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METALEPTEA

THE NEWSLETTER OF THE ORTHOPTERISTS' SOCIETY

President's Message

By DAVID HUNTER
President
davidmhunter100@gmail.com

Dear Society members,

A Happy New Year 2023 to everyone—may you have every success in the coming year! Preparations are continuing for our upcoming 14th International Congress of Orthopterology (ICO) to be held in Mérida, Yucatán, México in October. Mario Poot-Pech, President of the Organizing Committee has been organizing the Congress in collaboration with National and International Plant Protection Agencies who are planning to send substantial numbers of delegates to the Congress to give us a good basis for a successful event. And the Yucatán is a wonderful place, with the stunning beaches of the Rivieria Maya, biosphere reserves, and the pyramids of the ancient Mayan civilization all on display. It will be a real opportunity for all of us to get together once again. ¡Bienvenido a Yucatán!

In this regard, it is time for all of us to think about what we will present at the Congress. The ICO website (**https://ico2023mexico.com/**) has information on registration, accommodation, presentation requirements, and abstracts. There have been some symposia proposals covering the latest research in Latin America, several on locust management (including the use of biopesticides and latest techniques), group behavior, and conservation. In Morocco, we also had symposia on a wide variety of topics

from the effects of climate and environmental change to sexual selection, molecular aspects of taxonomy, physiology, communication and behavior, and evolutionary biology to name a few. So, with the deadline for symposia proposals being the end of January (we will take proposals into February!) - consider your part in making our next Congress a success.

I also bring to your attention our annual call for applications for the **Theodore J. Cohn Research Fund**. If you are a student or postdoctoral member of our Society or have members in your research group who are, we encourage applications ahead of the March 31 deadline. You can see reports on the work of past successful applicants in the present and recent issues of *Metaleptea*. Application details are in the current *Metaleptea* and on the **Orthopterists' Society website**.

No doubt you have heard of the devastating floods in Pakistan a few months ago and the massive aid requirements. I will be traveling there

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as part of my consultancy with Asian Development Bank to give support to the recovery of the agricultural sector from devastating losses, which many are saying are a consequence of climate change.

Once again, enjoy another excellent *Metaleptea*, thank you, Hojun Song, Derek A. Woller, and everyone who has contributed!

The 14th International Congress of Orthopterology: October 2023!

By MARIO A. POOT-PECH
President, Organazing Committee
mpootpech@gmail.com

The International Congress of Orthopterology draws near, and the history and flavor of the Mayan culture is already in the air. We are hosting events that will be a mix of flavors: symposia, meetings, forums, cultural, and archaeological events. For now, it is important to keep in mind two important dates:

31 January, 2023: Deadline for symposia submissions or other academic proposals, such as workshops, meetings, forums, etc.

30 April, 2023: Deadline for abstract submissions.
Please send proposals to: **orthoptera@ico2023mexico.com**.
Please contact us with any questions.

You can check the proposal requirements here: **https://ico2023mexico.com/symposium-requirements/**

The Congress will be in the Hotel "El Conquistador" in Mérida City, Yucatán State, México.

14th INTERNATIONAL CONGRESS OF ORTHOPTEROLOGY
Mérida, Yucatán, México

The 14th International Congress of Orthopterology Grants and Awards

By DAVID HUNTER
President
davidmhunter100@gmail.com

GRANTS

2019 Travel Grants to the 14th International Congress of Orthopterology (ICO) in México, October 16-19, 2023.

Call for Applications

The Orthopterists' Society will provide a total of $15,000 for travel to 14th ICO. The funds will be for 5-8 separate grants of varying amounts, which will cover costs of travel to the ICO, plus congress hotel and registration expenses. The grants are mainly for students and young professionals who are giving a presentation at the congress (papers or posters) and who have insufficient funds for travel and who need either partial or complete funding for their travel.

In order to allow planning by recipients, applications should be sent to David Hunter (davidmhunter100@gmail.com) by May 31, 2023.

AWARDS

All awards will be presented at the 14th ICO in México, October 16-19, 2023.

2023 Ted Cohn Award for Excellence as a Young Professional Orthopterist Call for nominations (2 Awards Available)

Call for Applications

This award is for young professionals, aged 35 or less, who are at the last stage of dissertation, or doing a postdoc, or even early-stage research or another relevant professional position. There are two $2500 awards, one for applied and another for non-applied orthopterists. Because this is an excellence award, it should be based on research products, such as publications. The application is based on a 1-page personal statement, C.V., the applicant's most significant publication, and 1-2 letters of support.

Proposals should be sent to David Hunter (davidmhunter100@gmail.com) by August 31, 2023. The OS Executive Board will choose amongst the candidates.

2023 D.C.F. Rentz Award for Lifetime Dedication to Orthopterology

Call for Nominations

This award is intended to recognize the outstanding contributions of the nominee to Orthoptera research, particularly the work of retired or Emeritus orthopterists who have devoted their entire life to the study of Orthoptera. Complete applications consist of a letter of nomination with a brief description of the accomplishments of the candidate proposed, along with one or two letters of support.

Proposals should be sent to David Hunter (davidmhunter100@gmail.com) by August 31, 2023. The OS Executive Board will choose among the candidates and the awardees will receive a personalized award certificate to reflect the nature of their contributions to Orthopterology.

2019 Sir Boris Uvarov Award in Applied Acridology

Call for Nominations

This award bears the name of the Father of Modern Acridology, the famous Russian-English Orthopterist, Sir Boris Uvarov (1886-1970). Co-sponsored by the Association of Applied Acridology International and the Orthopterists' Society, this award recognizes outstanding contributions that have a direct impact on both the theory and practice of locust and/or grasshopper management. The award consists of a plaque and a $4000 prize. Nominations can be submitted by any person or organization and self-nominations will be accepted. Nomination packages must include a C.V. of the nominee (5 pages maximum) and a letter of recommendation specifically stating the nominee's significant contributions to the theory of locust and/or grasshopper management in the form of publications, research grants, student advising, and presentations at national and international scientific forums as well as evidence of major impact into the practice of locust and/or grasshopper management at national or international level.

Nominations should be sent by email to Alexandre Latchininsky (alexandre.latchininsky@fao.org) by August 31, 2023. Nominees/candidates will be judged by an award panel consisting of Orthopterists' Society members with international expertise in both theoretical and practical locust and/or grasshopper management and will include at least one previous recipient of the award.

For more information, please visit **https://orthsoc.org/resources/grants-awards/ico-grants-awards/**

The Theodore J. Cohn Research Fund: A new call for applications for 2023

(Application Deadline: March 31, 2023)

By MICHEL LECOQ
Chair, Theodore J. Cohn Research Fund Committee
mlecoq34@gmail.com

Dear fellow Orthopterists,

I have the pleasure to announce a new call for applications for The Theodore J. Cohn Research Fund. This research grant is primarily to fund research projects in Orthoptera (*sensu lato*) by young researchers, often as part of a master's or Ph.D., though Postdoctorates may also be funded. A total amount of $15K per year is available and it is possible to fund research grants for up to $1,500 per grantee.

I particularly encourage students and young researchers from Africa and Asia to submit a project. The committee will examine all applications with the same care and attention. The intrinsic quality and originality of the research project will be the only criteria.

Full detailed information can be found on the Orthopterists' Society website, on the "Grants & Awards" page:
http://orthsoc.org/resources/grants-awards/the-theodore-j-cohn-research-fund/

Proposals should be submitted in the suggested format and limited to the number of pages indicated. As usual, proposals should be submitted at the following address:
Michel Lecoq, Manager, The Ted Cohn Research Fund
e-mail: mlecoq34@gmail.com

As a reminder, those whose projects have been selected are required to submit an article presenting their main results in a future issue of *Metaleptea*.

I wish all of you the best for the year 2023!

The 2023 OSF Grants Funded

By MARIA MARTA CIGLIANO
Museo de La Plata, División Entomología, FCNyM-UNLP
CEPAVE, CONICET-CCT La Plata, ARGENTINA
cigliano@fcnym.unlp.edu.ar

Dear members of the Orthopterists' Society, I am glad to let you know that our program for supporting the **Orthoptera Species File** has come back on track after the impasse that we had due to problems with the COVID-19 pandemic.

For 2023 Orthoptera Species File Grants, we received and evaluated 22 proposals by applicants from 15 countries: Australia, Austria, Brazil, Cameroon, Colombia, Cyprus, Germany, India, Malaysia, Nepal, Pakistan, Portugal, Singapore, The Netherlands, and the United States of America. Twelve proposals (listed below) were selected by the OSF Grants Committee for the total amount of $47,000 USD. The proposals were selected based on the amount of data (images, specimen records, and sounds) expected to be added to the Orthoptera Species File. Also considered was the candidates' expertise on the studied group, the quality of the proposal and its relation to a taxonomic research project, if the project is related to a region of the world where Orthoptera are understudied, as well as if the project has an adequate budget. As an exception, one project related to the Cockroach Species File has been included.

Projects funded for 2023

Austria:

1) Slobodan Ivković (Trier University, Germany) & **Laslo Hovart** (Austria). Taxonomy, bioacoustics and distribution of Orthoptera in the Western Balkans (North Macedonia II)

Brazil:

2) Lucas Denadai de Campos (Universidade de São Paulo, Brazil). Photographic database of Gryllinae and Oecanthinae crickets (Ensifera, Grylloidea) type specimens deposited in the Academy of Natural Sciences of Philadelphia (ANSP)

3) Neucir Szinwelski (State University of Western Paraná, Brazil). The Orthoptera from Paraná: Reducing Orthoptera biodiversity gaps in a threatened Atlantic Forest hotspot, and adding in OSF data from one of the most diverse state in Brazil

Cameroon:

4) Charly Oumarou-Ngoute (Faculty of Sciences, University of Douala, Cameroon). The grasshopper (Orthoptera, Caelifera) diversity of Mount Bamboutos in the Cameroon Volcanic Line

Colombia:
5) Oscar Cadena (Universidad Distrital Francisco José de Caldas, Colombia). Study of Melanoplinae (Acrididae), Mecopodinae and Hexacentrinae (Tettigoniidae) of high Andean forests and paramos of the eastern mountain range of Colombia - Extension of the project to areas not covered, mainly in the south of the eastern range, and the central range of the Colombian Andes

India:
6) Ranjana Jaiswara (Panjab University, India). Photography of male and female genitalia of Gryllinae (Orthoptera,Grylloidea) type specimens at NHM, London

Malaysia:
7) Amira Muhammad Aqilah (University of Malaya, Kuala Lumpur, Malaysia). Digitalization of Orthoptera Types from museum collections in Malaysia.

Nepal:
8) Madan Subedi (Agriculture and Forestry University, Ghyalchok, Gorkha, Nepal). Photographic records of the groundhoppers (Orthoptera: Tetrigidae) of the unexplored wetlands of Ramaroshan, Accham, Nepal

Pakistan:
9) Sundus Zahid (Mansehra. KPK, Pakistan). Digitization of (Pakistani and Sri Lankan) type specimens deposited in the Natural History Museum (NHM), London

Singapore:
10) Ming Kai Tan (National University of Singapore). Bridging the Sampling Gaps for Orthopterans in Southeast Asia: From Malay Peninsula to Borneo

USA:
11) Heidi Hopkins (Ithaca College, New York, USA). Photographing primary Blattodea types held in Australian museums and searching for an elusive Australian desert cockroach
12) Ricardo Mariño Pérez (Museum of Zoology, University of Michigan, USA). Caelifera type collection of Bernice P. Bishop Museum (BPBM) in Orthoptera Species File

A Call for Manuscripts for a Special Issue of *Insects*

"Locusts and Grasshoppers: Bionomics, Distribution, and Population Management"

By ALEXANDRE V. LATCHININSKY
Food and Agriculture Organization of the United Nations, Rome, ITALY
alexandre.latchininsky@fao.org
MICHAEL G. SERGEEV
Novosibirsk State University and Institute of Systematics and Ecology of Animals
Novosibirsk, RUSSIA
mgs@fen.nsu.ru

Dear Colleagues,

Locusts, grasshoppers and other orthopteran insects are an intrinsic part of grassland ecosystems. Among them, locusts have been notorious pests since the dawn of agriculture. Infamous for their voracity, fecundity, and transboundary migratory capabilities, they often damage crop fields and rangelands and, thus, jeopardize national and regional food security. The eruptive characteristics of their long-term dynamics lead to extremely irregular outbreaks. Despite numerous and diverse studies, we still do not fully understand which changes and relationships trigger outbreak development.

At the same time, grasshoppers and other orthopterans are one of the most widely distributed and abundant groups of animals in grasslands. They consume the main part of primary production, intensify the local fluxes of matter and energy, accelerate plant growth, and provide other ecosystem services. Many rare and endemic orthopterans deserve conservation efforts, but, simultaneously, locust outbreaks may develop within the habitats of rare species. This means there are contradictions between approaches of plant protection and those of conservation biology. Conservation strategy can prevent or limit anti-locust treatments, especially those using insecticides.

Furthermore, locust invasions have become even more severe due to climate change. This is why we should develop innovative approaches to safeguard the ecosystem services of orthopteran insects and, if necessary, apply economically and environmentally acceptable measures to manage their populations.

We are pleased to inform you that the journal "***Insects***" (Impact Factor 3.141) published a call for submissions to the Special Issue **"Locusts and Grasshoppers: Bionomics, Distribution, and Population Management,"** for which we will serve as Guest Editors:
https://www.mdpi.com/journal/insects/special_issues/9WA5CA9EX2
The deadline is 1 September 2023.

THE CRICKET COURSE 2023

Archbold Biological Staion, FL, USA, July 3-7, 2023

By HOJUN SONG
Texas A&M University
College Sttation, TX, USA
hsong@tamu.edu

(Photo credit: Piotr Naskrecki)

We are excited to offer the first ever CRICKET COURSE from July 3-7, 2023, at the **Archbold Biological Station (ABS)** in Florida, USA!

Rationale for a new course: Although katydids, crickets, and allies represent an excellent model system for ecology, behavior, physiology, bioacoustics, and evolutionary biology, there is currently no platform in North America to provide structured training on these insects. As part of the National Science Foundation grant titled "NSFDEB-NERC: Multidisciplinary approach to bioacoustics: Integrating phylogenomics, biophysics, and functional genomics to unravel the evolution of hearing and singing in katydids, crickets, and allies" (DEB-1937815), we have assembled a team of currently active specialists to create and offer a unique workshop called "THE CRICKET COURSE." This **5-day workshop** is targeted towards students, amateur naturalists, museum scientists, ecologists, and evolutionary biologists in order to provide hands-on training in identification, ecology, behavior, and bioacoustics of these amazing insects. The course will include lectures on taxonomy, phylogeny, biology, bioacoustics, and ecology of Ensifera, instructor-led collecting expeditions taking advantage of the diverse habitats found in Central Florida, exercises on taxonomic identification, specimen preservation, field observation, and sound recording and analysis.

Instructors: Dr. Hojun Song (Texas A&M University), Dr. Fernando Montealegre-Z (University of Lincoln, U.K.), Dr. Nathan Bailey (University of St. Andrews, U.K.), Mr. Brandon Woo (Texas A&M University), and Mr. Charlie Woodrow (University of Lincoln, U.K.)

Venue: THE CRICKET COURSE will take place at the ABS near Lake Placid, Florida, one of the most renowned biological stations in the world. ABS (5,193 acres) and the Archbold Reserve (3,648 acres) together comprise an 8,840-acre globally-significant preserve, located in the Florida scrub, one of the most distinctive natural habitats in the United States. Of course, it is home to numerous orthopterans, which makes ABS a perfect place to learn about crickets and katydids.

Participant Acceptance Criteria: THE CRICKET COURSE is open to all interested individuals (professionals, motivated amateurs, such as citizen/community scientists, undergraduate and graduate students, postdocs, and professors). Priority is given to applicants currently researching crickets, katydids, or other orthopterans and to those biologists for whom the course will have a significant impact on their research and/or teaching. An entomological background is not required. We aim to include students with interests and experiences in biology, including systematics, evolution, ecology, bioacoustics, and conservation. We also aim to enhance diverse perspectives through this event and highly encourage individuals from diverse backgrounds and underrepresented groups to apply. THE CRICKET COURSE is presented in English and is limited to 15 participants.

Cost: Course fees are estimated at $800 (USD). The fees cover meals, lodging, station fees, and local transportation for field trips. Participants are responsible for their own transportation costs between home and Ft. Myers Airport (RSW) from where we will take them to ABS, or between home and ABS by car.

Student Scholarships/Tuition Waivers: For accepted students traveling from the U.S. and Canada who demonstrate financial need, a limited number of partial tuition waivers are available for up to $500 (USD).

For more information about the course and instructors, please visit: **https://schistocerca.org/SongLab/index.php?page=the-cricket-course**

To apply: Please use this **Google Form**. The deadline for application is **March 31, 2023.**

Distributed European School of Taxonomy (DEST) Orthoptera Taxonomy and Conservation

Konitsa, Greece: July 17-23, 2023

By LUC WILLEMSE
Naturalis
Leiden, NETHERLANDS
luc.willemse@naturalis.nl

Under the auspices of the Distributed European School of Taxonomy (DEST), Naturalis Biodiversity Center (Netherlands) and the Department of Biological Applications and Technology of the University of Ioannina (Greece) will organize the first European summer school on Orthoptera taxonomy and conservation, accounting for 5 ECTS. The summer school will be hosted in the beautiful town of Konitsa in northwest Greece, in the heart of Vikos-Aoos Unesco Geopark from July 17 to 23, 2023.

This training course focuses on Mediterranean grasshoppers, crickets, and bush crickets, and combines theoretical knowledge with fieldwork. It consists of two parts: Four online interactive lectures will introduce participants to the magical world of grasshoppers in a versatile way, including topics on morphology, habitats, bioacoustics, sampling techniques, ecology, ethics, laws, and collecting regulations. The second part complements the entomological lectures, but focuses on fieldwork and lab sessions. Students will be trained in species sampling and identification *in situ*, specimen collection, preparation, and identification in the lab via stereoscopy, sound recording techniques, and macro-photography. They will also design and implement small-scale field experiments. The program is enriched with field excursions around Konitsa agricultural landscapes, such as the magnificent mountainous landscapes of Grammos near the Amarantos thermal springs of high geological interest, in the roadless area of Smolikas mountain, and in the wetlands of Lake Pamvotis in Ioannina. The course language is English.

The summer school is co-organized by Naturalis Biodiversity Center (Netherlands) and the Department of Biological Applications and Technology of the University of Ioannina under the auspices of the Distributed European School of Taxonomy-DES. The event is kindly hosted and supported by the municipality of Konitsa, courses will be held in the Center of Environmental Education of Konitsa, and accommodation will be offered in the student hotel of the municipality. The Feraki Fund, the University of Ioannina, and the Vikos-Aoos Unesco Global Geopark also kindly support the event.

Five orthopterists will form the core teaching group: Prof. Dr. Axel Hochkirch (University of Trier, Dep. of Biogeography, Germany), Prof. Dr. V. Kati (University of Ioannina, Dep. of Biological Applications & Technology), Baudewijn Odé (M.Sc) (FLORON, Netherlands), Roy Kleukers (M.Sc) (EIS Kenniscentrum Insecten, Netherlands), and Luc Willemse (M.Sc.) (Naturalis Biodiversity Center, Netherlands). Besides the core teaching group, guest tutor Dr. Haritakis Papaioannou (Vikos-Aoos Geopark) and others will be invited.

The course is open to enthusiastic students at any level of studies (undergraduates, MSc or PhD students), preferably with (but also without) experience in entomology, as well as post-graduates, young scientists, and (non)-professionals interested in grasshopper taxonomy, ecology, conservation, and field sampling. We welcome applications from all over Europe. A number of 15 to 20 applicants will be selected to attend the school in 2023.

The registration fee is €300 and covers accommodations, transport during the summer school, subsistence costs, and the use of equipment. Participants must cover their travel expenses to and from Konitsa and health insurance.

The course will be announced toward the end of January 2023 via the DEST website (**https://cetaf.org/dest/upcoming-courses/**), which will contain links, additional information, and a link to an application form.

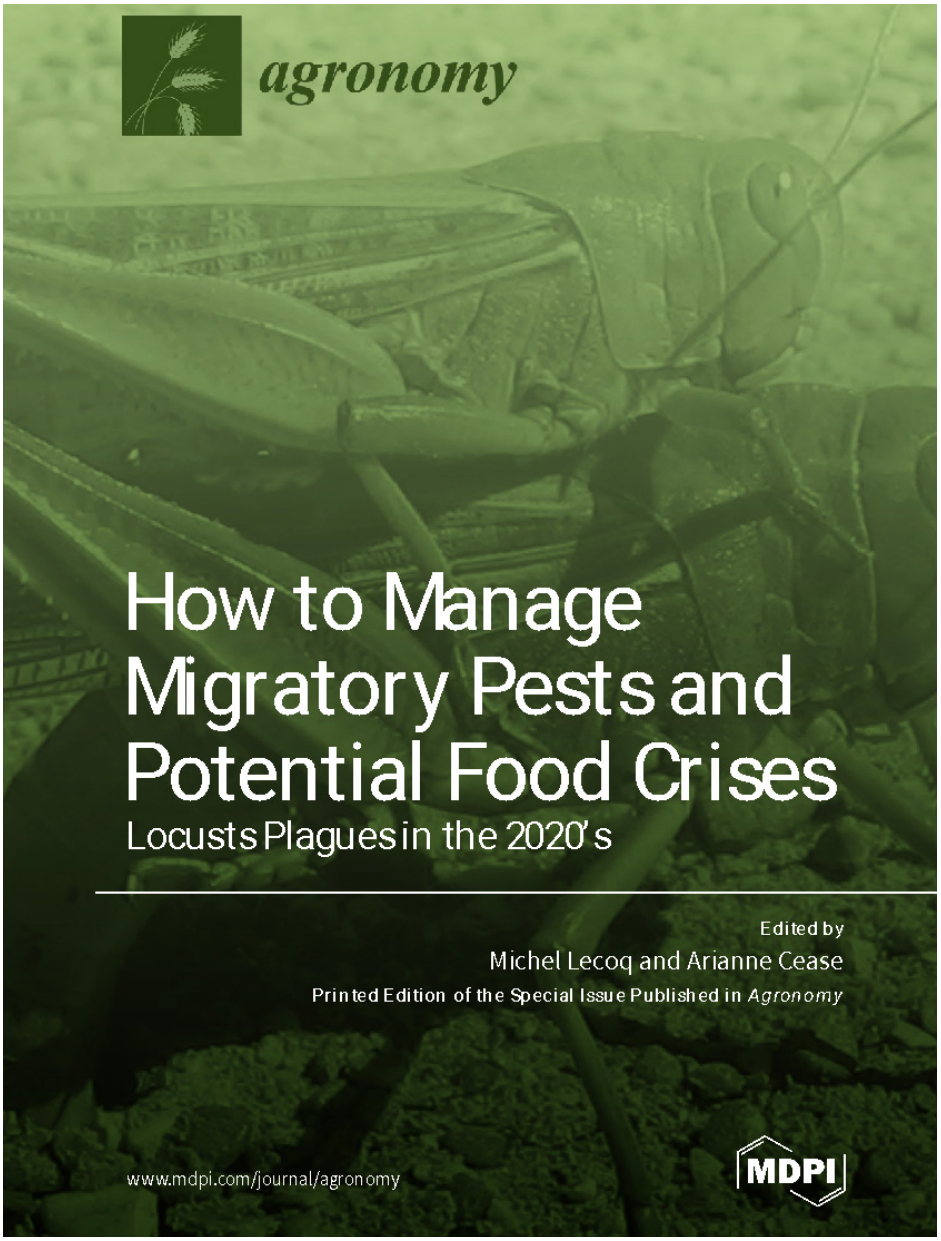
For more information please contact Luc Willemse (luc.willemse@naturalis.nl).

Book Announcement: *Locusts Plagues in the 2020's*

By **MICHEL LECOQ**
mlecoq34@gmail.com
ARIANNE CEASE
Arizona State University, AZ, USA
acease@asu.edu
Guest Editors

Dear Colleagues,

We are very pleased to inform you of the online publication, on the MDPI platform, of our book ***"How to Manage Migratory Pests and Potential Food Crises: Locusts Plagues in the 2020's."*** This book is a compilation of articles from a special issue of the journal *Agronomy*. It gathers the contributions of 54 authors from 19 countries in North and South America, Europe, Africa, Asia, and Australia. It covers topics related to the main species of economic importance, in particular the desert locust, Italian locust, Central American locust, brown locust, Moroccan locust, and migratory locust. Also, it mobilizes diverse disciplines ranging from ecology, biology and biogeography to social sciences and political philosophy. Throughout the pages and articles, this book aims to shed light on some overarching questions: 1) what have we learned from historical outbreaks; 2) how serious is the threat; 3) what research is ongoing and is needed to better manage these insects; 4) how should the world respond to plagues today, especially in the context of climate change; 5) are recommended preventive strategies really effective and what are the constraints to their application; and 6) is there a possibility to make better use of biological alternatives to chemical pesticides? We hope that this book will contribute by highlighting recent research and management advancements, and stimulate new activities to improve management strategies for these dangerous pests that have plagued humanity for millennia.



This book is freely accessible on the MDPI Books platform and you can also order a hard copy: **https://www.mdpi.com/books/book/6355**

Reference:

Lecoq M., Cease (Eds.), 2022. *How to Manage Migratory Pests and Potential Food Crises: Locusts Plagues in the 2020's*. Agronomy (Special Issue). MDPI, Basel. 344 pp. https://doi.org/10.3390/books978-3-0365-5751-9 (registering DOII)
ISBN 978-3-0365-5752-6 (Hbk);
ISBN 978-3-0365-5751-9 (PDF)

Regional Reports - What's happening around the world?

North America

By KATHLEEN KING
Regional Representative
USDA-APHIS-PPQ, Wyoming, USA
butterfliekisses2u@hotmail.com

Happy New Year! I hope that you are healthy and happy. Ready for some fun Orthoptera updates from North America and Canada?

Orthopterist colleagues in Canada reported several exciting updates.

First, two scientific papers were recently published:

- Meyhoff, Sejer D., Johnson, Dan L., Ellert, Ben H., Lutes, Katelyn. 2022. Seasonal changes of stable isotope signals in the primary feathers of plains sharp-tailed grouse. Wildlife Society Bulletin Dec 2022. https://doi-org.ezproxy.uleth.ca/10.1002/wsb.1412
- Meyhoff, Sejer D., Johnson, Dan L., and Bazinet, Scott. 2020. Fall diet in sharp-tailed grouse (*Tympanuchus phasianellus jamesi*) and consumption of the grasshopper *Melanoplus dawsoni* in Alberta, Canada. Food Webs 24: e00153

Second, there is an update to a long-term project which lists the Orthoptera of Canada. The "List of Orthopteroid Insects of Canada, with Common Names" was prepared by Dan Johnson in March 2014, at the request of Environment Canada. This was updated and presented at the National Grasshopper Management Board Meeting in February 2017 at the meeting in Colorado, USA. In his update, Johnson reported current research on grasshopper populations in Canada, including analysis of long-term survey data, and updates to the national list of Orthoptera. However, it was replaced by a separate list produced in 2019 by the Biological Survey of Canada.

Third, some great presentations were given at the Entomological Society of Alberta Annual Meeting in October 2022. These four presentations and their abstracts are as follows:

1. Johnson, D., Dueck, E., Schramm, D., Kawchuk, L., Meyhoff, S., Hudson, A., Johnson, D., Uloth, K., and Brust, M. **Regional comparisons of DNA of a grasshopper (*Melanoplus bruneri*) found in Peace regions of Alberta, with populations of this species in southern Alberta, east-central Alberta, British Columbia, and Wyoming.** Entomological Society of Alberta Annual Meeting Oct 21, 2022

Abstract: Bruner's spur-throat grasshopper, *Melanoplus bruneri*, is a prominent species in northern and foothills counties, and has been increasing in abundance. Apparent two-year fluctuations in abundance have been documented in the last decade or more of surveillance in northern counties by the Alberta Insect Pest Monitoring Network Staff, Alberta Agriculture and Forestry. Our previous research determined the geographic range of the lagged time series (even and odd years), estimated hatching and development models, and found from field evidence that the northern population has a very low rate of parasitism and a very low rate of pathology. We collected or obtained specimens of *M. bruneri* from Peace regions in Alberta, Peace regions in British Columbia, Cold Lake, Alberta, Cypress Hills, Alberta, Magrath, Alberta, other Alberta locations, and Wyoming. Anatomical dimensions of specimens were measured for regional comparisons. We extracted DNA (Qiagen DNEasy), and used PCR amplification to investigate genetic variation of single nucleotide polymorphisms (SNPs) of 51 individuals (typically 6 to 8 individuals per location) from the regions of origin. Comparisons were based on SNP variation in the 3' end fragment of cytochrome c oxidase subunit I (COI), which is believed to be less conserved than the main COI gene, and therefore more capable of detecting regional differences in genetic variation. Sequences, determined by Azenta Life Sciences, USA, were aligned using MEGA 11.0. DnaSP 6.0 was used to find haplotypes and a haplotype network was generated using PopART 1.7. Haplotype and nucleotide diversity in each population was calculated in DnaSP 6.0. A total of 21 haplotypes were detected, by including a range of numbers of base pair differences to define haplotypes. Haplotype diversity and nucleotide diversity were compared among source regions, with the goal to determine differences between the Peace, Alberta samples (Tangent, Manning, and locations around Peace River) with Cold Lake, Cypress Hills, Magrath, Mayerthorpe, Vanderhoof, Westlock, and Wyoming to assess possible unique qualities of the Peace populations.

