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METALEPTEA

THE NEWSLETTER OF THE ORTHOPTERISTS' SOCIETY

President's Message

By AXEL HOCHKIRCH
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Dear Society members,

I hope you are all enjoying your research activities on Orthoptera. The summer months represent the peak of Orthoptera activity in Europe. Therefore, I have been busy with fieldwork over the last weeks. We are currently repeating a survey project that was conducted between 2000 and 2004 in Luxembourg by revisiting 100 study sites to calculate population trends of Orthoptera for a new national red list. A general pattern found in all such biodiversity studies is biotic homogenization, which means that the Orthoptera fauna of our study sites has become more similar over time, even though alpha diversity (i.e., the number of species per site) may even increase. This process is driven by the loss of specialists and expansion of generalist species, which are benefiting from global change, such as increased fertilization from air nitrogen influx, convergence of agricultural land use practices, urbanization and the warming climate.

Central Europe is a relatively species-poor region, and the warming climate has facilitated range expansions of numerous species with a more southerly distribution, some of which were very rare or absent in the past, and some were even listed on national red lists in former times. On the contrary, species requiring traditional low-intensity land use (e.g., nutrient-

poor meadows) or adapted to moist habitats are disappearing. While these species may still find sufficient habitat in the north of Europe, the situation is likely to be more dramatic in regions with a lot of endemic species that may occupy only small ranges. The threats to Orthoptera vary across space; for example, overgrazing in arid regions is often a major threat to Orthoptera, island species suffer from the introduction of alien invasive species, while, in rainforests, deforestation is a major driver of Orthoptera declines.

In early July, I attended the 4th European Congress on Orthoptera Conservation (ECOC) in Rovereto (Italy), which was organized by our member Filippo Maria Buzzetti. This conference was a great event with numerous interesting presentations and discussions, illustrating the diversity of

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Orthoptera research and conservation projects on the continent, and even including presentations from non-European participants. During this congress, Joaquín Ortego reported that ranges of some Mediterranean mountain grasshoppers are indeed severely shrinking, which is an alarming observation. These species are trapped at high elevations of mountains and are unlikely to find climatically suitable habitats in the future. It thus will be crucial to foster research into these processes and develop strategies to prevent them from extinction. On the other hand, I was very pleased to hear about fruitful collaborations of researchers with practical conservation projects, such as translocation projects for *Arcyptera fusca* in Hungary (presented by Gergely Szövényi) and *Zeuneriana marmorata* in Italy (presented by Filippo Maria Buzzetti).

During the congress, we met again with eight attendees of the Summer School on Grasshopper Taxonomy and Conservation, which was held in 2023 in Greece (organized by our members Luc Willemse, Baudewijn Odé, Roy Kleukers, and Vassiliki Kati). The continuous interest of young students in Orthoptera is encouraging as it shows that our efforts in training a new generation of Orthopterists have been fruitful. On the last day of the congress, an excursion to Monte Bondone took place, where we were able to spot some beautiful Orthoptera species in a stunning alpine environment.

Being in the middle of Orthoptera season also means that hundreds of Orthoptera observations are being submitted each day to the major citizen science platforms (observation.org and iNaturalist). If I find some time in the evening, I sometimes validate such observations, which sometimes may contain some surprising records. Particularly in gardens and garden centers, we increasingly find Mediterranean Orthoptera that have been transported with garden plants to Central Europe. Not all of them are able to successfully reproduce here, but some appear to establish and even spread. One of these species is the Southern Sickle Bush-cricket (*Phaneroptera nana*), which first appeared in gardens and is meanwhile spreading in the wider landscape of the Upper Rhine Valley. Another species, which is currently only known from a few gardens is the Ringed Bush-cricket (*Rhacocleis annulata*). The future will show which of these species will spread and if any of them may even replace native species, but these observations show that the Orthoptera fauna is highly dynamic and will change substantially in the future.

I wish you all plenty of enjoyable Orthoptera observations and the best success with your research projects. Enjoy reading this nice issue of *Metaleptea* and thanks to everyone who has contributed, and particularly Hojun Song and Derek A. Woller.

Announcing 15th International Congress of Orthopterology,

San Martín de los Andes, Neuquén, Argentina (March 8-12, 2026)

By **MARIA MARTA CIGLIANO**
President, ICO2026, CONICET
HÉCTOR MEDINA
Vice-President, ICO2026 SENASA
AXEL HOCHKIRCH
President, Orthopterists' Society

We are delighted to invite you to the 15th International Congress of Orthopterology, which will be held in San Martín de los Andes, Neuquén, Argentina, from March 8-12, 2026.

San Martín de los Andes holds historical significance as the founding place of the Orthopterists' Society in 1976, originally established as the Pan American Acridological Society (PAAS) by 35 orthopterists. Our vision for the 2026 Congress is expressed as "Half a Century Advancing Orthoptera Research and Collaboration." This congress celebrates the scientific advancements and collaborative efforts made in Orthoptera research and management over the past fifty years, highlighting both the Society's milestones and its continued dedication to research and partnership.

San Martín de los Andes is a picturesque town located in the Argentine Patagonia, known for its stunning natural beauty. It is nestled on the shores of Lake Lácar and surrounded by the majestic Andes mountains. The town serves as a gateway to the Lanín National Park, home to the iconic

Lanín Volcano with endemic Orthoptera fauna from the high Andes and the Patagonian steppes.

We are committed to creating a congress where orthopterists from all over the world work together beyond the border of specialties, whether in research or applied management, to create a unity of knowledge.

We look forward to meeting you in San Martin de los Andes in March of 2026.

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

By TERESA YAWN
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Oecanthus alexanderi, *O. fultoni*, and *O. rileyi* produce rhythmic chirps that vary linearly with temperature and are easily countable. These crickets are often referred to as "thermometer crickets" because the direct relationship between chirp rate and temperature provides an easy method for accurately estimating the temperature around a calling cricket. The method is to simply count the number of chirps per a calculated time interval which is then added to a constant. The time interval is based on the slope of the line for a given species' chirp rate relative to temperature. The constant is based on whether you wish to estimate temperature in degrees Celsius (constant = 4) or Fahrenheit (constant = 39). Walker and Collins' (2010) paper "New World Thermometer Crickets: The *Oecanthus rileyi* Species Group and a New Species from North America" provides graphs, data, and calculations for determining the time interval for counting chirps for each of these species. This information is now available on Singing Insects of North America (SINA) on a webpage titled "Thermometer Crickets" for *O. rileyi* (https://orthsoc.org/sina/588thermometer.htm). At the time of this writing, I am working on similar pages for *O. fultoni* and *O. alexanderi*. These pages will be uploaded to SINA as soon as they are completed.

