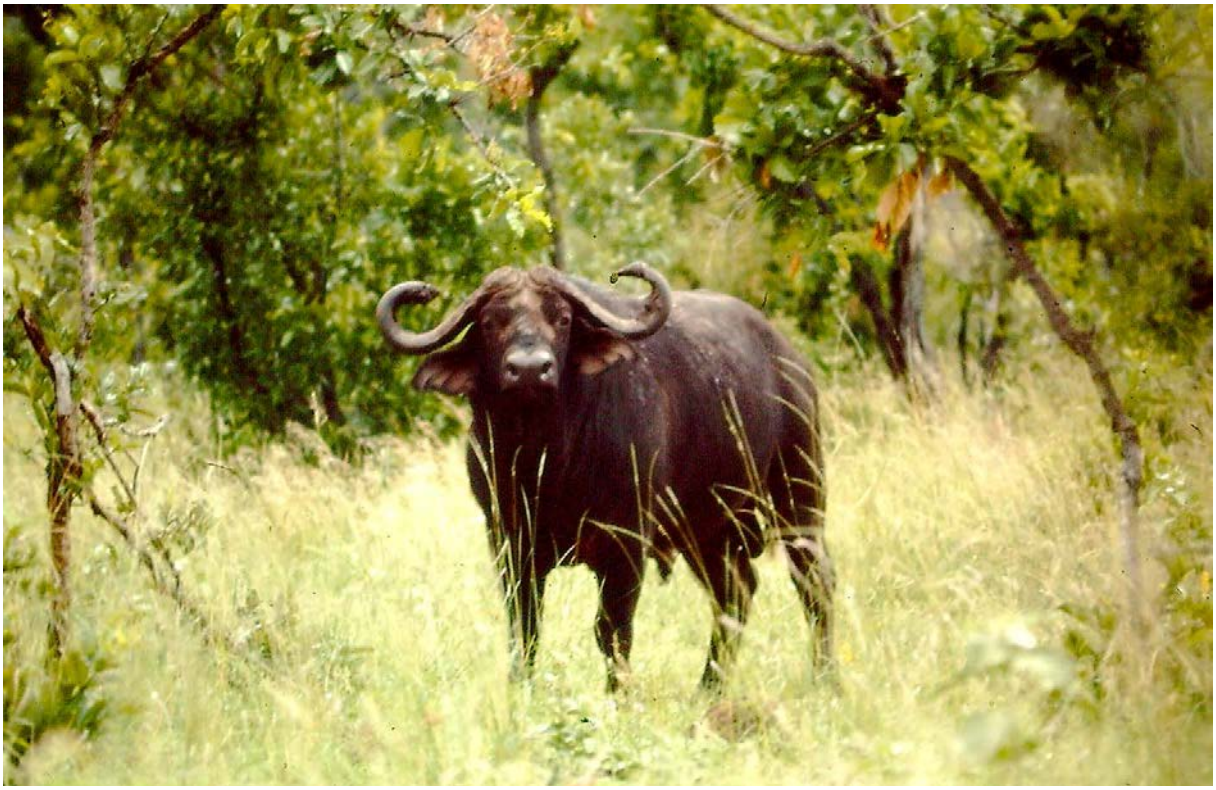
207) The Asian Elephant, a tamed species, kept in breeding where its size, once sumptuous, degenerates! Here, one of the rare specimens encountered with little restraint... Thailand (MB Phot)

208a) Elephants, small troop in the ‘1970 beautiful wooded savannah’ of the African Central R.

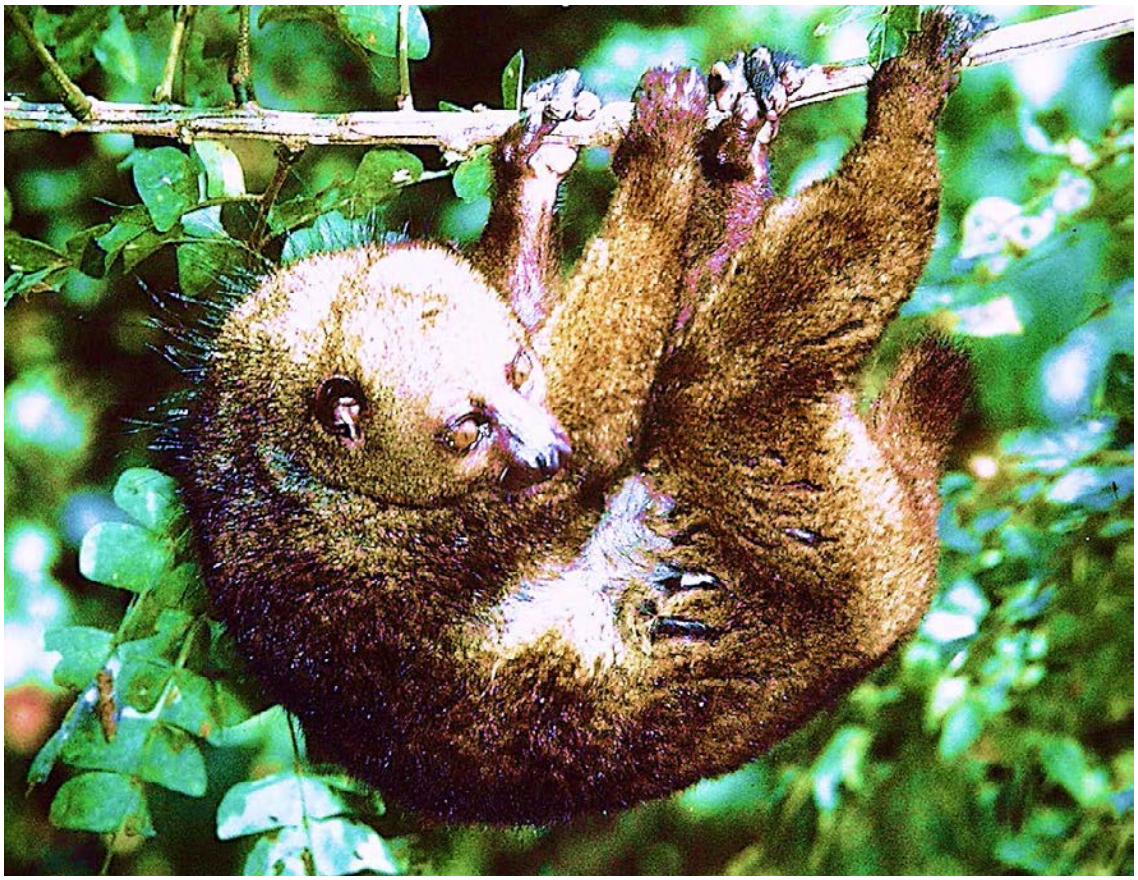
208b) The African Elephant, a fantastic animal. Many parent groups in distress*

Saint-Floris P.N. (**MB Phots, April 1969**)

***) Today: "20000 elephants are killed each year for their ivory"!** **ifaw,** février 2021.

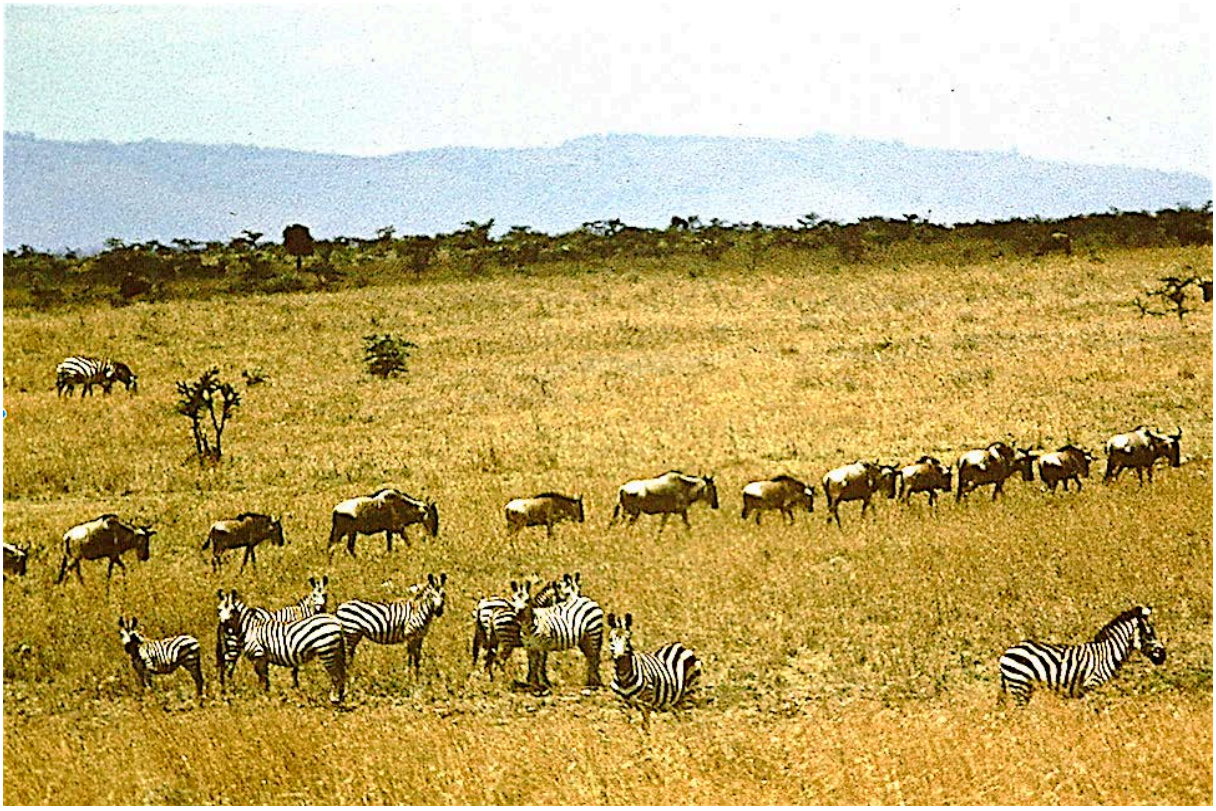


209) Great East African Buffalo. Isolated individual more or less covered with anti-diptera mud. Masai Savannah (MB Phot)



210) *Perodicticus potto*, the 'hairball' of the Boukoko-La Maboké Forest 1967 (MB Phot)

211) Guib harnessed, elegant on all four legs, like many other antelopes, many species of which are highly endangered. **Senegal, Niokolo Koba (MB Phot, 1996)**



212) Contrasting image of the very near future... Already! Hordes of wildebeest are not what they used to be. While the zebras, somewhat questioning, don't seem to have any problem...
Kenya, novembre (**MB Phot**).

