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METALEPTEA

THE NEWSLETTER OF THE ORTHOPTERISTS' SOCIETY

President's Message

By DAVID HUNTER
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Dear Society members,

While there has been a levelling off of the effects of COVID-19 in some areas, many of us continue to have limitations on our activities and we are having to learn to adapt, much like the insects we work on that have to adapt when faced with challenges. There has been particular disruption to our work in offices or laboratories, though field work has had less disruption because of COVID-19 being less common in many rural areas. And as I have found, many things can be accomplished with online meetings, not only with work but with catching up with colleagues, friends, and family.

And, of course, COVID-19 has made control of locusts more complex than normal, with an upsurge of *Schistocerca gregaria* from East Africa to the India-Pakistan border region and swarms of *Schistocerca cancellata* in Argentina and neighbouring countries.

We have had some good news in that the journal *Zootaxa* has retained its impact factor. The journal was placed on the list to have its impact factor ended because of over-self-citation; apparently too many papers in the journal cite other *Zootaxa* papers. But it turns out that 45% of taxonomic papers on Orthoptera are published in *Zootaxa*, so it is not surprising there is a "high" 43% rate

of citing other *Zootaxa* papers. Holger Braun sent me a letter supporting the retention of the impact factor for *Zootaxa*, which we circulated to members of our society, and thanks to the many of you who signed the letter, *Zootaxa* has been retained on the list of publications having an impact factor.

The many reports of our activities in this issue of *Metaleptea* demonstrate that in spite of limitations, there is continuing success of our work on Orthoptera and related insects: it is with great pleasure that I present another excellent *Metaleptea*, thanks once again to the tireless efforts of Hojun Song and Derek Woller!

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flight (Windhoek-Frankfurt) on March 31st through the German Embassy at Windhoek, but DM's permit to stay at Namibia would expire on March 30th, meaning it would be an issue and DM was required to extend her stay. Fortunately, DM was moved to an earlier repatriation flight on March 29th and did not have any issue to leave. DM dropped the rental vehicle at the Windhoek airport instead of the Cape Town airport.

RMP started to arrange accommodation for three weeks at Windhoek. Unfortunately, the lockdown did not allow exiting the city so the alternative plan of at least collecting nearby was out of question. In a stroke of good luck, one alumnus of University of Michigan was living in Windhoek, she was married with a member of the US Embassy and she suggested RMP to visit the Embassy website and RMP was able to enroll in a repatriation flight program for US citizen and US visa holders. On April 1st RMP flew Windhoek-Lusaka-Addis Ababa-Washington-Chicago-Detroit.

At the end we lost the last week of our month long expedition, but we gathered a lot of ecological information that we will use for future expeditions. It is imperative to report these field observations findings to ignite future research.

Acknowledgements

We want to thank Vanessa Couldridge for all her logistic support in South Africa. Corey Bazelet provided literature to identify *Acanthoplus discoidalis*. Bruno Massa, Daniel Otte and Hojun Song helped us to identify some specimens. University of Michigan authorities were always attentive and supportive to help RMP to return to USA. We would like to thank CapeNature for providing the permit (No. CN44-59-11619) to work in the Cape Floral Region Protected Areas and the Namibian farmers for providing access to their land and their interest in our work.

VIII Brazilian Symposium of Orthoptera and I Symposium of Orthopteroid Insects

By PEDRO G.B. SOUZA DIAS

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In early March of this year, in Águas de Lindoia, a small city in the state of São Paulo, we organized our already traditional meeting on Orthoptera, during the XXXIII Brazilian Congress of Zoology. This time, we went further and organized the first Brazilian meeting on orthopteroid insects, gathering the orthopterists and the small community of colleagues (most of them students) that are studying mantids and phasmids in Brazil. Thus, the VIII Brazilian Symposium of Orthoptera and I Symposium of Orthopteroid Insects occurred on March 4th and 5th.

For this event we increased the participation of students as invited speakers, providing an opportunity for them to present their projects in a congress. We also promoted ten talks, six of them presented by students, and two presented by postdocs. Moreover, 17 studies were presented in the poster session. The presented lectures were: **(1)** "The Orthoptera Collection at the Museu Nacional/UFRJ and the Brazilian orthopterology" by Dr. Pedro G.B. Souza Dias; **(2)** "The resumption of the studies on phasmids (Insecta: Phasmatodea) in Brazil: collections and challenges" by Edgar Blois Crispino and Phillip Watzke Engelking (graduate students); **(3)** "Brazilian tetrigids: where are they?" by Dra. Daniela Santos Martins Silva; **(4)** "*Cornops frenatum frenatum* (Orthoptera, Acrididae): bioecology and possibility of damage to heliconia plantations" by Dr. Marcos Gonçalves Lhano; **(5)** "Mating behavior and the influence of the courtship sound on the reproductive success of two species of Phalangopsidae crickets (Orthoptera, Grylloidea)" by Riuler Corrêa Acosta (graduate student); **(6)** "Orthoptera as environmental bioindicators: first attempts in Brazil" by Dr. Neucir Szinwelski and Victor