2. McIlwraith, E., Johnson, D., Secrist, G., and Richter, B. **Monitoring grasshoppers and preparing plans for sustainable pest management in the City of Lethbridge.** Entomological Society of Alberta Annual Meeting Oct 21, 2022

Abstract: Warm, dry summer weather over several years resulted in increased survival, growth, and reproduction of the two-striped grasshopper, *Melanoplus bivitattus*, at the interface of Lethbridge residential properties and agricultural land. During unusually hot weather in July, 2021, large numbers of late-instar and adult two-striped grasshoppers unexpectedly moved into lawns and gardens. The City of Lethbridge formed a Grasshopper IPM plan that included public information, regular monitoring in source roadside grass and adjacent fields (late summer 2021 and May to October, 2022), grasshopper species composition tracking, movement mapping, assessment of abundance of natural enemies and pathogens of two-striped grasshopper, and planning for non-toxic control actions where they might become warranted. The results yielded a unique regularly sampled time series sequence of abundance

and development (immature instars) of the two-striped grasshopper before and after rainfall, a major mortality factor. Two intense rainstorms in 2022 markedly and directly reduced numbers of immature two-striped grasshoppers in brome grass roadsides near the City limits, averting a second summer of invasion. The fungal pathogen *Entomophaga grylli* infected and killed significant numbers of adult two-striped grasshoppers in July and August, 2021, reducing a portion of oviposition in progress. In 2022, less than 1% of immature two-striped grasshoppers were killed by spiders and other predators. Parasites (internal and surface) occurred in less than 2% of two-striped grasshoppers, and *E. grylli* was very low or absent. Egg-laying potential, assessed in cages, was typically 40 to over 150 eggs per female. Monitoring of hatching, development, abundance, and pathology in 2023 is recommended.

3. Johnson, D. **Significant range expansion by Hayden's Grasshopper, *Derotmema haydeni*, in 2021-2022.** Entomological Society of Alberta Annual Meeting Oct 21, 2022

Abstract: Hayden's grasshopper, *Derotmema haydeni*, (Orthoptera: Acrididae: Oedipodinae) is a small band-winged grasshopper that has a wide distribution in North America, but low densities. It was previously known in Canada mainly from the extreme south-east corner of Alberta, and southern Saskatchewan along the USA border. Monitoring for this species by the author during 1983-2020 indicated that it was found only in the area near Pakowki lake, with rare specimens from as far west as Writing-on-Stone. Its unmistakeable anatomical features mean that outlying populations can be located, and one small local population near Drumheller, AB, was monitored 1987-1995, when it disappeared. On historical maps (Brooks; Vickery; others) and during annual surveys by the author during 1983-2020, it was never found west of Milk River, AB. This species tends to fly low and short distances only, remains where it hatches, moves little, and feeds locally on forbs, brome, sage, and certain flowering grassland plants. In 2021, Hayden's grasshopper unexpectedly expanded range to the west and, in 2022, both colour forms (red and yellow hindwing) were found for the first time across southern Alberta, relatively common including as far west as Lethbridge and Fort Macleod. It was found (red and yellow forms) on the University of Lethbridge campus, throughout the Oldman River valley, near Manyberries, and in grassland between Cardston, Lethbridge, and Coutts.

4. Meyhoff, S., Johnson, D., Ellert, B., Lutes, K., Byrne, J., and Wiseman, S. **Analysis of stable isotopes of feathers to estimate utilization of insect and plant components in the diet of plains sharp-tailed grouse.** Entomological Society of Alberta Annual Meeting Oct 21, 2022

Abstract: In recent field studies, we showed that arthropod prey are key components of the diet of plains sharp-tailed grouse (*Tympanuchus phasianellus jamesi*), especially grasshoppers (Orthoptera: Acrididae; 18 species found in crops). Further investigation used analysis of stable isotopes, which when applied to the tissue of a consumer organism can estimate the proportional utilization of foods based on different isotopic signals, and can also be used to estimate changes to diet over time. In this study, stable isotopes of nitrogen (δ15N) and carbon (δ13C) were used to examine feeding relationships. Primary feathers from 40 plains sharp-tailed grouse were analyzed and used to estimate diet proportions of vegetation and arthropods from May to October. Results of stable isotope analysis indicated that plains sharp-tailed grouse mainly utilize nutrients obtained from insect prey, which are mainly grasshoppers (Orthoptera: Acrididae), for primary feather synthesis. Grasshoppers were especially important in the fall diet, notably Dawson's grasshopper, *Melanoplus dawsoni*, 62.6% by number, 48.7% by dry weight, followed by marsh meadow grasshopper, *Pseudochorthippus curtipennis* (21.6% n, 19.7% wt), and Bruner's spur-throat grasshopper, *Melanoplus bruneri* (10.2% n, 20.8% wt). Food web dynamics are poorly understood, and emerging factors such as climate change are likely to alter bird-arthropod trophic relationships.

Now for exciting updates from the United States:

First, the National Grasshopper Management Board was finally able to hold an in-person meeting in Salt Lake City, Utah on September 20 & 21, 2022. This was the first in-person

Attendees of the annual Orthoptera networking event at ESA participate in a round of speed-networking.

meeting since 2019 due to COVID-19 restrictions and the attendance was impressive. Researchers, program managers, and field operations personnel from more than ten states were able to attend and present on a range of topics. The United States Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) Rangeland Grasshopper and Mormon Cricket Suppression Program personnel reported on survey activities in their states and suppression treatments, if any, that took place. Other interesting presentations at the meeting included a history of the Rocky Mountain locust, the discovery of some Egyptian Locust specimens around Las Vegas, Nevada and elsewhere, and an overview of published studies on grasshopper management in regards to non-target fauna.

APHIS Science and Technology presented results from a Mormon Cricket study in Idaho and nine other states over the 2022 field season. Science and Technology also provided updates on current and future research projects, one of which is investigating the efficacy of a biopesticide bait using *Metarhizium robertsii* (isolate DWR2009) and applying the bait using an ATV-mounted bait spreader to a horde of Mormon Crickets. Another ongoing project is exploring machine learning abilities and visual grasshopper survey density counts in the field. Several projects involved genetics, such as developing a smart molecular insecticide with RNAi based targeting (first publication from this research: Hoang, T., B. Foquet, B., S. Rana, D.W. Little, D.A. Woller, G.A. Sword, and H. Song. 2022. Development of RNAi Methods for the Mormon Cricket, *Anabrus simplex* (Orthoptera:Tettigoniidae). *Insects* 13(8):1-17. https://doi.org/10.3390/insects13080739), Mormon cricket genome sequencing, and migratory grasshopper genome sequencing. Other projects include investigating the use of unmanned aircraft systems (first publication from this research: Martin, D.E.; Rodriguez, R.; Woller, D.A.; Reuter, K.C.; Black, L.R.;Latheef, M.A.; Taylor, M.; López Colón, K.M. Insecticidal Management of Rangeland Grasshoppers Using a Remotely Piloted Aerial Application System. Drones 2022, 6, 239. https://doi.org/10.3390/drones6090239), sonic weaponry for managing rangeland grasshoppers, specimen collection preservation and possible DNA utilization, and some updated identification guides to pest grasshoppers.

The Orthoptera networking continued at the after-hours mixer.

Second, the Global Locust Initiative (GLI) noted that the beginning of 2023 marked the official ending of the last desert locust (*Schistocerca gregaria*) outbreak and an eventful year. With the relative calm in the aftermath of the outbreak GLI have been working hard with stakeholders to archive information and create new resources to fill knowledge gaps that were apparent during the outbreak to work against the "vicious cycle" that defines the locust challenge. This vicious cycle is highlighted in the opening article, *What Have We Learned after Millennia of Locust Invasions?*, in the recently published special issue of Agronomy focused on locust outbreaks edited by Michel Lecoq and Arianne Cease and contributed to by many GLI Network members.

To help avoid the loss of interest and knowledge of the locust problem between major upsurges, the GLI Network is focused on strengthening community connections across the globe through HopperLink. If you haven't had a chance to sign up for the GLI's online professional community, we'd love to have you join and invite your colleagues! With over 200 members from around the world, this is this place to share your research, projects, events, opportunities, and ask questions.

In addition to Network activities, researchers in the GLI Laboratory wrapped up two major projects, a Food & Agriculture Research Award (FFAR) project which advanced our understanding of the feedbacks among locust populations, land use, and governance, and a USAID-funded project in West Africa, "Bay Sa Waar" or "Communities for Sustainable Agriculture." Preliminary results showed that populations of a notorious pest, the Senegalese grasshopper (*Oedaleus senegalensis*), were lower and inflicted less damage in fertilized millet fields. These exciting early results

suggest that practices improving soil fertility help keep pest populations low and crop yields high, a result that will continue to be tested in an extended project with partners from CIRAD and Gaston Berger University. The GLI team ended the year on a high note while attending the 2022 Joint Annual Meeting of the Entomological Society of America (ESA) in Vancouver, Canada (November 12–16th, 2022), along with a great showing of fellow locust and grasshopper researchers, many of whom are students conducting locust research through the Behavioral Plasticity Research Institute (BPRI). Students from Texas A&M University and Arizona State University organized the first-ever member symposium focused primarily on phenotypic plasticity. The locust theme continued at the meeting with the annual Orthoptera networking event, this time co-hosted by GLI, BPRI, and The Orthopterists' Society. Thirty-five people from a diverse array of backgrounds participated in a speed-round of networking and shared their research and opportunities for collaboration. Overall, the conference was a huge success with a fantastic showing of Orthoptera science. For a list of team talk titles and their speakers click here.

GLI looks forward to opportunities and collaborations with all of you in the new year!

One last update: if you missed the 2022 ESA meeting and are interested in viewing the online program, you still can. Click here to register and view the on-demand content, view the in-person photos and view the list of 2022 student competition winners. And don't forget that ESA branch meetings are coming up. You can find out more information about them, including symposia topics, submission deadlines, and hotel reservation deadlines for each branch from here.

East Europe - North and Central Asia

By MICHAEL G. SERGEEV
Novosibirsk State University and Institute of Systematics and Ecology of Animals
RUSSIA
mgs@fen.nsu.ru

Many orthopterists from the region attended the 16th Congress of the Russian Entomological Society (August, 22–26, 2022, Moscow, Russia). The Congress was hosted by Moscow State University. Several hundreds of Russian entomologists and several dozens of their colleagues from different countries presented results of their studies in different fields of entomology. The Program of the Congress included some presentations concerning orthopteroids:

1. A.A. Alekseev, M.V. Tyurin, V.Y. Kryukov, V.V. Glupov, Y.A. Yurchenko, V.B. Odeyanko. Evaluation of the effect of fine and granular forms of avermectins on the Moroccan locust *Dociostaurus maroccanus* (Orthoptera: Acrididae) and mosquito larva.
2. A.A. Benediktov. Species biodiversity of the *Chorthippus biguttulus* group (Orthoptera: Acrididae) in the Middle Volga region (Russia)
3. S.K. Cherchesova, V.I. Mamaev, M.I. Shapovalov, I.E. Dzioeva, A.V. Yakimov. To the fauna of the stoneflies (Plecoptera) of the North Ossetian State Nature Reserve
4. M.D. Ganina, M.V. Tyurin, V.Y. Kryukov, S.V. Morozov. Comparative analysis of the cuticular lipids of *Locusta migratoria* and *Calliptamus italicus* (Orthoptera: Acrididae): potential contribution to resistance to fungal pathogens
5. A.N. Gladkikh. The basis of resistance to pathogens in the gut in the cockroach *Pycnoscelus nigra* Brunner (Blattodea: Blaberidae)
6. I.O. Karmazina, N.V. Shulaev. On the fauna of Orthoptera in the Sengileevskie Mountains National Park (Ulyanovsk Oblast, Russia)
7. G.R. Lednev, I.A. Kazartsev, M.V. Levchenko, A.V. Gerus, Yu.Yu. Ilinsky. Entomopathogenic microorganisms in locust populations (Orthoptera: Acrididae) in the South of Russia
8. E.S. Novikova, M.I. Zhukovskaya. Daily behavioral changes of the American cockroach *Periplaneta americana* L. (Blattodea: Blattidae) in a shelter

The female of *Bryodema gebleri* (Fischer de Waldheim) in the dry steppe of Central Tuva (S. Siberia) (Photo by M.G. Sergeev)

9. A.A. Pokivailov. Patterns of the distribution of Orthoptera in the Pamir-Alay
10. M.G. Sergeev. Terrestrial Orthopteroidea of Inner Asia: patterns of spatial and temporal distribution
11. M.G. Sergeev, N.S. Baturina, O.V. Yefremova, V.D. Zharkov, V.V. Molodtsov, K.V. Popova. Ecological and spatial modeling of the distribution of abundant acridid species (Orthoptera: Acrididae) in the southeastern West Siberian Plain
12. N.S. Sevastianov, V.Y. Vedenina. Comparative analysis of phylogenetic reconstructions and of the songs in grasshoppers of the subfamily Gomphocerinae (Orthoptera: Acrididae)
13. M.I. Shapovalov, S.K. Cherchesova. Stoneflies (Plecoptera) of the Northwestern Caucasus
14. E.O. Shcherbakov. Functional morphology of the male genitalia of the European Mantis *Mantis religiosa* L. (Mantodea: Mantidae)]
15. S.Y. Storozhenko. The Orthoptera of Beringia
16. I.D. Sukatsheva, N.D. Sinitshenkova. The Early Mesozoic—the time of the arising of recent families of caddisflies, mayflies, and stoneflies (Trichoptera, Ephemeroptera, Plecoptera)]
17. T.A. Tarasova, N.S. Sevastianov, V.Y. Vedenina. New data about acoustic communication of *Stenobothrus newskii* Zubowsky, 1900 (Orthoptera: Acrididae: Gomphocerinae)
18. M.E. Tchernyakhovsky. On the issue of preserving Acridoidea (Orthoptera) populations under extreme conditions
19. E.N. Terskov. Species diversity and geographical distribution of grasshoppers (Orthoptera: Acridoidea) of the Ciscaucasia
20. O.V. Yefremova, V.V. Molodtsov. The distribution of *Chorthippus albomarginatus* (De G.) (Orthoptera: Acrididae) as a potential pest in Kemerovo Oblast
21. V.V. Zaika. The hydroentomofauna of the Us River basin, Western Sayan
22. R.D. Zhantiev, O.S. Korsunovskaya. Modern insect bioacoustics: achievements, problems, prospects.

In the middle of 2022, the special project "Ecologo-geographical modeling of distribution of possible pest and rare species of grasshoppers and other orthopteran insects over the south of the Asian part of Russia and adjacent regions" run by the orthopterists from Novosibirsk State University, the Institute of Systematics and Ecology of Animals (Novosibirsk), and the Federal Scientific Center of the East Asia Terrestrial Biodiversity (Vladivostok) was supported by the Russian Science Foundation (22-66-00031). The main goals of the project are (1) to reveal spatial and temporal distribution patterns of populations of abundant and rare species (including the invasive ones) over the southern parts of Asian Russia and adjacent territories, (2) to hypothesize (based on species distribution models) scenarios of their shifts during the several next decades relative to global changes and human-induced transformations of local ecosystems, and (3) to reveal areas that are critically important for population monitoring of both pest and rare forms. This holistic approach should allow us to make a breakthrough in the basic and applied ecology, and entomogeography of Orthoptera. Implementation of such a complex approach to modeling of ecologo-geographic distribution and population dynamics of abundant and rare species will enable validation of efforts to manage their populations in some reasonable manner that is applicable from the ecologo-geographic and evolutionary points of view.

Finally, the international team of orthopterists from several countries (Kazakhstan, Russia, Turkmenistan, Uzbekistan) and FAO have almost completed the book "The Moroccan Locust *Dociostaurus maroccanus* (Thunberg, 1815). Morphology, Ecology, Distribution, Population Management."

Latin America

By MARTINA E. POCCO
Regional Representative
CEPAVE, CONICET - UNLP
División Entomología, Museo de La Plata, UNLP
La Plata, ARGENTINA
martinapocco@fcnym.unlp.edu.ar

Two Orthoptera symposia took place in South America before the end of 2022. The first one was held in La Plata, Argentina, from October 24 to 28, within the context of the XI Argentine and XII Latin American Congress of Entomology (XI Congreso Argentino (CAE) y XII Congreso Latinoamericano de Entomología (CLE)). This congress was held at La Plata National University in a hybrid way (in-person and virtual), with 520 abstracts presented. One of the seven plenary speakers of the congress was Dr. Hojun Song, who gave a conference virtually on the evolution of locust swarms and phenotypic plasticity in grasshoppers. It was an amazing talk!! The congress included 23 symposia, one of which was the

Speakers at the XI Congreso Argentino y XII Congreso Latinoamericano de Entomología

Orthoptera symposium, entitled "South American Orthoptera: studies on ecology, evolution, phylogeny, and management." It was organized by Dr. Yanina Mariottini and Dr. M. Celeste Scattolini and included 11 presentations focused on studies on Orthoptera from South America, integrating several topics, such as systematics, evolution, ecology, and management, among others. It was a great pleasure to receive the visit of our OS president, Dr. David Hunter, who traveled from Australia to attend this meeting and talked about the environmental and biological factors important in outbreaks and upsurges of the South American locust, *Schistocerca cancellata*. The symposium was successfully conducted, and it was a great opportunity to meet colleagues from Argentina, Colombia, Uruguay, Brazil, and Australia. We really enjoyed this meeting!

The second Orthoptera symposium in this region was the IX Brazilian Orthoptera Symposium and II Orthopteroid Insects Symposium. This event was held in Brazil at Universidade Federal de Viçosa, in Viçosa, Minas Gerais state, from December 5 to 9, 2022. This symposium was also organized as a hybrid meeting and included the participation of 21 national and international speakers. Dr. Daniela Santos Martins Silva, Dr. Natállia Maria de Freitas Vicente, and Dr. Carlos Frankl Sperber organized it. This meeting was also a great success and included talks, mini-courses, and posters within seven thematic areas. In addition to the bioacoustics, systematics, ecology, and evolution of Orthoptera and orthopteroid insects topics, this edition discussed the challenges of promoting an inclusive academic environment for women, black men and women, and the LGBTQIA+ population.

Detailed reports of both symposia are presented at the end of this issue of *Metaleptea*, including the list of participants and abstracts.

We are eagerly waiting the 14th International Congress of Orthopterology, held in Mexico, from October 16 to 19, 2023. The ICO 2023 will be held in Merida city, Yucatan state, in the heart of the Mayan culture. For more information, please visit the website of the congress, **https://ico-2023mexico.com/**. The deadline for symposia proposals is January 31, and abstract submission is on April 30. Hope to see you all in Mexico!

Orthoptera Species File Grant Reports

Grasshoppers and Crickets of the Adriatic Islands

By **KARMELA ADŽIĆ[1,2,*], MAKS DERANJA[1,3], AMIRA AQILAH MUHAMMAD[4], MARKO PAVLOVIĆ[1,5], MAJA MIHALJEVIĆ[1] & FRAN REBRINA[1]**

[1]University of Zagreb, Faculty of Science, Department of Biology, Rooseveltov trg 6, 10000 Zagreb, CROATIA
[2]Bakar, 51222 Bakar, CROATIA
[3]Dubrava, 10000 Zagreb, CROATIA
[4]Institute of Biological Sciences, Faculty of Science, Universiti Malaya, 50603 Kuala Lumpur, MALAYSIA
[5]Prva privatna gimnazija s pravom javnosti Varaždin, Frana Supila 22, 42000 Varaždin, CROATIA
*e-mail: karmela.adzic@gmail.com

Croatia is an appealing county for research on Orthoptera as it currently counts 187 species (Skejo et al. 2018, Ćato & Zagorac 2021, Stalling et al. 2021). Not all parts of Croatia are explored to the same extent and Adriatic islands represent a historically understudied area without any systematic research focused on Orthoptera (Skejo et al. 2018, Pavlović 2020). This area belongs to the Mediterranean biogeographic region, a biodiversity hotspot (Myers et al. 2000) additionally enriched by a unique relief of the area. The country counts over 1,000 islands, islets, and isolated rocks, which are biologically similar to the Dinaric mountains in Croatia (Skejo et al. 2018).

The biogeography of the Mediterranean has changed dramatically over the years. During the last glacial period around 26,500–20,000 years ago, the Mediterranean Sea level was 120 meters lower, meaning that the Adriatic Sea was present only in its southern part during the period. The Adriatic islands of today were mountaintops at the time, stretching along the Adriatic coast of the period. Some rivers in Dalmatia, like Cetina and Neretva, were significantly longer at that time and acted as strong dispersion barriers (Marseli et al. 2014, Sikora et al 2014., Amorosi et al. 2016).

The impact of those river barriers is reflected in modern distribution of species, such as *Barbitistes kaltenbachi* (Felix et al. 2020). Historical geological connection of the area is reflected in modern distribution of some species, like some otherwise typical Dinaric Mountain species like *Arcyptera brevipennis* and *Prionotropis hystrix* that are found on the Adriatic islands (Skejo et al. 2018, Cigliano et al. 2022).

Overview of the research on Orthoptera in Croatia is given by Skejo et al. (2018), while research on the Adriatic islands and the Dinaric mountains were studied by Pavlović (2020). General agreements are that the Adriatic islands lacked systematic comprehensive research of Orthoptera and that those areas could hide interesting discoveries. These were the motivations that inspired this project,

Figure 1. A representation of photographs taken during the fieldwork on the example of *Gampsocleis abbreviata* Herman, 1874 from Pag Isl. Photographs show living specimens in their lateral (**A**, **D**), dorsal (**C**, **F**), and frontal (**B**, **E**) view, both in female (**A–C**) and male (**D–F**). *(photographed by KA)*

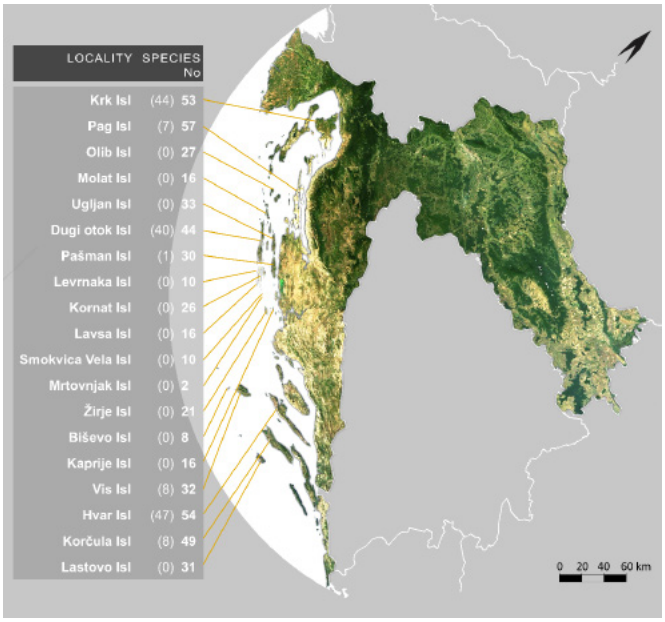


Figure 2. Map of Croatia with Adriatic islands visited during this project. Number of species known to inhabit islands are in brackets and numbers outside the brackets represent confirmed number of species per island after the research. The arrow points to the north.

mainly aiming to solve the existing gaps in our knowledge of Orthoptera on the Adriatic islands in Croatia.

Fieldwork was conducted using a combination of standard methods for research of Orthoptera. Visual census was used in all localities, as most of the species in the study area can be easily identified morphologically. This trait was additionally used for estimating relevant population sizes using the 1–3–7 method. Auditive census was used to complement the visual census to confirm identifications for species where song recording is needed and to document species that are harder to see (e.g., *Phaneroptera nana* and *Tettigonia viridissima* that live in the tree canopy or *Gryllus* species that live in the ground). For specimen collection we used a net-sweeping method or collected by hand. The net-sweeping method is not too helpful for collecting Orthoptera in the Mediterranean where the habitat is covered in robust and thorny plants and shrubbery, so the latter method was preferred. Collected specimens are stored in 70% ethanol in KA and MD private collections, and in the University of Zagreb, Department of Biology collection.

The primary method of research during fieldwork was photographing living specimens in their natural habitat, which was carried out by the project participants. Photographs of specimens were taken using a Canon EOS 600D digital SLR camera with a Canon EF 100mm f/2.8L macro lens attached. All the species encountered during fieldwork were photographed, with the goal of obtaining images of both males and females in dorsal, lateral, and frontal view (Fig. 1), and additionally of the nymphs whenever possible. Photographs taken during this project that were previously missing on OSF were uploaded to the database, indicated in Table 1.

The fieldwork was conducted on 19 islands: Krk Isl, Pag Isl, Olib Isl, Molat Isl, Dugi otok Isl, Ugljan Isl, Pašman Isl, Kornat Isl, Levrnaka Isl, Lavsa Isl, Smokvica Vela Isl, Mrtovnjak Isl, Kaprije Isl, Žirje Isl, Hvar Isl, Vis Isl, Biševo Isl, Korčula Isl, and Lastovo Isl. Out of the mentioned islands, only Lavsa Isl, Levrnaka Isl, and Mrtovnjak Isl are not inhabited (Fig. 2). These islands were picked to cover different regions of the Adriatic islands, from Kvarner islands on the north to the islands of Dalmatia on the south. Most of the islands we conducted research on had no previous records of Orthoptera (Fig. 2).

Research was conducted on two occasions in the summer of 2020 (June 1–18; July 15–August 3), three occasions in 2021 (June 1–28; July 13–August 8; September 5–7), and on

Table 1. Species of Orthoptera documented on Adriatic islands of Croatia during this project. Species with photographs uploaded to Orthoptera Species File are indicated with a plus sign (+) on the right.

ENSIFERA		*Pachytrachis frater* (Brunner von Wattenwyl, 1882)		*Arcyptera brevipennis* (Brunner von Wattenwyl, 1861)	+
Acrometopa macropoda (Burmeister, 1838)	+	*Phaneroptera falcata* (Poda, 1761)		*Aiolopus strepens* (Latreille, 1804)	+
Arachnocephalus vestitus Costa, 1855	+	*Phaneroptera nana* Fieber, 1853	+	*Aiolopus thalassinus* (Fabricius, 1781)	+
Barbitistes kaltenbachi Harz, 1965	+	*Pholidoptera dalmatica* (Krauss, 1879)	+	*Anacridium aegyptium* (Linnaeus, 1764)	+
Barbitistes ocskayi Charpentier, 1850		*Pholidoptera femorata* (Fieber, 1853)		*Calliptamus italicus* (Linnaeus, 1758)	+
Barbitistes yersini Brunner von Wattenwyl, 1878		*Platycleis affinis* Fieber, 1853		*Chorthippus (Glyptobothrus) maritimus* Mistshenko, 1951	
Conocephalus dorsalis (Latreille, 1804)		*Platycleis intermedia* (Serville, 1838)		*Chorthippus mollis* (Charpentier, 1825)	
Conocephalus fuscus (Fabricius, 1793)	+	*Poecilimon* sp.		*Dociostaurus genei* (Ocskay, 1833)	+
Cyrtaspis scutata (Charpentier, 1825)	+	*Pseudomogoplistes squamiger* (Fischer, 1853)	+	*Dociostaurus maroccanus* (Thunberg, 1815)	+
Decticus albifrons (Fabricius, 1775)	+	*Pteronemobius heydenii* (Fischer, 1853)		*Euchorthippus declivus* (Brisout de Barneville, 1848)	
Dolichopoda araneiformis (Burmeister, 1838)	+	*Rhacocleis buchichii* Herman, 1874	+	*Locusta migratoria* (Linnaeus, 1758)	+
Ephippiger discoidalis Fieber, 1853	+	*Rhacocleis germanica* (Herrich-Schäffer, 1840)	+	*Oedaleus decorus* (Germar, 1825)	+
Eumodicogryllus bordigalensis (Latreille, 1804)	+	*Ruspolia nitidula* (Scopoli, 1786)	+	*Oedipoda caerulescens* (Linnaeus, 1758)	+
Eupholidoptera schmidti (Fieber, 1861)	+	*Saga pedo* (Pallas, 1771)	+	*Oedipoda meridionalis* Ramme, 1913	+
Gampsocleis abbreviata Herman, 1874	+	*Sepiana sepium* (Yersin, 1854)		*Omocestus haemorrhoidalis* (Charpentier, 1825)	
Gryllomorpha dalmatina (Ocskay, 1833)		*Tessellana tessellata* (Charpentier, 1825)	+	*Omocestus petraeus* (Brisout de Barneville, 1856)	
Gryllotalpa nr. *Gryllotalpa* (Linnaeus, 1758)		*Tettigonia viridissima* (Linnaeus, 1758)	+	*Omocestus rufipes* (Zetterstedt, 1821)	
Gryllotalpa sp.		*Trigonidium cicindeloides* Rambur, 1838	+	*Paratettix meridionalis* (Rambur, 1838)	
Gryllus campestris Linnaeus, 1758		*Troglophilus* sp.		*Pezotettix giornae* (Rossi, 1794)	+
Leptophyes laticauda (Frivaldszky, 1868)	+	*Tylopsis lilifolia* (Fabricius, 1793)	+	*Prionotropis hystrix* (Germar 1817)	+
Melanogryllus desertus (Pallas, 1771)	+	*Yersinella raymondi* (Yersin, 1860)	+	*Stenobothrus fischeri* (Eversmann, 1848)	+
Mogoplistes brunneus Serville, 1838		CAELIFERA		*Stenobothrus lineatus* (Panzer, 1796)	
Oecanthus dulcisonans Gorochov, 1993		*Acrida ungarica* (Herbst, 1786)	+	*Tetrix bolivari* Saulcy, 1901	
Oecanthus pellucens (Scopoli, 1763)	+	*Acrotylus patruelis* (Herrich-Schäffer, 1838)	+	*Tetrix ceperoi* (Bolívar, 1887)	

one occasion in the summer of 2022 (June 14–19). During this fieldwork we were lucky to have less than 5 days of rain, which meant we were able to utilize our time quite well. Fieldwork was conducted by a freshly formed team of young entomologists: Karmela Adžić, Maks Deranja, Maja Mihaljević, Amira Aqilah Muhammad, Marija Piknjač, and Marko Pavlović, under the mentorship of experienced orthopterist Fran Rebrina.