Z_2 > Magic trust of the Swallows

Unhoped-for! I didn't see any more or hardly any of them fluttering and screaming, like in the sky of my young years? Today, I have a beautiful hope: I had just built a new and ultimate 'Boulardière', property in Saintonge this time...

That a couple of ***rustic swallows*** took possession of a corner of the beams of the new hangar

213) Nest completed and eggs laid, incubation assured...

214) Ten/twelve days later, four offspring are ready to swallow the reported prey... One by one, by the parents,

215)

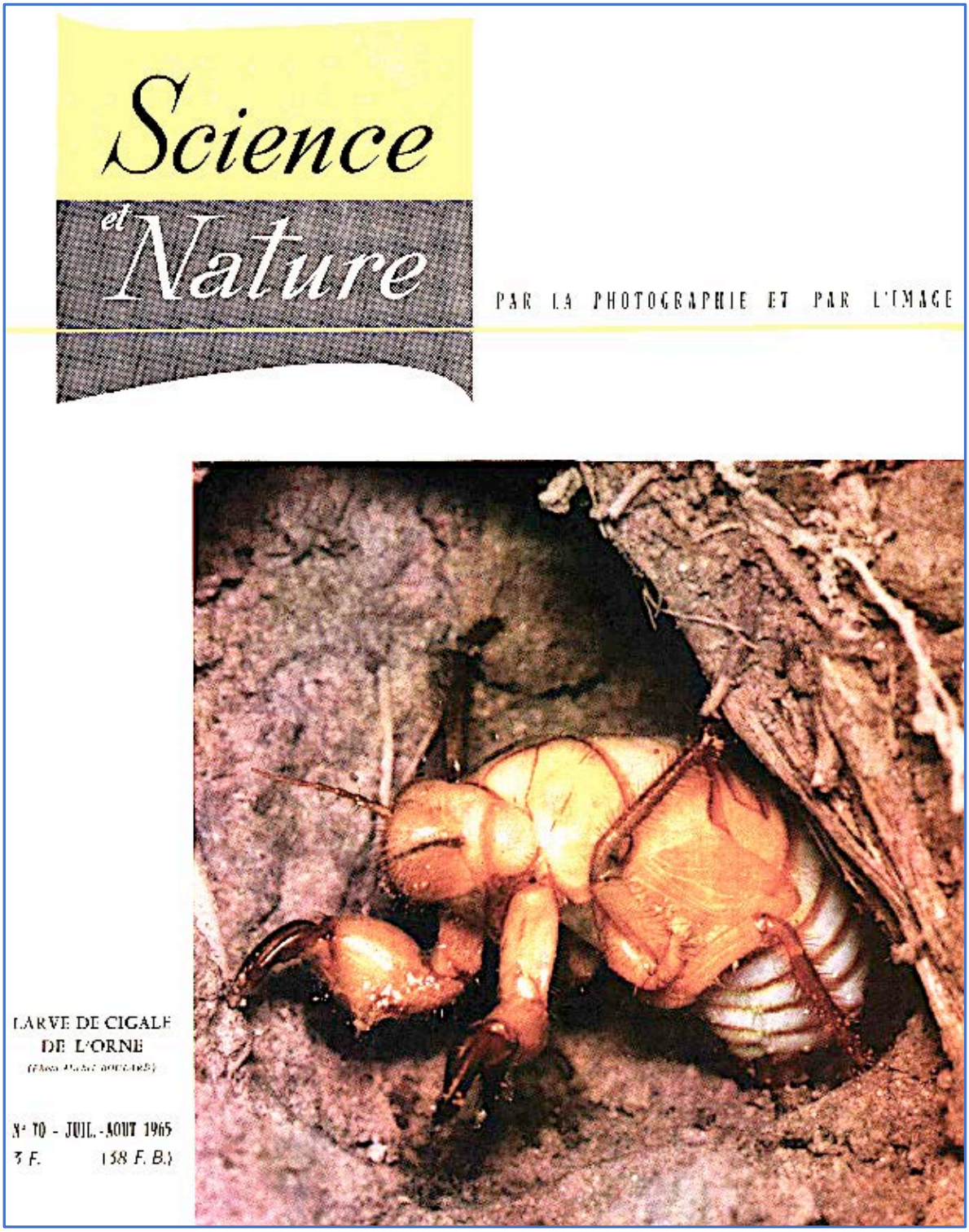
216) Young people always hungry!

France, Charente-Maritime, Villeneuve-la-Comtesse, May-July 2018 (MB Phots).

XI.- Références entomologiques personnelles

Michel BOULARD

1965 Bibliographie 2022



.-1965-.

a 1) **Comment vivent nos Cigales.-** ***Sciences et Nature,*** **70**, **1965** : 9-19, **16 fig**.
(1ère question, 1er article, **1ère Couverture**

b 2) **Note sur la biologie larvaire des Cigales (Hom. Cicadidae)**.- *Annales de la Société entomologique de France (N.S.),* **1** (3), 1965 : 503-521, 22 fig.
c 3) **L'appareil génital ectodermique des Cigales femelles**.- *Annales de la Société entomologique de France (N.S.),* **1** (4), 1965 : 797-812, 22 fig.

.-1966-.
a 4) **Sur un *Monocentrus* (Membracidae Centrotinae) nouveau nuisible au poivrier cultivé en Afrique Centrale**.- *Annales de la Société entomologique de France (N.S.),* **2** (3), 1966 : 577-584, 15 fig.
b*5) Travaux du Service d'Entomologie du Centre de Recherche Agronomique de Boukoko (R.C.A).- *I.F.C.C., Rapport annuel, C.R.A., Boukoko, 1966 : 118-123, 133, 203-204.*
c*6) Situation phytosanitaire des plantations de Haute-Sangha (R.C.A.).- *I.F.C.C., Rapport de Mission miméographié , C.R.A. Boukoko,* fév.1966 : 1-11 (avec **E. M. Lavabre**).
d 7) **L'appareil génital des Cigales femelles**.- *Thèse, Faculté des Sciences, Université de Paris,* 1966 : 1-77, 80 fig.
e*8) Examen entomologique des Plantations de Haute-Sangha.- *I.F.C.C., Rapport de Mission,* 8/1966 : 13p.

.-1967-.
a 9) **Hémiptèroïdes nuisibles ou associés aux cacaoyers en République Centrafricaine. Première partie (Hétéroptères et Homoptères Sternorhynques)**.- *Café Cacao Thé,* **11**(3), 1967 : 220-232, 4 H. T.
b*10) Défense des cultures. Travaux du Service d'Entomologie du Centre de Recherche Agronomique de Boukoko (République Centrafricaine).- *I.F.C.C., Rapport annuel, Centre de Recherche Agronomique, Boukoko,*1967 : 88-97,106, 134-135, 143-146.
c*11) Lutte contre les principaux Insectes nuisibles aux caféiers en République Centrafricaine. Notes à l'intention du planteur africain. 1 et 2, Généralités et Phyllophages (mangeurs de feuilles).- *I.F.C.C.* (*Institut Français du Café et du Cacao), Notes techniques, Boukoko,* 8-9, 1967 : 1-8.
d*12) Id.- 3, Scolytes et Foreurs.- *Ibid.,* 10, 1967 : 1-4.
e*13) Id.- 4, Insectes suceurs et Insectes gêneurs.- *Ibid.,* 11, 1967 : 1-4.
f 14) **Premières données sur les Insectes nuisibles au poivrier cultivé en République Centrafricaine**.- *L'Agronomie tropicale,* 1967 (11) : 1078-1098, 12 fig. (avec **E.M. Lavabre**).

.-1968-.
a 15) ***Gargara* nouveaux vivant sur cacaoyers et colatiers en Centrafrique**.- *Café Cacao Thé,* **12** (3), 1968 : 236-239, 2 pl. H.T.
b*16) L'entomofaune nuisible aux plantes pérennes cultivées en R.C.A.- *I.F.C.C., Rapport de Mission , C.R.A. Boukoko,* juin 1968 : 1-10.
c 17) **Capture dans la forêt de La Maboké d'une Cigale rarissime, *Musoda gigantea* Distant ; comparaison des genitalia de la femelle avec ceux chez *M. flavida* Karsch.-** *Cahiers de La Maboké,* **6** (1), 1968 : 39-48, 10 fig.
d 18) **Description de cinq Membracides nouveaux du genre *Hamma*, accompagnée de précisions sur l'espèce *rectum*.-** *Annales de la Société entomologique de France (N.S.),* 4(4) : 937-950, 16 fig.
e 19) **Documents sur deux Lépidoptères Lycaenides prédateurs d'Homoptères Membracidae**.- *Cahiers de La Maboké,* **6** (2), 1968 : 117-126, 14 fig.
f 20) **Description du mâle et de la larve de *Kallicrates bellicornis* Capener** (Hom. Membracidae).- *Cahiers de La Maboké,* **6** (2), 1968 : 127-131, 6 fig.
g*21) **Défense des plantes stimulantes**.- Travaux du Service d'Entomologie du Centre de Recherche Agronomique de Boukoko (Répub. Centrafricaine). *I.F.C.C., Rapport annuel,* 1968 : 115-129, 144, 147.

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a 22) **L'adaptation à la vie aquatique chez les larves de *Muansa clypealis* (Homoptera Cicadidae).-** *Comptes Rendus de l'Académie des Sciences, Paris,* sér. **D 268** : 2602-2604, 2 pl.
b 23) **Homoptères Jassidomorphes nouveaux liés aux colatiers et autres plantes stimulantes cultivées en Afrique centrale**.- *Café Cacao Thé,* **13** (2), 1969 : 151-156, 25 fig., 4 pl.
c 24) **Note sur *Hamma nodosum* Buckton et description d'une espèce nouvelle de Membracide appartenant au même genre.-** *Cahiers de La Maboké,* **7** (2), 1969 : 103-107,5 fig.
d 25a) **Hémiptèroïdes nuisibles ou associés aux cacaoyers en République Centrafricaine. 2ème partie : Homoptères Auchénorhynques**.- *Café Cacao Thé,* **13** (4), 1969 : 310-324, 38 fig., 4 H.T.
e*25b) **Défense des plantes stimulantes**.- Travaux du Centre de Recherche Agronomique de Boukoko (République Centrafricaine).- *I.F.C.C., Rapport annuel,* 1969 : 95-103.
f 26) **Notice sur les titres et les travaux scientifiques de Michel Boulard**.- MNHN, Paris, Laboratoire d'Entomologie, septembre 1969 : 1-57, Pl. I-X.