Prominently featured on *O. rileyi*'s webpage is a graph from Walker and Collins (2010) showing trend lines

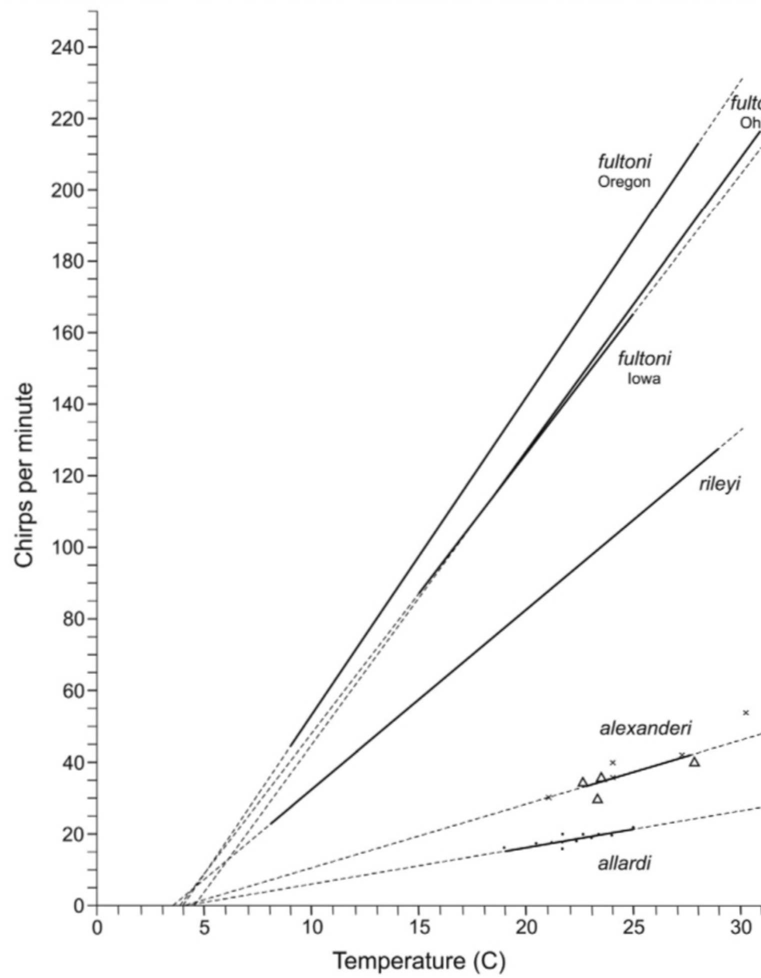

Figure 1. Trend lines for 4 species in the *O. rileyi* group. Figure 3, from Walker and Collins 2010.

for *O. alexanderi*, *O. fultoni*, and *O. rileyi* (as well as *O. allardi*, which is not a SINA species). Below the graph (Fig. 1) is a paragraph that explains it, followed by the formulas for *O. rileyi* that are used for estimating temperature, which are:

Number of chirps counted in 11 seconds + 4 = temperature °C

Number of chirps counted in 20 seconds + 39 = temperature °F

And it's that simple! If you hear an *O. rileyi* cricket singing, pull out a timer, count the chirps for 11 seconds (°C) or 20 seconds (°F), then add 4 to the number of chirps counted in 11 seconds to get the temperature in degrees Celsius or 39 to the number of chirps counted in 20 seconds to get the temperature in degrees Fahrenheit. The webpage shows how the formulas are calculated, followed by an example using an audio recording of *O. rileyi* singing for 11 seconds. The audio was recorded by J. Banas in Bernalillo County, New Mexico. If you listen to the audio, you will count 15 chirps. Add 15 to 4 and the result is 19 °C. Checking this answer against the trend line for *O. rileyi*, the data used to create the trend line, and the temperature at the time the audio was recorded (19 °C) demonstrates that the estimated temperature calculated using the formula is a reliable approximation of the actual and predicted temperature.

Regional Reports - What's happening around the world?

North America

By KATHLEEN KING
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Field season is starting to end or shift from fieldwork to lab or computer work. Here are some updates I hope you find as interesting as I did.

The United States Department of Agriculture (USDA)-Animal and Plant Health Inspection Service (APHIS)-Plant Protection and Quarantine's (PPQ) Grasshopper and Mormon Cricket Survey Program in Wyoming was able to confirm an established population of *Schistocerca lineata* in Platte County, Wyoming in 2024 during adult survey activities. This species was first found in 2023 and became a state record (Fig. 1). It appears this species is partial to congregating in the clumps of legume shrubs that grow along the creek bottom. Species identification of the plant is pending.

Other news includes work from Dr. JoVonn Hill, the Director of the Mississippi Entomological Museum and Assistant Research Professor at Mississippi State University. Dr. Hill is currently working on the third volume of The North American Grasshoppers: Melanoplinae. He is collaborating with Dr. Lacey Knowles at the University of Michigan on a project aimed at collecting and analyzing population-level genetic data for all Melanoplinae in North America and Mexico. Dr. Hill is overseeing several student projects related to grasshoppers, including Shelby Grice's work on the revision of *Hesperotettix*, Jireh Mwamukonda's studies on grasshoppers of Malawi and the revision of the *Melanoplus tribulus* group, and Musab Alkhalaf's work on the revision of the *Melanoplus flabellatus* group. Additionally, Dr. Hill is researching the community ecology of grasshoppers on the Lake Wales Ridge in Florida, alongside various projects focused on rangeland pests in the western United States.

Dr. Dan Johnson of the University of Lethbridge, Alberta, Canada is working on several Orthoptera projects. First, Dr. Johnson has been following the narrow range of a small bandwing species for 30+ years. This species has always been restricted in range, then suddenly with increased temperatures in 2021-2022, it moved over 100 kilometers in different directions. The species arrived in fairly large numbers in Dr. Johnson's hometown and established a population for the first time. Dr. Johnson looked for immatures and found them during 2022, 2023, and 2024. Dr. Johnson is continuing to follow this species and more information may be coming in a future issue of *Metaleptea*. Second, Dr. Johnson has a large new study of 20 parks and protected areas in which he is establishing the Orthoptera food webs for birds. Dr. Johnson and his team are mapping biomass, nutrition, timing, species, size, and other biometrics in this project. Since this project is new, Dr. Johnson does not have results yet.

The third project is a comprehensive study of Orthoptera diversity in Alberta's northern region. Because this region's orthopteran fauna has largely been unstudied, Dr. Johnson completed a survey of grasshopper species found in late summer in 32 northern counties and districts in Alberta (Peace and Athabasca). He and his team held workshops annually for several years, and the surveyors and fieldmen (AAAF) collected grasshoppers with sweep nets. Collected specimens were frozen and shipped to Dr. Johnson for identification. Over 1,000 collections yielded 12,686 grasshoppers which were all identified by Dr. Johnson. He also collected and identified thousands of his own specimens, plus 8,000 grasshoppers collected with regard to northern airports concerned about bird strike (when grasshoppers attract flocks of birds) for this project. Dr. Johnson also researched life cycles, parasitism, and forecasting models. The dominant species is *Melanoplus bruneri*, and this was consistent over several years

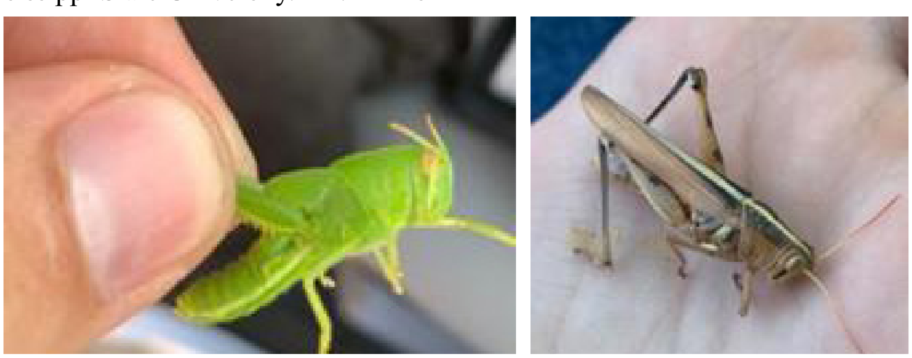

Figure 1. (left) Fifth instar nymph of *Schistocerca lineata* caught in Wyoming in 2024. (right) Adult female of *S. lineata* caught in Wyoming in 2024. Photo Credit: PPQ employee William Galloway

of sampling. *Melanoplus bruneri* used to be fairly minor, but was discovered to have increased greatly in the north in the early 1990s and then again in the late 1990s (field work of Dan Johnson). By 2010, *M. bruneri* was dominant across north and north-central Alberta. Dr. Johnson also has a data breakdown by year, county, vegetation, etc., with detailed statistical and GIS map results, and photo guides for all species. In 2024, grad student Jason Cheng started an MSc in his lab related to this topic and outbreak history.