Participants of VIII Brazilian Symposium of Orthoptera and I Symposium of Orthopteroid

Prasniewski (graduate student); **(7)** "Dead, but alive: biological collections in the age of "omics"" by Dra. Natallia Vicente; **(8)** "There is still hope: about the Tettigoniidae (Orthoptera: Ensifera) from the Iguaçu National Park, Brazil" by Marcos Fianco (graduate student); **(9)** "The mantids as a symbol of conservation" by João Felipe Herculano (graduate student); **(10)** "Macrophotography in scientific outreach: uniting science and art" by César Favacho (graduate student).

In addition to the talks, we also organized a forum, where we discussed several issues regarding research with orthopteroids in Brazil. Below is a set of some abstracts of the talks.

Participants of VIII Brazilian Symposium of Orthoptera and I Symposium of Orthopteroid

The Resumption of the studies on phasmids (Insecta: Phasmatodea) in Brazil: collections and challenges

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Phasmatodea is one of the few orders in Insecta still lacking a comprehensive phylogeny, and with several unsolved taxonomic questions regarding specially the Neotropical species. In order to explain the major concerns related to stick-insect study in Brazil we focused on basic aspects related to phasmids: taxonomic problems that affect specimen identification; the Areolatae vs Anareolatae situation; species diversity, and general biology. Around 200 species are known for Brazil, with at least twice that number expected to be unknown to science. The history of studies on Brazilian Phasmatodea was also discussed, from the major researchers from the XIX and XX century like Brunner von Wattenwyl, Redtenbacher, Stål, Salvador Toledo de Piza Junior, and others, to their studies describing species, their legacy and problems involved with their work and related Brazilian taxa. Examples, such as brief and vague descriptions based on external morphology, strong sexual dimorphism resulting in different species described for the same taxa, unknown life cycles, type material deposited in foreign museums and distribution range was exemplified by the taxonomic history of *Canuleius sanguinolentus* (Brunner von Wattenwyl, 1907). Some of the most recent works on Brazilian Phasmatodea were used to exemplify the challenges faced regarding entomological data accessibility and phasmid collections situation in Brazil. We listed depositories and collections with available information (Museu de Zoologia da Universidade de São Paulo with around 1300 specimens, Instituto Biológico with 11, and Escola Superior de Agricultura "Luiz de Queiroz" with important type material) and compare it with the majority of other institutions with their unknown situation regarding the existence of phasmid specimens. A summarization of all problems mentioned and possibilities for the future of Phasmatodea research in Brazil was presented, with focus on research grants, partnerships with other researchers and national/international companies.

Brazilian tetrigids: where are they?

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Members of the family Tetrigidae are distributed all over the world and usually live close to water, decomposing soil, and leaf litter. Tetrigids can be distinguished from other grasshoppers by several characteristics, the most important of which are the pronotum partially or completely covering the abdomen, with variable, ornate shape in certain groups; tegmina, when present, reduced and disposed laterally to the body; absent tympanic organ, and tarsal formula 2-2-3. Currently, the family includes about 280 genera within seven subfamilies: Batrachideinae Bolívar, 1887; Cladonotinae Bolívar, 1887; 1907, Lophotettiginae Hancock, 1909; Metrodorinae Bolívar, 1887; Scelimeninae Bolívar, 1887; Tetriginae Rambur, 1838 and Tripetalocerinae Bolívar, 1887. For taxonomists, the major part of systematic studies requires information that comes from scientific collections. Occasionally it is not possible to visit collections, but the digitization of published material (e.g., papers, books) help with this problem. The digitization of collections is also important because sometimes we do not have access to all the details of the organism in the original publications.

This case is particular to tetrigids, since in this group there are few pictures of the types; simple or short descriptions; drawings with positions that privilege few details and non-morphological information. Hence, the digitization solved one of our biggest problems: the relationship between descriptions/ images/drawings and the absence of specific data. Brazilian tetrigid fauna includes 61 species described and, until 2017, none of them were deposited in Brazilian museums. Among them, 30 type species are housed at the Academy of Natural Sciences of Drexel University (ANSP), Philadelphia. This great representativeness of Brazilian species is mainly due to the contributions of Joseph Lane Hancock and two other great tetrigid researchers in the 20th century: James Abram Garfield Rehn and Harold Johnson Grant Jr. This museum is extremely important to all Orthoptera taxonomists. Thus, this collection is considered one of the most important for orthopteroid researchers as well as for tetrigid researchers.