In total, we documented 70 species of Orthopter: 44 species of Ensifera and 26 species of Caelifera. Caelifera diversity is generally smaller on islands and Adriatic islands of Croatia do not have any endemic species of grasshoppers, while they do have endemic and interesting species of Ensifera. Maquis and garrigue habitats are common on all larger islands, but are often reduced by human activity on small islands where the space for agriculture was obtained by deforestation and degradation of such habitats. Such islands showed smaller Ensifera diversity, for example *Eupholidoptera schmidti* (a relatively common species across the Adriatic coast of Croatia) is not found on Kornat Isl where its shrubbery habitat is very scarce (Ensifera diversity is shown in Fig. 3).

Grassland and meadow habitats that are suitable for grasshoppers are quite rare on all Adriatic islands of Croatia due to the abandonment of traditional extensive agriculture. Species that are dependent on those habitats were thus hard to find. *Arcyptera brevipennis*, an example of such a species, was only found in one locality on Hvar Isl and one locality on Korčula Isl. We expect such isolated populations to decline with time as the succession of favorable habitats continues, possibly leading to the extinction of some (Caelifera diversity is shown on Fig. 4).

Some islands did not suffer the same intensity of habitat degradation as the others, seen for example on Lastovo Isl, which certainly contributed to the high number of taxa encountered there. That being said, we did not find *Calliptamus italicus* on Lastovo Isl. This came as a surprise as *C. italicus* is the single most common species we encountered on the islands, both in the number of individuals observed and the number of different localities we found it in.

Temperate climate of the area is evident in the changes one can observe in the same habitat in June and August, which is also reflected in Orthoptera diversity encountered in a given site. In our case, repeating fieldwork in the same localities in different months of the summer proved useful because early summer is perfect for research of Barbistini, but they are increasingly harder to find as the season progresses. Species like *Paramogoplistes novaki* can be found only after

Figure 3. Representatives of Ensifera diversity of Adriatic islands in Croatia photographed during fieldwork. Species are: (**A**) *Rhacocleis buchichii* Herman, 1874; (**B**) *Barbitistes kaltenbachi* Harz, 1965; © *Saga pedo* (Pallas, 1771); (**D**) *Poecilimon* sp.; (**E**) *Leptophyes laticauda* (Frivaldszky, 1868); (**F**) *Pholidoptera dalmatica* (Krauss, 1879); (**G**) *Gryllotalpa* sp.; (**H**) *Oecanthus dulcisonans* Gorochov, 1993. *(photographed by KA)*

Figure 4. Representatives of Caelifera diversity of Adriatic islands in Croatia photographed during fieldwork. Species are: (**A**) *Dociostaurus genei* (Ocskay, 1832); (**B**) *Prionotropis hystrix* (Germar, 1817); (**C**) *Oedipoda germanica meridionalis* Ramme, 1913; (**D**) *Chorthippus (Glyptobothrus) maritimus* Mistshenko, 1951; (**E**) *Arcyptera (Pararcyptera) brevipennis brevipennis* (Brunner von Wattenwyl, 1861); (**F**) *Acrida ungarica* (Herbst, 1786). *(photographed by KA)*

mid-August (Rebrina & Brigić 2017), bringing fieldwork on the Adriatic islands of Croatia to three crucial period during which research needs to be conducted to properly examine species diversity of the area.

During fieldwork we put great emphasis on education, which was primarily done by sharing educational flyers to locals and speaking to them. After fieldwork we continued with the education by conducting public presentations, which helped raise awareness on these interesting insects. We plan to continue with this practice in the future as the feedback has been quite rewarding.

Diversity of Orthoptera generally seems to correspond to island size (Fig. 1), but in such limited areas habitat diversity seems to dictate species composition. Determining to what extent which factors impact Orthoptera on the islands needs further research and will be the main topic of publications that will come out of this project. We plan to continue with research of Orthoptera in Croatia to resolve all the problems that arose during this project, from taxonomy dilemmas to complicated ecological questions, thus creating a solid foundation for future research of Orthoptera in the Mediterranean parts of Croatia.

Acknowledgements

We want to thank the Orthopterists' Society for approving our project for funding via an Orthoptera Species File grant and giving us the chance to start our careers in entomology by conducting research on Orthoptera in Croatia. We are also grateful to all additional fundings provided to this project by The Student Council of the Faculty of Science, The Student Council of the University of Zagreb, City of Bakar, and Vinica Municipality. Thanks to Josip Skejo who provided additional mentorship and confirmed certain species identifications. Many thanks to all who assisted with fieldwork and project organization.

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Xeno-canto: worldwide disclosing sound recordings of Orthoptera

By **BAUDEWIJN ODÉ**
baudewijnode@gmail.com

In September 2022, a new version of the website **xeno-canto.org** (XC) was launched and is now fully functional for collecting sound recordings of Orthoptera, in addition to birds. Until then, the website contained the largest collection of bird sounds available, mainly gathered by private sound recordists. The new version is a joint effort of several parties and has been made possible by contributions from the Orthopterists' Society through an OSF grant, Naturalis Biodiversity Center, and NLBIF (Dutch national node of GBIF).

Figure 1. Front page of the website with statistics for Orthoptera.

All new specifications

First, all of the approximately 30,000 species and subspecies of the Orthoptera Species File have been added to the species list, including genera and families. Full spectrum WAV-files in all resolutions (up to 384kHz) can now be uploaded to the website, as well as compact MP3-files. This means full-spectrum sound recordings in high quality can be presented. A viewer is added that both shows an oscillogram and a spectrogram. Sound recordings can be played at normal speed, however, sound recordings with ultrasonic components (sample rates above 48kHz) can also be played at a speed slowed down ten times. After clicking the spectrogram a version with full axis information is shown. This is all very useful for understanding the ultrasonic components and fine details of Orthoptera songs. We updated the metadata to disclose with Orthoptera sound recordings in XC, especially important ones, such as the appropriate song types for Orthoptera (e.g., calling song, rivalry song, courtship song) or the collection date for a specimen recorded in studio conditions. Also, the collection number of a collected specimen may be stored.

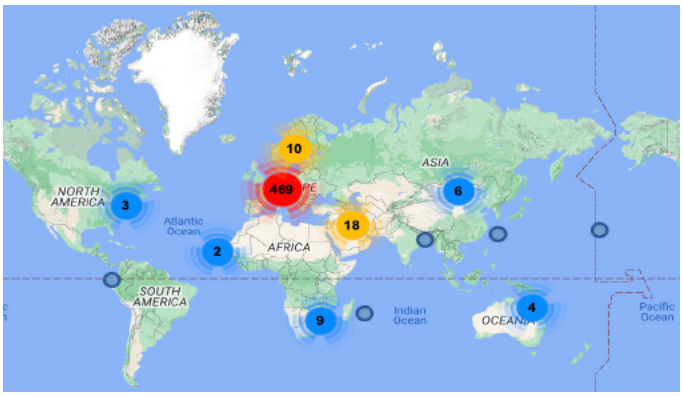


Figure 2. Map with the world distribution of locations with sound recordings of Orthoptera.

First disclosure of Orthoptera songs

A first set of 1,320 sound recordings by Baudewijn Odé from the period of 1991-2005, comprising 136 European species has been uploaded. They refer to at least 55 unique collected specimens from the Naturalis Leiden collection. Since the launch, a lot of people have already added to the collection, from all continents of the world, resulting in a total of more than 2,000 sound recordings, comprising more than 200 species as of December 2022. People have also uploaded unknown (mystery) sounds that a small

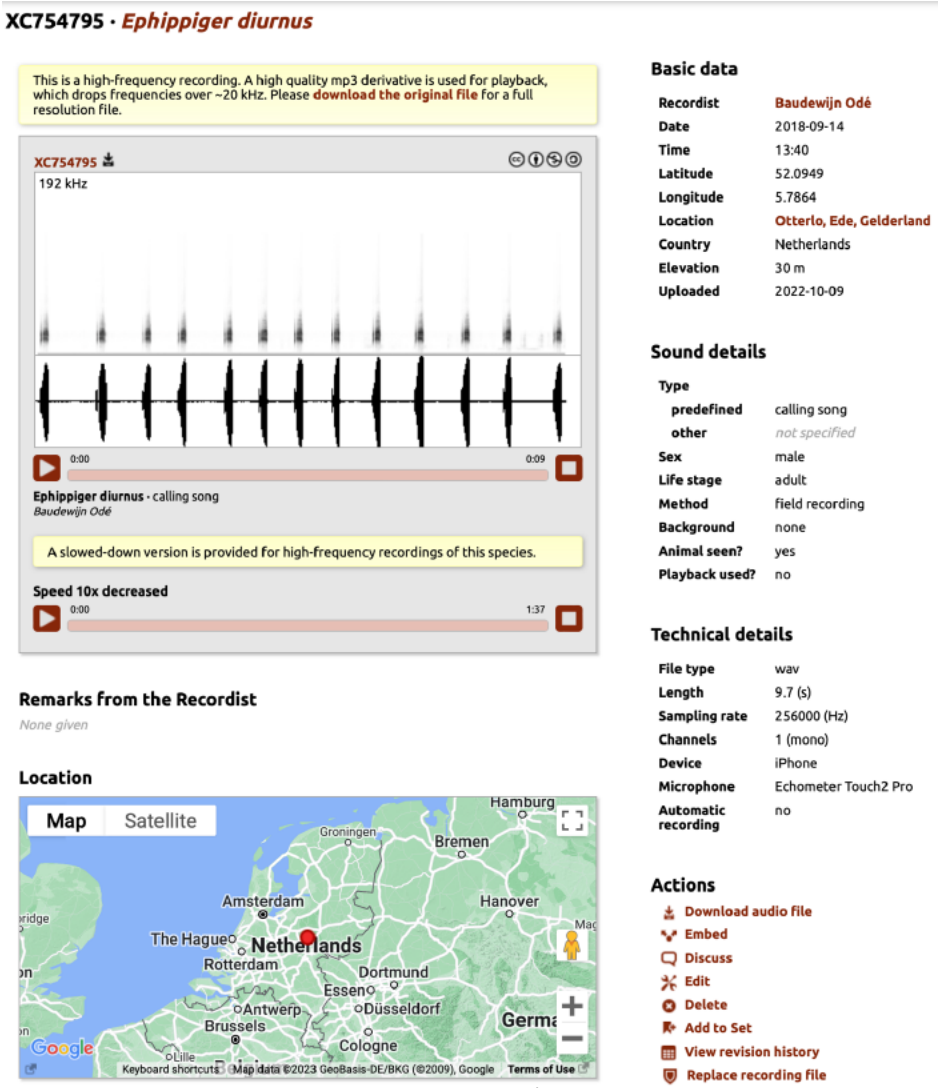


Figure 3. Individual sound recording with spectrogram/oscillogram, map, and metadata.

Figure 4. QR-code linking to sound recording

group of administrators will try to identify. Also, we expect people recording other species groups, such as birds and bats, will participate in sharing sounds of Orthoptera.

Sharing and using sound recordings in XC

The sound recordings in XC have fixed URLs, meaning people are able to refer to specific sound recordings, such as in scientific publications. In more popular publications like field guides QR codes may be useful to instantly play a specific song on a phone. Links to the species pages in XC are also shared in the Orthoptera Species File, under links, for 174 species. These links will be updated periodically to keep pace with the disclosure of sound recordings in XC.

Finally, sound recordings with appropriate geographic information will be disclosed in GBIF, adding to the worldwide database of biodiversity data. Sharing these data in combination with the songs may greatly enhance both knowledge, research, and conservation of Orthoptera.

Taxonomy, bioacoustics and distribution of Orthoptera in the Western Balkans (Montenegro and North Macedonia)

By IVKOVIĆ SLOBODAN[1] & HORVAT LASLO[2]
[1]Trier University, Department of Biogeography, Universitätsring 15 Trier, GERMANY, s6slivko@uni-trier.de
[2]Lohhäuslweg 9 Elsbethen, AUSTRIA, l.l.j.horvat@gmail.com

For this project we aimed to record the male songs and take photographs of rare and endemic Orthoptera from North Macedonia and Montenegro. Besides song and image data, we collected GPS data for species that are considered to be common for this area.

During June 2022 we organized our first field trip, where we visited lowland areas in eastern part of the North Macedonia (along and eastern from Vardar River), in order to collect and take photographs/sound recordings of early species, mainly from the family Pamphagidae and genera *Poecilimon* and *Isophya*.

Our first locality was Demir Kapija where we photographed *Dolichopoda remyi* Chopard, 1934, *Isophya tosevski* Pavićević, 1983, and *Poecilimon ornatus* (Schmidt, 1850). On the other side of the Vardar River, we found common species, such as *Xya pfaendleri* Harz, 1970, *Pteronemobius heydenii* (Fischer, 1853), *Melanogryllus desertus* (Pallas, 1771), *Aiolopus thalassinus* (Fabricius, 1781), and *Omocestus rufipes* (Zetterstedt, 1821). After the river shore, we visited a nearby hill where we found *Asiotmethis limbatus* (Charpentier, 1845) (Fig 1G). After Demir Kapija's surroundings, we travelled more south, on Dojran Lake, near the border with Greece. There, we proceeded to find interesting species, such as

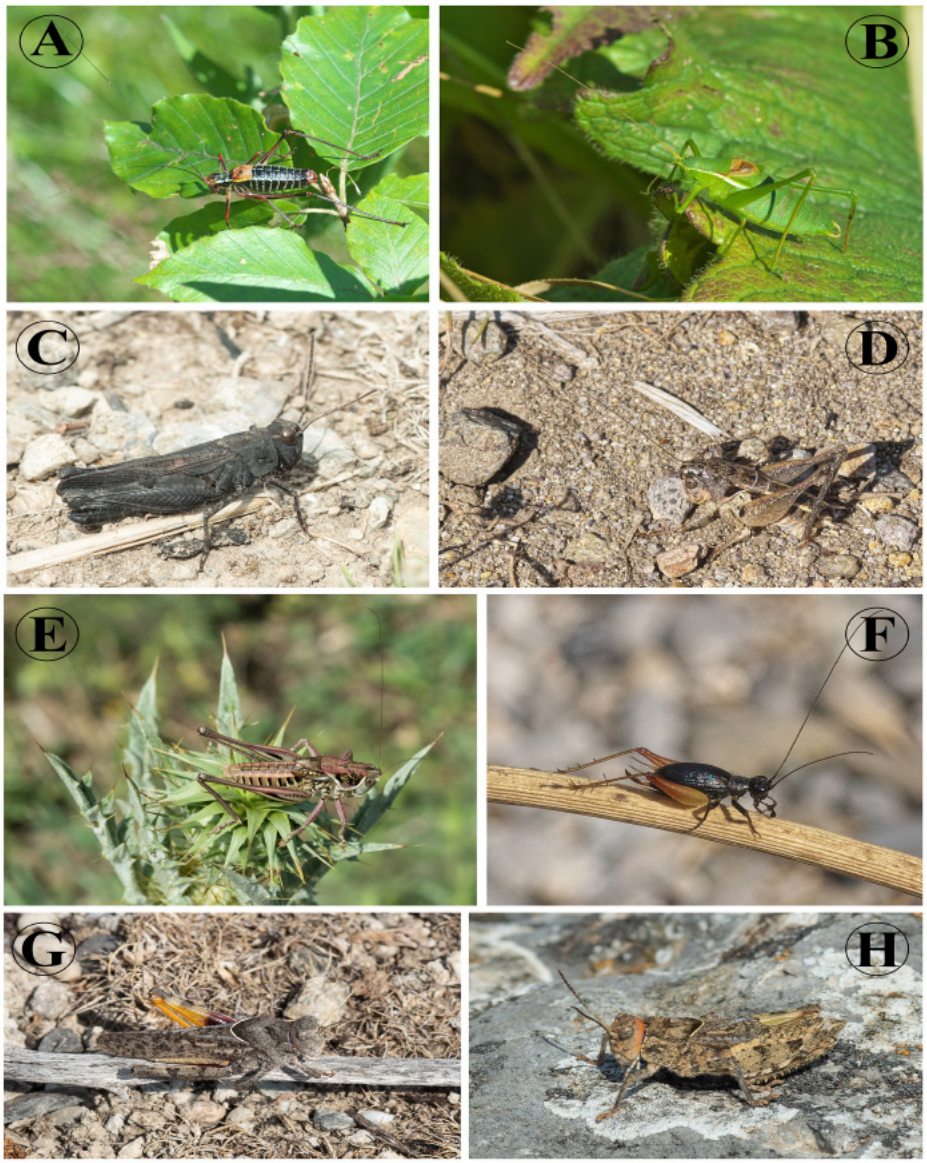


Figure 1. Interesting species observed during the 2022 field trip. **A** - *Barbitistes constrictus* Brunner von Wattenwyl, 1878; **B** - *Isophya andreevae* Peshev, 1981; **C** - *Celes variabilis* (Pallas, 1771); **D** - *Bucephaloptera bucephala* (Brunner von Wattenwyl, 1882); **E** - *Gampsocleis abbreviata* Herman, 1874; **F** - *Trigonidium cicindeloides* Rambur, 1838; **G** - *Asiotmethis limbatus* (Charpentier, 1845); **H** - *Glyphotmethis heldreichi* Brunner von Wattenwyl, 1882.

Figure 2. Females of different *Saga* species observed during the 2022 field trip. **A-** *S. campbelli campbelli* Uvarov, 1921; **B** - *S. rammei* Kaltenbach, 1965; **C** – *S. natoliae* Serville, 1839; **D** – *S. pedo* (Pallas, 1771).

Glyphotmethis heldreichi Brunner von Wattenwyl, 1882 (Fig 1H) and *P. macedonicus* Ramme, 1926. Our next stop was north from the Dojran Lake, a large plain west of the city of Štip. There, we found adult *Celes variabilis* (Pallas, 1771) (Fig 1C) and *Arcyptera microptera* (Fischer von Waldheim, 1833). Besides these, we observed numerous *Saga* Charpentier, 1825 (Fig. 2) and *Gampsocleis abbreviata* Herman, 1874 (Fig 1E) nymphs, so we expect to find adults without problem during our next visit.

Our next visit to Macedonia was organized at the end of July. On our way there we decided to overnight in Serbia on Stara Planina Mt. During the night search (using headlamps on the road) for Orthoptera, we found a new species record for the country: *Barbitistes constrictus* Brunner von Wattenwyl, 1878 (Fig 1A).

After Stara Planina Mt. we continued our trip to North Macedonia. We were disappointed that, since our last visit, the weather was extremely hot and dry, thus our expectations from the field trips in June were "lowered," as a majority of the meadows were covered with dry grass. Work in the field was extremely difficult, as early morning temperatures were around 35°C, while later in the day temperatures were over 40°C, thus we had to collect the material between 8 AM and 11 AM. Although the beginning was disappointing, we ended up finding numerous endemic species, such as *Notostaurus anatolicus* (Krauss, 1896), *Ramburiella turcomana* (Fischer von Waldheim 1846), *Bucephaloptera bucephala* (Brunner von Wattenwyl, 1882) (Fig 1D), *Montana macedonica* (Berland & Chopard, 1922), *Saga natoliae* Serville, 1839 (Fig 2C), *S. campbelli campbelli* Uvarov, 1921 (Fig 2A), and *S. rammei* Kaltenbach, 1965 (Fig 2B).

After lowland areas, we visited

Table 1. List of the species for which songs and photos are uploaded to Orthoptera Species File.*specimen from Hungary

species	♂	♀	song
1. *Tylopsis lilifolia* (Fabricius, 1793)	+	+	
2. *Acrometopa servillea servillea* (Brullé, 1832)		+	
3. *Leptophyes laticauda* (Frivaldszky, 1868)	+	+	
4. *Andreiniimon nuptialis* (Karny, 1918)	+		
5. *Isophya kraussii* Brunner von Wattenwyl, 1878*	+		+
6. *Isophya andreevae* Peshev, 1981	+		+
7. *Isophya tosevski* Pavićević, 1983	+		+
8. *Ancistura nigrovittata* (Brunner von Wattenwyl, 1878)	+	+	
9. *Barbitistes constrictus* Brunner von Wattenwyl, 1878	+		+
10. *Barbitistes yersini* Brunner von Wattenwyl, 1878		+	
11. *Poecilimon ornatus* (Schmidt, 1850)			+
12. *Poecilimon affinis affinis* (Frivaldszky, 1867)	+		
13. *Poecilimon macedonicus* Ramme, 1926	+		
14. *Poecilimon ebneri* Ramme, 1933	+	+	
15. *Platycleis affinis* Fieber, 1853	+	+	+
16. *Montana macedonica* (Berland & Chopard, 1922)	+	+	+
17. *Tessellana carinata* (Berland & Chopard, 1922)	+	+	
18. *Incertana incerta* (Brunner von Wattenwyl, 1882)	+	+	+
19. *Sepiana sepium* (Yersin, 1854)	+		+
20. *Metrioptera tsirojanni* Harz & Pfau, 1983	+	+	
21. *Pholidoptera femorata* (Fieber, 1853)	+	+	
22. *Pholidoptera dalmatica dalmatica* (Krauss, 1879)			+
23. *Eupholidoptera smyrnensis* (Brunner von Wattenwyl, 1882)	+	+	+
24. *Eupholidoptera schmidti* (Fieber, 1861)	+	+	
25. *Gampsocleis abbreviata* Herman, 1874	+	+	+
26. *Bucephaloptera bucephala* (Brunner von Wattenwyl, 1882)	+	+	
27. *Pachytrachis striolatus* (Fieber, 1853)	+		
28. *Rhacocleis germanica* (Herrich-Schäffer, 1840)		+	
29. *Yersinella raymondii* (Yersin, 1860)		+	
30. *Saga natoliae* Serville, 1839	+	+	+
31. *Saga pedo* (Pallas, 1771)		+	
32. *Saga campbelli campbelli* Uvarov, 1921	+	+	+
33. *Saga rammei* Kaltenbach, 1965		+	
34. *Bradyporus dasypus* (Illiger, 1800)	+	+	
35. *Bradyporus skopjensis* Karaman, 1961	+	+	+
36. *Modicogryllus truncatus* (Tarbinsky, 1940)		+	+
37. *Mogoplistes brunneus* Serville, 1883		+	
38. *Trigonidium cicindeloides* Rambur, 1838		+	
39. *Dolichopoda remyi* Chopard, 1934	+		
40. *Paratettix meridionalis* (Rambur, 1838)	+		
41. *Asiotmethis limbatus* (Charpentier, 1845)	+	+	
42. *Glyphotmethis heldreichi* Brunner von Wattenwyl, 1882	+	+	
43. *Calliptamus barbarus* (Costa, 1836)		+	
44. *Celes variabilis* (Pallas, 1771)	+	+	
45. *Oedipoda miniata miniata* (Pallas, 1771)		+	
46. *Sphingonotus caerulans* (Linnaeus, 1767)	+	+	
47. *Acrotylus patruelis* (Herrich-Schäffer, 1838)	+	+	
48. *Aiolopus strepens* (Latreille, 1804)	+	+	
49. *Arcyptera fusca* (Pallas, 1773)	+	+	+
50. *Arcyptera microptera* (Fischer von Waldheim, 1833)	+	+	+
51. *Ramburiella turcomana* (Fischer von Waldheim 1846)		+	
52. *Notostaurus anatolicus* (Krauss, 1896)	+	+	
53. *Dociostaurus brevicollis* (Eversmann, 1848)	+	+	
54. *Omocestus viridulus* (Linnaeus, 1758)	+	+	
55. *Stenobothrus fischeri* (Eversmann, 1848)	+	+	
56. *Stenobothrus stigmaticus* (Rambur, 1838)	+	+	
57. *Euchorthippus declivus* (Brisout de Barneville, 1848)	+		

higher elevations in the eastern part of the country, on the border with Bulgaria. Unfortunately, our field trip to the locality with *P. pechevi* Andreeva, 1978 was cancelled, because of a prohibition aimed at international people due to a "great risk for causing a forest fire," so we decided to visit another mountain south of that locality. This was proven to be a good decision as we found numerous *Isophya speciosa* (Frivaldszky, 1868), *Arcyptera fusca* (Pallas, 1773), *Pholidoptera aptera karnyi* Ebner, 1908 and, for us, the most important finding: *Isophya andreevae* Peshev, 1981 (Fig 1B). For this species there are only a few unpublished findings (Lemonnier-Darcemont, Chobanov personal communication). Besides common species for North Macedonia, during our last days in eastern part of the North Macedonia, we succeeded in finding *Gryllomorpha dalmatina* (Ocskay, 1832) and *Stenonemboius* cf. *gracilis*.

After North Macedonia, we visited Montenegro in order to collect final data for the upcoming checklist of Orthoptera in Montenegro. As the most important finding, we can emphasize *Trigonidium cicindeloides* Rambur, 1838 (Fig 1F). Although the species is very common in the Mediterranean area, due to a specific habitat and small size, specimens are hard to catch, similar to *Natula averni* (Costa, 1855). Considering that we have been visiting swampy areas near the coast for several years, it was just a question of time when we would find the species and this summer, we had luck. Besides *T. cicindeloides*, near the coast we found *Pachytrachis striolatus* (Fieber, 1853), *Acrometopa servillea* (Brullé, 1832), *Sepiana sepium* (Yersin, 1854), and *Galvagniella albanica* Mistshenko, 1952.

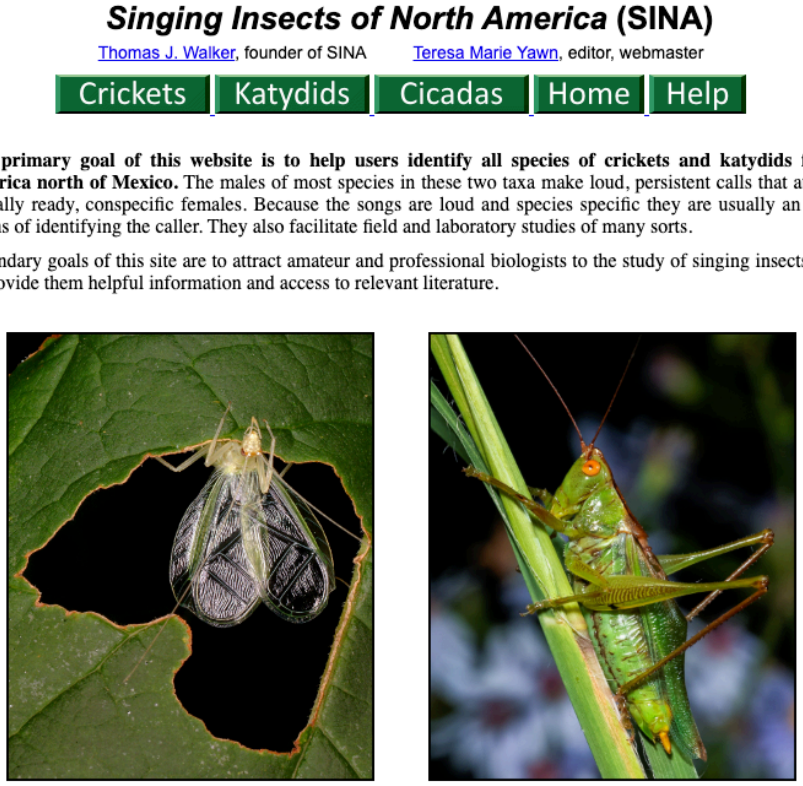
Although the conditions in which we worked this year didn't look promising, in the end we managed to photograph 56 species and record the songs of males from 18 species (Table 1). As a result of this project, we have two papers in preparation: 1) a checklist on Montenegro Orthoptera and 2)

examining the status of *Bradyporus skopjensis*. Besides publications, as with the material collected during previous field trips funded by the Orthoptera Species File, this material is also preserved in ethanol and will be used for our upcoming project on Barcoding of Orthoptera of Western Balkan countries.