Other fun news includes the upcoming "Orthoptera Networking Event — Locust Plasticity and More!" at the Entomological Society of America's annual conference, this time in Phoenix, Arizona. Join the Global Locust Initiative (GLI) for their annual networking event on Tuesday, November 12, at 4:00 PM. This year, they're hosting a mixer alongside the Behavioral Plasticity Research Institute and the Orthopterists' Society. Join in to connect with colleagues new and old and hear updates on projects and research. GLI wishes to invite anyone interested in any aspect of orthopteran biology, integrative pest management, sustainable agriculture, food security, or related fields to join the conversation. An informal gathering at Cornish Pasty Downtown (7 W Monroe St, Phoenix, AZ 85003) will follow the event.

The GLI is an Arizona State University initiative whose mission is to promote interdisciplinary locust research and management to improve the well-being of farming communities and global food system sustainability. GLI would love for you to join the global Network and become involved in the online community HopperLink. To do so, register here: https://global-locust-network.mobilize.io/registrations/groups/43483.

Table of grasshopper species data for project 3.

n	%	Orthoptera species	Common name
7726	60.9	*Melanoplus bruneri*	Bruner's Spur-throat grasshopper
2828	22.29	*Pseudochorthippus curtipennis*	Marsh Meadow Grasshopper
753	5.94	*Melanoplus borealis*	Northern Spur-throat Grasshopper
697	5.49	*Melanoplus bivittatus*	Two-striped Grasshopper
241	1.9	*Camnula pellucida*	Clear-winged Grasshopper
206	1.62	*Conocephalus fasciatus*	Slender Meadow Katydid
106	0.84	*Stethophyma gracile*	Graceful Sedge Grasshopper
35	0.28	*Melanoplus dawsoni*	Dawson's Grasshopper
26	0.2	*Chloealtis conspersa*	Sprinkled Broad-Winged Grasshopper
12	0.09	*Melanoplus sanguinipes*	Lesser Migratory Grasshopper
11	0.09	*Encoptolophus costalis*	Dusky Grasshopper
10	0.08	*Chloealtis abdominalis*	Cow Grasshopper
7	0.06	*Scudderia pistillata*	Broad-winged Bush Katydid
5	0.04	*Aeropedellus clavatus*	Club-horned Grasshopper
5	0.04	*Trimerotropis verruculata suffusa*	Crackling Forest Grasshopper
4	0.03	*Tetrix subulata*	Granulated Grouse Grasshopper
2	0.02	*Circotettix carlinianus*	Carlinian Snapper Grasshopper
2	0.02	*Dissosteira carolina*	Carolina Grasshopper
2	0.02	*Orchelimum gladiator*	Gladiator Meadow Katydid
1	0.01	*Arphia conspersa*	Speckle-winged Rangeland Grasshopper
1	0.01	*Eritettix simplex*	Velvet-striped Grasshopper
1	0.01	*Melanoplus confusus*	Pasture Grasshopper
1	0.01	*Melanoplus fasciatus*	Huckleberry Grasshopper
1	0.01	*Melanoplus huroni*	Huron Short-winged grasshopper
1	0.01	*Spharagemon collare*	Mottled Sand Grasshopper
1	0.01	*Sphagniana sphagnorum*	Bog Katydid
1	0.01	*Steiroxys trilineata*	Three-lined Shieldback
12686		**identified 2023; dan.johnson@uleth.ca**	

Middle East and the Caucasus

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The Middle East and the Caucasus are always on the agenda of the world media, if not with their scientific studies, then with their wars and directing the world politics. The same situation was valid in 2023 and 2024. However, 2023 and 2024 were also a period in which considerable studies were conducted on orthopteroid insects (Polyneoptera). In a search conducted in the Web of Science environment based on country addresses of this region (16 different countries), 66 articles related to orthopteroid insects (Polyneoptera) were encountered. The majority of these works are on pest management and physiology. The articles with phylogeny and phylogeography occupy the second and those with faunistic/taxonomic content the third. Considering the countries as addresses, Iran ranks first with 21 articles, Turkey and Israel rank second and third with 16 articles each. While three or fewer articles addressed to Saudi Arabia, Lebanon, Iraq and Jordan were found, no articles published in 2023-2024 were found from the remaining eight countries.

We think that many studies on orthopteroid insects are ongoing in the Middle East and Caucasus region. One of these is the study conducted on the genus *Chorthippus* in the Western Palearctic Region. The subgenus *Glyptobothrus* was chosen as the model lineage for this study because of several reasons. First, its taxonomy and phylogeny is poorly known and extremely complex because of frequent hybridisation. Second, it is a diverse lineage that includes many long and short winged forms, a character expected to affect the dispersal ability. Third, it includes both local endemics and widespread species. Fourth, there seems to be correlation between glacial cycles of Pleistocene and radiation steps of the lineage. The project aims to understand how demographic and evolutionary processes operating in microevolutionary scale shaped macroevolutionary patterns. By using the voluminous genetic data to be obtained, an attempt will be made to determine how demography directed speciation.

This project is entitled "Bridging the gap between demography and diversification: Insights from an evolution of grasshoppers (DEMODIV)," is led by Dr. Joaquin Ortego Lozano from the Department of Ecology & Evolution, Estación Biológica de Doñana (EBD-CSIC) and is supported by the Spanish Ministry of Science and Innovation. Also, Prof. Battal Çıplak (Antalya, Turkey), Prof. Anna Papadopoulou (Nicosia, Cyprus), Dr. Jorge Gutiérrez Rodríguez (Sevilla, Spain) and Dr. Oliver Hawlitschek (Hamburg, Germany) are researchers on the project. The Eastern Mediterranean part of the project (i.e., the Middle East) was carried out in the summer of 2024. All targeted *Glyptobothrus* species and populations were reached and sampled during the field studies by Dr. Joaquin Ortego Lozano and Battal Çıplak in summer of 2024. The project continues as planned and significant evolutionary results are expected.

Battal Çıplak and Joaquin Ortego Lozano were on mountain summits during field study (top) Ilgaz Mountain and (bottom) Palandöken Pass

Orthoptera Species File Grant Reports

Discovery and Documentation of New Orthoptera Species in East Africa: First Live Photographs and Newly Encountered Species

By CLAUDIA HEMP
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As part of an OSF grant to visit remote areas of East Africa and photograph rare Orthoptera species, several species previously known only from a few specimens stored in various European museums were encountered and photographed. The surveys also led to the discovery of species new to science. This overview focuses on the subfamilies Conocephalinae, Hetrodinae, Hexacentrinae, Mecopodinae, and Pseudophyllinae.

Figure 1. *Afroagraecia flava*. Only the male holotype is known at present. The species occurs at higher elevations in the Udzungwa Mountains of Tanzania.

Figure 2. *Afroagraecia jozani* is one of two known *Afroagraecia* species from Zanzibar. *A. sansibara*, the second species, was already described by Redtenbacher 1891. Only a few specimens were known until resampled and photographed.