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a 27a) **Existence de deux nouvelles espèces de *Panka* dans la forêt de La Maboké ; premières données biologiques sur ces petites Cigales**.- *Cahiers de La Maboké,* **8** (2), 1970 : 107-123, 24 fig.

b*27b) **Défense des plantes stimulantes**.- Travaux du Centre de Recherche Agronomique de Boukoko (République Centrafricaine).- *I.F.C.C., Rapport annuel,* 1970 : 1-6.

.-1971-.

a 28) ***Monocentrus* nouveaux d'Afrique centrale (Homoptera Membracidae)**.- *Annales de la Société entomologique de France (N.S.),* **7** (3), 1971 : 287-324, 85 fig.

b 29) **Cicadidae et Tibicinidae (Homoptera) récoltés en Guyane française par la Mission du Muséum national d'Histoire naturelle**.- *Annales de la Société Entomologique de France (N.S.),* **7** (3), 1971 : 685-693, 11 fig.

c 30) **Une tribu nouvelle pour la faune africaine des Homoptères Cicadellidae**.- *Bulletin de l'Institut Fondamental d'Arique Noire,* **33**, sér. A (3), 1971 : 712-717, 11 fig.

d 31) **Description de trois *Monocentrus*** nouveaux.- *Cahiers de La Maboké,* **9**(1), 1971 : 53-56, 6 fig.

e 32) **Premières notes faunistiques sur les Cigales du Gabon**.- *Biologia Gabonica,* **7** (4),1971 : 393-402, 16f.

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a 33) **Positions génériques des Cigales françaises & leur classification**.- *L'Entomologiste,***28**(6),1972:167-171.

b 34) **Contribution à l'étude de la faune cicadéenne de l'Angola (Insecta Auchenorhyncha)**.- *Publicações culturais da Companhia de Diamantes de Angola, Lisboa,* **84**, 1972 : 151-178, 34 fig.

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a 35) **Les Cigales de la République centrafricaine (Systématique et Notes biologiques) I : les espèces forestières.-** *Cahiers de La Maboké,* **9** (2), 1971-1972 (1973) : 133-162, 88 fig.

b 36) **Notes et documents dur la biologie d'*Analeptes trifasciata* F. en Afrique centrale (Coleo-ptera Cerambycidae)**.- *Cahiers de La Maboké,* **9** (2), 1971/72 (1973) : 163-173, 13 fig. (avec P. Téocchi).

c 37) **Classification raisonnée des Platypleures africaines (Homoptera Cicadidae)**.- *Bulletin du Muséum national d'Histoire naturelle, Paris, 3e sér.,* 90, **Zool. 69**, 1972(1973) : 1161-1188, 58 fig.

d*38) **Sur le nom de la plus petite Cigale de France.-** *Bull. Soc. ent. France,* 78 (1-2), 1973 : 78-79.

e 39) **Les Ydiellinae : sous-famille nouvelle de Cigales Platypediidae. Clé des familles et sous-familles des Homoptères Cicadoidea**.- *Annales Soc. Ent. de France (N.S.),* **9** (4), 1973 : 841-852, 16 fig.

f 40) Le pronotum des Membracides : Camouflage sélectionné ou Orthogenèse hypertélique ?.- *Bulletin Muséum national d'Histoire naturelle, Paris, 3e sér.,* 109, **Zool. 83**,1973 : 145-156, 3 pl., 17 fig.

g 41) Un type nouveau d'appareil stridulant chez les Cigales.- *Comptes Rendus de l'Académie des Sciences, Paris,* sér. D, 277, 1973 : 1487-1489, 1 pl.

h 42a) Cigales de France, aspects de leur biologie.- FILM 16mm, couleurs, son optique, 29min., S.F.R.S. Prod., Paris. *Film that won the Zoology Prize at the 6th International Scientific and Technical Film Festival, Brussels, March 1973. Film having received the Dollfus Prize of the Entomological Society of France in 1975.*

i*42b) *Id*.- *Bulletin Groupe Naturalistes FABRE, Lille,* 109, 1973 : 2-8.

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a 43) Comportement de ponte de *Cicadetta pygmea* (Olivier) et précisions sur la biologie de cette Cigale dans le Sud de la France (Hom. Tibicinidae).- *Bulletin de la Société entomologique de France,* **78** (7-8), 1973 (1974) : 243-249, 14 fig.

b 44) Sur une Cigale africaine nouvelle présentant une adaptation mélanique très probablement liée aux feux de brousse (Hom. Cicadidae).- *Annales Société entomologique de France (N.S.),***10** (2), 1974 : 381-393,18 f.

c 45) Description de deux Cigales nouvelles du genre *Musoda* (Hom. Tibicinidae).- *Bulletin de la Société entomologique de France,* **79** (1-2), 1974 : 46-50, 11 fig.

d* 46) Ordre des Dictyoptères.- in : Les Insectes.- *Grande Encyclopédie Alpha des Sciences et des Techniques. Grange Batelière éd., Paris,* Zool. II (34), 1974 : 17-23, 15 fig. // **e* 47) Ordre des Orthoptères**.- Ibid.- *Ibid.* (34), 1974 : 28, 1 fig.// **f* 48) Ordre des Embioptères**.- Ibid.- *Ibid.* (34), 1974 : 30-41, 24 fig.// **g* 49) Ordre des Psocoptères**.- Ibid.- *Ibid.,* (35), 1974: 43-44, 2 fig. // **h* 50) Ordre des Mallophages**.- Ibid.- *Ibid.,* (35), 1974: 44-45, 2 fig. // **i* 51) Odre des Anoploures**.- Ibid.- *Ibid.,* (35), 1974 : 45-46, 5 fig. // **j* 52) Ordre des Homoptères**.- Ibid.- *Ibid.,* (35-36), 1974 : 47-59, 30 fig.// **k* 53) Ordre des Thysanoptères**.- Ibid.- *Ibid.,* (36), 1974 : 70-71, 5 fig.

l* 54) Ordre des Strepsiptères.- Ibid.- *Ibid.,* (36), 1974 : 127, 3 fig. // **m***55) **Ordre des Hyménoptères**.- Ibid.- *Ibid.,* (38-39), 1974 : 128-152, 51 fig.

n 56) *Spoerryana llewelyni* n. g., n. sp., une remarquable Cigale d'Afrique orientale (Hom. Cicadoidea).- *Annales de la Société entomologique de France (N.S.),***10**(3),197 : 729-744, 35 fig.

.-1975-.

a 57) Cigales nouvelles ou peu connues d'Ethiopie.- *Annali del Museo Civivico di Storia naturale di Genova,* **80**, 1975 : 250-258, 12 fig.

b 58) Une nouvelle tribu de Cigales Platypediinae (Hom.).- *Doriana,* **5** (219), 1975 : 1-3.

c 59) Cigales nouvelles d'Afrique équatoriale et du Sud.- *Bulletin de la Société entomologique de France,* **80** (1-2), 1975 : 47-52, 10 fig.

e 60) Données nouvelles sur les Cigales angolaises.- *Publicacoes del Instituto de Investigação Agronómica de Angola, Nova Lisboa, Série Científica,* **40**, 1975 : 1-22, 32 fig.
f 61) Un nouvel Homoptère jassidomorphe des Cacaoyères camerounaises.- *Café Cacao Thé,* **19** (2), 1975 : 137-138, 5 fig.
g 62) Les Plautillidae, famille nouvelle d'Homoptères Cicadoidea.- *Annali del Museo Civivico di Storia naturale di Genova,* **80**, 1975 : 313-318, 5 fig.
h 63) Les Cigales des savanes centrafricaines. Systématique, notes biologiques et bio-géographiques.- *Bulletin du Muséum national d'Histoire naturelle, Paris, 3e sér.,* 315, Zool. 222, 1975 : 869-928, 88 fig.
i 64) *Iruana rougeoti* n. sp., intéressante Cigale éthiopienne (Hom. Tibicinidae).- *Bulletin de la Société entomologique de France,* **80** (5-6), 1975 : 176-179, 2 fig.

.-1976-.
a 65) Cinq genres nouveaux de Membracides africains.- *Bulletin de la Société entomologique de France,* **80** (7-8), 1975, (1976) : 239-245, 10 fig.
b 66) Sur une deuxième Cigale africaine dépourvue d'appareil sonore (Homoptera).- *Bulletin de l'Institut Fondamental d'Arique Noire,* **37**, sér. A (3), 1975 (1976) : 629-636, 5 fig.
c 67) Un type nouveau d'appareil stridulant accessoire pour les Cicadoidea. Révision de la classification supérieure de la superfamille (Hom.).- *Journal of Natural History,* **10** (4), 1976 : 399-407, 7 fig.
d 68) *Cicadetta fangoana*, une Cigale nouvelle pour la faune de France et la Science.- *L'Entomologiste,* **32** (4-5), 1976 : 153-158, 10 fig.

.-1977-.
a 69) Cigales nouvelles de Côte d'Ivoire et de Guinée.- *Bulletin de l'Institut Fondamental d'Afrique Noire,* **38**, sér. A (1), 1976 (1977) : 112-123, 21 fig.
b 70) Description d'une nouvelle *Tibicina* de l'Ouest asiatique ; révision de la liste des espèces paléarctiques appartenant à ce genre (Hom. Cicadoidea).- *Annales de la Société entomologique de France, (N.S.),* **12** (4), 1976 (1977) : 557-556,10 fig.
c 71) Une progéniture de Cochenilles dans la ponte d'une Cigale.- *L'Entomologiste,* **33** (2),1977 : 95-96, 1fig.
d 72) Hyménoptères prédateurs de Cigales.- *L'Entomologiste,* **33** (2), 1977 : 96.
e 73) Existence d'ailes antérieures pliantes chez les Membracides Tragopiens (Homoptères).- *Comptes Rendus de l'Académie des Sciences, Paris,* **284** (20), Sér. D : 1999-2002, 4 fig.
f*74) Entomologie et philatélie française. Emission prochaine d'un timbre représentant un Insecte [la Cigale rouge, *Tibicina hæmatodes* Scop.].- *L'Entomologiste,* **33** (3), 1977 : 105-112, 2 fig.
g*75) L'Insecte dans la philatélie française.- *L'Echo de la Timbrologie,* n°1479, 1977 :10-13, 12 fig.
h 76) *Paectira* nouvelles du Kénya (Hom. Cicadoidea).- *Stuttgarter Beiträge zur Naturkunde,* ser. A (Biologie), **296**, 1977 : 1-7, 21fig.
i*77) La nature à six, huit et mille pattes.- *Documents philatéliques,* 33-77, Poste & Télécommunications éd., Paris, 1977 : 1, 3 fig.
j*78) La Cigale rouge, croissance et métamorphose.- *Feuillet philatélique, 276, L'Empire philatélique éd., Paris, 1977 : 2 fig.*(en couleurs).
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d 291) Une Cigale sabulicole et buveuse d'eau : un « scoop » cicadologique ! *Insectes*, **142** (3), 2006 : 9-10, 5f.
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f 293) Facultés acoustiques, éthologie sonore des Cigales, entomophonateurs par excellence / *Acoustic faculties and sonic ethology of cicadas, entomophonators par excellence*.- *EPHE, Biologie et Evolution des Insectes*, **16**, octobre 2006 [**fascicule bilingue** français/ anglais] + 1CD audio réunissant les cymbalisations émises par 99 espèces (ISBN 2-9502395-2-8 / ISSN 1257-5496) : 1-182,117 fig., 1 planche en couleurs.
g 294) ***Cicadalna takensis,*** **nouvelle espèce d'un genre nouveau découverte en Thaïlande du Nord (Rhynchota, Cicadomorpha, Cicadidae)**.- *Bulletin de la Société entomologique de France,* **111** (3), 2006 : 129-132, 6 fig., 1 pl.
h 295) Une exception écologique : une Platypleure cespiticole. Description et premières données sur la biologie de cette espèce continento-tropicale restée jusqu'ici inédite. (Rhynchota, Auchenorhyncha, Cicadidae).- *Lambillionea*, **CVI**, **4**, Décembre 2006, Tome I: 620-630, 10 fig.