***Cornops frenatum frenatum* (Orthoptera, Acrididae): bioecology and possibility of damage to heliconia plantations**

Prof. Marcos Gonçalves Lhano
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In this lecture I will present the results of several studies that we conducted at our laboratory (called Laboratory of Insect Ecology and Taxonomy – LETI) to better understand the biology and ecology of *Cornops frenatum frenatum* (Marschall, 1836) (Acrididae, Leptysminae). The Neotropical grasshopper *C. f. frenatum* was first found in 2007 as one of the main pests of *Heliconia* spp. L. (Zingiberales, Heliconiaceae) plantations in Brazil. Significant damages and loss of the quality in the plant cultures can be caused by this species, which generates significant economic losses in the floriculture market. *C. f. frenatum* is a phytophagous grasshopper, which is gregarious in its initial instars of development and commonly found in plantations of *Heliconia* spp., causing great damage to these ornamental tropical plants. Environmental factors, such as photoperiod, temperature, ,and food availability, have a direct influence on the development of those insects and the study of their biology is essential to establish adequate programs of pest control. So, we evaluated the influence of the photoperiod on the nymphal development of *C. f. frenatum* in different photophases (L) and scotophases (E) (I = 24 L, II = 12L/12E and III = 24E), under controlled temperature (25 °C) using B.O.D. incubators. Longer development times were observed in individuals undergoing treatment III (24E), where the females needed an average of ± 98 days to complete the nymphal phase, whereas the males needed ± 87 days. Also, we verified that males present 4 to 6 instars and females 5 to 7 instars, depending on the photoperiod. The major survival of the specimens was found in treatment I (24L) and the lowest survival, in treatment III (24E). The circadian rhythm was also studied in grasshopper nymphs under the treatment II (12L/12E). It was found that most ecdyses occurred during the day (79%), and the passage from the last instar to the adult stage was also higher during this period (93%). Regarding mortality, most of them occurred during the night period. Observing these data, we inferred that individuals of *C. f. frenatum* had their development associated with the need of light. After we verified that the photoperiod exerts an important environmental condition (Zeitgeber) for the development of *C. f. frenatum*, we started the studies to describe the phenology of *C. f. frenatum* in culture of *Heliconia* sp. in an anthropized area. Collections were performed during 24 months in a farm producer of tropical flowers, located in Bahia state, where individuals were randomly sampled. For analysis of environmental influence on these population dynamics, climate data were also obtained (temperature, solar radiation and humidity). It was observed that the population of *C. f. frenatum* is multivoltine, featuring monthly variation in frequency of adults and nymphs, associated with the monthly variation of the humidity, temperature and solar radiation. The highest abundances were observed in months of low temperature and direct sunlight and high humidity. *Cornops frenatum frenatum* lives permanently on plants of *Heliconia* sp., feeding on them and ovipositioning on them. In laboratory, we conducted tests of food preference and acceptability of *C. f. frenatum* to different plant species. In the acceptability test with no chance of choice, were offered 12 different plants for nymphs (*Heliconia*, *Alpinia*, *Brassica*, *Canna*, *Etlinger*, *Lactuca*, *Maranta*, *Strelitzia*, *Zingiber* and three varieties of micropropagated *Musa*). We observed that four species presented high acceptability by the grasshoppers: *H. psittacorum* (host plant, 100% survival of nymphs), *C. indica, M. arundinacea* (both 96% survival rate) and *S. reginae* (63% survival). Although it had not been registered, it can be inferred that *C. indica*, *M. arundinacea* and *S. reginae* are susceptible to *C. f. frenatum* attack and may become their alternative host in the absence of a known host. Besides that, we also studied the mandibles type of *C. f. frenatum* and observed that it has a graminivorous type of feeding habit. Besides evaluating *C. f. frenatun* food preference, we studied the presence of its natural enemies in heliconia plantations and evaluated the potential of the fungal pathogen *Metarhizium acridum* (Driver & Milner) J.F. Bisch., Rehner & Humber (2009) (Ascomycota: Hypocreales) (CG423 strain) for its control. We found that *C. f. frenatum* nymphs are more susceptible to *M. acridum* when compared with adults. We concluded that entomopathogenic fungi present promising results in the control of those grasshopper species.