Figure 3. *Afroagraecia jozani*. The triangle-shaped dark fascia on the face is typical of quite a number of *Afroagraecia* species. Only a few species have a faint or no fascia on the face.

Figure 4. *Afroagraecia nguruensis* was described from the Nguru Mountains, occurring there in submontane elevations.

Figure 5. *Afroanthracites guttatus* is endemic to the North Pare Mountains. Each mountain range of the northern branch of the Eastern Arc mountains harbours at least one endemic species of *Afroanthracites*.

Results & Discussion

In the Agraeciini tribe, four species new to science were described in the genus *Afroagraecia* Ingrisch & Hemp, 2013: *A. flava* Hemp, 2019 (Fig. 1), *A. furcata* Hemp, 2019 (Fig. 2), *A. jozani* Hemp, 2019 (Fig. 3), and *A. nguruensis* Hemp, 2019 (Fig. 4). Additionally, seven new species were identified in the genus *Afroanthracites* Hemp & Ingrisch, 2013: *A. guttatus* Hemp, 2019 (Fig. 5), *A. inopinatus* Hemp, 2019 (Fig. 6), *A. lineatus* Hemp, 2019 (Fig. 7), *A. maculatus* Hemp, 2019 (Fig. 8), *A. magamba* Hemp, 2019 (Fig. 9), *A. ngologolo* Hemp, 2019 (Fig. 10) and *A. pommeri* Hemp, 2019 (Fig 11). Both genera are distributed across single mountain ranges along the Eastern Arc Mountains of Tanzania and Kenya. *Afroanthracites* species are especially often endemic to submontane to montane zones of their respective mountain areas, while *Afroagraecia* species also occur in lowland forests and along the Tanzanian and Kenyan coasts. These species were encountered during surveys of the forests along the Eastern Arc Mountains in search of rare and previously unphotographed Orthoptera.

The genus *Dendrobia* was established in 2017 by Hemp & Ingrisch and contains three species, all known only from Tanzanian mountain areas. *Dendrobia plagata* Hemp, 2019 (Fig. 12), was discovered during surveys of the

Figure 6. *Afroanthracites inopinatus* is closely related to *A. montium*, which is restricted to Mts Kilimanjaro and Meru. *A. inopinatus* is a common species in forests of the South Pare Mountains.

Figure 7. *Afroanthracites lineatus* only occurs on the highest peak of the Nilo Forest Reserve above 1500 m. A second, not-yet-described species was also encountered there. At lower elevations, *A. viridis* is common in the East Usambara Mountains.

Figure 8. *Afroanthracites maculatus* is beside *A. inopinatus* as one of two species endemic to the South Pare Mountains. Both species were newly described in 2019.

Figure 9. *Afroanthracites magamba* is one of numerous *Afroanthracites* species only found on the mountain block of the West Usambara mountains. At least three areas isolated climatically from each other within this mountain range harbours one, mostly two, or more species of this genus.

Figure 10. *Afroanthracites ngolongolo* is endemic to the Udzungwa Mountains, one of the most southernly mountain ranges of the Eastern Arc in Tanzania. Very likely, this huge mountain area harbours more than one *Afroanthracites* species. The higher elevations have not been explored by our team.

Figure 11. *Afroanthracites pommeri* is the only known *Afroanthracites* species known from Kenya so far. It occurs in the forest remains of the Ngangao Forest Reserve in the Taita Hills.

Figure 12. The genus *Dendrobia* was newly described in the course of our forest surveys in Tanzania. *D. plagata*, here shown, occurs in the Nguru Mountains of Tanzania.

Figure 13. *Enyialiopsis carolinus* was photographed alive for the first time for the OSF.

Figure 14. *Gymnoproctus similis* is widespread in Miombo woodlands of Central Tanzania.

Nguru Mountains as part of the OSF grant surveys.

The Hetrodinae fauna is poorly studied in most areas of East Africa, although Weidner (1941, 1955) conducted pioneering work on these conspicuous and charismatic insects. During our surveys, several previously undescribed *Enyaliopsis* taxa were found, and live photographs were provided for the OSF. Several populations of *Enyaliopsis carolinus* (Lucas, 1885) were located near Bukoba in central Tanzania, in Minziro Forest near the Ugandan border in western Tanzania near Lake Victoria, the Mingali Forest Reserve, and the Bereku Forest Reserve near Babati (Fig. 13) in central-north Tanzania. This survey significantly contributed to the knowledge of East African Hetrodinae, adding valuable information on distribution, morphological traits, and bioacoustics, and were presented in Heller et al. (2022). Additionally, two *Gymnoproctus* Karsch, 1887 species were photographed alive, revealing their color patterns and contributing to the knowledge of their distribution, habitats, and bioacoustics. Both *G. similis* Weidner, 1955 (Fig. 14) and *G. rammei* Weidner, 1941 (Fig. 15) occur in Miombo woodlands in central Tanzania and are seasonal species, mostly found between April and August. One of the largest species of

Figure 15. *Gymnoproctus rammei* also occurs in central Tanzania, but has not been found syntopically with *G. similis* so far, even though both species have a wide distribution in the region.

Figure 16. *Eugasteroides loricatus*, a large hetrodine species, is widespread in dry habitats in eastern Africa.

Figure 17. An unexpected population of the Balloon bushcrickets *Aerotegmina vociferator* was found in 2024 in Kimboza forest reserve in the foothills of the Uluguru Mountains.

Figure 18. Another species of the ground dwelling genus *Apteroscirtus*, *A. densissimus*, characterized by its stout appearance, was detected in the Nguru Mountains of Tanzania.

Figure 19. A surprising discovery was a separate species of the formerly monotypic genus *Gymnoscirtus*. *G. corifterus* has so far been found only in the Udzungwa Mountains, while *G. unguiculatus* is widespread, occurring in almost all forests of the Eastern Arc ranges.

Figure 20. *Philoscirtus cordipennis* is a large mecopodine species restricted to the East Usambara Mountains. Before our surveys this beautiful species was only known from a few museum specimens.

Figure 21. The West Usambara Mountains situated adjacent to the East Usambara Mountains harbour a second, smaller species of *Philoscirtus*, *P. viridulus*.

Figure 22. The genus *Stenympyx* was monotypic until *S. viridiflavus* was described. *S. annulicornis* is widespread in Central and West African forests, while *S. viridiflavus* is currently known only from a few localities in Tanzania. These species represent one of the very few examples of a genus distributed in both Central and West Africa on one hand and East Africa on the other.

Figure 23. Data on Cymatomerini are sparse, and there is considerable confusion regarding the species status of some taxa. The newly described *Cymatomerella morula* from central Tanzania is easily recognized by its black abdomen in both sexes.

Hetrodinae is *Eugasteroides loricatus* (Gerstaecker, 1869), and live photos of this conspicuous species (Fig. 16), found mostly in savanna habitats throughout Kenya and Tanzania, were captured.

During the surveys, more populations of various *Aerotegmina* Hemp, 2001 species were discovered. A surprising find was *A. vociferator* in the Kimboza Forest Reserve (Fig. 17). Based on its morphology and sound, it could only be assigned to this large Balloon bush cricket, with two other populations in submontane forests of the Nguru and Udzungwa Mountains. This new population in dry lowland forest at the foothills of the Uluguru Mountains was unexpected. Further research will investigate whether differences in morphology and bioacoustics distinguish this population from the other two populations. In a phylogenetic study on *Aerotegmina* (Grzywacz et al. 2021), the two populations of *A. vociferator* clustered clearly separate from each other, indicating recent speciation.