.- 2007 -.
a 296) ***The Cicadas of Thailand. Volume 1 General and Particular Characteritics*.-** Bangkok, White Lotus Pub., Juanary 2007: i-xvi, 1-103, 53 Text-fig., 46 colour Plates + 1 Audio CD: tracks 1-40. ISBN : 978-974-480-080-0.
b 297) ***Être ou ne pas être, les Facettes du Mimétisme***.- *EPHE, Biologie et Evolution des Insectes*, **17**, avril 2007 : 1- 152 + 1 CD réunissant la reproduction de 275 diapositives. **ISBN 2-9502395-2-10** ; ISSN 1257-5496.
c 298) ***Dimissalna*****, nouveau genre de Cicadette (Rhynchota, Cicadidae)**.- *Bulletin de la Société entomologique de France,* **112** (1), 2007 : 93-98, 4 fig.
d 299) Cigales nouvelles, originaires de Thaïlande et appartenant au genre *Purana* Distant, 1905 (Rhynchota Cicadomorpha, Cicadidae).- *Nouvelle Revue d'Entomologie*, **23** (2006)**,** (3) :195-212, 26 fig.
e 300) **Nouvelle image de la biodiversité chez les Cigales thaïlandaises**.- *Bulletin de la Société entomologique de France,* **112** (2), 2007 : 238, 1 fig.
f 301) Description et éthologie sonore de sept espèces de Cigales d'Asie continento-tropicale, dont cinq nouvelles pour la science et une jusqu'ici inédite pour la Thaïlande [Rhynchota, Cicadoidea, Cicadidae].- *Revue française d'Entomologie* (N.S.), 2007, 29 (2-3) : 93-120, 32 fig.
g 302) Additions bio-taxonomiques à la Cicadofaune thaïlandaise [Rhynchota, Cicadoidea, Cicadidae].- *Lambillionea*, **CVII**, 4, Décembre 2007, Tome I : 493-510, 4pl.

.- 2008 -.
a* 303) Les Cigales thaïes. Liste actualisée (Biodiversité, Biogéographie et Bibliographie) incluant les diagnoses de deux nouveaux genres, les descriptions de sept espèces nouvelles et les Cartes d'Identité Acoustique (CIA) de *Chremistica siamensis* Bregman et de *Leptopsaltria samia* (Walker). / **Thai cicadas. Updated list** (Biodiversity, Biogéography and Bibliography) with description of a two genera, seven new species and CIA of *Chremistica siamensis* Bregman and *Leptopsaltria samia* (Walker) (Rhynchota, Cicadomorpha, Cicadidae).**-** *EPHE, Biologie et Evolution des Insectes,* **18,** janvie**r 2008 : 1-112, 46 fig.**
b 304) Statuts et éthologies sonores de quatre nouvelles espèces de Cigales malgaches, dont deux représentent un nouveau genre et une nouvelle sous-tribu (Rhynchota, Auchenorhyncha Cicadidae).- *Lambillionea*, **CVIII**, 2, Juin 2008 : 161-178, 8 pl.// **b'** 304') Addendum : Notes synonymiques à propos de la cicadofaune malgache.- *Lambillionea*, **CVIII**, 2, Juin 2008 : 178.
c 305) Sur un magasin de Cigales asiennes, comprenant quatre espèces nouvelles et quelques autres captures intéressantes [Rhynchota, Cicadoidea, Cicadidae].- *Nouvelle Revue d'Entomologie*, **24 (4)** (29.8.2008) : 361-371, 23 fig.
d 306) ***Platylomia operculata*** **Distant, une Cigale curiste devenant « altruiste » malgré elle (Rhynchota Cicadomorpha Cicadidae)**.- *Lambillionea*, **CVIII**, 3, Septembre 2008: 345-357, 17 fig.
e 307) ***Platylomia Operculate*** **Distant, 1913, a cicada that takes water from Hot springs and becomes victim of the people (Rhynchota: Cicadomorpha: Cicadidae)**.- *Acta entomologica slovenica* **16**(2) XII.2008: 105-116,14 fig.

.- 2009 -.

a 308) Descriptions et éthologies singulières de deux nouvelles espèces de la tribu des Leptopsaltriini (Rhynchota, Cicadoidea, Cicadidae).- *Bulletin de la Société entomologique de France,* **114** (1),2009 : 47-54, 10 f.

b*309) La Cigale persévérante et l'araignée mélomane.- *L'Entomologiste*, **65**, 2009, n°1 : 63-64, 2 fig.

c 310) Nouvelles Cigales colligées en Thaïlande (Rhynchota, Cicadoidea, Cicadidae).- *Lambillionea CIX, 1,* Mars 2009 : 39-58, 24 fig.

d 311) *Baeturia laperousei* Boulard, statut spécifique corroboré par l'acoustique. (Rhynchota, Cicadoidea, Cicadidae).- *Revue française d'Entomologie* (N.S.), 2008 (2009), 30 (2-4) : 67-70, 4 fig.

e 312) *Pomponia mickwanae* n.p., nouvelle espèce de Cigale thaïe (Rhynchota, Cicadoidea, Cicadidae).- *Revue française d'Entomologie* (N.S.), 2009, 31 (1) : 39-43, 7 fig.

f 313) Sur la naissance imaginale de *Formotosena montivaga* Distant, grande et somptueuse Cigale asienne. Clarification conceptuelle à propos de cet événement (Rhynchota, Cicadomorpha, Cicadidae).- *L'Entomologiste*, 65, 2009 (4): 175-180, 13 fig.

g* 314) Errata & Corrigenda.- Michel Boulard, *The Cicadas of Thailand. Volume 1 General and Particular Characteritics*.- Bangkok, White Lotus Pub., Juanary 2007: i-xvi, 1-103, 53 Text-fig., 46 colour Plates + 1 Audio CD: tracks 1-40.- *Nouvelle Revue d'Entomologie*, **25 (3)** (28.8.2009) : 246.

h 315a) Sur une nouvelle espèce *de Mogannia*, (Rhynchota, Cicadoidea, Cicadidae).- *Lambillionea CIX, 3,* Septembre 2009 : 250-253, 3 fig.

i 315b) Notes synonymiques et corrigenda.- *Lambillionea CIX, 3,* Septembre 2009 : 253.

j 316) *Distantalna* genre nouveau pour les Tosenini (Rhynchota, Cicadomorpha, Cicadidae).- *Nouvelle Revue d'Entomologie*, **25 (4) :** (26.11.2009) : 325-328, 2 fig.

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a 317) Description de *Megapomponia foksnodi* n. sp. (Rhynchota, Cicadidae, Pomponiini).- *Bulletin de la Société entomologique de France,* **115** (1), 2010 : 15-16, 1 fig.

b 318) Création du genre *Sechellalna* pour «*Yanga* » *seychellensis* Distant, 1912, Cigale dépourvue d'organe sonore (Rhynchota, Cicadidae).- *Lambillionea*, CX, 3, 2010 : 334-337, 9 fig.

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a 319) Nouveaux Membracidae néotropicaux du genre *Aspona* Stål, 1862 (Rhynchota, Cicadomorpha).- *Bulletin de la Société entomologique de France,* 116 (1), 2011 : 91-98, 14 fig.

b*320) « Les émissions sonores des cigales et des orthoptères », 2011.- *dans* : Blanc, A. et Fischetti A., Février 2011, *Les animaux musiciens*. Une exposition sonore et scientifique sur la communication animale : Pl. 8.

c 321) Nouvelles Cigales néotropicales de la sous-tribu des Guyalnina (Cicadidae, Cicadinae, Fidicinini).- *Lambillionea, CX, 4* : 1-14, 19 fig. (avec Nilza Maria Martinelli, Jaboticabal, Univ. de SaoPaulo, Brésil).

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a 322) Nouvelles Cigales originaires de Tanzanie (Rhynchota, Auchenorhyncha, Cicadidae).- *Bulletin de la Société entomologique de France,* 117 (1), 2012 : 41-52, 23 fig.

b* 323) *The Cicadas of Thailand. Volume 2 Taxonomy and Sonic Ethology*.- *EPHE, Biologie et Evolution des Insectes*, Preliminary and limited edition in A4: 19, mai 2012 : 410pp, 261 fig., 96 A4 colour Plates, 1 Carte mémoire Audio (107 pistes). ISBN 2-9502395-5-2.

c 324) *MIMÉTISME. Usages biologiques du paraître*.- Paris, Boubée éd., A4, mai 2012 : 229p., 227 fig., 40 Planches H.T., 1 Carte mémoire. ISBN 978-2-85004-127-2.

d 325) Un nouveau genre et une nouvelle espèce de Cigale aphone du Malawi (Cicadidae, Cicadettinae).- *Bulletin de la Société entomologique de France,* **117** (3) 2012 : 277-281, 4 fig.