Update on the Singing Insects of North America (SINA) Website

By TERESA YAWN
Editor/Webmaster, SINA
tmd@teresamariedreams.com

The Singing Insects of North America (SINA) website (https://orthsoc.org/sina/) was founded in 2000 by Thomas J. Walker, an expert on Orthoptera who has, among many other accomplishments, dedicated his life to studying the systematics and acoustic behavior of singing insects. He created SINA as a resource for persons interested in identifying crickets and katydids using songs, images, maps, morphology, literature, and keys. Tom was editor of SINA from 2000 to 2022, and over the years, under his editorship, it has grown into a large, user-friendly website with a dedicated following. I had the honor of working with Tom from 2018 to 2022 because he hired me to be the SINA Webmaster. We worked together on many projects, two of which were large in scope: the addition of several new and revised *Gryllus* species (Weissman and Gray 2019) and the addition of 12 new *Neduba* species, plus updating nine that were redescribed (Cole et al. 2021). Many species were quite interesting, such as *Anurogryllus celerinictus*, a field cricket native to Cuba and Jamaica that seems to have recently gained a foothold in Florida and whose loud, distinct calling song matches a recording of the sound associated with the Cuban sonic attacks on U.S. diplomats. Besides *A. celerinictus*, there are several other non-native SINA species, which prompted Tom to start a page on the Origins and spread of SINA species that are aliens. Tom and I expanded SINA's database through our research and from contributions submitted by SINA users and we worked to improve and update SINA's user interface.



SINA spent most of its years hosted by the University of Florida's (UF) web server, but when Tom was nearing retirement, he was concerned that if SINA remained on UF's server, it would not be updated and would eventually be archived. When this concern was brought before the Board of the Orthopterists' Society (OS), they decided SINA was worth supporting and agreed to host SINA. In late 2019- early 2020, SINA was transferred to the OS's web server. I am grateful that the OS has provided a home for SINA and that, in September 2021, they welcomed me to continue as Webmaster. When Tom retired as Editor in February 2022, I became the Editor too. It is a privilege to follow in Tom's footsteps and to keep SINA alive and growing as it continues to develop in its new home with the OS. As Editor of SINA and a member of the Orthopterists' Society, I would like to provide regular SINA updates in *Metaleptea*, this being the first.

A new species of tree cricket was recently added to SINA: *Oecanthus beameri* Collins and Lightfoot 2022. In 2019, while visiting the Oecanthinae collection at the Academy of Natural Sciences of Drexel University (ANSDU; Philadelphia, PA), Nancy Collins, an energetic oecanthine enthusiast, discovered two specimens

in the *O. quadripunctatus* drawer that were smaller and paler than the other specimens. The labels on the insect pins named Raymond H. Beamer as the collector who, in 1932, collected these two specimens in White Sands, New Mexico. Nancy contacted David Lightfoot (Museum of Southwestern Biology, Albuquerque, New Mexico) about the specimens. A trip to White Sands National Park resulted in the collection of seven adult male and one adult female *Oecanthus* crickets, recordings of their songs, and field observations and photographs of the habitat. After a thorough study of the specimens and collected materials, Nancy and David concluded this was a new species of tree cricket, which they described in Collins and Lightfoot 2022. A key to the *nigricornis* species group is included in their manuscript and is now available on SINA's *Oecanthus* genus page. The Oecanthus genus page was updated earlier this year (2022) with contributions from Nancy. *Oecanthus alexanderi* (*rileyi* species group); *O. pini*, *O. salvii*, and *O. walkeri* (and recently, *O. beameri*; *nigricornis* species group); and *O. californicus*, *O. latipennis*, *O. major*, *O. texensis*, and *O. varicornis* (*varicornis* species group), species that were missing from the page, were added, along with drawings showing antennal markings for these species (drawn by me based on photographs).

Many people continue to contribute to SINA, and I am thankful for their contributions, which help to expand and update the information on SINA. If you have something you'd like to contribute—a new species or revision of species, new species' locations, audio, video, images, literature, information, or observations, or if you have questions, comments, or other queries about SINA, please contact me at: tmd@teresamariedreams.com.

A brief report of the Oedipodinae expedition in central Mexico

By DANIELA SANTOS MARTINS SILVA[1], SALOMON SANABRIA-URBAN[2], JASON T. BRACKEN[1] & TEREZA JEZKOVA[1]

[1]Department of Biology, Miami University, Oxford, OH, USA

[2]Facultad de Estudios Superiores Iztacala, Universidad Nacional Autónoma de México, MEXICO

[1]danielasantos.biology@gmail.com

Mexico is one of the most megadiverse countries, representing 12 percent of global biodiversity in a land surface. Situated between the Nearctic and Neotropical regions, it exists as a transition zone that hosts immense biodiversity across a number of biomes that include tropical vegetation, with deciduous and rain forests; pine-oak forests, with coniferous and Quercus-Pinus forests; cloud, subtropical, or mesophytic forests; and arid or xerophytic vegetation.

With respect to this diversity, we conducted an expedition in late 2022 through much of Central Mexico, visiting 12 locations in the states of Michoacán, Hidalgo, Jalisco, and Querétaro (Table 1; Fig.1). This expedition was part of a project in the Jezkova Global Change Biology Lab at Miami University (Ohio) to investigate spatial patterns and mechanisms driving diversification of Oedipodinae grasshoppers. Although the oedipodines were the main objective of this fieldwork, we also sought the broader goals of contributing to the knowledge of Mexican fauna of Orthoptera and collecting specimens for taxonomic and phylogenetic studies.

After virtual meetings, Salomon

Table 1. Checklist of spots during the central Mexico fieldwork.

Locality	State	Latitude	Longitude	Date
Zitácuaro	Michoacán	19,390719	-100,391901	15 December
Ciudad Hidalgo	Michoacán	19,676013	-100,538194	16 December
Morelia	Michoacán	19,704561	-101,119124	16 December
Tzintzuntzan	Michoacán	19,600	-101,629924	17 December
Uruapan	Michoacán	19,45353	-101,965966	17 December
Mazamitla 1	Jalisco	19,919984	-102,965414	18 December
Mazamitla 2	Jalisco	19,911591	-103,010364	19 December
Zapopan	Jalisco	20,613527	-103,491498	19 December
Tequila	Jalisco	20,849420	-103,854658	20 December
Teotihuacán	México	20,693052	-103,838644	20 December
La Noria	Querétaro	20,505492	-100,319864	21 December
Alfajayucan	Hidalgo	20,431967	-99,457614	22 December
Tecomatlán	Hidalgo	20,184647	-99,033179	23 December

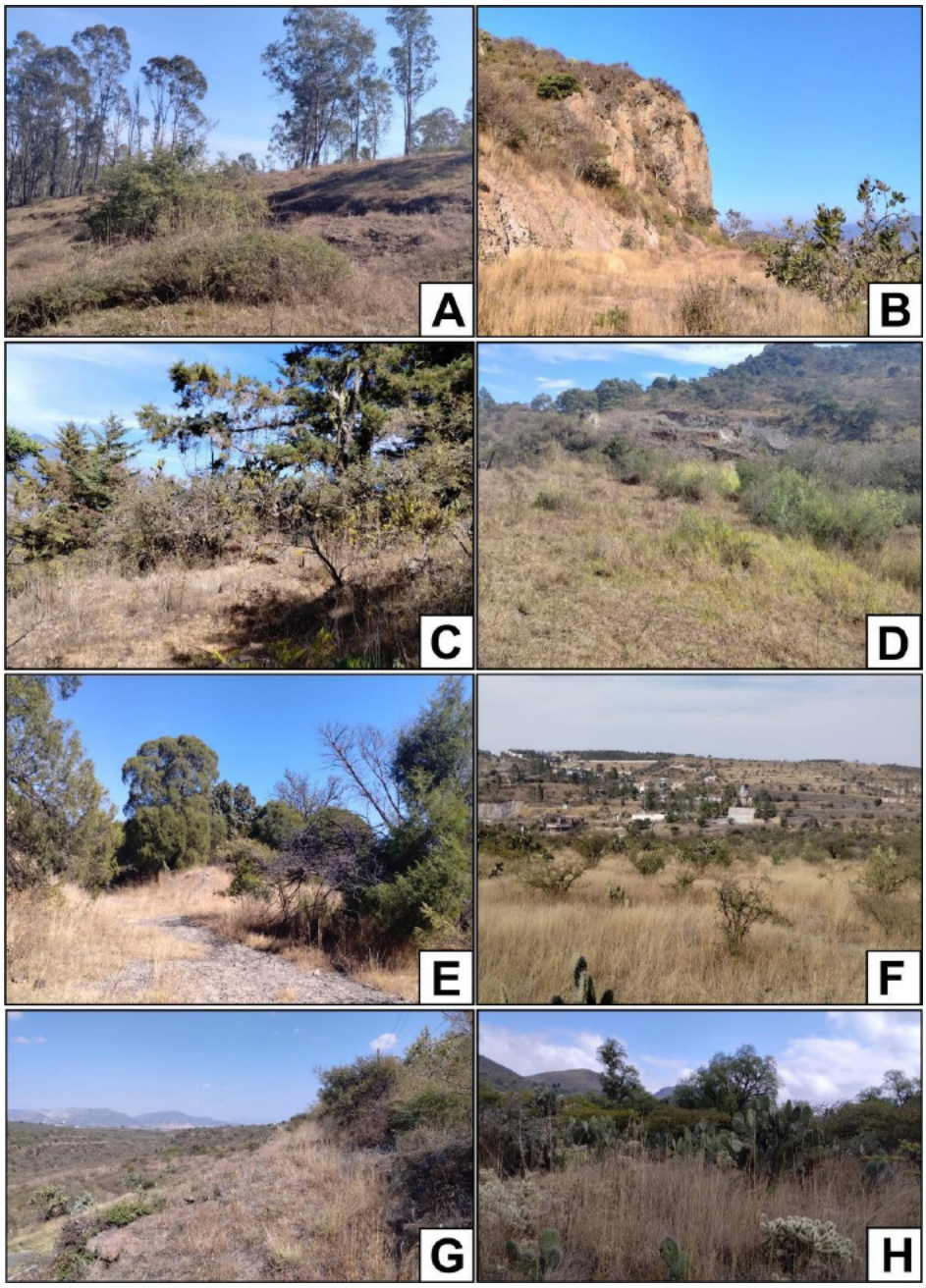


Figure 1. Some of the different visited habitats in central Mexico: (**A**) Camino al Potrero, Ciudad Hidalgo; (**B**) near Puerto de Buenavista, Morélia, Michoacán; (**C**) near El Cerrito de Niño Jesus, Michoacán; (**D**) near Parque El Tecolote, Mazamitta, Jalisco; (**E**) near Tequila city, Jalisco; (**F**) Querétaro, Querétaro de Arteaga; (**G**) road in Hidalgo state; (**H**) Santa Cruz Norte, San Nicolas, Tecomatlán.

Sanabria-Urban, Jason Bracken, and I (Fig.2A) met in Mexico City on December 15, 2022 to begin our expedition. Our areas of focus were mainly in semi-desert and xerophytic areas of Mexico, where most of the vegetation was much drier than usual, due to the season of our fieldwork and the recent droughts that occurred just prior. We focused our fieldwork on type localities of some Oedipodinae species, which in many cases had been swallowed by expanding urban areas or had their natural vegetation replaced by avocado, guava, corn, or agave crops. To improve our chances for collection, we often looked for less perturbed areas nearby. Despite the less-than-ideal conditions, we succeeded in finding and catching oedipodines in most localities, as well as numerous other grasshopper species as we describe below. On 22 December, we were invited to have dinner and spend the night at Ricardo Mariño-Pérez parents' house (Fig.2B), and we were collecting in this region for an additional two days, as we enjoyed great company and further expanded our species count.

Oedipodinae species

In Mexico, the present count of Orthoptera fauna include 1,008 recorded species, with 499 species of grasshoppers, 66 of which represented by Oedipodinae. These particular grasshoppers are recognized by the stridulatory apparatus typically (but not always) present and hindwings that usually carry a darker marginal band. The most abundant oedipodine sampled was *Arphia nietana* (Saussure, 1861) (Fig.3A), collected in at least eight of our field-sampling localities. These grasshoppers were found in natural and perturbed areas, and show an amazing variation in the color pattern of the wings (red, orange, and yellowish), hind tibiae (red or yellow), and ornamentations in the coloration of the pronotum. Other species that were collected included: *Encoptolophus costalis* (Scudder, 1862), *Lactista azteca* (Saussure, 1861), *Leuronotina orizabae* (Saussure, 1884) (Fig.3B),

Figure 2. Fieldwork and expedition team (A) Salomon, me, and Jason in Zona Arqueológica Teuchitlán o Guachimontones and (B) the same team with Ricardo Mariño-Pérez in Tecomatlán.

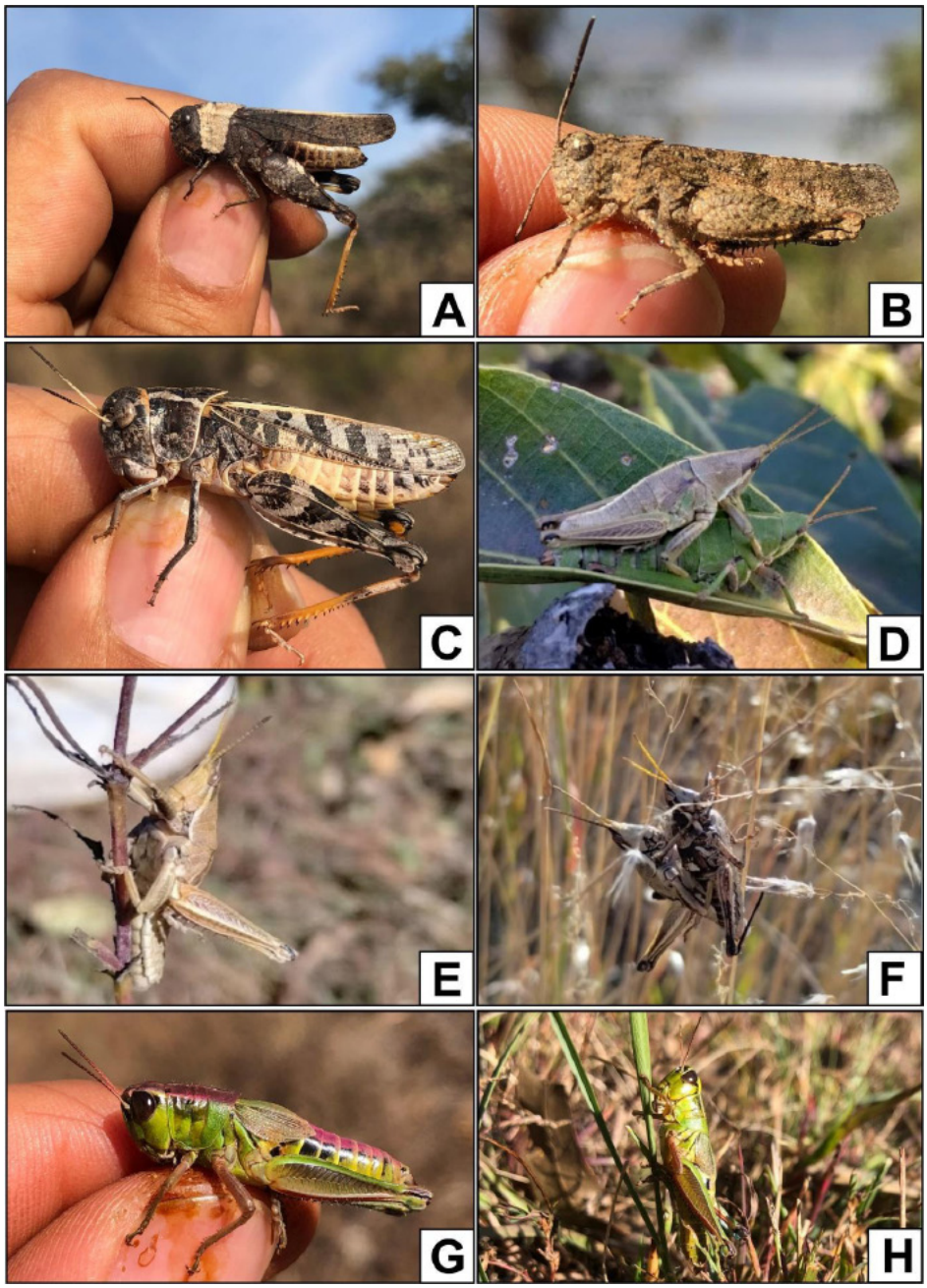


Figure 3. Some species of grasshoppers observed during the fieldwork: (**A**) *Arphia nietana*; (**B**) *Leuronotina orizabae*; (**C**) *Hippiscus ocelote* female; (**D**) a couple of *Sphenarium purpurascens* in an avocado tree; (**E-F**) *Sphenarium borrei*; (**G- H**) *Phoetaliotes nebrascensis*.

Leprus elephas (Saussure, 1861), *Trimerotropis pallidipennis* (Burmeister, 1838), *Trimerotropis melanoptera* McNeill, 1901, *Tomonotus mexicanus* Saussure, 1861, and *Mestobregma sp*. In places under pressure from urban development, we collected several specimens of *Hippiscus ocelote* (Saussure, 1861) (Fig.3C). This was unexpected and contrary to our experience of collecting so many specimens from disturbed areas (Fig.1F).

Pyrgomorphidae

The genus *Sphenarium* Charpentier, 1842 comprises a group of fusiform and flightless grasshoppers, and is the most diverse group of the New World Pyrgomorphidae. These grasshoppers show an extensive variation in external morphology and have been culturally and economically important for Mexican people since pre-Hispanic times. During our expedition, we collected 2 species, *Sphenarium purpurascens* Charpentier, 1845 (Fig.3D) and *Sphenarium borrei* Bolívar, 1884 (Fig.3E). The former was by far the most abundant and frequently collected across the entire expedition. This might be expected given the species is regarded as one of the most concerning crop pests in Mexico. They are known to feed on corn, bean, alfalfa, squash, broad bean, sorghum, and even avocado crops.

Sphenarium borrei was relatively less common and less abundant, although we also observed this species feeding on corn crops, as well as native plant species. This species also represents the oldest lineage of *Sphenarium* yet known, something that is evident in its external morphology and coloration, noticeably different from *S. purpurascens*, which, in turn, represents one of the youngest species in the genus.

Melanoplinae

One of the most abundant subfamilies in all localities of our fieldwork, the Melanoplinae show an astonishing variation in size, wing form, and coloration patterns, and represent the most diverse subfamily of Acrididae in Mexico. During our expedition the most frequent species encountered was *Phoetaliotes nebrascensis* (Thomas, 1872) (Fig.3G-H) followed by *Melanoplus differentialis* and *Melanoplus lakinus* (Scudder, 1878) (Fig.4E). Other more colorful, but less common, melanoplines during our expedition were *Philocleon nigrovittatus* (Stål, 1875) (Fig.4A,D), *Philocleon anomalus* Roberts, 1941 (Fig.4F), *Aztecacris laevis* (Rehn, 1900) (Fig.4B), and *Dactylotum bicolor bicolor* Charpentier, 1845 (Fig.4C).

One interesting find during our expedition was to observe some individuals of *Phoetaliotes nebrascensis* feeding on cacti fruits (*Opuntia* sp.) in a locality near Queretaro. Although this behavior has been documented for *Sphenarium purpurascens* as well, to our knowledge, this is the first time recorded for a Melanoplinae species. This incidental observation makes sense considering that most of the

other plants commonly consumed by melanoplines, such as Asteraceae, were dry at the site.

Other grasshoppers, Ensifera, and orthopteroids

During our expedition, we identified several other species of Caelifera, including *Rhammatocerus viatorius* (Saussure, 1861), *Schistocerca nitens* (Thunberg, 1815), *Schistocerca americana* (Drury, 1773), *Taeniopoda eques* (Burmeister, 1838), *Brachystola* sp. (Fig.4G), *Syrbula montezuma* (Saussure, 1861) (Fig.4H), *Amblytropidia mysteca* (Saussure, 1861) among other grasshoppers. Within Ensifera we found three species of *Insara* sp., *Scudderia* sp. and also members of genus group *Dichopetala*. Regarding the orthopteroids, we found two mantis species from desertic environments: *Yersinia mexicana* Saussure, 1859 and *Pseudovates chlorophaea* Blanchard, 1836.

In conclusion, after this period in Mexico we considered our expedition a success because most of our records will help to increase the information regarding the distribution ranges and morphological variation of the identified species. In addition, we collected material for taxonomic and molecular analyses, as well as ecological observations for further studies of Mexican orthoptera fauna. We believe that all the activities along this trip will improve the collaborative work between North and Latin American orthopterists, aside from having strengthened the bonds of friendship in this multicultural team.

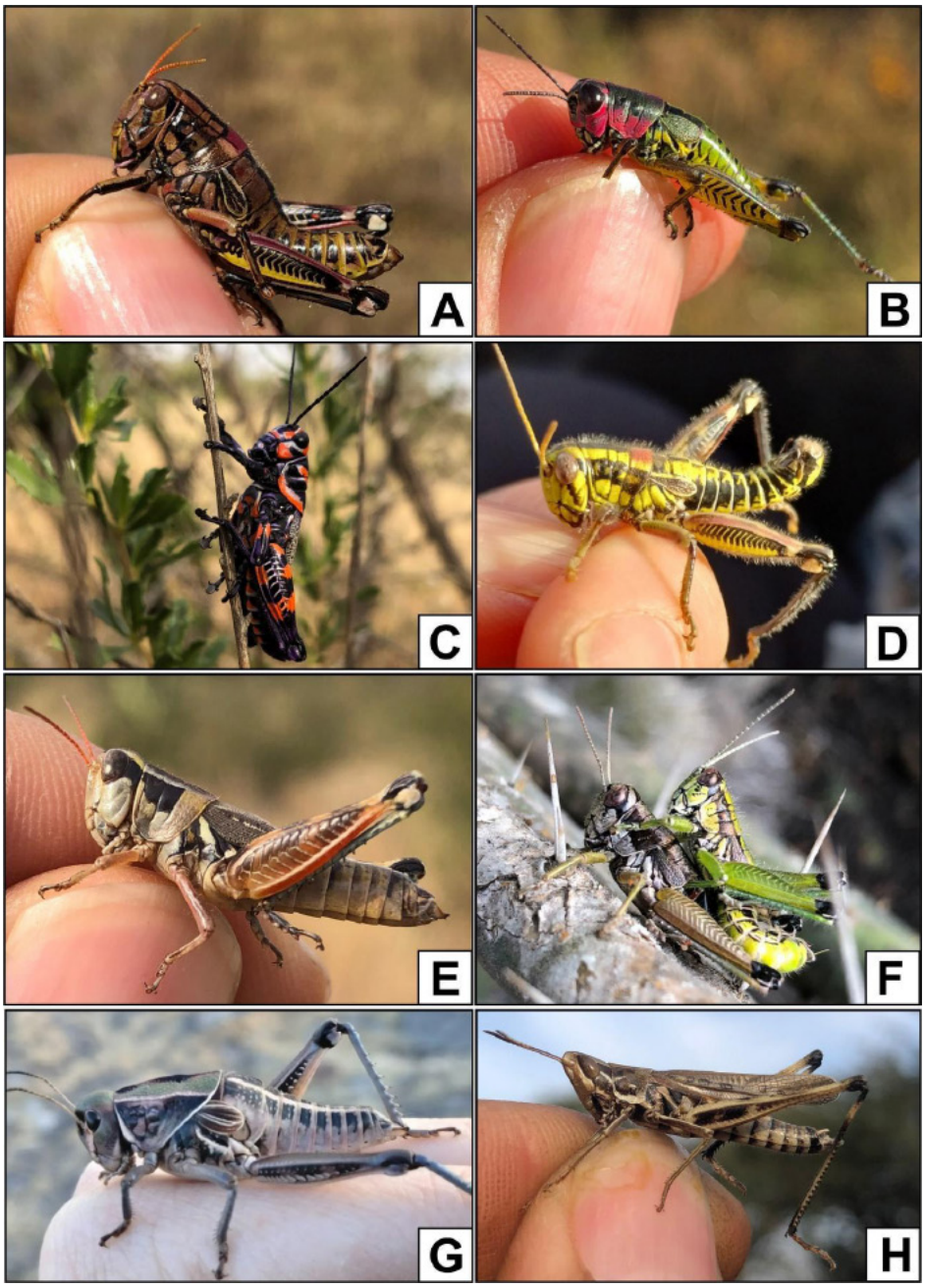


Figure 4. Some species of grasshopper observed during the fieldwork: (**A, D**) *Philocleon nigrovittatus*; (**B**) *Aztecacris laevis*; (**C**) *Dactylotum bicolor bicolor*; (**E**) *Melanoplus lakinus*; (**F**) *Philocleon anomalus*; (**G**) *Brachystola* sp.; (**H**) *Syrbula montezuma*.

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Proceedings of the 2022 ESA Organized Meeting, "Small Orders, Big Ideas (Polyneoptera)"

By DEREK A. WOLLER[1], CARLA DE LOERA[2], & HOJUN SONG[3]
[1]USDA-APHIS-PPQ-Pest Exclusion and Import Programs, Riverdale, MD, USA
asilid@gmail.com
[2]Texas A&M University, College Station, TX, USA
carla_deloera05@tamu.edu
[3]Texas A&M University, College Station, TX, USA
hsong@tamu.edu

Since 2014, a symposium or organized meeting (depending on the whim of the conference organizers) focused on Poyneoptera has been part of the annual Entomological Society of America (ESA) conference, containing presentations by a balanced ratio of younger researchers (often students) and seasoned ones, and covering interesting topics that focus on one or more of the 10 extant polyneopteran orders: Blattodea (+Isoptera), Dermaptera, Embiodea, Grylloblattodea, Mantodea, Mantophasmatodea, Orthoptera, Phasmatodea, Plecoptera, and Zoraptera. This year, the ESA meeting was held in Vancouver, Canada on November 16, 2023 and we had eight speakers participate (three in-person, five virtual), from Germany, Japan, and the U.S.A. As always, we attribute a majority of the event's success to the wonderful speakers and their engaging presentations and you can still register and watch the virtual presentations by searching the ESA program for "polyneoptera."

The speakers were: (in-person and hosted by Carla de Loera) Jack McKermitt, Jackson B. Linde, Janice S. Edgerly (who entertained audiences of this event for the 8th time!); (virtual) Paula Castillo, Yoko Matsumura, Monika J. B. Eberhard, Terrence Sylvester, and our wonderful keynote speaker, Robin M. Tinghitella. Collectively, these presentations covered six of the Polyneoptera orders: Orthoptera (always, although, interestingly, no talks were focused specifically on Caelifera for the first time ever), Blattodea (Isoptera), Embioptera, Phasmatodea, and, for the first time ever, talks on both Mantophasmatodea and Zoraptera. A diverse array of topics were discussed, ranging from sexual selection to systematics to the evolution of olfactory systems systematics, and more. If you would like to learn more about the presentations, a brief abstract and figure (for some) are provided below.

Calling out for love: effects of varying sexual selection intensities on reproductive effort

Jack McKermitt (jtmcker@ilstu.edu), Illinois State University, with Bert Foquet, Ben Sadd, Scott Sakaluk, and John Hunt

Sexual selection is a critical selective force that promotes the evolution of traits that enhance an individual's reproductive success. To better understand the evolution of these traits, we must identify factors underlying variation in sexual selection. The mating system is one key component that influences the magnitude of selection. A common proxy used to characterize the mating system is the operational sex ratio (OSR), or the number of sexually active males to sexually receptive females. Individuals may also modulate trait expression depending on their environment via behavioral plasticity. Using decorated crickets (*Gryllodes sigillatus*), we established two selective regimes under different OSRs to investigate how the intensity of sexual selection influences the evolution of calling effort, a sexually selected male trait. I exposed males from each OSR to different levels of perceived competition, recording their calls in the presence of an experimentally muted competitor or as solitary

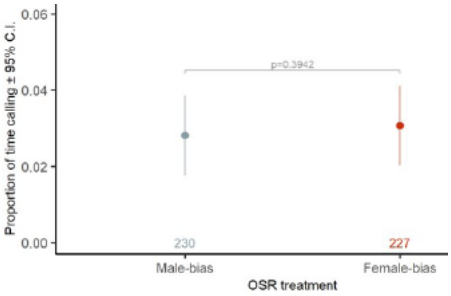

Figure 1. OSR treatment.

individuals. With these treatments, it is possible to discern if males from different OSRs modulate their calling depending on the level of competition (Fig. 1). This study will contribute to our growing knowledge of the evolutionary ecology of sexual selection, using a system where fitness-relevant traits favored by sexual selection and male-female interactions are easily quantified.