In the Mecopodinae subfamily, *Apteroscirtus* Karsch, 1892 is a dweller of the litter layer in forests throughout tropical Africa. In the Nguru Mountains, a new species, *A. densissimus* Hemp, 2020, was recently discovered (Fig. 18). Also in the genus *Gymnoscirtus* Karsch, 1892, monotypic with the widespread *G. unguiculatus* (Karsch, 1888), a new species in the Udzungwa Mountains, *G. corifterus* Hemp, 2020 (Fig. 19), was found shedding light on speciation patterns in the area. The genus *Philoscirtus* was monotypic with *P. cordipennis* Karsch, 1896 until recently (Fig. 20), with the only species described from the East Usambara Mountains of Tanzania known only from a few specimens stored in the Naturkunde Museum Berlin, Germany and unidentified material in the Natural History Museum London, U.K. Stable populations of this large Mecopodinae species were found in the shrub and tree layer of several submontane forests in the East Usambara Mountains, particularly in the forests of the Nilo Forest Reserve, which still have extensive patches of undisturbed pristine forest. These populations were photographed, bred, and studied for their biology. In the adjacent West Usambara Mountains, a closely related *Philoscirtus* species was found and described as *P. viridulus* Hemp, 2015 (Fig. 21).

For Pseudophyllinae taxa, a considerable amount of new distribution data was gathered, and a new species, *Stenampyx viridiflavus*, was described (Fig. 22). This species likely occurs in various lowland wet to submontane forests in Tanzania and probably Kenya. The discovery of a second species of *Stenampyx*, a previously monotypic genus known from Central to West Africa, raises intriguing questions about speciation mechanisms. It is one of the few genera shared between Central and West, and East Africa. The implications of this finding are discussed in Hemp (2020). In the course of the surveys also a new Cymatomerini species was found occurring in Central Tanzania in the Mpwapwa District. *C. morula* Hemp, 2019 (Fig. 23) is characterized by its black abdomen. Up to now it was only found in its type locality and the East Chenene Forest Reserve north of Dodoma.

Conclusions

Surveys funded by the OSF resulted in a wealth of new data on Caelifera and Ensifera in East Africa. Numerous new species were discovered, significantly contributing to the biodiversity of eastern Africa, particularly in endangered forest habitats. These findings underscore the importance of continued research and conservation efforts in East Africa's unique and endangered forest habitats.

Acknowledgements

The research endeavor was made feasible through a grant from the Orthoptera Species FIle, which provided essential funding for a photographic expedition spanning Tanzania and Kenya. The study also received support from the Synthesys Project (http://www.synthesys.info/), funded by the European Community Research, „Structuring the European Research Area Programme," which enabled me to visit various collections in Europe. My gratitude also goes to my field assistant, Erick Materu, who conducted most of the surveys in selected forest areas in Tanzania.

References

Grzywacz, B., Warchalowska-Sliwa, E., Kociński, M., Heller, K.-G. & Hemp, C. 2021. Diversifcation of the balloon bushcrickets (Orthoptera, Hexacentrinae, Aerotegmina) in the East African mountains. Scientific Reports, 11(9878). Available at http://https://www.nature.com/articles/s41598-021-89364-4

Heller, K.-G., Chobanov, D., Warchalowska-Sliwa, E., Hemp, C. 2022. Review of song patterns and sound production in armoured ground crickets (Orthoptera: Tettigoniidae: Hetrodini) with karyological data and taxonomic notes. Zootaxa 5120 (4): 451–481. https://doi.org/10.11646/zootaxa.5120.4.1

Hemp, C. 2020. A new species of *Stenampyx* Karsch, 1890 from East Africa (Orthoptera: Tettigoniidae, Pseudophyllinae, Phyllomimini) – evidence of a former connection of West-Central and East African forests. Zootaxa 4763 (4): 593–599. https://doi.org/10.11646/zootaxa.4763.4.9

Weidner, H. 1941. Die Hetrodinae des Hamburgischen Zoologischen Museums und Instituts. Zoologischer Anzeiger. 134:268-295

Weidner, H. 1955. Die Hetrodinae (Orthoptera, Saltatoria). Mitteilungen aus dem Hamburgischen Zoologischen Museum und Institut. 53:110-166.

Digitizing Orthoptera Type Specimens: Photographic database of Gryllidae and Oecanthidae crickets (Ensifera, Grylloidea) in the Academy of Natural Sciences of Philadelphia (ANSP)

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Housing over 11,000 primary insect types, the Academy of Natural Sciences of Philadelphia (ANSP) Entomology Collection is a crucial resource for Orthopterists worldwide. Their Orthoptera collection is particularly significant, representing one of the largest and most historically important collections of its kind. If you are an Orthoptera taxonomist or systematist, you will likely need to visit this collection someday. According to OSF (Cigliano et al., 2024), the ANSP entomology collection houses nearly 6,000 Orthoptera type specimens, including over 3,000

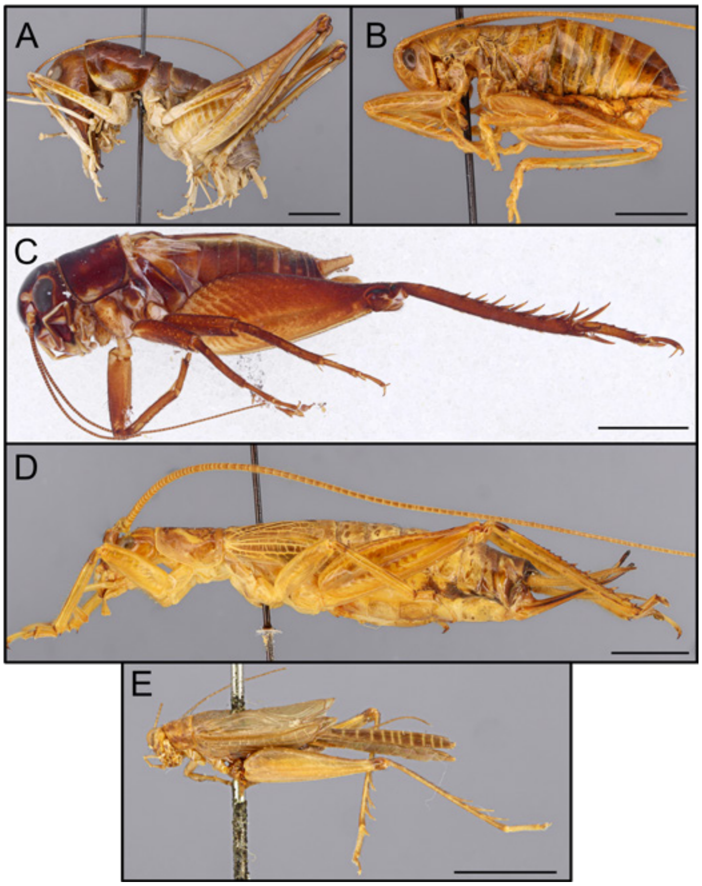

Figure 1. Families photographed: A. *Licodia cerberus* Rehn, 1930 (Anostostomatidae, Stenopelmatoidea), lateral view; B. *Neoeremus oaxacae* (Herbard, 1932) (Gryllacrididae, Stenopelmatoidea); C. *Damaracheta kasungu* Otte, 1987 (Gryllidae, Grylloidea); D. *Prognathogryllus alternatus* Otte, 1994 (Oecanthidae, Grylloidea); E. *Anaxypha paraensis* Rehn, 1918 (Trigonidiidae, Grylloidea). Scales = 5mm.