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a 326) Éthologie sonore chez deux Cigales Nord thaïlandaises et conclusion naturelle (Rhynchota, Cicadomorpha, Cicadidae).- *L'Entomologiste*, 69 (3) : 259-262, 6 fig.

b 327) Une nouvelle espèce de *Psithyristria* Stål de l'île de Luçon (Philippines) (Hemiptera, Cicadidae, Psithyristriini). – *Bulletin de la Société entomologique de France,* 118(3) : 285-288 (en collaboration avec Sheryl YAP, Laguna, University of Philippines).

c 328) *The Cicadas of Thailand. Volume 2 Taxonomy and Sonic Ethology*.- Siri Scientific Press: 436p., 487 B.&W. figs, 96 colour Plates + **111 Audio tracks available in line**. N° ISBN : 78-0-9567795-9-5 (2013).

d 329) Une Cigale-marteaux chez les Cicadidae. Nouvelle espèce, nouveau Genre, nouvelle sous- Tribu (Cicadettinae, Cicadettini). *EPHE, Biol.Evol.Insectes,* 20, XII 2013 : 3-8 (Avec **Stéphane Puissant**).

e 330) Remarques sur certains points de nomenclature concernant la Famille des Cicadidae, ou vraies Cigales. Résolution du problème « *Tibicen, Tibicina* et *Lyristes* ».- *EPHE, Biologie et Evolution des Insectes,* 20, Décembre 2013 : 9-24 (avec **Stéphane Puissant**).

f 331) Florilège sonore des Cigales Thaïes.- *EPHE, Biol. Evol.Insectes,* 20, XII 2013 : 75-89 + 1 Carte mémoire.

.- 2014 .-

a 332) Données taxonomiques et éthologiques nouvelles sur quatre espèces de Cigales du Sud thaïlandais (Auchenorhyncha, Cicadoidea, Cicadidae).- *Bulletin de la Société entomologique de France,* 119(1) : 15-26.

.- 2015 .-
a 333) Famille des Cicadidae. Résolution du problème posé par les genres dénommés *Tibicen*, *Tibicina* et *Lyristes* (Auchenorhyncha* Cicadoidea).- *L'Entomologiste*, 71, 2015, n° 2: 75-86. (avec Stéphane Puissant).
b 334) Comment on *Tibicina* Amyot, 1847 and *Lyristes* Horváth, 1926 (Insecta, Hemiptera, Homoptera): proposed conservation by the suppression of Tibicen Berthold, 1827 Latreille, 1825|, and concerning the type species of *Cicada* Linnaeus, 1758 (Case 239; see BZN 41: 163–184; 71: 103–131; 179–180).- *Bulletin of Zoological Nomenclature* 72(3) : 1-2. September 2015. En collaboration avec **Stéphane Puissant, Young June Lee, Masami Hayashi, Cong Wei** et **Jérôme Sueur**.

.- 2016 .-
a 335) Description du mâle de la Cigale-marteau, *Cicadmalleus micheli* Boulard & Puissant, 2013, et position systématique de l'espèce (Hemiptera, Cicadoidea, Cicadidae). *Bulletin de la Société entomologique de France,* 121 (3) : 313-321, 10 fig. (En collaboration avec Stéphane Puissant).

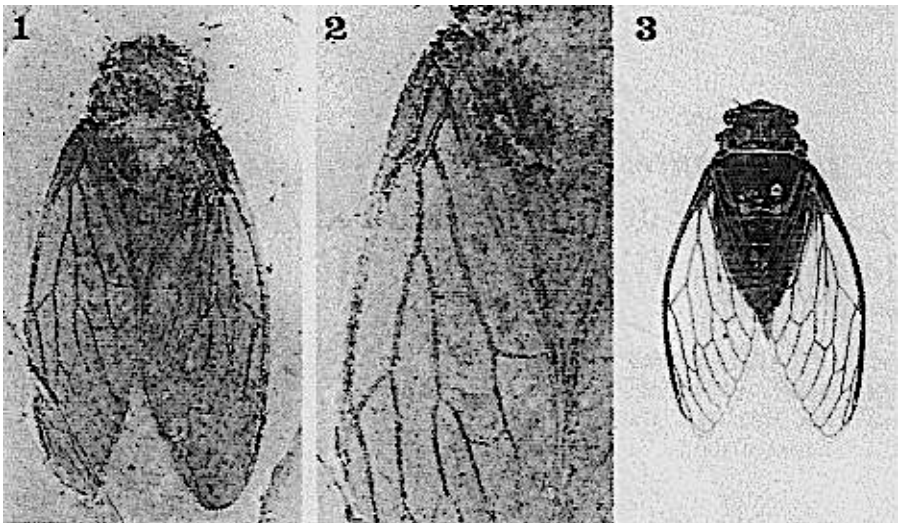
.- 2017.-
a 336) Michel Boulard, Entomologiste, éco-éthologiste, photographe. Autobiographie d'un bourlingueur. *EPHE*, *Biologie et Evolution des Insectes*, 21a, 2017 : i-xii, 1-352, 560 éco-photographies. ISSN 1257-5496 / ISBN 2-9502395-7-9.

.- 2018.-
a 337) *Id*. Seconde édition (addenda et corrections). *EPHE*, *Biologie et Evolution des Insectes*, 21b, 2018 : i-xii, 1-426, 600 éco-photographies. ISSN 1257-5496 / ISBN 2-9502395-8-7.
b 338) Sur deux Cigales de la faune inter-tropicale dédiées au Cicadologiste *Matija Gogala*, collègue et ami. *Acta entomologica slovenica*, **26 (2)** :151-164, **17 fig**.

.- 2019
a 339) Les Cigales n'ont ni larve, ni nymphe. "Brève" de bionomie en 8 diapositives. *L'Entomologiste*, 75, n° 6 (*novembre-décembre 2019*): 357-360, 8 fig.

.- 2022.-
b 340) Ma vie avec les Cigales, quelques relations voisines et autres. *EPHE*, *Biologie et Evolution des Insectes,* **Autobiographie bilingue, en 2 Volumes de** 512p., chacun, *sous presse*...
a 341) Sur deux nouveaux genres et quatre nouvelles espèces de Cigales originaires du Gabon. *Bulletin de la Société entomologique de France*, en collaboration avec Stéphane Puissant, sous presse...

Ensemble bibliographique comportant, entre autres, les descriptions de 60 nouveaux Genres et de 457 nouvelles espèces selon les disciplines entomologique et mimétologique.



Tibicina gigantea Boulard et Riou (1+2) compared to ***Tibicina haematodes,*** the Provençal red cicada (1 and 3, same scale; **MB Phot.**)

XII. - Additives

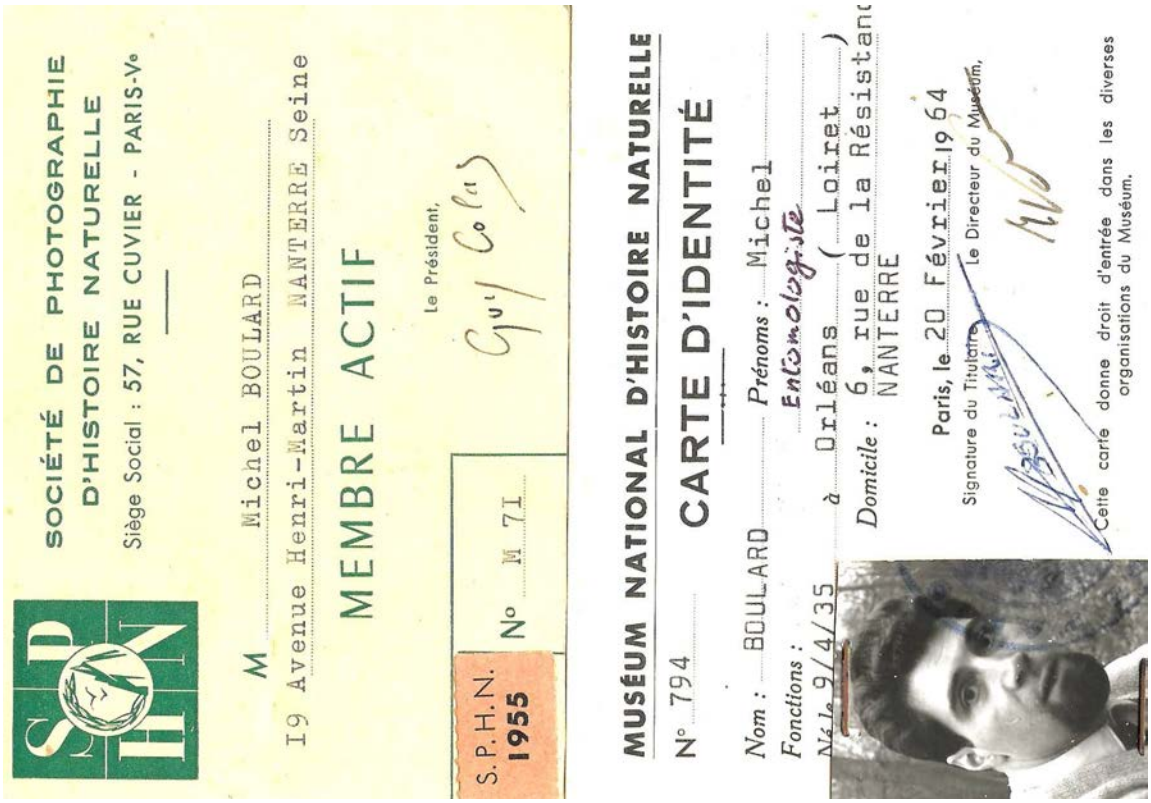
-> New types

During my various Overseas Missions, I was able to collect many Insects, other than Cicadas or Membracids, as well as a few millipedes. Distributed among the various specialists concerned, they have given rise to more than thirty original articles, where one species of Insects has the generic status ***Boulardus***, while 33 others and one species of Myriapod bear, forged as an epithet, the patronymic: ***boulardi***.

-> Citations:

In December 2021*, the Bibliographic Journal of* **Academia.edu** *noted*
"1.215 papers mention Boulard Michel"

-> Epistolary credits


SOCIÉTÉ DE PHOTOGRAPHIE D'HISTOIRE NATURELLE
Siège Social : 57, RUE CUVIER - PARIS-Vᵉ
M Michel BOULARD
19 Avenue Henri-Martin NANTERRE Seine
MEMBRE ACTIF
Le Président,
S.P.H.N. 1955 N° M 71

MUSÉUM NATIONAL D'HISTOIRE NATURELLE
N° 794 CARTE D'IDENTITÉ
Nom : BOULARD Prénoms : Michel
Fonctions : Entomologiste
Né le 9/4/35 à Orléans (Loiret)
Domicile : 6, rue de la Résistance NANTERRE
Paris, le 20 Février 1964
Signature du Titulaire Le Directeur du Muséum,
Cette carte donne droit d'entrée dans les diverses organisations du Muséum.

3rd October, 1969

Professor J.Carayon has invited me, as a specialist in the insect sub-order Homoptera, to provide an opinion on the work of Dr Michel Boulard, whom he informs me is a candidate for the position of Directeur adjoint in his laboratory.