Comprehensive phylogeny of stick insects (Insecta: Phasmatodea) reveals hyper-convergence and taxonomic incongruence

Jackson B. Linde (jackslinde35@gmail.com), Department of Biology, Brigham Young University, Bean Life Science Museum, with Sarah Bank-Aubin, James A. Robertson, Sven Bradler, and Michael F. Whiting

The insect order Phasmatodea (phasmids) includes the charismatic stick and leaf insects with more than 3,000 described species. Phasmids exhibit substantial morphological variation beyond the typical stick-like form: there are gracile fliers, robust "tree lobsters," dorsoventrally flattened species that look just like leaves, and some with extreme spines.

These masters of masquerade crypsis imitate twigs, bark, bean pods, grass, and even lichen (Bedford 1978). They also have substantial variation in body length spanning from less than an inch, *Timema cristinae*, to 25.2 inches, *Phobaeticus chani*, with the latter being the longest insect in the world (Vickery 1993; Hennemann and Conle 2008). A major aspect of phasmid evolution appears to be rampant convergent evolution. There is convergence seen in body form, oviposition technique, and cross-kingdom convergence with angiosperm seeds.

One powerful example of convergence is seen in each life stage of *Extatosoma tiaratum*. First, the eggs of *E. tiaratum*, and many other phasmid species, are morphologically convergent with angiosperm seeds. Second, the juvenile stage of freshly hatched *E. tiaratum* nymphs mimic ants in color and with their egg capsule. Lastly, the adult stage of *E. tiaratum* is convergent with dried leaves. An example of morphological convergence are the tree lobster morphs of *Eurycantha horrida* (Lonchodidae) and *Dryococelus australis* (Lanceocercata). While they look incredibly similar, they are distantly related from a phylogenetic standpoint (Buckley et al. 2009; Bradler et al. 2014). Perhaps the most striking example of convergence is phasmid eggs and angiosperms, as they have a fatty, knob-like structure, known as a capitulum and elaiosomes, respectively. These structures are near-identical in appearance and fats contained (Stanton et al. 2015; O'Hanlon et al. 2020). These convergent fatty-knobs entice ants to disperse eggs and seeds for phasmids and angiosperms in a process called myrmecochory. Each example of convergent evolution above was only discovered through the light of phylogeny. To document such widespread convergence in phasmids requires a more extensive and robust phylogenetic framework. Here we reconstructed the most deeply taxon-sampled phylogeny to date with 974 exemplars to further document and study this convergent evolution.

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Dispersal risks and decisions shape how non-kin groups form for a tropical silk-sharing webspinner (Order Embioptera)

Janice S. Edgerly (jedgerlyrooks@scu.edu), Santa Clara University

Embioptera construct silken coverings exposed on tree bark in humid and warm environments or in leaf litter and underground in dry habitats. Relying on silk can promote the evolution of sharing, especially when its presence means life and its absence, quick death. Evidence from more than 30 years of research reveals potential drivers of the facultative colonial system observed for adult females in the neotropical species *Antipaluria urichi* (Clothodidae) (Fig. 2). Dispersal behavior is a regular feature of their life cycle. To determine risks of dispersal and decisions of where to settle, I released females into the field as dispersers and monitored their ability to survive in the face of likely predation while they walked. I also re-released captured naturally dispersing adult females and scored their decisions to join silk or to settle on their own. Results showed that dispersers risk at least a 25% chance of being killed while walking, orient to large diameter trees as they cross the ground, and join the silk of others if they encounter silk while walking on bark. These results align with observations of natural field colonies in that adult females and late-stage nymphs do join existing colonies of non-kin. A laboratory experiment demonstrated that dispersing females orient to vertical and large diameter tree-like objects, a behavior that matches the distribution of colonies in the field. The ultimate reason for this distribution is probably because large trees support more expansive epiphytic algae and lichens (food for this species), although the impact of food resources on dispersion has not been tested. Joining others is at least partly due to the risk of being outside of the silk covering—very dangerous for these soft-bodied insects. Joining pre-existing silk structures also appears to lend protection

Figure 2. *Antipaluria urichi* female.

against predators that attack the silk in search of the occupants but may put the joiner at risk of higher parasitism rates experienced by reproductive females when sharing silk with other egg-layers.

From morphology to genes: an overview of the olfactory system of the Formosan subterranean termite, *Coptotermes formosanus*

Paula Castillo (pcastillo@agcenter.lsu.edu), Louisiana State University, with Qian "Karen" Sun

Subterranean termites are eusocial insects that heavily rely on chemical signals to communicate. Olfaction is an essential sense for the adaptive social life of many insects, however, in termites, it remains largely unknown how olfactory cues are perceived in the antennae, and if there are sensory level differences among castes to accommodate their differential behavioral repertoires. In this study, we investigated the external morphology of the antennae along with its gene expression profiles in workers, soldiers, and alate reproductives of the Formosan subterranean termite, *Coptotermes formosanus*. Through morphological analysis of the antennae, we identified nine types of antennal sensilla present in all castes, of which about 90% perform chemosensory function (chemosensilla). The quantitative composition of these sensilla differs between alate reproductives (males and females) and non-reproductives (workers and soldiers). At the molecular level, through transcriptomic analysis of the antennae in all castes we identified more than 100 putative chemosensory genes, including chemosensory proteins (CSPs), odorant-binding proteins (OBPs), odorant-receptors (ORs), and ionotropic receptors (IRs).

Differential gene expression analysis revealed that greater differences are found between reproductives versus non-reproductive castes. The odorant receptor co-receptor (*orco*) is a fundamental protein for chemosensory function. We put particular emphasis into investigate its spatial (tissue) and temporal (developmental stage) gene expression profiles. Our results showed that the *orco* gene was primarily expressed in the antennae, where its expression is higher in alate reproductives than workers and soldiers. In addition, *orco* is expressed in eggs and all postembryonic developmental stages, suggesting an alternative function of this gene in early developmental stages. Overall, our results provide evidence of differences at the morphological and molecular levels of the chemosensory system across castes of the Formosan termites, which may underlie their reproductive division of labor. However, additional research is required to establish a clear link between our findings, olfactory function, and behavioral display.

The Evolution of Zoraptera (Polyneoptera)

Yoko Matsumura (yoko.matumura.hamupeni@gmail.com), Entomology Group, Institut für Spezielle Zoologie und Evolutionsbiologie mit Phyletischem Museum, Friedrich Schiller University Jena, Germany, with Rolf G. Beutel, Jose A Rafael, Izumi Yao, Josenir T. Camara, Sheila P. Lima, and Kazunori Yoshizawa

Together with Dermaptera, Zoraptera is likely the first split among the polyneopteran orders. To understand the evolution of Polyneoptera, accumulating more knowledge on zorapteran species is essential. Based on a broad taxon sampling from all continents where the group is known we conducted the first species-level phylogeny, using partial sequences of 18S rRNA, Histone 3, 16S rRNA, and 12S rRNA genes. The resulting phylogenetic trees show that Zoraptera is divided into three major clades, and that two of them are composed of species distributed on different continents. The monophyly of these clades is at least partly supported by shared derived morphological features. The divergence age estimation and ancestral distribution area reconstruction unveiled an ancient origin and early radiation initiated in the Permian. The plate tectonics theory suggests that the present distribution of Zoraptera was mainly established by vicariance, rather than dispersal. The three major clades likely originated on the Pangaea supercontinent, or alternatively on the Gondwana and Laurasia supercontinents. Their ancient origin explains previously found conspicuous interspecific divergence variation of the spermatozoa morphology, genital apparatus, sperm structure, and mating behavior, in striking contrast to a highly conserved general body morphology. We also compiled data on available reproductive features and reconstructed the character evolution. Although homologies in the genital character system are not fully established yet, the analyses revealed repeated acquisitions and/or losses of a hyper-elongated intromittent organ, mating hooks, and tergal protuberances. Our latest projects are aimed at gaining a better understanding of the evolution of Zoraptera.

2002-2022: 20 years of Mantophasmatodea research in a nutshell

Monika J. B. Eberhard (monika.eberhard@uni-greifswald.de), University of Greifswald, Zoological Institute and Museum, General & Systematic Zoology

The insect order Mantophasmatodea (heelwalkers, Fig. 3) was discovered and formally described only 20 years ago in 2002. It is thus the "youngest" insect order we know. Moreover, the whole order was first described based on preserved museum specimens and fossils in Baltic amber. Extant species occur in southern Africa where the predatory, secondary wingless insects waited a long time for their discovery, well-hidden in shrubs and tufts of grass. So far, the insect order comprises 21 described species. A fascinating aspect of mantophasma-

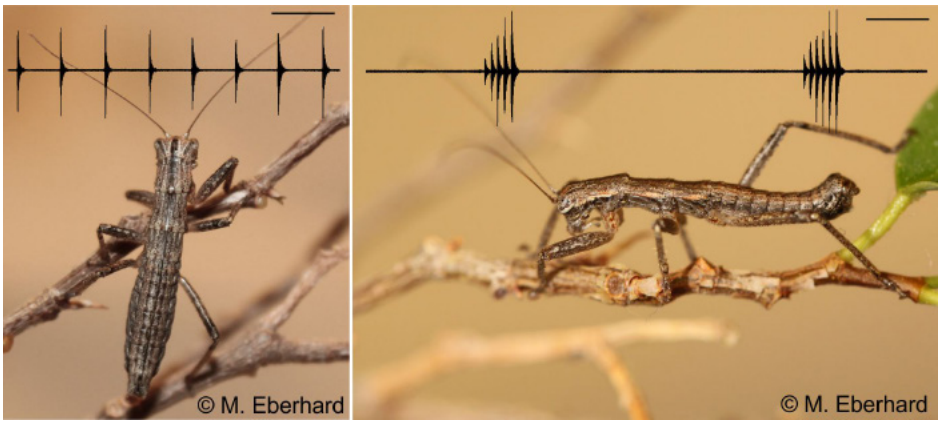


Figure 3. Example of and sex-specific acoustic signals of Mantophasmatodea.

todean behavior is their communication system using substrate vibrations (recently termed "biotremology"). Males and females tap the substrate with their abdomen and generate vibrations in the branches or blades of grass on which they reside. Males even possess a sclerotized process on their subgenital plate, the drumming organ, to produce the percussive signals. These signals are species- and sex-specific (Fig. 3) and serve the insects for species recognition and mate localization; they are probably also involved in mate choice. Simon Küpper (former BSc student) found that many characteristics of male vibratory courtship signals are affected by changes in temperature and also vary with male age (Eberhard et al. 2019, doi: 10.1016/j.beproc.2019.103907).

Heelwalkers perceive substrate vibrations with very sensitive scolopidial organs within their legs; most importantly the subgenual organ within the tibiae (Eberhard et al. 2010, doi: 10.1016/j.asd.2010.02.002).

In addition to the communication system, we also investigated the anatomy of reproductive organs in Mantophasmatodea, where Josefine Kreuz (former BSc-student) and I discovered that Mantophasmatodea males have only one seminal vesicle developed on the right side of the body while it is missing on the left side. We hypothesize that this extreme asymmetry evolved due to the long copulation duration and mating position, where the male bends its abdomen around the right side of the female to the left (Kreuz & Eberhard 2022, doi: 10.1186/s40850-021-00105-6).

I hope that we will discover many more interesting aspects about Mantophasmatodea biology, ecology, and behavior in the future.

Lineage-specific patterns of chromosome evolution are the rule not the exception in Polyneoptera insects

Terrence Sylvester (tsylvester@bio.tamu.edu), Texas A&M University, with Carl E. Hjelmen, Shawn J. Hanrahan, Paul A. Lenhart, J. Spencer Johnston, and Heath Blackmon

We can describe a genome in its simplest form by the number of chromosomes and the type of sex chromosomes it contains. The first records of chromosome numbers date back to 1882, and since then, we have accumulated over a century of chromosome number data from many different clades in the tree of life. Despite chromosome numbers being such a fundamental trait of genomes, we lack a proper understanding of how chromosome numbers evolve across large clades. To address this issue, we collected all available chromosome number data for the insect clade Polyneoptera and assembled a dataset consisting of 823 karyotype records for this insect clade. Chromosome numbers in Polyneoptera have a considerable variation among clades, which allowed us to explore the plausible causes of these chromosome number differences. We first evaluated our data to see if there was evidence for chromosome fusion or chromosome fission during the transition of sex chromosome systems.

Here, we used a taxonomic approach where we compared the distribution of autosome numbers among genera with species having multiple sex chromosome systems. Our analysis shows evidence for chromosome fusions playing an essential role in the transition of sex chromosome systems. We then analysed our data using a phylogenetic approach. Here we reconstructed the polyneopteran phylogeny and combined it with the chromosome number data and a model of chromosome number evolution to estimate the rates of chromosome fusion, fission, and whole genome duplications across the polyneopteran clades. Our analysis allowed us to assess the importance of rates of chromosome number evolution among Polyneoteran clades and the impacts of genome size and parthenogenesis on chromosome number evolution. We find that polyneopteran orders show striking differences in the rates of chromosome number evolution. We also find that the transition into parthenogenesis coincides with higher rates of polyploidy. Finally, we find that the variation in genome size fails to explain the chromosome number evolution rate differences among Polyneoptera. Our results suggest that there is difficulty in finding consistent rules governing the evolution of chromosome numbers at this scale. This could be due to the presence of many forces leading to the variation in chromosome number among the polyneopteran clades.

The origins of novelty in communication between the sexes

Robin M. Tinghitella (robin.tinghitella@du.edu) University of Denver, with E. Dale Broder, David Zonana, Jay Gallagher, Gabrielle Welsh, and Aaron Wikle

The diversity of signaling traits

within and across taxa is vast and striking, prompting us to consider how novelty evolves in the context of animal communication. New communication features could first arise in signalers or receivers, but the microevolutionary processes that result in novel signal or receiver traits remain relatively unknown because observing the contemporary evolution of new traits is so very rare. Further, how new sexual signals, the focus of this talk, arise, persist, and spread is difficult to envision because signals and receiver responses frequently coevolve, and new signal features could disrupt existing communication systems. How then do novel sexual signals come to be? Over the past five years, my lab discovered two novel sexual signals in introduced Hawaiian populations of the Pacific field cricket (*Teleogryllus oceanicus*), a study system already well-known for rapid evolutionary change in response to a similarly introduced natural enemy (the acoustically orienting parasitoid fly, *Ormia ochracea*).

In this talk, I first characterized four prominent morphs of male Pacific field crickets, including the recently evolved purring and rattling types that produce novel sexual signals. I then described a series of experiments designed to interrogate the selective landscapes surrounding the origin of these novel signals. We found that both purring and rattling males produce attenuated songs (both are quieter and more broadband than the ancestral, typical song), but do so using different morphological mutations to the wing; purring wings have reduced file and resonator structures (similar to flatwing males), while rattling wings have distinct gaps in the teeth of the file (Fig. 4). In field-based studies, both novel songs appear attractive to female crickets, but to simultaneously protect them from parasitism, suggesting they are private modes of communication. Further work revealed that <5 years from the apparent origin of the signal, neither female crickets nor parasitoid flies have clear, consistent preferences for certain components of purring song; instead we found extreme inter-individual variation in preference functions. This study system continues to provide a treasure-trove of new insights into the microevolutionary processes that result in novel signal or receiver traits.

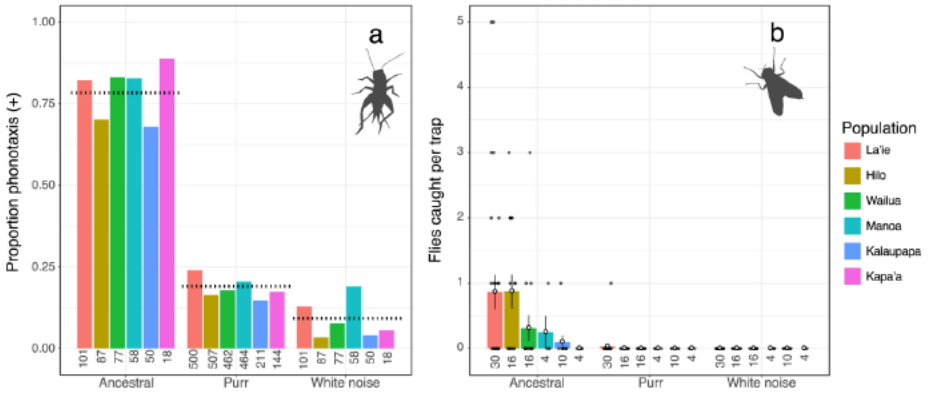


Figure 4. Purring appears to be a private mode of communication among crickets. Responses of female crickets (**a**) and parasitoid flies (**b**) to field-based playbacks of ancestral song, purring song, or white noise in six Hawaiian populations. Female crickets are most responsive (positively phonotactic) to ancestral song, and respond positively to purring song more than they do white noise. In extensive field study, only a single parasitoid fly was ever recovered at a sound trap playing purring song. *Figure from:* Tinghitella, R.M., Broder, E.D., Gallagher, J.H., Wikle, A., Zonana, D.M. 2021. Responses of intended and unintended receivers to a novel sexual signal suggest clandestine communication. *Nature Communications*. 12:797.

Proceedings of the 2022 South American Orthoptera Symposium in the XI Argentine Congress and XII Latin American Congress of Entomology

By YANINA MARIOTTINI[1] & M. CELESTE SCATTOLINI[2]

[1]Instituto Multidisciplinario sobre Ecosistemas y Desarrollo Sustentable, UNICEN, Tandil, ARGENTINA
[2]Centro de Estudios Parasitológicos y de Vectores (CEPAVE), CONICET-UNLP, La Plata, ARGENTINA

We are delighted to mention that in October 2022, in La Plata (Argentina), the XI Argentine Congress and XII Latin American Congress of Entomology were held. Grasshopper studies were present throughout the congress, with one plenary lecture, one symposium, two oral presentations, and five posters. Hojun Song opened the grasshopper talk cycle with a splendid virtual plenary talk entitled "Evolution of locust swarms and phenotypic plasticity in grasshoppers." Afterward came the symposium entitled "South American Orthoptera: Studies on ecology, evolution, phylogeny, and management." These presentations brought together 12 speakers from six countries (two of them were virtual) and covered four main thematic areas of grasshopper studies: Evolutionary and phylogenetic studies, Ecological and biogeographical studies, Species management, and Ecological stud-

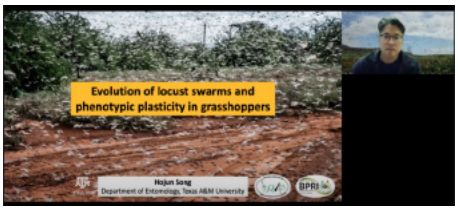
ies of pest species. We are extremely happy with the result of this congress, and it was the perfect setting for interaction with colleagues and a starting point for many collaborative projects. Among the travelers, we were thrilled that David Hunter was kind enough to fly across the globe to join us for an extraordinary talk. Likewise, it was honored to learn that the symposium was declared important by the Inter-American Coordination Group on Plant Health (Grupo Interamericano de Coordinacion en Sanidad Vegetal-GICSV), which gathers the phytosanitary protection organizations of the Americas. Finally, we would like to deeply thank the Orthopterists' Society for their support, which allowed us to bring together all these people from such distant regions. Without their contribution, this beautiful meeting would not have been possible.

If you are interested in knowing more about the presentation, brief abstracts of the talks, names of the speaker, and some photographs of the congress and the lovely post-symposium dinner are provided below.

Evolutionary and phylogenetic studies

Evolution of locust swarms and phenotypic plasticity in grasshoppers

Song, Hojun (Hojun.Song@ag.tamu.edu)



The genus *Schistocerca* (Orthoptera: Acrididae) includes some of the most devastating locust species in the world, including the desert locust (*S. gregaria*), the Central American locust (*S. piceifrons*), and the South American locust (*S. cancellata*). These locust species show an extreme form of density-dependent phenotypic plasticity in which cryptic and shy individuals, known as the solitarious phase, can transform into conspicuous and gregarious individuals, known as the gregarious phase, in response to changes in local population density. In fact, this "locust phase polyphenism" is what makes the locusts distinctly different from regular grasshoppers. Intriguingly, *Schistocerca* includes 45 species, most of which are non-swarming sedentary grasshopper species, and phylogenetic studies have shown that the locust species do not form a monophyletic group, suggesting that locust phase polyphenism has evolved multiple times in the genus. Furthermore, recent experimental studies have indicated that some of the non-swarming grasshopper species show reduced density-dependent phenotypic plasticity, suggesting that *Schistocerca* as a whole is an exciting model clade that can be used to study how phenotypic plasticity has evolved as species diverge. In this presentation, I will describe a research program that integrates phylogenetics, behavioral ecology, physiology, functional genetics, and comparative genomics to understand the evolution and mechanisms of phenotypic plasticity in *Schistocerca*, and highlight some of the latest findings.

Systematic and phylogenetic studies of the South American genus *Diponthus* and its relationships within Romaleini (Acridoidea: Romaleidae)

Estudios sistemáticos y filogenéticos del género sudamericano *Diponthus* y sus relaciones dentro de Romaleini (Acridoidea: Romaleidae)

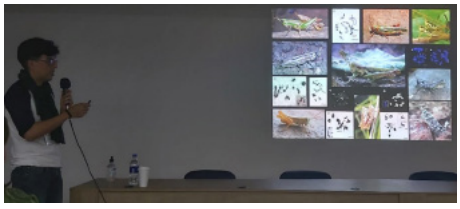
Pocco, Martina E.
(martinapocco@fcnym.unlp.edu.ar)

Las tucuras de la subfamilia Romaleinae se distribuyen casi exclusivamente en la región Neotropical, con pocos representantes en el sur de la región Neártica. Es un grupo que reviste importancia evolutiva por su notable diversificación, así como también importancia económica dado que algunas especies son perjudiciales para el agro. Dentro de Romaleinae, es común la presencia de coloración aposemática y comportamiento gregario en estadios juveniles, y muchas especies exhiben variación intraespecífica en la coloración. La mayoría de los géneros de Romaleinae mejor representados en Sudamérica han sido revisados taxonómicamente, a excepción del género *Diponthus* Stål, que cuenta con el mayor número de especies de la subfamilia en Argentina. Este género, endémico del sur de Sudamérica (centro y norte de Argentina, Uruguay, sur de Brasil, sudeste de Paraguay y sudeste de Bolivia) se encuentra incluido dentro de la tribu Romaleini, y cuenta con 22 especies nominales, de las cuales

16 son consideradas válidas hasta el presente. Su posición dentro de la tribu e incluso dentro de la subfamilia ha sido cuestionada por distintos autores, debido a las características de su genitalia y por la ausencia del mecanismo de estridulación tegmino-alar que se encuentra en la mayoría de los Romaleinae. En este trabajo se desarrollan estudios sistemáticos de revisión del género *Diponthus*, y se realizan análisis filogenéticos del grupo basados en datos morfológicos. Como resultado, se establecen nuevas sinonimias y se describen cuatro nuevas especies para Argentina, Brasil y Bolivia. Las especies de *Diponthus* se distinguen principalmente por caracteres de las tegminas, de la genitalia masculina y por el patrón de coloración del cuerpo. Se recupera la monofilia del género *Diponthus*, y como grupo hermano a *Gurneyacris*. Ambos presentan características únicas de la genitalia masculina que los diferencian de los restantes Romaleinae. Se discuten los resultados obtenidos, principalmente en relación con su ubicación dentro de la tribu y las relaciones con otros Romaleinae, y aspectos sobre los patrones de diversificación del grupo en Sudamérica.

Chromosomal rearrangements and karyotypic evolution in grasshoppers of the genus *Ronderosia* (Orthoptera, Acrididae)
Rearreglos cromosómicos y evolución cariotípica en saltamontes del género *Ronderosia* (Orthoptera, Acrididae)

Castillo, Elio R.D (castillo.eliorodrigo@gmail.com)



Las variaciones en los cariotipos debido a reordenamientos cromosómicos (RCs) han sido considerados durante mucho tiempo como impulsores de cambios evolutivos. Los RCs pueden jugar un papel crítico en la especiación, ya que los cariotipos divergentes resultantes son a menudo incompatibles y están asociados a la delimitación de especies. Los saltamontes del género *Ronderosia* presentan gran diversidad de CRs, ofreciendo una oportunidad única para examinar el impacto de los RCs en la evolución y la especiación. Los reordenamientos pueden involucrar exclusivamente autosómas, así como un autosoma y el cromosoma X, conduciendo en el último caso a la formación de neo-sistemas cromosómicos de determinación sexual (neo-SCDS). A pesar del potencial papel de los RCs en la especiación, los patrones generales de los cambios cariotípicos debidos a los RCs aún no están claros en *Ronderosia*. Aquí investigamos la evolución cariotípica en ocho especies de *Ronderosia* utilizando evidencia citogenética y la reconstrucción ancestral del número cromosómico y la localización de 4 genes de la familia multigénica (5S, 18S, U2 y H3). Los resultados evidencian grandes diferencias entre los cariotipos de las especies de *Ronderosia*, particularmente en los neo-SCDS. Sugerimos que los RCs tendrían un papel central en las variaciones del número cromosómico y la diversidad de neo-SCDS observada en el género. El estudio comparativo i) evidenció reordenamientos adicionales (inversiones paracéntricas), que habían quedado ocultos en trabajos anteriores, ii) mostró variaciones no sólo en la heterocomatina constitutiva, sino también en el número de loci y la localización de los genes de las familias multigénicas, y iii) mostró neo-SCDS divergentes entre las especies, evidenciados por la remodelación de la cromatina en varias regiones de estos elementos. El papel de los RCs y la diversidad de los neo-SCDS sugieren que especies incipientes con escasos cambios morfológicos, como los observados en las especies de *Ronderosia*, podrían acumular marcadas diferencias en sus cariotipos contribuyendo al aislamiento reproductivo post-zigótico. Además de la evolución del número cromosómico en la filogenia del género, el cambio cromosómico debido a fusiones céntricas, se encuentra vinculado al patrón de divergencia observado en el árbol.

Ecological and biogeographical studies:

Interesting records and new species of tetigonids from the Province of Buenos Aires
Registros interesantes y especies nuevas de tetigónidos de la Provincia de Buenos Aires

Braun, Holger (braun@fcnym.unlp.edu.ar)

En la provincia de Buenos Aires se encuentran representantes de cuatro subfamilias de Tettigoniidae. La mayoría de las 30 especies confirmadas pertenece a los Phaneropterinae. En general tienen alas bien desarrolladas, aunque algunas especies braquípteras son particularmente interesantes. En la orilla del Río de la Plata se estableció una muy pequeña población de *Xenicola dohrni*, una especie distribuida en el sur de Brasil, y en el Parque Provincial Pereyra Iraola vive una especie aún no descripta del género *Anisophya*. En ambas especies el canto del macho es ultrasónico y las hembras responden con una señal propia, también ultrasónica. Entre los Conocephalinae son notables algunas especies del género *Conocephalus*. En reservas costeras de la ciudad de Buenos Aires fue encontrado *C.*

ochrotelus, otra especie brasileña, y *C. doryphorus* de Uruguay vive también en el lado argentino del Río de la Plata, además hay una especie nueva cuya descripción está en progreso. Las últimas dos especies están junto con el muy común *C. longipes* en pastizales de la Reserva Natural Punta Lara, y los cantos continuos de los machos de las tres se diferencian por su patrón temporal. La especie *Phlugis proseni* cuya localidad tipo es Punta Lara, está confirmada por varios registros recientes. Pertenece a los Phlugidini (controvertidamente asignados a los Meconematinae), que son pequeños depredadores de ojos grandes y patas anteriores con espinas largas. *Ph. proseni* y *Dasyscelus normalis* (Pseudophyllinae) son los únicos integrantes, respectivamente, de grupos mayormente tropicales que llegan hasta Buenos Aires.

The Dysoniini tribe (Orthoptera: Tettigoniidae) masters of crypsis in Neotropical forests

La tribu Dysoniini (Orthoptera: Tettigoniidae) maestros de la cripsis en los bosques Neotropicales

Cadena-Castañeda, Oscar J. (ojccorthoptera@gmail.com)

La tribu Dysoniini tiene una amplia distribución en el Neotrópico, desde el Noreste de México hacia el norte de Argentina, con la mayoría de sus integrantes en Sudamérica. Estos tetigónidos destacan por su camuflaje con líquenes y briófitos, además de presentar un vertex elevado, inusual en la subfamilia Phaneropterinae, a la cual pertenecen. Mediante un análisis filogenético de la tribu y la optimización de caracteres referentes a los hábitos de camuflaje, mimetismo y comportamientos asociados a estas preferencias adaptativas. Las optimizaciones para la filogenia estructural son indicadas en cada carácter optimizado, mostrando los nodos en los cuales difieren los distintos tipos de optimizaciones por carácter. Los caracteres analizados sobre el comportamiento de desplazamiento de los taxones estudiados, están estrechamente relacionados con el tipo de mimetismo o camuflaje que tenga cada grupo, siendo así que aquellos taxones que se camuflan en líquenes foliosos, se desplacen en una marcha lenta y disimulada, en contraste los taxones que se camuflan con líquenes arbustivos o fruticosos procuran simular el movimiento que ejerce el viento sobre los líquenes en los cuales se camuflan haciendo más efectiva su estrategia, siendo prácticamente indistinguibles en su ambiente natural. Se halló que el mimetismo con hojas es el estado ancestral, observado en la subtribu Hammatoferina, como es usual en la mayoría de los géneros de la subfamilia Phaneropterinae. El camuflaje apareció independientemente en las subtribus Markiina y Dysoniina. La primera subtribu se especializo en confundirse entre líquenes arbustivos o fruticosos, simulando el movimiento de estos líquenes cuando pasa el viento. La segunda subtribu, se camufla entre líquenes foliosos, además de tener una marcha lenta, similar a los fásmidos; exceptuando a las especies del género *Quiva*, que imitan avispas ichneomonidas, con movimientos agiles y veloces. Con estos resultados se discute sobre la aparición del camuflaje y mimetismo de las especies de la tribu y como estos convergen con otros taxones de otras áreas geográficas del planeta. La relación entre los caracteres optimizados es agrupada en el árbol más parsimonioso, indicando la frecuencia y relación entre caracteres y los taxones estudiados.