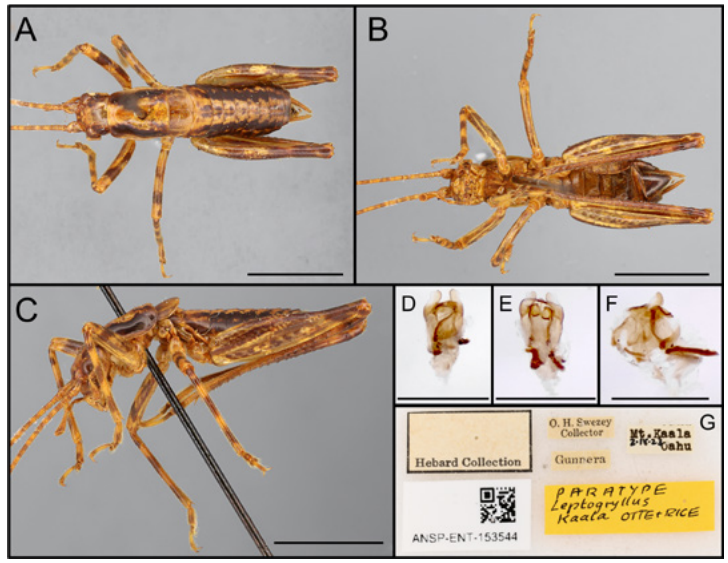

Figure 2. *Leptogryllus kaala* Otte, 1994, paratype male: A. dorsal view, B. ventral view, C. lateral view; male genitalia: D. dorsal view, E. ventral view, F. lateral view; G. labels. Scales: A, B, C = 5mm; D, E, F = 1mm.

primary types. This impressive collection was largely assembled through the efforts of renowned orthopterists, such as Samuel H. Scudder, Lawrence Bruner, James A.G. Rehn, Morgan Hebard, and, more recently, Daniel Otte. A significant portion of the specimens originate from the Neotropics, a region renowned for its exceptional orthopteran diversity.

This project builds upon my previous work at the ANSP in 2018, for which I photographed cricket types of Tafaliscinae, Podoscirtinae (Oecanthidae), and Phalangopsidae (~100 species photographed). The current initiative focused on photographing the remaining Oecanthidae, primarily the subfamily Oecanthinae, as well as all Gryllidae types. The digitization of these taxa provides invaluable resources for the orthopterist community. I also photographed select taxa from other groups for colleagues and uploaded their images to OSF.

Upon my arrival in Philadelphia, I received a warm welcome from Jason Weintraub (Collection Manager), Greg Cowper (Curatorial Assistant), and the staff of the Entomology Department and other departments within the Academy. They provided invaluable support, ensuring a productive and enjoyable stay. I also had the pleasure of several insightful conversations with Daniel Otte, who generously shared his expertise on collecting crickets, systematics, and evolution.

During this project, I photographed types from the following families:

- Grylloidea
- Gryllidae: 152 specimens
- Oecanthidae: 89 specimens
- Trigonidiidae: 11 specimens
- Stenopelmatoidea
- Anostostomatidae: 2 specimens
- Gryllacrididae: 4 specimens

This resulted in a total of 258 photographed specimens. The majority were primary types, although some secondary types and a small number of non-type specimens were also included (Table 1, Fig. 1).

Specimens were photographed in dorsal, lateral, and ventral views. When available, male genitalia were also photographed in dorsal, lateral, and ventral views. Labels were photographed for all specimens (Fig. 2). Images were captured using a Canon SL2 camera with a 100mm macro lens and a ring light for illumination. The camera was mounted on a tripod (Fig. 3A). Male genitalia were photographed using a camera attached to a Leica EZ4 D stereo microscope (Fig. 3B). Images were taken at multiple focal points and stacked using Helicon Focus software. Stacked images were edited in Affinity Photo 2.

Over 20,000 photographs were taken, totaling more than 150 gigabytes of data, including both stacked and original images. After editing, 1,401 photographs of type specimens, labels, and (where applicable) male genitalia were uploaded to the OSF database. Links to each digitized taxon are provided in Table 1.

This project aimed to support research and inquiry in cricket taxonomy and systematics. High-quality photographs of type specimens are essential for taxonomic work, and wider

Table 1

Taxon	Subfamily	Preservation	Type	OSF Link
TRIGONIDIIDAE				
Argizala herbardi	Nemobiinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/833811/overview
Anaxipha esau	Trigonidiinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/834152/overview
Anaxipha paraensis	Trigonidiinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/834106/overview
Anaxipha simulacrum	Trigonidiinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/834183/overview
Anaxipha stramenticia	Trigonidiinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/834189/overview
Symphyloxiphus pulex	Trigonidiinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/834437/overview
ANOSTOSTOMATIDAE				
Licodia cerberus	Lutosinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/841115/overview
Licodia grandis	Lutosinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/841116/overview
GRYLLACRIDIDAE				
Camposgryllacris australis	Gryllacridinae	pinned	syntype	https://orthoptera.speciesfile.org/otus/839904/overview
Abelona harpistylata	Hyperbaeninae	pinned	holotype	https://orthoptera.speciesfile.org/otus/840514/overview
Neoeremus oaxacae	Gryllacridinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/839767/overview
GRYLLIDAE				
Agnotecous yahoue	Eneopterinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/831616/overview
Agnotecous yahoue	Eneopterinae	alcohol	paratype	https://orthoptera.speciesfile.org/otus/831616/overview
Eneoptera fasciata	Eneopterinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/831763/overview
Eneoptera bicolor	Eneopterinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/831755/overview
Ponca venosa	Eneopterinae	pinned	paratype	https://orthoptera.speciesfile.org/otus/831595/overview
Abmisha illex	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830006/overview
Abmisha sigi	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/839767/overview
Astrupia gazensis	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/839767/overview
Astrupia sodwanensis	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830549/overview
Callogryllus curtipennis	Gryllinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/830819/overview
Callogryllus olohius	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830822/overview
Natalogryllus escourtensis	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/829703/overview
Natalogryllus eshowensis	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/829704/overview
Cophogryllus simonsi	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/829209/overview
Cryncus agilis	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830837/overview
Cryncus alternatus	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830838/overview
Cryncus duplicatus	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830838/overview
Cryncus grumeti	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830845/overview
Cryncus impiger	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830847/overview
Cryncus matuga	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830849/overview
Cryncus mombo	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830851/overview
Cryncus sagalus	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830856/overview
Damaracheta kasungu	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/829736/overview
Damaracheta mlozi	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/829737/overview
Damaracheta zomba	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/829739/overview
Gryllita arndti	Gryllinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/830323/overview
Gryllita arizonae	Gryllinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/830343/overview
Gryllita bondi	Gryllinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/830324/overview
Anurogryllus (Urogryllus) cubensis	Gryllinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/829637/overview
Miogryllus lineatus	Gryllinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/830286/overview
Turoanogryllus maculithorax	Gryllinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/830773/overview
Gryllus (Gryllus) vocalis	Gryllinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/927665/overview
Gryllus (Gryllus) pennsylvanicus	Gryllinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/829349/overview
Gryllus (Gryllus) armatus	Gryllinae	pinned	lectotype	https://orthoptera.speciesfile.org/otus/829305/overview
Gryllus (Gryllus) barretti	Gryllinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/829308/overview
Gryllus (Gryllus) bellicosus	Gryllinae	alcohol	paratype	https://orthoptera.speciesfile.org/otus/829309/overview
Gryllus (Gryllus) mzimba	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/829343/overview
Gryllus (Gryllus) nyasa	Gryllinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/829345/overview
Gryllus (Gryllus) personatus	Gryllinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/829355/overview
Gryllus (Gryllus) rixator	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/829357/overview
Miogryllus verticalis	Gryllinae	pinned	syntype	https://orthoptera.speciesfile.org/otus/927636/overview
Gryllus (Gryllus) vocalis	Gryllinae	pinned	lectotype	https://orthoptera.speciesfile.org/otus/927665/overview
Gymnogryllus amani	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830075/overview
Phonarellus (Semaphorellus) kareni	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830065/overview
Miogryllus rehni	Gryllinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/830283/overview
Loxoblemmus (Loxoblemmus) macrocephalus	Gryllinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/829931/overview