Dr Boulard's publications on the Homoptera are of high quality and given evidence of an original outlook and a true naturalist's spirit of curiosity.

It is of importance to entomologists everywhere that posts in key institutions, such as the Museum National D'Histoire Naturelle, be held by people with a dedicated interest in their subject, and I regard Dr Boulard as such a one.

Although I have only met him on one occasion and for a short time, I have corresponded with him over a long period and as a result feel that I know him well. In consequence, it is not only because of his entomological talents that I would like to see him appointed to the staff of the Museum, but also because of his personal ones.

Accordingly, it gives me very great pleasure to be able to give him my fullest support.

J.W.Evans E.A.,Sc.D.,D.Sc.

L.T.D. 1803.

Telegrafiese Adres: OMOLOGIST, PRETORIA."
Telegraphic Address:
Tel. 2-9761.

In Antwoord Geliewe na Onderstaande Nommer te Verwys.
In reply please Quote this Number.

DEPARTEMENT VAN LANDBOU-TEGNIESE DIENSTE, VORSINGSINSTITUUT VIR PLANTBESKERMING, LANDBOUGEBOU, BEATRIXSTRAAT, PRIVAATSAK 134, PRETORIA.

DEPARTMENT OF AGRICULTURAL TECHNICAL SERVICES, PLANT PROTECTION RESEARCH INSTITUTE, AGRICULTURE BUILDING BEATRIX STREET, PRIVATE BAG 134, PRETORIA.

3. X. 1969

Prof. J. Carayon,
Muséum National d'Histoire Naturelle,
Entomologie,
45 bis, Rue de Buffon,
Paris (Ve), FRANCE.

Dear Dr. Carayon,

Many thanks for your letter of 29.IX.69, informing me that Mr. M. Boulard is a candidate for the position of Director Adjoint in your laboratory.

I have been in frequent communication with Mr. Boulard for several years, and have been very favourably impressed by his dedication to entomology. He is undoubtedly a very keen observer and collector, and his published work on Membracidae and other Homoptera is very good. He shows a real understanding of these insects and his photographs are of outstanding merit. My impression is that his knowledge and great enthusiasm for entomology should make him eminently suitable for the position he seeks.

With kind regards,

Yours sincerely,

A. L. Capener.

T.C.
EGE ÜNİVERSİTESİ
ZİRAAT FAKÜLTESİ
Bitki Koruma Bölümü

SAYI :

Bornova/İZMİR

KONU :

17../.6.../ 1987

Dr. Michel Boulard
Entomologie Economique,
Muséum National D'Histoire Naturelle,
45 Rue Buffon, 75005 Paris
FRANCE

My dear Michel,

I thank you very much for your letter dated 5 th June, 1987 and also the cassete which both of them I received yesterday.

I wanted to write you a letter long ago but I didn't have time as I am going to retire very soon because of my old age! and for this reason, I am very much busy with my works. I want to finish my works before my retire. However, I am going to attend at 6 th Auchenorrhyncha meeting in Italy-Turin. Will you come there? If it is so, I may see you there far the last time and this makes me very happy indeed.

I looked at oscillogrammes and spectrogrammes of the three species of Lyristes. It is a wonderful works and one can see clear separation of these three species. It would be a wonderful idea if you prepared a short paper about this subject to the 6 th Auchenorrhyncha meeting. I am sure it will be interested to everyone there. Did you think about it?

Dear Michel as you remember, I have given all my specimens of the new species of isodol and gemellus and practically I haven't have any more specimens in my collection. However, I cam find easily about gemellus (I think the one has big population near İzmir-Kemalpaşa), isn't it? but the other one I am afraid, I may not have. I know, you will send me the paratype specimens. Will you be please kind enough to let me have them in your earliest convenience? As you already finished their description.

How is about your grandson? Is he allright?

My kindest regards to you and your family.

Yours ever

DR. J. W. EVANS
47 BUNDARRA ROAD
BELLEVUE HILL
SYDNEY 2023
AUSTRALIA

8-8-73

My dear Michel,

It was a great pleasure to receive a letter from you yesterday and I was most interested to hear of the cicada you had discovered which had replaced tymbal [illegible] sound production by stridulation.

Many years ago I found apparent stridulating areas on the forewings of Triassic cercopids but it is of course impossible to know whether these acted as a replacement of tymbals or were accessory sound producing organs. Wings with these structures are illustrated on page 19 of the Memoirs of the Queensland Museum, 14, 1961, Fig. 4, A-C.

I hope as well as reviewing the different types of sound-producing organs in cicadas you will give thought to the purpose of cicada songs. When, for instance, in the midule of the night huge numbers suduenly start singing and then as suddenly stop it surely (Eternal) suggests an assembling rather than an immediate function. Then, the fact that the nymphs of Astalion have well developed tymbals in the nymphs of every instar, except the first, and of course in both sexes, again suggests such a purpose for the song.

I had arranged to show your film at the Australian Museum on September 10th but of course because of the present foolishness and the prevention by trades unions, not the Government, of communication with France I have not liked to write to the Service du Film de Recherche Scientifique on the matter, but will do so when mails become normal.

We had a most intersting time in the Northern Territory and saw more birds of great interst than I have ever seen collected together in one place before. We camped by a river and by following ant trails found some very interesting eurymelids.

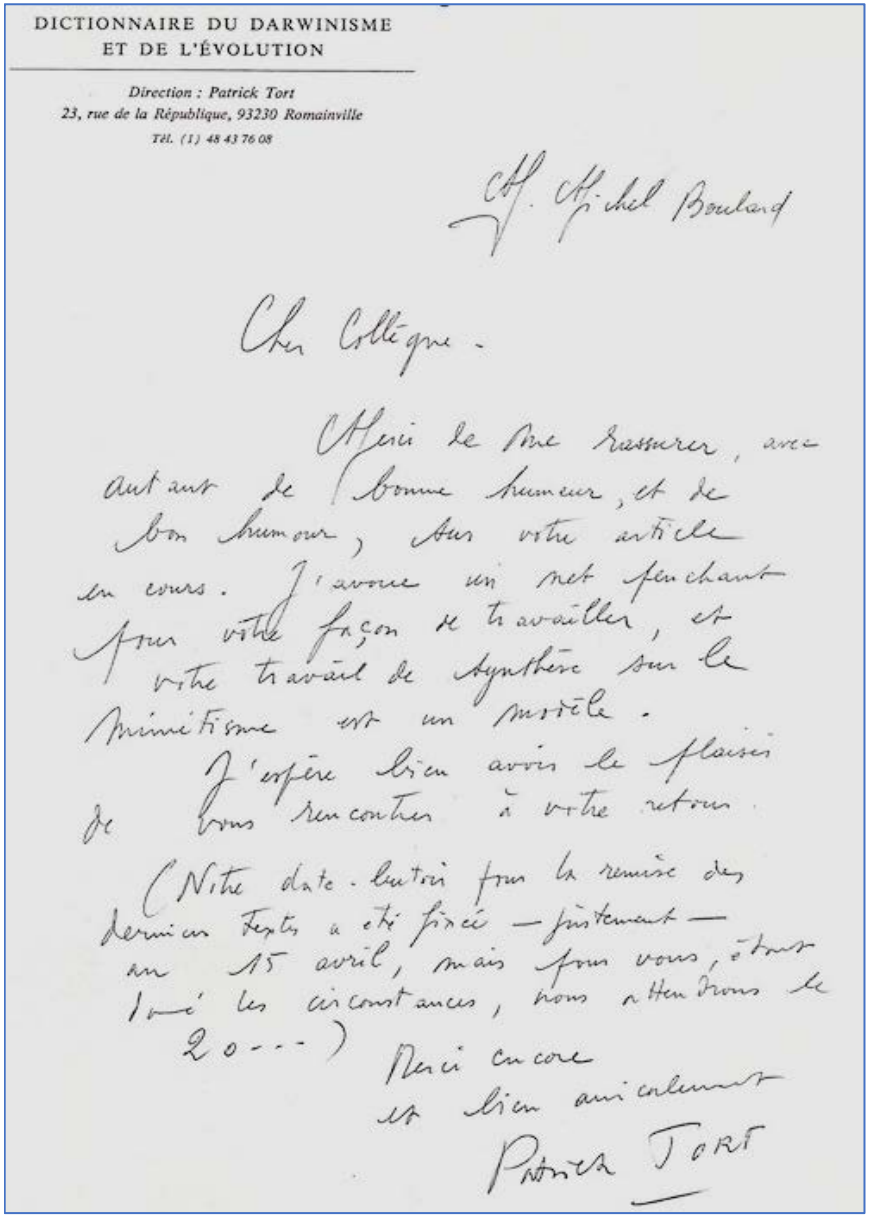
Your photos of the stridulating cicada [illegible] are most convincing; what a maghificent tool the scanning electron microscope provides. I have had cause to use it only once so far and found it very rewarding.

We are still planning tp spend a fortnight in France next year; a week in Paris and possibly another in the Touraine. Some friends heere have suggested we hire a car together and follow the course of the Loire, but I dont know whether anything will come of this.

My wife recently spent 10 days in hospital, but when I tell you she is going sailing on the harbour today and we have 4 people coming to dinner this evening you will understand she is now quite well. With all good wishes to your wife and yourself,

Yours very sincerely

John. W. Evans



DICTIONNAIRE DU DARWINISME
ET DE L'ÉVOLUTION

Direction : Patrick Tort
23, rue de la République, 93230 Romainville
Tél. (1) 48 43 76 08

Cher M. Michel Boulard

Cher Collègue.