Species management:

Mycoinsecticide development to control the locust plague *Schistocerca cancellata* (Orthoptera acrididae)

Desarrollo de un micoinsecticida para el control de la langosta plaga *Schistocerca cancellata* (Orthoptera acrididae)

Pelizza, Sebastián A. (sebastianpelizza@conicet.gov.ar)

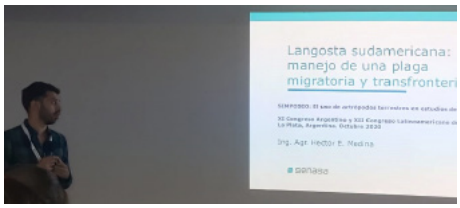
Los acridios (tucuras y langostas) son herbívoros dominantes en la mayoría de los sistemas de pastizal. Durante los últimos años se produjo un recrudecimiento del problema acridiano en Argentina. Ante la falta de insecticidas de bajo impacto ambiental para el control de Acridoideos es imprescindible contar con alternativas de control amigables con el medio ambiente. Existen casos exitosos en distintas regiones del mundo, donde se han desarrollado micoinsecticidas, basado en hongos entomopatógenos para el control de insectos plagas. Es por ello, que se firmó un convenio I+D entre CONICET y la empresa NITRAP SRL, para el desarrollo de un micoinsecticida. Se aislaron por primera vez para nuestro país, cinco cepas de *Beauveria bassiana*, que se encontraban afectando naturalmente a la langosta plaga *Schistocerca cancellata*. Estas cepas fueron depositadas en el cepario del Instituto Spegazzini con los siguientes códigos identificatorios (LPSc 1225; LPSc 1226; LPSc 1227; LPSc 1394 y LPSc 1395). A partir de la cepa LPSc 1227, se obtuvo un formulado biológico (polvo mojable), el cual se probó bajo condiciones de semi campo en la localidad de Salvador Mazza en la provincia de Salta. Para

realizar el ensayo se utilizaron jaulas de aluminio con tejido mosquitero, con 20 ninfas de tercer estadio de *S. cancellata* en su interior. La dosis del micoinsecticida, fue de 2 grs/l y fue mezclado con aceite de soja a razón de 10 cc/l. Los insectos fueron rociados a modo de spray con una mochila automática. Se realizaron tres réplicas y un control tratado de igual modo, pero sin el agregado del inoculo fúngico. Se registró la mortalidad diaria durante 4 días. La concentración de esporas del micoinsecticida fue de 2 x10^9conidios/ml y la viabilidad de los conidios fue superior al 95% en promedio. Se observó una mortalidad de 70 ± 4,5% en las ninfas tratadas. Si bien faltan realizar una mayor cantidad de pruebas a campo y en diferentes regiones del país con el micoinsecticida obtenido, esta primera prueba nos permite pensar que en poco tiempo podremos contar con una alternativa amigable con el medio ambiente para el control de esta especie de acridio plaga.

South American locust: management of a migratory and transboundary pest

Langosta sudamericana: manejo de una plaga migratoria y transfronteriza.

Medina, Héctor E. (hmedinal@senasa.gob.ar)



La langosta sudamericana, *Schistocerca cancellata*, es una plaga migratoria y transfronteriza con una gran capacidad de desplazamiento, alcanzando hasta 150 km/día, donde nubes de millones de individuos, conocidas como mangas, se desplazan rápidamente sin respetar fronteras. Sumado a esto, su gran voracidad y la capacidad de alimentarse de casi cualquier material vegetal la convierte en una gran amenaza para la actividad agropecuaria de Sudamérica. Hasta la primera mitad del siglo XX, *S. cancellata* fue una de las principales plagas de la agricultura en Argentina, Bolivia, Paraguay, Uruguay y Brasil. Desde 1954 hasta 2014 con un programa de manejo preventivo, que consiste en la vigilancia permanente y el control temprano de focos, se limitaron las poblaciones de langostas y solo se requirieron tratamientos de pequeña a moderada escala en el noroeste de Argentina, donde se encuentra la zona de cría permanente. La ausencia de brotes significativos durante 60 años, asociados a la naturaleza cíclica de la plaga, condujo a una reducción gradual de los recursos, problemática mundial que es conocida como “el circulo vicioso antiacridido». El nuevo periodo de plaga se inició en julio de 2015 con la aparición repentina de mangas en Argentina que luego se expandieron a Bolivia y Paraguay, poniendo bajo amenaza a Brasil y Uruguay. Debido a las características migratorias de las langostas los esfuerzos aislados no son suficientes para contener a la plaga, resultando clave el manejo regional de la problemática. Además de la cooperación entre países, el trabajo con el sector privado y organismos de investigación fue, es y será necesario en la lucha contra la langosta. En este sentido cobra vital importancia la gobernanza para la gestión de la plaga, que hace hincapié en las relaciones e interacciones entre los actores involucrados. Con la gobernanza se establecen los roles y funciones de cada actor, entendiendo que el objetivo común es el control de plaga. Resultado de este trabajo se establecen distintos comités a nivel municipal, provincial, nacional e interregional, en donde se establecen las acciones a implementar. A nivel regional, en el marco del Comité de Sanidad Vegetal del cono sur(COSAVE), existe un grupo técnico que aúna esfuerzos para lograr sostener el manejo preventivo de la plaga y dar respuesta rápida a los brotes de langostas. En este sentido, y a través de la cooperación con el IICA, se está desarrollando un Sistema Regional para el Monitoreo, Gestión y Alerta por langostas.

Environmental and biological factors important in outbreaks and upsurges of the South American locust, *Schistocerca cancellata*

Hunter, David M. (davidmhunter100@gmail.com)

For almost 60 years, there were only occasional localized outbreaks of the South American locust (SAL), *Schistocerca cancellata* (Serville, 1838), but there was a sudden appearance of many swarms in Santiago del Estero province during July 2015, which was followed by a widespread upsurge that continued for several years. The precursors to these initial swarms were not found, and while recent studies (Trumper et al. 2022 Agronomy 12, 135) have indicated the possible importance of a decline in resources for survey, a more detailed study of the biological factors associated with the upsurge are provided here. To avoid development during the winter dry season, adult SAL undergo an autumn/winter diapause from March onwards and resume egg maturation in spring, after rain has fallen. In many years, the first rains occur in mid to late spring so that egg maturation and oviposition do not occur until October or November. In this common situation, two generations per year are possible, but in some years winter/early spring rain allows maturation to begin in September, allowing three generations but only in the warmest of areas. Studies by Hunter & Cosenzo

(1990: Bull. Entomol. Res. 80, 295-300) showed that in the 1970's and 1980's, the only regions warm enough for three generations were in the provinces of Catamarca and La Rioja and adjacent areas. However, in recent years, there has been an increase in maximum temperatures and rainfall in northwest Argentina related to climate change, which means that many more areas are warm enough for three generations. Detailed studies during the upsurge have revealed further aspects of the biology of SAL, including many examples of egg maturation beginning in September if rain falls, a quiescence in eggs if rainfall is marginal, with subsequent egg hatch immediately after heavier follow-up rain, and a long period of oviposition lasting for 4-6 weeks or even longer. Also evident during the SAL upsurge was a clear migratory circuit where a spring/early summer generation in Argentina was often followed by some or most of the locusts migrating north to Bolivia/Paraguay with a return migration to Argentina in winter. The increasing temperatures and rainfall combined with the clearing of forests for agriculture are likely to mean that many more areas have become very suitable for locust breeding, and the importance of the migratory circuit in reaching these many suitable areas is discussed.

Oviposition sites preference of the South American locust (*Schistocerca cancellata*)
Preferencia de sitios de oviposición de la langosta sudamericana (*Schistocerca cancellata*)

Scattolini, M. Celeste (mcscattolini@cepave.edu.ar)

Históricamente en la Argentina la langosta sudamericana, *Schistocerca cancellata* (Serville 1838), ha sido una de las principales plagas del agro. Durante las últimas seis décadas la langosta ha estado en recesión confinada a la región noroeste de Argentina. Sin embargo, a partir del 2014 han acontecido explosiones demográficas de *S. cancellata*, registrándose mangas de hasta 25 km² en la región centro norte del país. La utilización de Sensores Remotos (SR) y Sistemas de Información Geográfica (SIG) aplicados para conocer la distribución espacio-temporal de los principales factores geoespaciales que afectan a la dinámica de las poblaciones de distintas especies de langostas han contribuido a una mejora significativa en las predicciones de explosiones demográficas de estas plagas en otras regiones del mundo. En este estudio se utilizan tecnologías de los sensores remotos y de los SIG para caracterizar los suelos más propensos para la oviposición de la langosta. Se utilizan datos recopilados por el SENASA desde el año 2014 hasta el 2021 para determinar la presencia/ausencia de oviposiciones y mosquitas (ninfas de los estadios 1 y 2) de la langosta en su ámbito de distribución en la Argentina. Los factores geoespaciales considerados fueron elevación del terreno, pH, conductividad eléctrica, porcentaje de sodio, índice de aridez, uso de suelos (mapa de INTA) y cobertura y uso del suelo del Gran Chaco Americano y de Pampa (Proyecto MapBiomas). Se evaluó la importancia relativa de las variables independientemente y se generó un modelo lineal generalizado para determinar la asociación entre las características del suelo y los sitios de oviposición de esta especie. Los análisis se realizaron con los softwares abiertos QGIS y R. Se determinó que las variables de pH, conductividad eléctrica, porcentaje de sodio y algunos tipos de coberturas que se encuentran alrededor de los sitios de presencia ayudarían a determinar aquellos seleccionados para oviponer. Dicha información permitirá clasificar las áreas según el riesgo en función de la presencia de estas características de los suelos ayudando a generar, a futuro junto con otra evidencia, mapas de riesgo de la langosta que serán decisivos para optimizar los esfuerzos de monitoreo y manejo de la plaga.

Ecological studies of pest species:

Main acridid pest species of the Pampean region and Patagonia
Principales especies de acridios plaga de la región Pampeana y la Patagonia

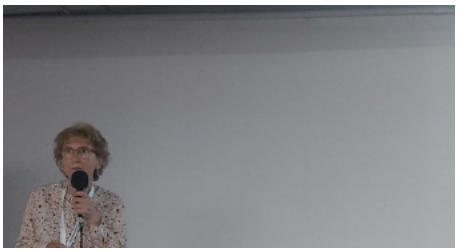
Mariottini, Yanina (ymariottini@hotmail.com)

Desde los inicios de la agricultura y la ganadería en nuestro país, diferentes especies de acridios son consideradas de importancia económica para estas actividades. En las últimas décadas se han constatado frecuentes explosiones poblacionales, las que ocasionaron importantes pérdidas económicas en pasturas y cultivos. Podemos mencionar a *Schistocerca cancellata* y *Tropidacris collaris* en el centro y norte de Argentina, *Dichroplus maculipennis* en diferentes zonas de la Región Pampeana y la Patagonia, *Dichroplus elongatus*, y *Borellia bruneri* en la Región Pampeana y *Bufonacris clarassiana* en la Patagonia. Desde el año 2005 hasta el presente se realizan muestreos de acridios en diferentes comunidades vegetales del sur de la provincia de Buenos Aires, lo que nos permitió registrar el resurgimiento de *D. maculipennis* como el acridio plaga más perjudicial en el sur de la región Pampeana, con el desarrollo de un "outbreak"

de magnitud histórica durante 2008-2010. A partir de allí, *D. maculipennis* es la especie dominante en la mayoría de las comunidades de acridios de esta zona, registrándose año tras año altas densidades (mayores a 20 ind/m2) en diversas localidades, lo que lleva a que productores e instituciones vinculadas a esta problemática lleven adelante medidas de control. Por otro lado, estudios realizados sobre fenología, desarrollo postembrionario, longevidad, aspectos reproductivos, comportamiento alimentario, eficiencias ecológicas, morfometría, de relación entre la densidad de esta especie y variables climáticas, como así también avances en el control biológico, nos permiten en la actualidad tener un mayor conocimiento y poder elaborar diferentes pautas a la hora de establecer un plan de manejo racional de esta especie. En diversas zonas de la estepa Patagónica de Chubut, Rio Negro y Santa Cruz, *B. claraziana* es la especie de acridio dominante. En los últimos años las explosiones poblacionales de esta especie han tomado gran relevancia. Desde el año 2017 se realizan monitoreos que nos permitieron avanzar en el conocimiento de la distribución y dinámica de esta especie. También hemos realizado estudios en laboratorio sobre aspectos de su ciclo de vida, consumo y con el uso de entomopatógenos como posibles controladores biológicos de esta especie. Finalmente, consideramos que para establecer el estatus de plaga de una especie y tender a un manejo integrado son necesarios estudios ecológicos a largo plazo a través de monitoreos continuos en espacio y tiempo, en combinación con estudios en laboratorio que nos permitan profundizar en la dinámica poblacional y el ciclo de vida de las mismas.

Harmful acridids in Uruguay
Acridios perjudiciales en Uruguay

Lorier, Estrellita (lorier@fcien.edu.uy)



En Uruguay los acridios (Orthoptera: Acridoidea), son insectos nativos que causan importantes daños de manera esporádica. Hasta el momento se han registrado 109 especies de acridios, agrupadas en 52 géneros pertenecientes a tres familias (Acrididae, Ommexechidae y Romaleidae). Más del 75% de las especies son habitantes de pastizales, conocidas vulgarmente como «tucuras" o langostas criollas. Las últimas explosiones poblacionales ocurrieron con intervalos de 50 años aproximadamente (1950 y 2008). Considerando abundancia, distribución geográfica, y magnitud de los daños producidos en pastizales y cultivos, las especies de mayor importancia en ambos eventos fueron *Borellia bruneri, Borellia pallida* (Acrididae: Gomphocerinae) *Dichroplus pratensis, Dichroplus conspersus* y *Dichroplus elongatus* (Acrididae: Melanoplinae). En la última explosión poblacional también se observaron daños producidos por los melanoplinos *Scotussa lemniscata* y *Baeacris pseudopunctulatus*. La "langosta voladora" *Schistocerca cancellata* (Acrididae: Cyrtacantacridinae), de hábitos gregarios o migratorios invadió nueve veces el territorio uruguayo entre el fin del Siglo XIX y el comienzo del XX causando pérdidas cuantiosas. En 1946-48 se produjo la última invasión que fue una de las más importantes. Este insecto dejó de ser una amenaza para el país en el momento que Argentina realizó el control en las áreas de cría permanente para evitar la formación de mangas. En el año 2020 el Uruguay se enfrentó nuevamente a la amenaza de una manga de esta langosta que se acercó en la provincia de Entre Ríos a pocos km del límite oeste de nuestro país. El país se mantuvo en estado de alerta frente al posible ingreso después de más de 70 años. A nivel regional se articularon acciones de los países del Cono Sur a través del COSAVE, lo que permitió compartir información del movimiento y control de las mangas en Argentina. En nuestro país el desarrollo de programas de manejo de tucuras y de la langosta voladora se ha enfrentado al problema de que las amenazas de daño están muy espaciadas en el tiempo, lo que dificulta obtener información y disponer de recursos una vez que disminuye la magnitud del problema. Disponer de nuevas herramientas, como el sensoramiento remoto, y compartir información entre los países de la región, permite que el problema acridiano pueda ser enfrentado de forma más efectiva, minimizando los daños productivos y ambientales.

Acridids of economic importance in Brazil: current state of knowledge
Acridios de importancia económica en Brasil: estado actual del conocimiento

Souza Dias, Pedro G.B. (pedrogdias@gmail.com)

En Brasil se registran 1952 especies de Orthoptera en 565 géneros y 17 famílias, lo que equivale a aproximadamente 30% de la diversidad conocida en la región Neotropical. Mientras que la fauna brasileña de Caelifera es bien conocida, con registros

de 924 especies, para Ensifera son conocidas 1028 especies, número mucho más bajo que la real diversidad del suborden. Los acridios (Acridoidea) comprenden 681 especies, en 3 famílias: Acrididae (476 spp.), Ommexechidae (13 spp.) y Romaleidae (192 spp.). Además, se destaca la familia Proscopiidae, con 106 especies conocidas. A pesar de tener una gran diversidad de especies de acridios, en Brasil hay solamente 20 especies importantes económicamente. Entre estos, se destaca *Schistocerca cancellata* (Serville), que aunque no hay registros de nubes en territorio brasileño, existen registros de entrada de nubes provenientes de países vecinos (Argentina, Paraguay) en la región sur del país. Las otras especies economicamente importantes de denominan, en portugués, gafanhotos (tucuras). En este trabajo presentaré las principales tucuras económicamente importantes en Brasil (algunas reconocidas como plagas): *Schistocerca pallens* (Thunberg) (Acrididae, Cyrtacanthacridinae); *Orphulella punctata* (De Geer) (Acrididae, Gomphocerinae); *Cornops frenatum frenatum* (Marshall) (Acrididae, Leptysminae); *Baeacris punctulatus* Thunberg (Acrididae, Melanoplinae); *Tropidacris collaris* (Stoll) (Romaleidae, Romaleinae); *Prionolopha serrata* L. (Romaleidae, Romaleinae); *Chromacris speciosa* Thunberg (Romaleidae, Romaleinae); *Stiphra robusta* Mello-Leitão (Proscopiidae); *Cephalocoema sp*. Serville (Proscopiidae); Proscopia Klug (Proscopiidae); *Tetanorhynchus leonardosi* (Mello-Leitão) (Proscopiidae). La especie más importante en Brasil es *Rhammatocerus schistocercoides* (Rehn), conocida como 'gafanhoto do Mato Grosso'. Esta especie causó grandes problemas económicos en los estados de Mato Grosso y Rondônia en las décadas de 1980 y 1990, lo que llevó el Gobierno brasileño a crear una oficina especializada para su control y manejo. Durante este período se elaborarán los principales estudios con *R. schistocercoides*, generando las principales publicaciones para esta especie. Aunque la última crisis con *S. cancellata* en Argentina tuvo grandes repercusiones sobre la capacidad de causar daños de esta especie en la agricultura brasileña, investigaciones enfocadas en la identificación, manejo y control de tucuras plagas son aún escasos. Actualmente, no existen órganos técnicos especializados en el manejo de tucuras en Brasil.

Proceedings of the IX Brazilian Orthoptera Symposium and II Orthopteroid Insects Symposium

By DANIELA SANTOS MARTINS SILVA[1], NATÁLLIA MARIA DE FREITAS VICENTE[2] & CARLOS FRANKL SPERBER[2]

[1]Department of Biology, Miami University, Oxford, OH, 45056, USA
[2]Department of General Biology, Universidade Federal de Viçosa, Minas Gerais, BRAZIL

The Orthoptera Symposium is one of the most important events of Brazilian Polyneoptera studies, occurring regularly every two years since 2006. In all previous editions, the symposiums were organized in order to involve issues about topics related to the aspects of Orthoptera biology, such as bioacoustics, ecology, cytogenetics, genetics, phylogeny, and taxonomy. The ninth edition of the Brazilian Orthoptera Symposium and II Orthopteroid Insects Symposium was held in the auditorium of the Department of Forestry Engineering - Universidade Federal de Viçosa – Viçosa city, Minas Gerais state from 05 - 09 of December 2022 (Fig. 1). Our meeting program included talks, short courses, and posters in the following areas: Morphology and Physiology, Biology (eg. Bioacoustics, Cytogenetics); Orthoptera Behavior; Biodiversity, Taxonomy, Systematics and Evolution; Ecology; Biogeography and Conservation and Pest Control and Management.

In this edition, we made a step forward and managed to make our event to be held free of charge and widely spread to attract students and researchers who could not afford the registration fees for expensive events. We also included wide-ranging discussions that involved contemporary social appointments in order to discuss the challenges of promoting an inclusive academic space for women, students from underrepresented ethnic or racial backgrounds, and the LGBTQIA+ population. This was the context in which we proposed the theme of our meeting: "**It is necessary to reinvent**".

After the improvement in Covid-19 vaccination rates in Brazil, and the decrease in contamination cases we kept a lot of attention to guidelines that help prevent the spread of coronavirus during the symposium. We requested participants to wear masks inside the auditorium, provided alcohol-based solution for cleaning hands, and our symposium was organized as a hybrid event, allowing for both in-person and online participation.

Figure 1. Part of the speakers and participants in the IX Brazilian Orthoptera Symposium and II Orthopteroid Insects Symposium in Viçosa, Brazil, December 2022.

In the context of the event, we proposed in this edition:

- Expand our network and establish new connections (professional and personal);
- Opportunities for young researchers (mainly added women as speakers);
- Talks with notorious national and international researchers in their respective areas;
- Include more researchers from Orthopteroids groups in our network;
- Learn and discuss new subjects (to inspire us);
- More representativeness at the symposium;
- Discuss subjects beyond scientific issues that permeate the academic life of students, professors, and researchers.

During our symposium, we had 21 national and international speakers (Fig. 2-4). In the lectures, we focused on providing the opportunity for beginner researchers, women, and internationally renowned researchers to share their knowledge with us:

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- Female genitalia in the identification of Orthoptera, Dr. Natállia Maria de Freitas Vicente (Fig.2A-B);
- Identification of Proscopiidae grasshoppers (Orthoptera: Caelifera), Me. Larissa Lima de Queiroz (Fig.2C-D);
- Morphofunctionality of the katydid's ovipositor, Me. Marcos Fianco (Fig.2E-F);
- Biology and Identification of Embioptera, Me. Paula Jessica Costa Pinto (Fig.2G-H);
- Global Locust Initiative, Dr. Arianne Cease, Dr. Rick Overson, and Mira Ries (Fig.3A);
- Phylogenetics of Oedipodinae grasshoppers across the US and Mexico, Dr. Tereza Jezkova (Fig.3B);
- Navigating through Research Opportunities as a Latin American, Dr. Nathalie Baena-Bejarano (Fig.3C);
- Orthoptera Species File to Taxon-Works, Dr. Maria Marta Cigliano (Fig.3D);
- Taxonomy of understudied groups in the light of zoological collections: The case of taxonomic revisions of praying mantis in Brazil, Bernardo Rodrigues Ferraz (Fig.3G-H).

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- The genus *Schistocerca* as a model clade for studying phenotypic plasticity, Dr. Hojun Song (Fig.3E);
- Patrones de diversificación en melanoplinos sudamericanos, Dr. Maria Celeste Scattolini (Fig.3F);
- "It is necessary to know-it to better destroy-it": locust swarms and science in South America (1897-1952), Dr. Valeria Dorneles Fernandes (Fig.3I-J);
- White ant, the death of an order, and other story of termites, Dr. Tiago Carrijo (Fig.4A);
- Taxonomy of Phasmatodea: Historical overview and new perspectives, Dr. Pedro Ivo Chiquetto Machado (Fig.4B);
- Behavioral evolution in Hawaiian Crickets, Dr. Kerry Shaw (Fig.4C);
- Hybrid zone of crickets, *Gryllus fir-*

Figure 2. Brazilian speakers (A-B) Dr. Natállia Maria de Freitas Vicente; (C-D) Me. Larissa Lima de Queiroz; (E-F) Me. Marcos Fianco and (G-H) Me. Paula Jessica Costa Pinto.

mus and *G. pennsylvanicus*: reproductive barriers and gene flow between species, Dr. Luana Maroja (Fig.4D);
- Praying Mantids from the Neotropical Region: an overview of their biodiversity and research needs (Insecta: Mantodea), Dr. Julio Rivera (Fig.4E).

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- Advancing Bioacoustics of Orthoptera from Southeast Asia, Dr. Ming Kai Tan (Fig.4F);
- Convergent evolution of harmonic hopping and multiple origins of high-frequency calls in Eneopterinae crickets, Dr. Tony Robillard (Fig.4G);
- Recording, analysis and documentation of acoustic signals from Orthoptera, Me. Riuler Correa Acosta (Fig.4H-I);
- The fifth family of true crickets, Oecanthinae: phylogenetic relationship, divergence times and evolution, Dr. Lucas Denadai de Campos (Fig.4J-K).

Regarding the short courses, seven courses were available on issues relevant to Brazilian Orthopterology:
- Who are you grasshopper? History and Taxonomy of Neotropical Caelifera, Dr. Daniela Santos Martins Silva (Fig.5A);
- Bioacoustics of crickets, Me. Riuler Correa Acosta (Fig.5B);
- Photography Techniques, Me. Cesar Augusto Chaves Favacho (Fig.5C);
- Orthoptera in Subterranean Environments - Methods and Analysis of Cave Fauna, Dr. Marcio Perez Bolfarini (Fig.5D);
- Scientific illustration (graphite drawing techniques), Me. Gustavo Costa Tavares (Fig.5E);
- Evolution and Systematics of Orthopteroid Insects, Dr. Darlan Rutz Redü (Fig.5F, H);
- Techniques for collection, rearing and diversity of Grylloidea, Me. Maria Vitória Alves Borille (Fig.5G).

On December 7th and the following days, 29 posters from the abstracts sent to the symposium were shown in the hall of auditorium. Our scientists were able to discuss with the public the recent studies developed in several laboratories and research groups on Orthopteroids in Brazil (Fig.6). Some of these abstracts are below:

Taxonomic Revision, Morphology, and Natural History of *Xerosoma* Serville, 1831 (Insecta: Phasmatodea)

Phillip Watzke Engelking, Victor Morais Ghirotto, Edgar Blois Crispino, Thies H. Büscher, Raphael Aquino Heleodoro, Pedro Alvaro Barbosa Aguiar Neves & Pitágoras da Conceição Bispo

Stick insects (Phasmatodea) are a significant part of the Brazilian fauna and are quite diverse in the Neotropical region. However, their biology did not receive much attention in literature and their taxonomy remains severely understudied. *Xerosoma* Serville belongs to Pseudophasmatidae and comprises winged, roughly brownish phasmids, which resemble bark or dry branches and inhabit the Atlantic Forest in Brazil. In this study, we present a redescription and revision of

the genus, which includes three valid species, *Xerosoma canaliculatum*, *Xerosoma michaelis* and the new species *Xerosoma* sp. nov. here described. We found that *Xerosoma senticosum* syn. nov. is a junior synonym of *X. canaliculatum*. We also present an identification key and the geographic records for the three species. Additionally, we present a detailed study on the morphology and natural history *of X. canaliculatum* with the description of nymphal stages, egg, male genitalia, ontogeny, oviposition method, life habits, defense mechanisms, mating behavior and other aspects regarding their ecology. The work also highlights the shortcomings related to Xerosomatinae classification, where its tribes find themselves without proper characterization of their type species and with heterogeneous genera. We hope to provide a basis for a proper diagnosis of Xerosomatinae and encourage future studies with this group, as there is still much to be discovered about this lineage of Neotropical stick insects.

Figure 3. International and Brazilian speakers (A) Dr. Arianne Cease, Dr. Rick Overson, and Mira Ries; (B) Dr. Tereza Jezkova; (C) Dr. Nathalie Baena-Bejarano; (D) Dr. Maria Marta Cigliano; (E) Dr. Hojun Song; (F) Dr. Maria Celeste Scattolini; (G-H) Bernardo Rodrigues Ferraz; (I-J) Dr. Valeria Dorneles Fernandes.