Mating behavior and the influence of the courtship sound on the reproductive success of two species of crickets Phalangopsidae (Orthoptera, Grylloidea)

Riuler Corrêa Acosta

The reproductive behavior of crickets includes a set of events that begin with the attraction of females to males by means of acoustic signals. The sexual recognition occurs through contact among antennae, triggering the court rituals, which simultaneously involve the emission of acoustic signals, vibrations of the antennas, touches of antennae and palps, in addition to

body vibrations. Although these signals have a definition based on elaborate behavior, little is known about their real meaning. Thus, the objective here is to present the functions of the courtship sound in two species of crickets Phalangopsidae. Females of each species were subjected to three types of males: males containing the whole tegmina, males with clipped tegmina (mute males) and mute males with playback. Both experiments with mute males did not have the acoustic production by the males. In the long-legged cricket *Endecous* (*Notendecous*) *onthophagus* (Berg, 1891), the courtship sound is directly associated with the mating success, because the males who do not produce sounds do not copulate. The same experiments were carried out with the cricket *Adelosgryllus rubricephalus* Mesa & Zefa, 2004. The results showed that the courtship sound is not necessary for copulation, since in all encounters there was copulation. However, phonotaxis tests have shown that the *A. rubricephalus* courtship sound is effective for attracting females over short distances. Through the results obtained, we provide information that the function of the acoustic signals is associated with the repertoire composition, mainly due to the fact that *E. onthophagus* has a complete repertoire, whereas *A. rubricephalus* does not have a calling sound.

Orthoptera as environmental bioindicators: First attempts in Brazil

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In the last 30 years, Brazil has produced about 37 articles involving the ecology of Orthoptera, eight articles that include Ensifera and 29 with Caelifera. Most of these articles, however, have not achieved significant interest from the scientific community given their low impact factor and the number of citations they have reached, in addition to other factors that we will not address here. Over these 30 years, several data were collected, both for taxonomy, bioacoustics, cytogenetics, molecular biology, and ecology. The largest research project with Orthoptera ever approved in Brazil, the "SISBIOTA-Orthoptera" had an investment of 1.2 million reais and enabled areas of significant importance in Brazil to be sampled for research in several areas of knowledge. During this project, a large amount of data were produced. Other projects with less financial support were also developed and also produced a series of data that could be used for ecological works. So, if data collection occurs, why is Orthoptera's ecology work less represented? In this lecture we analyzed some Orthoptera ecological papers and unpublished works in order to identify the reason for the lack of ecological works. We have identified at least seven gaps that make it impossible or fragment the work with Orthoptera ecology: i) no species determination; ii) missing true replicates; iii) lack of specific coordinates; iv) differing sample design; v) missing environmental characteristics; vi) missing functional characters; and vii) there is no sharing of data or a combined database. The first item is unfortunate and in several regions of Brazil where Orthoptera are collected, species determination is practically impossible, either due to the great and unknown biodiversity or the lack of taxonomists in the area. Even with all the excellent taxonomists we have in Brazil, it would be practically impossible for them to be able to identify/describe/publish all the material collected during the SISBIOTA-Orthoptera, for example. And if they did, it would be at the cost of abandoning all the personal work already started. This is the main gap for ecology work, without determining species it is impossible to carry out quality work in the area of ecology. Brazil urgently needs to invest in the training of taxonomists, as it did some time ago. True replicates, specific coordinates, coincident sample design, and environmental characteristics are the basis for ecology work. Before 2010, a series of sample designs were designed, which compromises the comparison of data today. Geographic coordinates did not mark the collection point, but the location/area sampled; true replicates were scarce, and the characteristics of the environment were not always collected/mentioned. After the SISBIOTA-Orthoptera, a standardization was proposed, allowing comparisons, however we still run into the first problem. The last items are gaps that can be easily resolved, but they represent gaps because the information is not available in databases, so it is not easily accessible. Perhaps the new OSF catalog (Orthoptera Species File) could consider including such information in its database and facilitating access to these data. Although we highlight a series of gaps that hinder ecology work with Orthoptera in Brazil, we are not standing still. We have a group that has started to collaborate (taxonomists, ecologists, cytogeneticists, etc.), seeking to strengthen the knowledge of Orthoptera in our country. The unfolding of Brazilian Orthoptera ecology is near.

There is still hope: about the Tettigoniidae (Orthoptera: Ensifera) from the Iguaçu National Park, Brazil

Marcos Fianco

Tettigoniidae is the most speciose family within Orthoptera, occupying all vegetational strata, from litter to canopy. Most katydids are related to forests, and the production of acoustic signals is paramount to their biology. This work is a presentation of a faunistic inventory of katydids that we have done at the Iguaçu National Park, a large remnant of Atlantic forest in southern Brazil. Additionally, we describe the calling song performed by males. A total of 87 species were collected, 66 of them identified in species level, and 11 of them corresponding to undescribed species (new to science). The most abundant subfamily was Phaneropterinae (56 taxa), followed by Conocephalinae (22), Pseudophyllinae and Meconematinae (4 each), and Pterochrozinae (2). We were also able to record and describe the calling songs of 36 species, 31 not described until then. Sounds were recorded for species of Phaneropterinae (24), Conocephalinae (8), Pseudophyllinae (3), and Pterochrozinae (1).