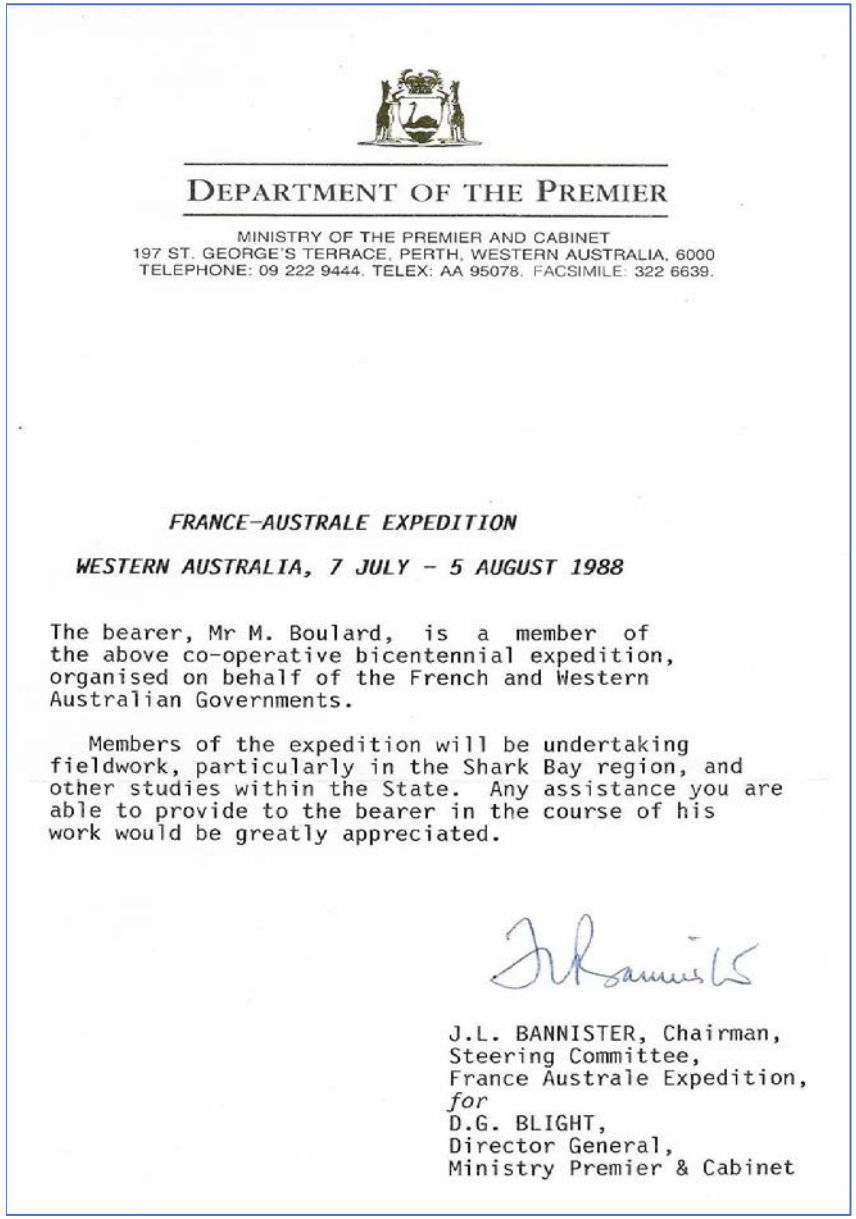
Merci de me rassurer, avec autant de bonne humeur, et de bon humour, sur votre article en cours. J'avoue un net penchant pour votre façon de travailler, et votre travail de synthèse sur le Primitivisme est un modèle.

J'espère bien avoir le plaisir de vous rencontrer à votre retour.

(Note date - limite pour la remise des derniers Textes a été fixée — justement — au 15 avril, mais pour vous, étant donné les circonstances, nous attendrons le 20 - - -)

Merci encore et bien amicalement

Patrick TORT



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TELEPHONE: 09 222 9444. TELEX: AA 95078. FACSIMILE: 322 6639.

FRANCE-AUSTRALE EXPEDITION

WESTERN AUSTRALIA, 7 JULY - 5 AUGUST 1988

The bearer, Mr M. Boulard, is a member of the above co-operative bicentennial expedition, organised on behalf of the French and Western Australian Governments.

Members of the expedition will be undertaking fieldwork, particularly in the Shark Bay region, and other studies within the State. Any assistance you are able to provide to the bearer in the course of his work would be greatly appreciated.

J.L. BANNISTER, Chairman,
Steering Committee,
France Australe Expedition,
for
D.G. BLIGHT,
Director General,
Ministry Premier & Cabinet

DICTIONNAIRE DU DARWINISME
ET DE L'ÉVOLUTION

Direction : Patrick Tort
23, rue de la République, 93230 Romainville
Tél. (1) 48 43 76 08

22/12/91

M. Michel Boulard

Cher Collègue.

Votre travail sur les Métamorphoses est une merveille. C'est un vrai plaisir d'apprendre tant de choses en un seul article. Je me félicite sans réticence de vous avoir demandé ce travail – et vous remercie du résultat.

Pouvez-vous m'envoyer dès que possible votre bibliographie (avez-vous toujours un modèle de présentation) ?

Nous achevons le contrôle scientifique.

Remise prochaine aux PUF.

Amitiés

Patrick TORT

Ministère de l'Education nationale
Ecole Pratique des Hautes Etudes
Laboratoire de Biochimie et Ecologie des Invertébrés marins

à M. Michel Boulard.

Paris le 2 Mars 1994

Cher Monsieur Boulard,
mon cher collègue,

Je viens de recevoir à Paris, où je me trouve depuis quelques jours, votre dossier de candidature à la première classe. Je vous remercie de me l'avoir fait parvenir, et je dois vous dire que j'ai été très touché par le fait que vous me demandiez d'être votre rapporteur.

Soyez assuré – vous le savez bien – que j'aurais accepté avec plaisir de le faire, surtout en raison de l'estime que je vous porte et que je porte à vos travaux.

Mais le Secrétariat m'a fait savoir qu'une Commission scientifique avait désigné un autre (deux autres ?) rapporteur. Formellement, je ne pourrai pas l'être. Mais soyez assuré de mon appui en cours de séance. Reste à savoir comment la séance se déroulera et comment l'Assemblée des directeurs réagira dans son ensemble, et sur quels critères.

En tout cas, j'ai été impressionné par votre liste de travaux, par l'aspect pluridisciplinaire de vos approches, et par la revue EPHE "Biologie et Evolution des Insectes", qui est le germe de grandes choses.

Meilleur et amical souvenir. Bien à vous

Hubert J. CECCALDI.

MUSÉUM NATIONAL D'HISTOIRE NATURELLE

ZOOLOGIE
MAMMIFÈRES ET OISEAUX

55, RUE DE BUFFON
75005 PARIS

Professeur Jean DORST
Membre de l'Institut

PARIS, LE 27 juin 1996

Monsieur Michel Boulard
Muséum

Cher Monsieur, collègue et ami,

c'est avec une joie bien sincère que je viens de recevoir ce splendide ouvrage consacré à notre chère cigale ! Vous m'avez comblé et je vous sais gré de ne pas m'avoir oublié.

Je ne l'ai pas encore lu in extenso , mais déjà suffisamment pour en avoir appris beaucoup sur ces charmantes petites bêtes. La partie scientifique est en tous points remarquable par sa précision et la foule de renseignements inédits Il est vrai que vous êtes orfèvre en la matière ! La partie ethologique et écologique est tout aussi intéressante. Elle rassemble des documents en tous genres, de la poésie à l'enseigne de bistrot. Il est vrai que la cigale jouit d'une popularité peu commune, mais la diversité des sources rendait sans doute la quête documentaire difficile et le choix encore plus

Quant à l'illustration, elle est digne de tout ce que nous connaissons de vous. Toutes ces espèces sont remarqueblement à leur place, dans toutes les phases de leurs comportements.

Bravo et merci à vous et à Bernard Mondon de nous avoir donné ce superbe ouvrage si original. Il vous fait honneur, comme à l'ensemble du Muséum.

Je suis sur mon départ pour le midi, votre livre sera dans mes bagages et je lirai au chant de vos chères petites bêtes !

Bien amicalement à vous,

Jean Dorst

Carcyon

Paris, 19 juillet 1995

Mon cher Boulard,

Beaucoup de remerciements et toutes les félicitations auxquelles vous avez droit de ma part pour votre ouvrage sur les Cigales. Aussitôt celui-ci reçu, je me suis précipité pour le parcourir, non sans avoir apprécié l'ampleur la présentation de l'ouvrage (imprimés, format, mise en page, caractères etc). Je connaissais déjà à toute, la richesse des données et l'originalité de beaucoup d'entre elles.

La qualité de vos illustrations et de leur reproduction sur papier défiait ce qu'on pouvait attendre. Il en est de même pour les enregistrements sonores sur CD. (dont on regrette parfois l'indisponibilité brièveté, au moins en ce qui concerne les espèces "communes").

Le titre définitivement choisi pour le bouquin me désorçonne un peu, encore que je comprenne bien le symbolisme du termes "biologies" et surtout "mémoires", au premier abord plus abstrait. Plus que les mots eux-mêmes, c'est leur emploi au pluriel qui me gêne un peu, car il peut donner l'impression que l'on a affaire à des "morceaux choisis" plus qu'à une étude globale. Mais ne vous inquiétez pas, cette impression, toute personnelle, est mineure et n'entâche en rien la valeur de l'ensemble.

J'ai été plus gêné - à première lecture - par la discordance entre votre partie et celle de Bernard Mondon, laquelle apporte pourtant une foule d'informations intéressantes. La discordance tient peut-être pour une large part à la différence, inévitable, de votre illustration, toujours claire et précise, avec celle des documents le plus souvent anciens, reproduits par Mondon.

Nous reparlerons de tout cela plus tard, quand j'aurai "effleuré" de plus près le livre. En attendant, l'écriture, comme toute effort d'activité me fatigue, car je subis - pour des mois sans doute - les contre-coup de ma dernière intervention chirurgicale. Je ne vais pas quand nous irons en Provence (si j'y vais!). Ce ne sera certainement pas avant Septembre.

Encore tous mes compliments
et bien cordialement à vous

J. Carcyon

Date Sun, 6 Apr 2008 10:33:34 +1000
À mbkcicada01@yahoo.fr, mboulard@mnhn.fr
De "Max Moulds" <msmoulds@bigpond.net.au>
Objet Your book and papers arrived

Mon cher Michel,

I am back home again and at last settled back into work after all our field work in Argentina and then Australia. Argentina was not very successful. It seemed to be a bad cicada year and our opportunities to collect cicadas were restricted somewhat because we were travelling with a big group of people who were mostly collecting other Auchenorrhyncha. We did manage to get most of the common species though, about 30 species in total. Our Australian trip was not much better but we did get a number of good species and Kathy and Dave managed to get some important observations on the mating behavior of Froggattoides for a paper they are preparing. I think we were just too late in the season and most cicadas had come and gone after unusually long monsoonal rains.

Your book and other papers arrived safely. CONGRATULATIONS on a wonderful book. And I am very excited because it is in English and I can read it! The photographs are excellent. It is so good to have colour illustrations for identification. Thank you too for the copy of EPHE 16. I have not had a chance to read it yet but it looks very impressive. Again I am excited about the English. I think having the English in both your book and EPHE will bring your work to the forefront of the English speaking cicada workers. The CDs are really a wonderful asset and compliment both publications very well. So CONGRATULATIONS once again on 2 very important publications.

I am now about to start working again on my generic review of the Australian cicadas and hope to have it complete by the end of this year.