Taxon	Subfamily	Preservation	Type	OSF Link
GRYLLIDAE				
Modicogryllus (Modicogryllus) amani	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830404/overview
Modicogryllus dewhursti	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830419/overview
Modicogryllus (Modicogryllus) garriens	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830431/overview
Svercus palmetorum genomes	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/829250/overview
Modicogrylllus (Modicolgryllus) jagoi	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830434/overview
Modicogryllus (Modicogryllus) keynensis	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830435/overview
Modicogryllus (Modicogryllus) maliensis	Gryllinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/830480/overview
Modicogryllus (Modicogryllus) meruensis	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830442/overview
Modicogryllus (Promodicogryllus) mombasae	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830387/overview
Modicogryllus (Modicogryllus) mulanje	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830446/overview
Svercacheta siamensis	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830631/overview
Modicogryllus (Modicogryllus) parilis	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830454/overview
Modicogryllus (Modicogryllus) perplexus	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830455/overview
Modicogryllus (Modicogryllus) rehni	Gryllinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/830457/overview
Modicogrylllus (Modicolgryllus) segnis	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830459/overview
Modicogryllus (Modicogryllus) serengetensis	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830460/overview
Modicogrylllus (Modicolgryllus) zinzilulans	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830474/overview
Neogryllopsis africanus	Gryllinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/830726/overview
Neogryllopsis tshokwane	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830743/overview
Notosciobia animata	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830203/overview
Notosciobia canala	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830204/overview
Notosciobia fausta	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830205/overview
Notosciobia goipina	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830206/overview
Notosciobia hirsuta	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830207/overview
Notosciobia nola	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830209/overview
Notosciobia oubatchia	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830210/overview
Notosciobia paranola	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830211/overview
Notosciobia poya	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830212/overview
Notosciobia puebensis	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830213/overview
Notosciobia rex	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830214/overview
Notosciobia thiensis	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830216/overview
Platygryllus atritus	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830869/overview
Platygryllus capensis	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830870/overview
Platygryllus primiformis	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830879/overview
Platygryllus serengeticus	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830883/overview
Podogryllus bonga	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830754/overview
Podogryllus chyulu	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830757/overview
Podogryllus estesi	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830759/overview
Velarifictorus (Velarifictorus) grylloides	Gryllinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/829547/overview
Scapsipedus meridianus	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/829476/overview
Taciturna dlinza	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830250/overview
Taciturna knysna	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/830251/overview
Teleogryllus (Teleogryllus) africanus	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/829806/overview
Teleogryllus (Teleogryllus) bicoloripes	Gryllinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/829808/overview
Teleogryllus (Teleogryllus) gnu	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/829816/overview
Teleogryllus (Teleogryllus) grumeti	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/829820/overview
Teleogryllus (Teleogryllus) leo	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/829822/overview

Taxon	Subfamily	Preservation	Type	OSF Link
GRYLLIDAE				
Teleogryllus (Teleogryllus) marabu	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/829826/overview
Teleogryllus (Teleogryllus) meru	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/829828/overview
Teleogryllus (Teleogryllus) natalensis	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/829830/overview
Teleogryllus (Teleogryllus) zulandicus	Gryllinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/829841/overview
Velarifictorus (Velarifictorus) amani	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/829520/overview
Velarifictorus (Velarifictorus) dedzai	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/829536/overview
Velarifictorus (Velarifictorus) kasungu	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/829551/overview
Velarifictorus (Velarifictorus) lengwe	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/829554/overview
Velarifictorus (Velarifictorus) matuga	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/829558/overview
Velarifictorus (Velarifictorus) nyasa	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/829567/overview
Velarifictorus (Velarifictorus) obniger	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/829568/overview
Velarifictorus (Velarifictorus) shimba	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/829575/overview
Velarifictorus (Velarifictorus) viphius	Gryllinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/829583/overview
OECANTHIDAE				
Leptogryllus hanaula	Oecanthinae	alcohol	paratype	https://orthoptera.speciesfile.org/otus/836650/overview
Leptogryllus haupu	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836651/overview
Leptogryllus kaala	Oecanthinae	pinned/alcohol	paratype	https://orthoptera.speciesfile.org/otus/836652/overview
Leptogryllus kainalu	Oecanthinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/836653/overview
Leptogryllus kawela	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836655/overview
Leptogryllus kipahulu	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836656/overview
Leptogryllus kohala	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836657/overview
Leptogryllus lanaiensis	Oecanthinae	alcohol	paratype	https://orthoptera.speciesfile.org/otus/836658/overview
Leptogryllus luteus	Oecanthinae	alcohol	paratype	https://orthoptera.speciesfile.org/otus/836659/overview
Leptogryllus mauiensis	Oecanthinae	pinned/alcohol	paratype	https://orthoptera.speciesfile.org/otus/836660/overview
Leptogryllus mauumae	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836661/overview
Leptogryllus molokai	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836662/overview
Leptogryllus montgomeri	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836663/overview
Leptogryllus oahuensis	Oecanthinae	pinned/alcohol	paratype	https://orthoptera.speciesfile.org/otus/836667/overview
Leptogryllus ookala	Oecanthinae	pinned/alcohol	paratype	https://orthoptera.speciesfile.org/otus/836639/overview
Leptogryllus perkinsi	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836640/overview
Leptogryllus poamoho	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836641/overview
Leptogryllus waikemoi	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836644/overview
Neoxabea astales	Oecanthinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/836563/overview
Neoxabea brevipes	Oecanthinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/836567/overview
Neoxabea meridionalis	Oecanthinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/836572/overview
Neoxabea meridionalis	Oecanthinae	pinned	lectotype	https://orthoptera.speciesfile.org/otus/836572/overview
Neoxabea obscurifrons	Oecanthinae	pinned	lectotype	https://orthoptera.speciesfile.org/otus/836574/overview
Neoxabea quadrula	Oecanthinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/836575/overview
Neoxabea trinodosa	Oecanthinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/836576/overview
Oecanthus californicus pictipennis	Oecanthinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/836507/overview
Oecanthus leptogrammus	Oecanthinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/836500/overview
Oecanthus pictipes	Oecanthinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/836481/overview
Oecanthus socians	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836537/overview
Prognathogryllus alapa	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836601/overview
Prognathogryllus alternatus	Oecanthinae	pinned	paratype	https://orthoptera.speciesfile.org/otus/836604/overview
Prognathogryllus aphrastos	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836605/overview
Prognathogryllus awili	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836606/overview
Prognathogryllus epimeces	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836608/overview
Prognathogryllus flavidus	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836609/overview
Prognathogryllus giganteus	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836610/overview
Prognathogryllus hana	Oecanthinae	pinned/alcohol	paratype	https://orthoptera.speciesfile.org/otus/836611/overview
Prognathogryllus haupu	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836612/overview
Prognathogryllus hea	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836613/overview