An intrigating new species of *Odontogryllus* Saussure, 1877 (Orthoptera: Gryllidae: Odontogryllini) from Brazilian Amazon

Beatriz Harumi Kondo Oya, Luiz Augusto Padilha Santos, Gustavo Costa Tavares

Odontogryllus Saussure, 1877 is the most diverse genus of the tribe Odontogryllini and currently has 11 species. The genus is characterized by crickets without timpanum on the anterior tibiae; males with reduced tegmina, without stridulatory apparatus; tegmina of females absent or very reduced, scale-like; paranotal gland present; hindwings absent; elongated subgenital plate in males; and tubular phallic complex, with pseudepiphallic lateral lobes bifurcated dorsoventrally, long, and well-developed. Almost all known species are South American, recorded from the state of Amazonas (Brazil) to the foothills of the Ecuadorian, Peruvian, and Colombian Andes, except for a single species described for Mexico. *Odontogryllus* is very similar to another genus of Odontogryllini, *Xulavuna* Mello & Campos, 2014. However, in the latter, males have a gland in the tegmen, and the phallic complex has a subtubular pseudepiphallus, strongly bilobed and distally expanded. Thus, this work aims to present an intriguing new species of *Odontogryllus* from the Brazilian Amazon. The species was collected in the Caxiuanã National Forest, an area of primary forest characterized as a dense rainforest located in the state of Pará. A Leica M205 A stereo microscope coupled to a Leica DFC 450 camera was used to analyze, measure and photograph the specimens. The male phallic complex was removed with micro pins and clarified in a cryotube containing 10% KOH immersed in boiling water for 15 minutes. The new species has a notable invagination on the anal margin of the tegmina in males, forming a conspicuous gland, but it remains hidden under

Figure 4. International and Brazilian speakers (A) Dr. Tiago Carrijo; (B) Dr. Pedro Ivo Chiquetto Machado; (C) Dr. Kerry Shaw; (D) Dr. Luana Maroja; (E) Dr. Julio Rivera; (F) Dr. Ming Kai Tan; (G) Dr. Tony Robillard; (H-I) Me. Riuler Correa Acosta; (J-K) Dr. Lucas Denadai de Campos.

the posterior edge of the pronotum when at rest. The presence of this gland is a diagnostic characteristic of the genus *Xulavuna*. However, the phallic complex of the new species is tubular, with lateral pseudepiphallic lobes dorsoventrally bifurcated, long, and well-developed, typical of *Odontogryllus*. Therefore, we assign this new species to the last genus, being the only one with a gland in the tegmen. This species is characterized by relatively robust individuals (1.8mm males and 2.1mm females from the head to the tenth tergite), brownish in color, but the head and tip are slightly darker. The dorsal projection of the main lobe of the pseudepiphallus is strongly extended dorso-posteriorly, with a conspicuous tuft of bristles at the apex. The tegmina of females are very reduced and scale-like, and the ovipositor is slightly longer than the posterior femur. The description of this new species is relevant for understanding the relationships between *Odontogryllus* and *Xulavuna*, as it presents diagnostic characteristics of the two supposed lineages.

A new species of *Hygronemobius* Hebard, 1913 (Orthoptera: Nemobiinae) from the Brazilian Amazon

Luiz Augusto Padilha Santos, Beatriz Harumi Kondo Oya, Gustavo Costa Tavares

Hygronemobius Hebard, 1913 is a genus of nemobine crickets with greater distribution in the Neotropical region, being typically found in leaf litter. They are small individuals, with posterior tibia bearing three dorsal spurs on each margin and three external and two internal apical spurs; tegmina of males always present, with arp divided by a single longitudinal vein and poorly defined mirror; male genitalia with a very wide ectophallic fold, forming a distinct ventral half-disc, with two ventrally directed pseudepiphallic lobes and a small dorsal cavity; females with reduced tegmina, like two small dorsolateral scales; ovipositor slightly curved, with an enlarged apex and almost without ornamentation; hindwings almost always absent. Currently, 29 species are considered valid, and nine are officially registered in Brazil. The new species presents all the characteristics proposed for the genus. As a result, this work aims to describe a new species of *Hygronemobius* found in the Brazilian Amazon. The specimens were analyzed, measured, and photographed using a Leica M205 A stereo microscope coupled with a Leica DFC 450 camera. The male phallic complex was removed with micro pins and clarified in a cryotube containing 10% KOH immersed in boiling water for 15 minutes. The new species was collected in Juruti, Pará State. This species fits into the *benoisti* group once it has brownish body coloration, palps not whitish, females with well-defined spotting patterns, and male genitalia with the apical pseudepiphallic lobes indistinctly separated from the sclerotized pseudepiphallic sclerite. However,

this species is distinguished from the others by being the only one to present the apical pseudepiphallic lobe, in dorsal view, triangular, with a very wide base, internal margin bearing numerous denticles, and apex curved inwards and downwards. In addition, the pseudepiphallic sclerite is wide, with an anterior margin wider than the posterior one, bearing conspicuous and very long bristles; rami separated from pseudepiphallic sclerite; and endophallic apodeme ending before the rami. In lateral view, the pseudepiphallic median lobe is broad and with a concave margin; the ectophallic fold is poorly-developed. It has shades of brown with dark spots distributed along the body; in males, the right tegmen is brown with whitish portions; in females, the metanotum and anterior margin of the first tergite are blackish; ovipositor shorter than the posterior femur, slightly curved with ensiform apex. The new species is more similar to the Atlantic Forest species: *Hygronemobius indaia*, *Hygronemobius iperoigae*, and *Hygronemobius guriri*. However, these species have pseudepiphallic lobes that are not so sclerotized, remarkably separated from the pseudepiphallic sclerite, which lacks long bristles. The relevance of this work is based on the description of a new species of *Hygronemobius*, the fifth species of the genus recorded for the Brazilian Amazon.

Figure 5. Brazilian speakers in short courses (A) Dr. Daniela Santos Martins Silva; (B) Me. Riuler Correa Acosta; (C) Me. Cesar Augusto Chaves Favacho; (D) Dr. Marcio Perez Bolfarini; (E) Me. Gustavo Costa Tavares; (F, H) Dr. Darlan Rutz Redü; (G) Me. Maria Vitória Alves Borille; (I) New students in the symposium; (J) Brazilian orthopteroids researchers Daniela Santos Martins Silva, Larissa Lima de Queiroz, Maria Vitória Alves Borille, Paula Jessica Costa Pinto, and Natállia Maria de Freitas Vicente.

Richness and abundance of Phaneropterinae from Rio Guarani State Park, Três Barras do Paraná, PR.

Thayla Melissa Gimenez Nogueira, Marcos Fianco, Neucir Szinwelski

The Tettigoniidae (Orthoptera), popularly known as katydids, has several subfamilies, such as Phaneropterinae. The subfamily Phaneropterinae has a wide and varied diversity and geographical distribution, spanning the whole world, with over 2806 species, it's the the largest subfamily of Tettigoniidae, accounting for 35% of the subfamily population, and 9.6% of the Orthoptera population. It has different morphological characters such as green and dry leaves camuflage in *Phylloptera* Serville, 1831 and *Orophus* Saussure, 1859, respectively. This research was done in the Rio Guarani State Park (PERG) with the aim of learning more about the diversity of the local fauna of Phaneropterinae and contribute to Linneano and Wallaceano deficts. The PERG has 2.235ha and it is the second largest Atlantic Florest fragment from the Parana state, it is located in Três Barras do Paraná municipaly, South-west Parana. The specimens were sampled and captured manually through nocturnal activity search (7 P.M to 11 P.M) and light traps (7 P.M to 3 A.M), the sampling was done from September to December 2021, and during February 2022, for a total of three days per month. Nymphs collected

were brought to the Orthoptera Laboraty of UNIOESTE (LabOrth), there, they were housed in plastic containers and reared with water and fed with fish flakes until their adult stage. The specimes were photographed in vivo with digital camera to register their original colors. The individuals collected was sacrificed trough freezing, and then manipulated with entomological pins and kiln dried in 40º C for 48 hours. The subfamily, genus and species taxonomic identifications followed taxonomic keys and compared with material type photographs from the Orthoptera Species File. In total, 177 individuals of the subfamily Phaneropterinae were collected and sorted into a total of 9 tribes, 11 genera and 13 species, those being: *Anaulacomera* (*Cervicercora*) *dama*, *A*. (*Anallomes*) *sylviae*, *A. trispinata*, *Anaulacomera* sp. n.1, *Anaulacomera* sp. n.2, *Aniarella typica*, *Aniarella* sp., *Anisophya melanochloris*, *Anisophya una*, *Ceraia cortunoides*, *Ceraia liebermanni*, *Cephalophylloptera spinulosa*, *Engonia minor*, *Engonia* sp., *Enthephippion olivaceum*, *Hyperophora brasiliensis*, *Hyperophora* sp., *Topana* (*Topana*) *angulata*, *Phylloptera fosteri*. This research contributes with the elucidation of Linneano deficits, by reason of the newly registered species, which will be described soon, and Wallaceano deficits, since it's the third faunistic inventory of katydids in the Parana state and the fourth overall in Brazil. Lastly, it is a support tool for conservation and keeping to the conservation unit of PERG, besides, it opens the path to new scientific studies which can contribute to the preservation of Brazilian diversity.

Study of Orthoptera camouflage through photographic analysis

Matheus Victor Cavalcanti da Costa, Victor Cordeiro de Moura, Rayssa Farias Carvalho, Antonio Carlos de Freitas

Currently, with around 29,000 species, the order Orthoptera is distributed across all continents, with the exception of Antarctica; showing greater abundance in tropical regions, such as Brazil. One of the characteristics of these animals is their colors, which can vary between species. One of the main survival strategies in the animal kingdom is camouflage, when the organisms color is similar to that of the substrate. In recent years, the study of colors has intensified, mainly driven by technological development. The increasing accessibility of photographic equipment and the emergence of new image analysis software have encouraged researchers to use photography as a scientific method in the study of colors and patterns. With the use of these resources, it is possible to carry out qualitative and quantitative studies of colors for different purposes. However, there are still few studies that seek to rank the ability of these animals to camouflage themselves in the environment where they live. Using photographic equipment, the ImageJ image analysis software, and the R programming language, to determine the Color Overlapping Index (COI), this work quantitatively compared the coloration of different Orthoptera in relation to the substrate where they were found, in order to establish a ranking of the degree of camouflage of these insects. The images of the Orthoptera were obtained in field trips, with random searches, being photographically recorded in the environment in which they were found. In a preliminary analysis, the Color Overlapping Index (COI) ranged from 1.2 to 100% (normalized values), with the lowest value representing the least camouflaged animal. It is believed that this technique has potential as a tool in ecological, zoological, behavioral studies, among others. The next stage of this work is the analysis of Color Overlapping between organisms of the same species.

Survey of praying mantises genera (Insecta, Mantodea) on Lorianópolis Island, Santa Catarina, Brazil

Gabriel de Almeida Ponte Gomes, Bernardo Rodrigues Ferraz, Luiz Carlos de Pinho

Mantodea is an order that comprises more than 2,500 species of insects popularly known as praying mantis. These animals are generalist predators and can feed on a wide variety of prey, from other invertebrates to small vertebrates such as birds and amphibians. Even though they are well known in popular culture, studies on these insects are still quite scarce, especially in terms of diversity and distribution in the Neotropics. In Brazil, over 250 species are known, making the country with the greatest diversity of praying mantis species in the world, and it is estimated that the true diversity in the country is about 700 species. Some characteristics of praying mantis biology make the study of these animals especially difficult, such as their low population density, highly specialized camouflage and slow movement due to their sit-and-wait feeding strategy. Such factors added to a complex taxonomic history make it difficult to find many specimens in their natural habitat and identify them. In order to increase the understanding of the group's diversity in Brazil, a study is carried out on the diversity of Mantodea on the island of Florianópolis, Santa Catarina, Brazil. Scientific expeditions were carried out and photographic records were made of the animals found and, then, identified through specialized literature and comparison with previously identified specimens. So far, a total of 65 individuals have been registered, divided into official records (specimens collected or examinated in entomological collections) and unofficial records (records from the iNaturalist citizen science platform). Official records (n=18): 5 *Acanthops* Serville, 1831; 2 *Acontista* Saussure, 1869; 1 *Cardioptera* Burmeister, 1838; 1 *Chloromiopteryx* Giglio-Tos, 1815; 2 *Miobantia* Giglio-Tos, 1917; 2 *Photina* Burmeister, 1838; 1 unidentified Thespidae and 1 *Zoolea* Audinet-Serville, 1839. We also found 3 ootheca of *Acanthops*, *Photina* and *Stagmatoptera*. Male individuals were more abundant (44.6%

males and 21.5% females), with a predominance of adults (72.3% of individuals found as adults and 23.1% found as nymphs).Unofficial records (n=47): 12 *Acanthops* Serville, 1831; 12 *Acontista* Saussure, 1869; 1 *Brunneria* Saussure, 1869; 3 *Cardioptera* Burmeister, 1838; 1 *Chloromiopteryx* Giglio-Tos, 1815; 1 *Coptopteryx* Saussure, 1869; 1 unidentified Mantidae, 1 *Mantoida* Newman, 1838; 1 *Miobantia* Giglio-Tos, 1917; 1 *Parastagmatoptera* Saussure, 1871; 5 *Photina* Burmeister, 1838; 1 unidentified Photinaidae, 3 *Stagmatoptera* Burmeister, 1838; 3 unidentified Thespidae, and 1 *Zoolea* Serville, 1839. January was the month with the most records of individuals (18.5% of records), with the Campeche neighborhood (27.6761° S, 48.4862° W) being the location with the highest number of records. Of the 19 genera so far registered for the State of Santa Catarina, 12 have already been registered for the island of Florianópolis, showing a partial reflection of the State, representing about 63.16% of the known diversity.

Description of the feeding behavior of a species of *Coptopteryx* Saussure, 1869 (Mantodea, Coptopterygidae) in Florianópolis, Santa Catarina, Brazil

Gabriel de Almeida Ponte Gomes, Renato Hajenius Aché de Freitas, Bernardo Rodrigues Ferraz

Praying mantises are hemimetabolous insects of the order Mantodea, with over 2,500 species known worldwide. They are predatory insects that use the first pair of robust raptorial legs to capture prey, as they do not have any type of venom and/or poison while using their chewing mouthparts to ingest them. There is a difference between praying mantis predation strategies: some groups like the genus *Eremiaphila* Lefebvre 1835 actively pursue ants on the ground, while others like *Hymenopus coronatus* Olivier, 1792 use camouflage plus a sit-and-wait strategy for food. There are also those that intercalate between the two strategies, chasing prey in some situations and waiting for it to approach in others, such as species of the genus *Coptopteryx* Saussure, 1869. An adult female of *Coptopteryx* sp. was collected in Pinhalzinho, Santa Catarina on February 24, 2022, having been reared in the laboratory until its natural death on April 13, 2022. From this specimen, four ootheca were obtained, and mating with males was not observed. From the first ootheca placed, 16 nymphs hatched, of which 11 survived. For all hatched nymphs, the following variables were recorded and characterized daily: (1) daytime temperature; (2) weather; (3) number of food offerings; (4) feeding method; (5) feeding time; (6) feeding denial; (7) instar and (8) individual size. The nymphs were measured at each ecdysis, fed with adults of *Drosophila melanogaster* Meigen, 1830 and behaviors such as investigation time, prey handling and deimatic behavior were recorded and described. Preliminary results from the ongoing study indicate that nymphs fed everyday use a sit-and-wait strategy, while nymphs that go through two or more days without feeding are more likely to stalk and actively pursue their prey. In all instars, the nymphs showed individual variations in behavior, varying the place where food chewing began (head, thorax or abdomen), predation strategy (sit-and-wait or chase), and first day of feeding after birth and percentage of refused prey (with a variance of 6.3% to 40%). Ethological studies on praying mantises are still very embryonic and uncommon in the literature, in addition to being extremely scarce in the Neotropics in particular. Data from the present study represent partial results of a study still in progress in which nymphs are still being reared in the laboratory.

A new species of *Cycloptiloides* Sjöstedt (Orthoptera: Mogoplistidae: Mogoplistinae) from Brazilian Amazon

Adiney Ferreira Ferreira, João de Jesus Oliveira Mota, Gustavo Costa Tavares

Mogoplistidae crickets have bodies densely covered with scales, which earns them the common name of scaly crickets. They are small crickets and normally flattened dorsoventrally, with well-developed saltatory legs and an orthognathous head, *Cycloptiloides* Sjöstedt has a large oval head; frontal region, between the antennal orbits, swollen; pronotum glabrous, which in males is extended posteriorly, slightly wide and rounded, almost or completely covering the tegminae; paraproct of males with long or short processes; phallic complex mostly membranous; females' pronotum not projected backward; and ovipositor normally narrow, with ensiform or lobiform apex. This genus currently has 14 valid species, mainly distributed in Asia and Africa, with only two species from America: *Cycloptiloides americanas*, recorded from the United States to Brazil, and *Cycloptiloides riveti*, from Ecuador. This work aims to describe a new species of *Cycloptiloides* from the Brazilian Amazon. The specimens were analyzed, measured, and photographed with a Leica M205 A stereo microscope coupled to a Leica DFC 450 camera. The male phallic complex was removed with micro pins and clarified in a cryotube containing 10% KOH immersed in boiling water for 15 minutes. Measurements were given in (mm) and are defined as: Total dorsal length (Ctd); pronotal disc length (Pd); pronotum width (Lp); interocular length (Ci); Posterior femur length (Cfp); Posterior tibial length (Ctp); ovipositor (Ov). The new species was collected in the Caxiuanã National Forest (Melgaço-PA), and it differs from the other species of the genus for being the only one to have the last segment of the maxillary palp smaller than the third and fourth and also for presenting a tenth tergite median process with two macrosetae. The species is also characterized by diminutive size (males: 2.9–3.8 mm; females: 3.4–4 mm); head in dorsal view wider than the anterior edge of pronotum (includ-

ing eyes) and convex anterior margin; ovoid eyes, taller than wide, upper portion wider than the lower portion and with non-pigmented marginal ommatidia; ocelli absent; pronotal disc longer than wide, extending to the fourth abdominal tergite and almost completely covering the tegmina; paraprocts arranged almost parallel, with apexes slightly converging and rounded. The females are apterous, slightly larger than males, with a short and wider than long pronotum with a straight, non-projected posterior edge. The subgenital plate, in ventral view, is triangular, with a truncated posterior border. In lateral view, it is rectangular, dilated at the base, ventrally rounded, and truncated at the apex, arranged obliquely to the ovipositor. The latter is almost straight, with the apex lanceolate and slightly down curved. As previously mentioned, this is the only species of *Cycloptiloides* with the last segment of the maxillary palp smaller than the others and a medial projection with macrosetae in the last abdominal tergite. The relevance of this work is based on the description of this new species, which is the fourth species of Mogoplistidae recorded in Brazil and the first in the Brazilian Amazon.

Global completeness of the (un) knowledge of Orthoptera: Biogeographic biases and gaps on digital accessible knowledge

Rodrigo Antônio Castro-Souza, Victor Prasniewski, Nicolas Silva Bosco, Neucir Szinwelski, Geiziane Tessarolo, Thadeu Sobral-Souza

Knowledge of species distribution in space and time is a fundamental task for biodiversity conservation, and directly depends on the analysis of biases and gaps in biogeographic knowledge. For this, digital accessible knowledge can be used at a macroscale, as it is freely available to society and covers large set of primary biodiversity records extracted from published articles, biological collections and platforms in the form of an online database. Here, we examined the completeness of Orthoptera species inventories available online. We used a large-scale database built for this insect group, where 21 sources were compiled (GBIF, Inaturalist, NBN Atlas, SiBBr, ALA, Monarch, Canadensys, VertNet, IDigBio, PortalBio, STRI, speciesLink, Grasshoppers, Crickets and Allied Insects (Orthoptera) of Ireland, Madrean Discovery Expedition Flora & Fauna Database, Ecoengine, Ecoregistros, NEON Biorepository, OBIS, Biodiversidad de Guatemala Data Portal, InvertEBase, Ecdysis), organized and integrated according to the taxonomic classification proposed by the Orthoptera Species File (OSF) catalog. More than 3 million records were obtained with taxonomic, spatial and temporal information. We calculated completeness using species accumulation curves (SAC), subtracting "1" from the resulting curve angle of each local permutation (x100). Thus, we quantify the ratio of the number of different species already cataloged from the random increase in the number of records in each terrestrial location on the globe, represented here by cell-grids of ~50 x 50 km. In this way, we obtained completeness values that ranged from 0 to 1, where 1 indicates a complete inventory, 0 incomplete, and intermediate values indicate places where greater sampling effort is still needed. All analyses, filtering, integration and data management were conducted in an Rstudio environment. Our findings indicate a large bias in the digitized databases for the order Orthoptera, showing that research effort on Orthoptera is extremely incipient for negative temperate latitudes and tropical latitudes, since the data set were not enough for the calculation of completeness in most parts of the continents (threshold of > 45 records). Most of the digitized primary occurrence records are concentrated in Southern North America, Central Europe, and Eastern Oceania, except in the case of some countries, such as Japan, North Korea, South Africa and New Zealand. The other terrestrial regions of the globe have large gaps in digital accessible biogeographical knowledge. We conclude that it is of crucial importance to invest in digitalization and availability of information for the Orthoptera order where such spatial gaps exist, train and qualify taxonomists, and organize research expeditions to regions not yet inventoried or poorly explored.

Acoustic Monitoring: what does sound reveal about singing insect assembly? (Preliminary Analyzes)

Riuler Corrêa Acosta, Jessie Pereira dos Santos, Lucas Augusto Kaminski

The passive acoustic monitoring (PAM) is a non-invasive method that allows the recording of acoustic assemblages, supporting studies of life history, phenology and description of ecological patterns and processes. The distribution of singing species can be influenced by the physical structure of the habitat and by the acoustic competition of the communication channels, which can act as a filter in the assembly of these assemblages. Through the PAM, we aimed to analyze the structure of the acoustic assemblage of singing insects (orthopterans and cicadas), testing the following hypotheses: i) the acoustic assemblages present differences in species composition according to the plant structure of the environment (open field x closed forest); and ii) forest environments have a higher degree of partitioning. Acoustic recordings were made at Parque Estadual de Itapuã (30°20'40.93" S, 51° 1'32.14"W), Viamão, Rio Grande do Sul, Brazil. This area presents a natural mosaic of fields and forests. The recordings were made between January and March 2020, using the AudioMoth recorders. Eight sampling points were selected with the possibility of installing the recorders in open and closed places, spaced 50m from the edge. It was recorded 1 minute every 5, all day, over 14 days. Collections and recordings were carried out to identify sonotypes. The sounds were analyzed and marked manually using

the Audacity 3.0.2 software. Due to the large volume of data, only 4 files were analyzed per hour (1 every 15 min). We compared the composition of species and dominant frequencies between environments through Non-metric Multidimensional Scaling (NMDS) using Bray-Curtis as a measure of similarity, and PERMANOVA to test the consistency of clusters.
To analyze the distribution of sound emissions, we plotted the proportion of species frequencies and dominant frequencies in hourly intervals for each of the environments. Species composition did not differ between open field (13 species) and closed forest (11 species) environments (Stress=0.091; p=0.40). Likewise, no differences were observed in the composition of dominant frequencies between the two environments (Stress=0.088; p=0.40). Crickets and katydids vary their place of sound emission, as they stridulating in both environments, regardless of the time of day. On the other hand, we observed the katydid *Copiphora brachyptera*, which stridulates only in closed forest, the crickets *Oecanthus* sp. and *Lerneca inalata*, which stridulate only in the open field, as well as the cricket *Anaxipha* sp. which uses frequency bands unoccupied by cicadas to sing during the day and night. Grasshoppers were heard only in open places. Although the forest assemblages have fewer singing species, we observed that more species split the frequency- time when compared to the open field, especially in the period between 8 am and 5 pm, when cicadas are emitting their signals. From our preliminary analyses, we conclude that structure difference does not seem to be a limiting factor for changing species composition in assemblages; and that the highest degree of partitioning is found in closed places, possibly due to the very structure of the forest and the selective pressure that cicadas can exert on other singing taxa.

Grasshoppers (Orthoptera, Acridoidea) from the Saint-Hilaire Municipal Natural Park, Rio Grande do Sul, Brazil

Riuler Corrêa Acosta, Vítor Falchi Timm, Edison Zefa, Maria Kátia Matiotti da Costa

Acridoidea is the largest superfamily of grasshoppers of the Suborder Caelifera, including 11 families, five of them represented in the Neotropical region: Acrididade, Ommexechidae, Pyrgomorphidae, Romaleidae and Tristiridae. The taxonomic knowledge about the Neotropical Acrididiofauna is extremely important, since many environments have been poorly sampled and, on the other hand, are at risk of degradation due to anthropic action. In this way, the inventory of grasshoppers in areas of great diversity is a priority and essential for the development of management and conservation techniques. The Saint-Hilaire Municipal Natural Park (SH) is a Nature Conservation Unit composed of a mosaic of native fields and forests, and stands out for being in an area of ecological tension, between the Pampa and Atlantic Forest biomes. From collections carried out in April and May 2022, the objective of this study was to present a list of species occurring in the Saint-Hilaire Park. The collections were carried out at the SH, a park located between the municipalities of Porto Alegre and Viamão (30°20'40.93"S, 51°1'32.14"W). The active collections were carried out during the day with sweeping nets and nets, between 10 am and 5 pm, in open field sites close to the edge of the forest, at temperatures varying between 17 and 19ºC. The grasshoppers were sorted and identified at the Entomology Laboratory of the Pontifícia Universidade Católica do Rio Grande do Sul (PUCRS), and are deposited in the collection of the Science and Technology Museum (MCTP) of the same institution. A total of 62 individuals were collected, all Acrididae, totaling 25 species, distributed in 20 Genera and five subfamilies. All species collected are new records for the area, in addition to a new species of the genus *Pseudoscopas* Hebard, 1931. Among the collections, the species *Allotruxalis gracilis* (Giglio-Tos, 1897), *Eutryxalis filata* (Walker, 1870), *Metaleptea adspersa* (Blanchard, 1843) and *Parorphula graminea* Bruner, 1900 from the subfamily Acridinae; *Amblytropidia robusta* Bruner, 1906, *Compsacris pulcher* Bolívar, 1890, *Orphulella concinnula* (Walker, 1870), *Orphulella punctata* (De Geer, 1773), *Rhammatocerus pictus* (Bruner, 1900) and *Sinipta acuta* Rehn, 1939 from the subfamily Gomphocerinae; *Leptysmina pallida* Giglio-Tos, 1894 and *Stenopola bohlsii* Giglio-Tos, 1895 from the subfamily Leptysminae; *Baeacris pseudopunctulata* (Ronderos, 1964), *Dichroplus misionensis* Carbonell, 1968, *Dichroplus paraelongatus* Carbonell, 1968, *Dichromatos schrottkyi* (Rehn, 1918), *Pseudoscopas* sp. n., *Ronderosia bergii* (Stål, 1878), *Ronderosia piceomaculata* (Carbonell, 1972), *Scotussa cliens* (Stål, 1861) and *Scotussa lemniscata* (Stål, 1861) from the subfamily Melanoplinae; *Abracris dilecta* Walker, 1870, *Abracris flavolineata* (De Geer, 1773), *Omalotettix obliquus* (Thunberg, 1824) e *Vilerna rugulosa* Stål, 1878 from the subfamily Ommatolampidinae. Due to the studied region comprising an ecotone, resulting from the contact between the Pampa and Atlantic Forest biomes, the grasshopper species sampled in this work are characteristic of these two biomes, and the high number of annotated species demonstrates the importance of the SH as a Conservation Unit. The present study demonstrates the importance of faunal surveys in areas of great diversity, providing data for the advancement of taxonomy and systematics, as well as expanding knowledge of the geographic distribution of grasshoppers in southern Brazil.

The collection of stick insects (Insecta, Phasmatodea) of the Museu Nacional/UFRJ: The first four years

Bernardo Rodrigues Ferraz, Edgar Blois Crispino, Phillip Watzke En-

gelking, Victor Morais Ghirotto, João Marcos Vieira Lima, Pedro Guilherme Barrios de Souza Dias

Stick insects (order Phasmatodea) are insects popularly known for its conspicuous camouflage, resembling sticks and twigs, ranging from 7 to more than 30 centimeters. The order comprises about 3,500 species described while there are currently 229 described for Brazil with an estimated richness of 600 species for the country. Although much has been done in recent years with the resumption of the study of these animals in Brazil, there is still much to be done. Among the main obstacles to the development of research on Phasmatodea are the deposition of type material in foreign collections, lack of characterization of basic body structures, and lack of information about the deposition of types and the state of the Brazilian collections of Phasmatodea. The Museu Nacional, the oldest museum in Brazil, had a large entomological collection estimated at 12 million specimens, with material collected over the past 100 years, and is an essential source for the knowledge of Brazilian fauna. After the fire that caused the loss of most of the insect collection, including the orthopteroid collection, the Laboratório de Orthoptera of the Museu Nacional has been expanding the collection since 2018 by receiving material and conducting collections. Collections have taken place in several states, with the main focus being the conservation units in Rio de Janeiro. The Phasmatodea collection has specimens fixed in a dry way, pinned in entomological pins, or in 85% ethanol. Identification was done by comparison with identified material from other collections and updated bibliography. So far, the entomological collection of woodworms at the National Museum has 133 specimens from 4 families known to Brazil and 13 genera, as follows: Family Diapheromeridae: *Exocnophila* Zompro, 2001 (5 specimens); Family Heteronemiidae: *Ceroys* Audinet-Serville, 1838 (31 specimens); *Tersomia* Kirby, 1904 (1 specimen); *Pygirhynchus* Audinet-Serville, 1838 (20 specimens); Family Prisopidae: *Prisopus* Peletier de Saint Fargeau & Audinet-Serville, 1828 (3 specimens); Family Pseudophasmatidae: *Brizoides* Redtenbacher, 1906 (1 specimen); *Paraphasma* Redtenbacher, 1906 (37 specimens); *Parastratocles* Redtenbacher 1906 (3 specimens); *Prexaspes* Stål, 1875 (10 specimens); *Pseudophasma* Kirby, 1896 (12 specimens); *Stratocles* Stål, 1875 (1 specimen); *Tithonophasma* Zompro, 2004 (6 specimens); *Xerosoma* Audinet-Serville, 1831 (3 specimens). The collection currently covers 10 Brazilian states with a focus on the Southeast region with 76.69% of the specimens coming from there. Of these all, an important addition was recently made with the return of 40 specimens of Phasmatodea previously loaned to Pedro Ivo Chiquetto Machado for his doctoral thesis, which were not lost in the 2018 fire, and now make up the historical collection of Phasmatodea of the National Museum.