Hope you and Kwan are well. I enjoyed seeing the photos of you and Kwan in your publications.

Best wishes

Max

Objet : RE: Letter in sufferance

De : Duffels, H. (Hans.Duffels@ncbnaturalis.nl)

À : mbkcicada01@yahoo.fr;

Date : Vendredi 22 juin 2012 9h38

Mon cher Michel,

When I was in Leiden earlier this week I found your Cicadas of Thailand volume 2 on my desk. Thank you very much for sending me your very very interesting and most useful book on the cicadas of Thailand that presents such a beautiful overview of all cicadas occurring in the area. I think that your Thai publisher is not right in saying that the book is interesting for a few customers only. I am sure that everybody who wants to identify a cicada of the mainland of SE Asia will/must use this book and of course all entomological libraries will buy it.

These days I spent many pleasant hours of reading, for me it is like fascinating literature. There are so many interesting data on taxonomy, sound, ecology etc. etc., and of course for a taxonomist it is wonderful to have all cicadas of one genus together, so that they can easily be compared. This is specially true for the speciesrich genera like Purana, Pomponia and others. It helps me a lot to have all species together. It is very good that you published this book yourself as EPHE 19, because all information is now directly available.

I have not yet listened to the sounds. Will do that after the EHC6 congress in Bulgaria.

With kindest regards,

Hans

SIXIEME FESTIVAL INTERNATIONAL
DU FILM SCIENTIFIQUE ET TECHNIQUE
DE BRUXELLES 1973

centre universitaire du film scientifique de l'université libre de bruxelles

LE FILM

CIGALES DE FRANCE
de M. Michel Boulard

A OBTENU

LE PRIX DE ZOOLOGIE

AU FESTIVAL DE BRUXELLES 1973

Le Jury

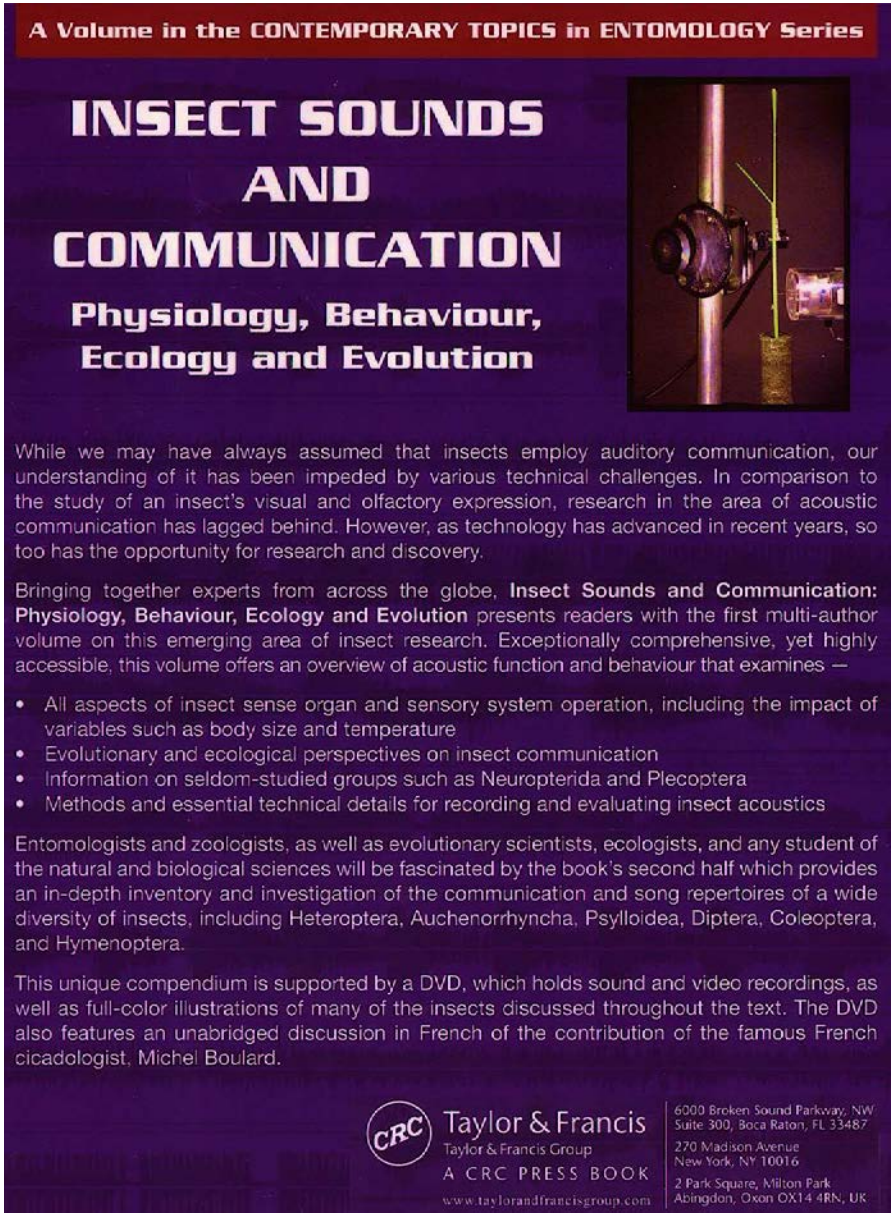
Puissant Stéphane, le 29 juin 2020, 19:50.

Cher Michel bonsoir,

Je vous transmets un message que l'un de nos collègues indiens, Vivek Sarkar m'a écrit pour vous :

" It was an honor interacting with Prof. Michel Boulard. I greatly admire the work that he has done on Thai Cicadas. His work is legendary and many time served as a guiding star in my study. I dream to do some field work with him at some point in my life. That would be epic."

À très bientôt, bien à vous, Stéphane,



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Entomologists and zoologists, as well as evolutionary scientists, ecologists, and any student of the natural and biological sciences will be fascinated by the book's second half which provides an in-depth inventory and investigation of the communication and song repertoires of a wide diversity of insects, including Heteroptera, Auchenorrhyncha, Psylloidea, Diptera, Coleoptera, and Hymenoptera.

This unique compendium is supported by a DVD, which holds sound and video recordings, as well as full-color illustrations of many of the insects discussed throughout the text. The DVD also features an unabridged discussion in French of the contribution of the famous French cicadologist, Michel Boulard.

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De: **Hubert Bost** Hubert.Bost@ephe.sorbonne.fr
Objet: **Autobiographie d'un bourlingueur**
Date: **4 mai 2017 12:53**
À: michelcicada@gmail.com
Cc: **Présidence EPHE** Presidence.Ephe@ephe.sorbonne.fr

Cher collègue,

Un mot pour vous remercier très vivement à la fois d'avoir bien voulu vous occuper de rédiger votre notice du Dictionnaire prosopographique de l'EPHE et pour l'envoi de votre « Autobiographie d'un bourlingueur ». Je l'ai parcourue avec beaucoup d'intérêt : historien, je confesse être souvent dans l'incapacité de comprendre pleinement les enjeux scientifiques, mais le parcours que vous avez accompli est passionnant. Et les photos m'ont fasciné par leur originalité et leur beauté.
Je vais signaler cette publication à la doyenne de la section des sciences de la vie et de la terre ainsi qu'aux collègues qui pourraient recourir à cette précieuse synthèse dans le cadre de la rédaction du livre historique, actuellement en cours, sur les 150 ans de l'Ecole.
Encore merci, et mes plus cordiaux messages,

Hubert Bost

Hubert BOST
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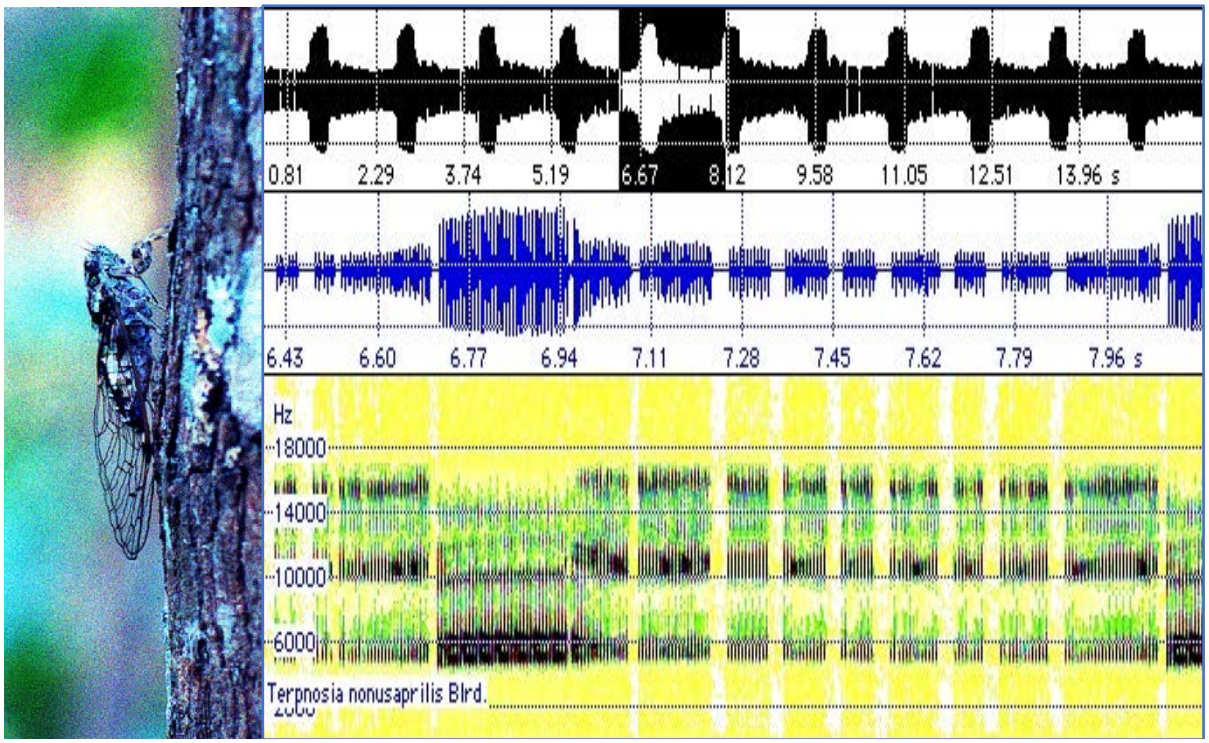
Thank you for following up here.... **End clap**



See you later

MB September 2022

Sketched by Sergio, baladin portraitist, during a dedication of the second published of "Vies et mémoires de cigales".

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Memoir closing my EPHE Review
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Michel M. Boulard

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2022