Current status of the genus *Metaphotina* Piza, 1964 (Mantodea, Acontistidae) and points about its diversity and distribution

Bernardo Rodrigues Ferraz, Julio Rivera, Pedro Guilherme Barrios de Souza Dias

The order Mantodea comprises about 2500 species of predatory insects known as mantises, conspicuous for their abductor forelegs, triangular head and elongated prothorax. The Neotropical region records 13 of the 31 known families and more than 85 genera, with Brazil alone having about 250 species. Members of the family Acontistidae, known as dwarf mantises, are small mantises that range from 1.8 to 5 centimeters, with robust forelegs and shortened pronotum, distributed from Central America and the Antilles to Argentina. Acontistidae comprises 7 genera with 25 valid species and has been the subject of several taxonomic and systematic studies in the last decade, the most recent of these being the genus *Metaphotina* Piza, 1964, revalidated in 2020. *Metaphotina* is characterized by its small size between 3 and 4 centimeters when adults, with stout and short pronotum, brachypterous females, and males possessing a projection along the apophysis on the ventral phallomere, including 4 species: *M. piracicabensis* Piza, 1964; *M. bimaculata* Saussure, 1870; *M. brevipennis* Saussure, 1872; and *M. rehni* Giglio-Tos, 1927. Despite studies that have revalidated it, the taxonomic status of *Metaphotina* remains controversial and questions about its true diversity, biology, and ecology remain cloudy. The present work deals with preliminary results of the first author's master's thesis, the taxonomic revision of the genus *Metaphotina*, including important information for the study of the family. Until the beginning of this work, the genus was known for Argentina, Bolivia, Paraguay, and Uruguay and recorded in five Brazilian states. So far, 428 specimens from institutional collections have been observed, photographed and dissected, and their locality of origin noted. The genus *Metaphotina* has its distribution extended to 16 Brazilian states, with most of the collected material coming from the southeastern region, mainly São Paulo, certainly due to a historical collecting bias of the group. The records so far point to a high abundance in dry regions of the country (Cerrado and Caatinga biomes), where the phytophysiognomy is predominantly shrubby and low plants with low humidity, indicating an environmental preference of these animals and showing a large extension of their populations in regions with similar environmental conditions; for other countries, the genus is recorded in Argentina, Bolivia, Paraguay and Bolivia (lacking only testimonial material from Uruguayan populations), in biomes very similar to the Brazilian in which specimens were recorded. Analyzing material from Assunción (Paraguay), 70km from Sapucay, type locality of *M.*

rehni, it was not possible to observe significant differences when compared with type material of *M. rehni* and *M. piracicabensis*, then based on these observations, it is proposed that *M. piracicabensis* be considered as a junior synonym of M. rehni. In analysis of little-observed populations from the Northeast of Brazil, considerable differences in genitalia and external morphology were observed representing at least one species previously unknown for Bahia and Ceará, but due to the plasticity observed in populations from the Center-South, further statistical studies involving linear morphometry will be conducted to distinguish whether they are two species or geographical variations of the same species.

The collection of praying mantis (Insecta, Mantodea) of the Museu Nacional/UFRJ: The first four years

Bernardo Rodrigues Ferraz, João Felipe Herculano da Rocha, João Marcos Vieira Lima, Pedro Guilherme Barrios de Souza-Dias

Mantises (order Mantodea) are insects popularly known for their typical lurking body position, in which their forelegs are positioned similar to a praying person. The order has about 2500 described species, with more than 250 species found in Brazil. Even though it harbors about 10% of the world's praying mantis fauna, knowledge of the diversity of this group is still very underestimated in Brazil, and zoological collections are one of the most important means for studying the fauna and describing new taxa. The Museu Nacional had a large entomological collection estimated in 12 million specimens, with material collected over a wide variety of places and periods, being an essential source for the knowledge of the Brazilian fauna. After the loss of most of the collection of orthopteroid insects, the Orthoptera Laboratory of the National Museum has been carrying out since 2018 several collections to restore the collection of the oldest scientific institution in the country. The collections took place in several states with a focus on conservation units in Rio de Janeiro. The Mantodea collection has specimens fixed in a dry way, pinned in entomological pins, or in a wet way, in 85% alcohol. Identification was done by comparison with identified material from other collections and updated bibliography. To date, the entomological collection of praying mantises in the Museu Nacional has 266 specimens from all 11 families known to Brazil and 35 genera, including: Family Acanthopidae: *Acanthops* Serville, 1831 (10 specimens); *Metilia* Stal, 1877 (1 specimen); Family Acontistidae: *Acontista* Saussure, 1872 (2 specimens); *Metaphotina* Piza, 1964 (21 specimens); *Raptrix* Terra, 1995 (3 specimens); Family Angelidae: *Angela* Serville, 1839 (2 specimens); Family Coptopterygidae: *Brunneria* Saussure, 1869 (1 specimen); *Coptopteryx* Saussure, 1869 (3 specimens); Family Liturgusidae: *Fuga* Svenson, 2014 (15 specimens); *Liturgusa* Saussure, 1869 (3 specimens); Family Photinaidae: *Cardioptera* Burmeister, 1838 (6 specimens); *Hicetia* Saussure & Zehntner, 1894 (4 specimens); *Orthoderella* Giglio-Tos, 1897 (1 specimen); *Paraphotina* Giglio-Tos, 1915 (2 specimens); *Photina* Burmeister, 1838 (12 specimens); *Photiomantis* Piza, 1968 (2 specimens); Family Mantoididae: *Mantoida* Newman, 1838 (8 specimens); Family Stenophyllidae: *Stenophylla* Westwood, 1845 (2 specimens); Family Thespidae: *Anamiopteryx* Giglio-Tos, 1915 (8 specimens); *Bantia* Stal, 1877 (17 specimens); *Chloromiopteryx* Giglio-Tos, 1915 (5 specimens); *Diabantia* Giglio-Tos, 1915 (1 specimen); *Eumusonia* Giglio-Tos, 1916 (13 specimens); *Macromusonia* Hebard, 1922 (13 specimens); *Miobantia* Giglio-Tos, 1917 (30 specimens); *Musoniella* Giglio-Tos, 1916 (2 specimens), *Thesprotia* Stal, 1877 (14 specimens); Family Chaeteessidae: *Chaeteessa* Burmeister, 1838 (1 specimen); Family Vatidae: *Chopardiella* Giglio-Tos, 1914 (1 specimen); *Oxyopsis* Caudell, 1904 (8 specimens); *Parastagmatoptera* Saussure, 1871 (7 specimens); *Pseudovates* Saussure, 1869 (5 specimens); *Stagmatoptera* Burmeister, 1838 (23 specimens); *Vates* Burmeister, 1838 (5 specimens); *Zoolea* Serville, 1839 (4 specimens); and 11 unidentified nymphs. The scope of the collection extends over 14 Brazilian states, with a focus on the Southeast region, with 58.64% of the specimens coming from there, growing rapidly with the addition of several specimens that are being, in part, worked on in two taxonomic revisions of genera being carried out by the authors BRF and JFH.

Orthoptera diversity in Cerrado physiognomies

Natália Diesel Mello, Luís Gustavo Ferreira Sanchez, Felipe Malheiros Gawryszewski, Pedro Henrique Brum Togni

Arthropod community composition and structure are influenced by environmental factors such as climate, vegetation, resources, and biotic interactions that act as filters for species occurrence. In the Cerrado biome, the cerrado *sensu stricto* is an open layer savanna vegetation physiognomy defined by the presence of trees and shrubs. The gallery forests are humid and have closed tree canopy. Both physiognomies are subjected to a seasonal climate with marked rainy and dry periods. There is still a large knowledge gap on the occurrence and diversity of Orthoptera in Cerrado's physiognomies and the seasonal factors that may influence the group occurrence in different vegetation types. The objective of this study was to assess the diversity of the order Orthoptera, at the family and morphospecies level, in natural areas of savanna (cerrado sensu stricto) and forest (gallery forest) formations of Cerrado throughout the seasons. Samplings were done in three replicates of each physiognomy in three periods of 2019, corresponding to the dry period, the rainy period, and the transition from the rainy to the dry period. The insects were collected with sweep

nets and active visual search. In total, we collected 170 individuals of Orthoptera, of which 46 were adults and 124 nymphs. From these, 162 individuals were collected in the cerrado *sensu stricto* (44 adults and 118 nymphs) and only eight individuals in the gallery forest (two adults and six nymphs). Altogether, we collected 11 families of Orthoptera and 81 morphospecies. The sampled families were: Acrididae, Eumastacidae, Gryllidae, Mogoplistidae, Phalangopsidae, Proscopiidae, Pyrgomorphidae, Romaleidae, Tettigoniidae, and Trigonidiidae. The most abundant family was Acrididae, with 21 adults and 68 nymphs collected, followed by Tettigoniidae, with four adults and 28 nymphs. Considering only the adult individuals, we identified seven families (Acrididae, Gryllidae, Mogoplistidae, Proscopiidae, Romaleidae, Tettigoniidae, and Trigonidiidae) and 54 morphospecies. The abundance distribution of orthopterans in adult and nymph stages were: dry period – 26 individuals (13 adults and 13 nymphs), rainy period - 58 individuals (15 adults and 43 nymphs), transition - 86 individuals (18 adults and 68 nymphs). The highest richness and abundance of Orthoptera were verified in the transition from the rainy to dry period, while the lowest values were obtained in the dry period. Thus, we found a contrasting occurrence of orthopteran morphospecies in open savanna and gallery forest areas that can be associated with the different conditions and resources available in each physiognomy but also with the sampling bias due to solely active sampling methods. It becomes evident that there is a temporal dynamic in the communities from cerrado sensu stricto evaluated here. Therefore, there is a need for more studies of orthopteran communities in other physiognomies of Cerrado to better understand their distribution and diversity.

Diversity of the Caelifera in the Minas Gerais state, Brazil

Rafael Pereira Paulino da Silva, Daniela Santos Martins Silva, Marcelo Ribeiro Pereira

The suborder Caelifera is a monophyletic taxon represented by grasshoppers, stick grasshoppers, tetrigids and others. They are predominantly diurnal with some nocturnal groups, and can have antennae with up to 30 segments. When winged, they have parchment wings that may or may not be involved in the production of sounds due to femur-tegmina, tegmina-wing or femur-abdomen friction. The ovipositor is formed by six valves and tarsal formula varying in 3-3-3, 2-2-3 (Tetrigidae), and 1-1-1 (Cylindrachetidae). The tympanic organ is located in the first abdominal segment, the cerci is short and non-articulated (except in Tridactyloidea) and male genital plate without styles. Currently, caeliferans have 11 superfamilies, 35 families, 97 subfamilies, 222 tribes, more than 2,500 genera and 12,000 species, of which more than 920 species occur in Brazil. In this context, the objective of this study was to evaluate the information contained in the online base "Orthoptera Species File", for the species of caeliferans in the

Figure 6. Symposium participants at poster presentation.

state of Minas Gerais. Among the 920 species known for Brazil, there are 117 species described for this state, determined in 6 families. The most representative families were Acrididae (83 species), followed by Romaleidae (21 species), Proscopiidae (6 species), Ommexechidae (3 species), Eumastacidae (2 species) and Ripipterygidae (2 species), respectively. The most representative subfamilies were Melanoplinae (24 species), Romaleinae (21 species), Gomphocerinae (17 species), Copiocerinae (7 species), Acridinae (7 species), Ommatolampidinae (7 species), Proscopinae (6 species), Omexechinae (3 species), Ripterigininae (2 species), Temmnomastacinae (2 species), Rhytidochrotinae (1 species), Cyrtacanthacridinae (1 species), Proctolabinae (1 species). The state of Minas Gerais is composed of three vegetational domains, predominantly the Cerrado, followed by the Atlantic Forest, followed by the Caatinga in the north of the state. Due to the presence of these biomes, Minas Gerais has a high index of insect richness. The results obtained reveal a considerable number of grasshopper species in Minas Gerais, highlighting the importance of conservation of the biomes in this state.

Figure 7. Brazilian speakers in round-table discussions (A-B) Women in Science by Dr. Patrícia de Abreu Moreira, Helena Puri, and Dr. Rosy Mary dos Santos Isaias; (C-D) Challenges of a non-diverse environment: perspectives of young scientists LGBTQIA+, Me. Leo Lanna, Lvcas Fiat, Dr. Christian Gonzatti, and Me. Maria Vitória Alves Borille; (E) Science Dissemination with (F) Wikitermes by Dr. Joice Constantini, (G) Mantis Project with Me. Leo Lanna, Lvcas Fiat, and (H) Phasma Project with Me. Edgar B. Crispino, Phillip W. Engelking and Victor M. Girotto.

A new species of *Bambuina* de Mello, Horta & Bolfarini, 2013 (Orthoptera: Grylloidea: Phalangopsidae: Luzarinae) from the Parque Nacional do Itatiaia, Brazil

Maria Vitória Alves Borille, Lucas Denadai de Campos, Pedro Guilherme Barrios de Souza-Dias

Phalangopsid crickets are highly diversified in the Neotropics, mainly in Brazil, where Phalangopsidae stands as the most diverse family, with 127 species recorded in 43 genera. *Bambuina* de Mello, Horta & Bolfarini, 2013 is a monotypic genus described from a cave of the Serra do Caraça, a group of mountains of the Espinhaço Range, Minas Gerais State, and southeastern Brazil. The present work aims to describe the second species of the genus *Bambuina*, the first for the state of Rio de Janeiro, found along the Parque Nacional do Itatiaia. Founded in 1937, the PNI is located in the Mantiqueira massif, a mountain that makes an interchange between the states of Rio de Janeiro, Minas Gerais and São Paulo. After the taxonomic analysis of the external morphology and of the male and female genitalia, we obtained confirmation of a new species for the genus, which is distinguished from *B. bambui* by the following characters: proximal part of males FWs folded, metanotal glandular structures absent. Male: FWs shorter than *B. bambui*, not surpassing the posterior margin of first abdominal tergite, without longitudinal vein; PsP1 inner margin short, outer margin elongated, pointed; PsP2 less developed. Female: copulatory papilla rounded, proximal margin flattened,

Figure 8. Part of the team that worked to make the symposium happen (A) Daniela and Natallia as Scientific Committee, (B) Insectum Group (Entomological Studies Group from Universidade Federal de Viçosa).

with central, distal protuberance rounded. The new species of *Bambuina* found in Rio de Janeiro proves that despite being the best-studied family in the country, the diversity of phalangopsidae is still far from being known, which is why survey studies of the fauna of Brazilian forests are indispensable, as well as studies revision of their subfamilies, tribes and genera.

Preliminary checklist of Grylloidea (Insecta: Orthoptera: Ensifera) from Parque Nacional do Itatiaia

Maria Vitória Alves Borille, Lucas Denadai de Campo, Pedro Guilherme Barrios de Souza-Dias

Crickets are highly diverse in the Neotropics, occupying all of their Biomes. In Brazil, representatives of all five families of Grylloidea are found: Gryllidae, Mogoplistidae, Oecanthidae, Phalangopsidae and Trigonidiidae. However, little is known about this diversity, since all regions of the country are subsampled or not sampled. Faunal inventories are essential for understanding and describing biodiversity and, in Brazil, only three Grylloidea surveys have been carried out to date, none in the state of Rio de Janeiro. This work aims to sample for the first time the diversity of crickets in the Itatiaia National Park, the oldest conservation unit in Brazil. Located in Serra da Mantiqueira, the park covers about 30,000 hectares, covering municipalities in the states of Rio de Janeiro and Minas Gerais. The park's vegetation consists of a mosaic of Atlantic Forest determined by altitude, the lower altitudes are characterized by dense forest, and the higher altitudes by altitude fields, with a predominance of shrubs and low vegetation. In addition to the field expeditions, the Museu Nacional and Fiocruz collections were analyzed, resulting in 34 genera and 44 species of Grylloidea identified to date for the Parque Nacional do Itatiaia. Phalangopsidae is the most diversified family in the Park with 196 specimens studied, divided into two subfamilies, 11 genera, one new genus, 13 identified species, eight of them new to Science, and 11 new records for the state of Rio de Janeiro. Trigonidiidae has 177 specimens, divided into two subfamilies, nine genera, two new genera, 10 species, four new, and nine new records for the state. Oecanthidae has 28 specimens, divided into three subfamilies, seven genera, one new, 11 species, five new species, and seven new records for the state. Mogoplistidae had only one specimen collected, representative of the genus *Ornebius*, the only one that occurs in Brazil and there was still no record of occurrence in the State of Rio de Janeiro. Research is almost complete, with some more problematic groups yet to be identified, such as some Trigonidiinae and Gryllinae, for example. The partial results show that the diversity of the Grylloidea in the Parque Nacional do Itatiaia is the greatest ever found in a Brazilian park.

Orthoptera in textbooks: A Preliminary Results

André Fonseca Antunes, Pedro Guilherme Barrios de Souza Dias, Daniela Maeda Takiya

The order Orthoptera, has popularly known as katydids, crickets, grasshoppers and mole crickets. It is the sixth largest order of insects, with more than 28,000 described species, 4,000 of which are registered in Brazil. The textbook is still one of the fundamental strategies in the teaching-learning process, especially in the natural sciences. As a result, this pedagogical material undergoes frequent content updating, which is still modified by teachers to be implemented in the classroom. Taking into account that the textbook may be the student's only contact with scientific communication, he must be able to stimulate knowledge, insert scientific language and pay attention to natural phenomena and entities. Although teaching zoology is one of the most attractive issues for students, it does not reflect the diversity found in nature, with the focus being on vertebrates, especially mammals. On the other hand, entomology in basic education has two central aspects, the first quantitative, comparing the biomass or species richness, and the second on the morphological characterization and, primarily, the importance in the area of health and economy, reiterating the dangerous aspect, disgusting or transmitting diseases. The objective of the study was to carry out a quantitative analysis about the relationship of orthopterans in the textbooks. The work was carried out from an exploratory study, using textbooks from basic education. Therefore, all Orthoptera mentioned by text, photographs or schematic figures were counted. Along with this, it will be registered in which thematic area the orthopteran was presented. So far, 56 textbooks from basic education have been analyzed, in which 29 had records of orthopterans. The most registered representatives in the textbook were grasshoppers, followed by leaf bugs, crickets, katydids and stick insects. However, mistakes in the identifications were common. Most of the records were based on schematic figures, showing grasshoppers as a

model of the main morphophysiological systems of animals, mainly arthropods. However, based on the analysis of books of the initial years, from the age of 6 in Brazil, only the destructive character of locusts was pointed out, even placing them in thematic axes such as "harmful animals". The katydids, most often referred to as leaf bugs, appeared in photographs associated with themes such as natural selection and camouflage, reinforcing the aspect of resemblance to leaves. However, we recognize that there is a tendency to use the word leaf bug, especially in the most recent textbooks, disusing the name "katydids", in addition to relating only the green Orthoptera to these insects. Finally, it is crucial to point out the negative symbolic value used for locusts when observed only based on agricultural pests, mainly in the initial series.

Likewise, on the last day of the symposium, we had three brilliants round-table discussions with themes not previously talk over in our research groups: Women in Science (Fig.7A-B), Challenges of a non-diverse environment: perspectives of young scientists LGBTQIA+ (Fig.7C-D), and Scientific Dissemination (Fig.7E-H). In the Women in Science round-table discussions, had the opportunity to follow discussions conducted by leading researchers on this subject: (i) "Motherhood and Science" with Dr. Patrícia de Abreu Moreira from Universidade Federal de Ouro Preto (UFOP), regarding how science was shaped by patriarchal culture and how women had to fight to overcome spaces in science; (ii) Helena Puri which discussed the perspective and the importance of women in building the knowledge of indigenous people; (iii) "Black Woman and Scientist: The standard or the exception" given by Dr. Rosy Mary dos Santos Isaias from Universidade Federal de Minas Gerais (UFMG) that pointed the difficulties of black female researchers in building a scientific career (Fig.7A-B). These discussions were important because they brought to our participants issues that are experienced mainly by female students and researchers at the beginning of their careers, and remain as obstacles during the construction of their professional occupations. These issues can drive amazing women away from academic and scientific careers, and to warfare these issues, we first have to recognize that this problem exist and be aware of them.

The second round-table discussion was the "Challenges of a non-diverse environment: perspectives of young scientists LGBTQIA+" (Fig.7C-D): (i) "Why discuss LGBTphobia inside a laboratory?" by Maria Vitória Alves Borille; (ii) "Diversity in Research, pop culture and digital networks" by Dr. Christian Gonzatti, and (iii) Leo Lanna and his partner, designer Lvcas Fiat both from the National Geographic Explorer and Mantis Project, talked about the difficulties of being an LGBTQIA+ researcher and doing fieldwork in remote areas. Our goal in bringing this discussion to the symposium was to report from researchers and students who unfortunately have already gone through situations of embarrassment, disrespect, and fear for being what they are inside universities, labs, and fieldwork. Our purpose was to give voice and space to this discussion and plant a seed: that there is no prejudice or discrimination in our research groups, and we hope that our laboratories and collaborations are safe and inclusive spaces.

The third round-table discussions were about "Scientific Dissemination" (Fig.7E-H) with discussions about the advances and challenges in this subject that is not always approached in a serious way in the academy: (i) Phasma Project with Edgar B. Crispino, Phillip W. Engelking and Victor M. Girotto; (ii) Wikitermes by Dr. Joice Constantini and (iii) Mantis Project by Leo Lanna and Lvcas Fiat.

We consider the IX Brazilian Orthoptera Symposium and II Orthopteroid Insects Symposium to be a successful event:

- 21 national and international speakers (14 of them women);
- 7 short courses;
- 29 posters;
- 3 round-table discussions;
- 85 subscribers with in-person and online participation;
- Exhibition of 12 images in the Photography competition;
- Gathering of non-perishable food items.

Natallia and I (scientific coordinators) (Fig.8A) were very happy after almost a year of work, writing proposals and projects, many meetings, and moments of uncertainty, we received such positive feedback from all colleagues and symposium participants! The symposium is an extremely important space for the presentation and discussion of works and scientific advances achieved. It is also a unique opportunity to exchange experiences, integrate research groups and increase inter-institutional relations, with the aim of strengthening Brazilian and worldwide orthopterology. In that sense, we were victorious. In addition, the round-table discussions were activities that made us very glad and proud.

Thus, we would like to thanks the Insectum Group (Entomological Studies Group from Universidade Federal de Viçosa) (Fig.8B) who supported us, and organized the virtual communication interface with participants. We also would like to thank Thamires Souza for producing the symposium logo; Rafael Pereira Paulino da Silva for his help in the production of images and publicity material; João Felipe Herculano da Rocha for the extremely high quality photographs taken during the symposium; to the speakers, guests and participants (face-to-face and virtual) who were with us during that week. Our deepest gratitude to The Orthopterist Society for all their support, CAPES and Universidade Federal de Viçosa.

Treasurer's Report

By PAMELA MIHM
Treasurer
p.mihm@regency-multifamily.com

The Statement of Assets as of December 31, 2022 and the 2022 Summary of Cash Receipts and Expenditures are shown below. The Orthoptera Species File, which is funded by an endowment from the University of Illinois, continues to be the largest cash activity. The second-largest use of cash was publishing the *Journal of Orthoptera Research* (JOR). The Society is able to support the Theodore J. Cohn Research Fund and other worthy endeavors through the generosity of some members. The Society's total assets decreased from $1.9 million at the end of 2021 to $1.6 million at the end of 2022. The investments were impacted by the decline in the value of stocks and bonds, high inflation, and higher interest rates. We have made and continue to make changes to the investment portfolio to try to maximize the value and earnings. If you have any questions, please contact me at p.mihm@regency-multifamily.com.

Orthopterists' Society
Statement of Cash Receipts and Expenditures
(1/1/22 through 12/31/22)

Cash Receipts	
Dues	$3,635.00
Publications	1,295.00
Community Foundation endowment	11,643.50
Royalty and revenue sharing	4,562.94
Book reimbursements	142.98
Transfer cash from Vanguard & Wells Fargo	43,400.00
Proceeds from sale of investments	20,000.00
University of Illinois allocation	182,000.00
Total Cash Receipts	$266,679.42
Cash Expenditures	
Publisher JOR	$8,637.40
Pensoft Publishers	10,451.57
JOR assistance	12,000.00
Research grants (Ted Cohn)	14,976.00
Executive director remuneration	0.00
Ed. Metaleptea remuneration	1,500.00
Assistant Ed. Metaleptea remuneration	1,000.00
Webmaster remuneration	500.00
JOR editor remuneration	3,000.00
Maintenance of Orthoptera Species File	146,820.00
Grants-Orthoptera Species File	32,933.00
Professional fees (income tax preparation and audit)	5,565.00
Webmaster SINA site support	3,600.00
Accounting reimbursement	12,000.00
IX Orthopteran Symposium Support	2,500.00
South American Orthoptera Symposium Support	5,000.00
Congress 2023 contribution	7,000.00
Other	1,844.36
Total Cash Expenditures	$269,327.33
Cash Receipts over Cash Expenditures	$(2,647.91)
Beginning Cash Balance	16,469.63
Ending Cash Balance	**$13,821.72**

Orthopterists' Society
Statement of Assets
(As of December 31, 2022)

Cash	
Paypal cash balance	$502.29
Chase Bank	13,319.43
	$13,821.72
Investments at market value	
Vanguard:	
Grants (Note 1)	$417,255.02
Operating (Note 2)	746,489.59
	$1,163,744.61
Wells Fargo:	
AAAI (Note 3)	$16,504.25
Endowment (Note 4)	35,008.15
Operating (Note 2)	267,063.26
Grants (Note 1)	95,064.33
	$413,639.99
Total assets	**$1,591,206.32**

Note 1: This fund is restricted and can only be used for research grants.
Note 2: This fund is nonrestricted.
Note 3: This fund can only be used for the Uvarov Award made at each int'l meeting.
Note 4: The income in this account is available for Society expenses; can extract capital but must have a plan for repaying it within 3 years.

Editorial

By HOJUN SONG
Editor, *Metaleptea*
hsong@tamu.edu

Every time I finish putting together an issue of *Metaleptea*, I struggle to figure out what I want to write in my editorial. Sometimes, I complain about how busy I am. Other times, I share some exciting things that I have run into. This time, maybe I want to talk about the Orthopterists' Society meetings since our International Congress of Orthopterology (ICO) meeting in Merida, México is coming up soon.

As an academic, I attend a lot of meetings and conferences. Some meetings are more enjoyable than others, but my favorite meetings are definitely the Orthopterists' Society meetings. Why? There are several reasons, but for me, it really comes down to people. The OS meetings I have attended have been relatively small, with no more than 200 participants. Unlike large meetings like the ESA meetings or International Congress of Entomology (ICE) meetings with thousands of people, these small meetings naturally allow more intimate and personal networking. There is something special about meeting people who share the same interest, which in this case is a passion for Orthoptera. Even among entomologists, it's pretty difficult to find people who are really passionate about Orthoptera. We all know this, which may be why we tend to gravitate towards those who also like Orthoptera. There is a genuine sense of camaraderie in the OS meetings. The people we meet at the OS meetings are not only colleagues, but they become lifelong friends. So, in a way, the OS meetings feel like family reunions to me.

My very first OS meeting was the 2001 meeting in Montpellier, France. I was a first-year graduate student then, and I remember feeling enormously inadequate because I realized I did not know much. When I met the giants in the field whose names I only learned from papers and books, I remember being awe-struck and intimidated at the same time. But mostly, I remember people being kind and fun to be around. The late Ted Cohn was incredibly kind and generous to me.

If you have never been to an OS meeting, consider attending the upcoming meeting in Merida. Merida is a magical place full of locusts, Mayan culture, friendly people, and amazing food. Of course, my dear friend Mario Poot-Pech is in charge of organizing the congress, so I know we will have a great time there. We will have an excellent program and a fantastic opportunity to catch up with old friends and make new friends. So, see you all in Merida!

This issue of *Metaleptea* is filled with interesting reports, meeting proceedings and stories contributed by our members. I would also like to thank our Associate Editor, Derek A. Woller, for his continued assistance in the editorial process.

To publish in *Metaleptea*, please send your contribution to hsong@tamu.edu with a subject line starting with [**Metaleptea**]. As for the format, a MS Word document is preferred and images should be in JPEG or TIFF format with a resolution of at least 144 DPI. The next issue of *Metaleptea* will be published in May of 2023, so please send me content promptly. I look forward to hearing from you soon!

Officers of the Orthopterists' Society