Taxon	Subfamily	Preservation	Type	OSF Link
OECANTHIDAE				
Prognathogryllus hypomacron	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836614/overview
Prognathogryllus kahea	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836616/overview
Prognathogryllus kahili	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836617/overview
Prognathogryllus kipahulu	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836618/overview
Prognathogryllus koahla	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836619/overview
Prognathogryllus kukui	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836620/overview
Prognathogryllus makai	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836621/overview
Prognathogryllus makakapua	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836622/overview
Prognathogryllus mauka	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836623/overview
Prognathogryllus olympus	Oecanthinae	pinned	holotype	https://orthoptera.speciesfile.org/otus/836625/overview
Prognathogryllus opua	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836626/overview
Prognathogryllus parakahili	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836627/overview
Prognathogryllus parakukui	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836628/overview
Prognathogryllus pararobustus	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836629/overview
Prognathogryllus pihea	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836630/overview
Prognathogryllus puna	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836631/overview
Prognathogryllus spadix	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836633/overview
Proganathogryllus stridulans	Oecanthinae	pinned	paratype	https://orthoptera.speciesfile.org/otus/836634/overview
Prognathogryllus victoriae	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836635/overview
Prognathogryllus waikemoi	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836636/overview
Prognathogryllus weli	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836637/overview
Thaumatogryllus cavicola	Oecanthinae	pinned	paratype	https://orthoptera.speciesfile.org/otus/836669/overview
Thaumatogryllus conanti	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836670/overview
Thaumatogryllus mauiensis	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836671/overview
Viphyus livingstonei	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836558/overview
Viphyus victorinoxi	Oecanthinae	alcohol	holotype	https://orthoptera.speciesfile.org/otus/836559/overview

Figure 3. Photographic equipment: A. To photograph specimens; B. To photograph male genitalia.

access to these resources is crucial. While the ANSP houses one of the world's largest Orthoptera collections, much work remains to be done in terms of digitization. This includes Grylloidea groups not yet digitized like Mogoplistidae and Trigonidiidae crickets. I hope to return for a third visit to complete the digitization of all Grylloidea (true crickets) type specimens within the ANSP collection. The ANSP provides an excellent research environment, and I anticipate returning soon.

I would like to thank the Orthopterists' Society for funding this project. I am also grateful to the OSF staff, Maria Marta, Holger Braun, and María Belén, for their guidance on using TaxonWorks. Thank you to Pamm Mihm for her assistance with financial matters, and to Jason Weintraub and Greg Cowper for hosting me at the ANSP Entomology Collection.

Reference

Cigliano, M.M., H. Braun, D.C. Eades & D. Otte. Orthoptera Species File [July 2nd, 2024]. <http://orthoptera.speciesfile.org/>

Singers Orthopterans: Bioacoustics of Southern Species Rio Grande do Sul, Brazil

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Dear orthopterists, through this brief text, I come to present the results from the grant entitled 'Singers Orthopterans: bioacoustics of southern species in Rio Grande do Sul, Brazil'. The Brazilian Pampa region, where the collections were carried out, is characterized primarily by flat terrain, low vegetation with some small to medium-sized shrubs, and nearby of forest edge (MMA, 2023). Although the region appears uniform across Brazil, Argentina, and Uruguay, the fields in these countries consist of a mosaic of different vegetations, resulting from a combination of various factors such as altitude, soil type, rainfall and temperature (Olson et al. 2001; Pillar et al. 2009; Hasenack et al. 2010).

Over the course of these two years of work, collections and acoustic recordings were carried out in four locations: Estação Ecológica do Taim (TAIM), between municipality of Rio Grande and Santa Vitória do Palmar; Floresta Nacional de São Francisco de Paula (SFP), municipality of São Francisco de Paula; Parque Estadual de Itapuã (PEI), municipality of Viamão; and Parque Natural Municipal Saint'Hilaire (SH), between municipality of Porto Alegre and Viamão. Among these four ecological reserves and conservation units, only TAIM features vegetation exclusive to the Pampa Biome, characterized by extensive open fields, encompassing a variety of grasses and shrubs. The others are situated in transition zones between the Pampa and Atlantic Forest Biomes, with large trees present.

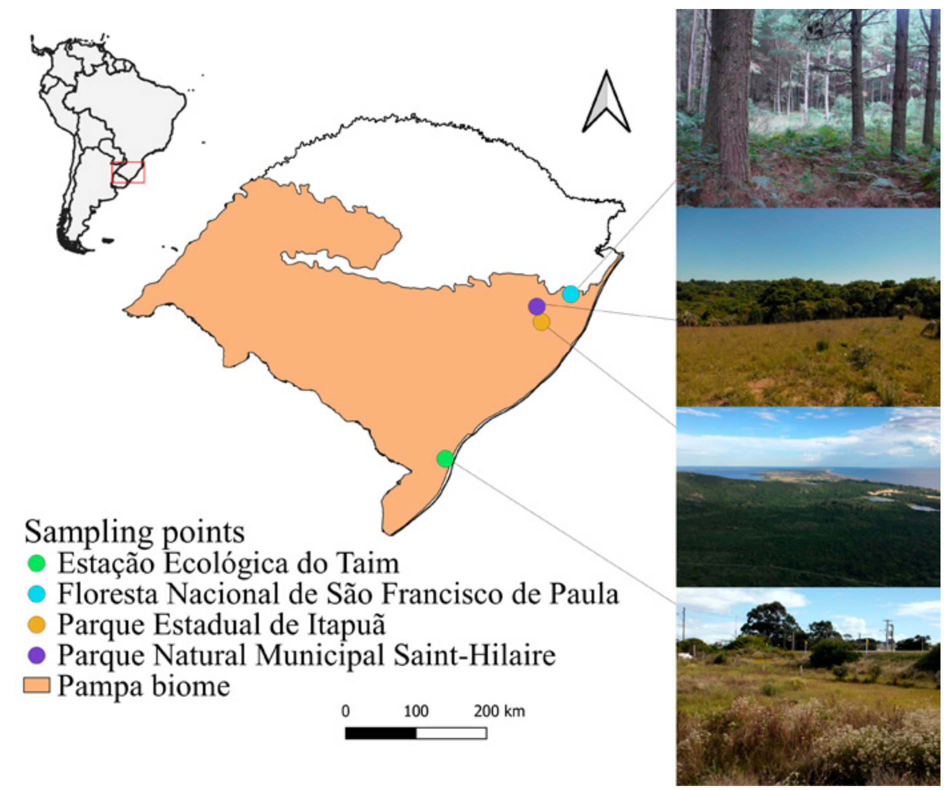

Figure 1. Orthopterans' collection area, and sampled points in the State of Rio Grande do Sul, Brazil.

Song recordings acquired from areas near the conservation units, along with recordings predating the two years of our fieldwork, were taken into account (Fig. 1).

The collections were conducted between December 2021 and December 2023 in edge habitats, native open fields and canopy environments. Due to the difficulty of collecting some individuals in the canopy, the support of colleagues in the field was necessary, such as Vítor Falchi Timm (Orthoptera cytogeneticist), Lucas Augusto Kaminski (ecologist specializing in insect-plant interactions), Maria Kátia Matiotti da Costa (specialist in taxonomy of grasshoppers) and Edison Zefa (specialist in bioacoustics, taxonomy and cytogenetics of Grylloidea) (Fig. 2).

The insects were field recorded using the Tascam MKIII DR-100 recorder, configured at a sample rate of 96 kHz/16bit for crickets and grasshoppers, and 192 kHz/16bit for katydids. We employed the Yoga HT-81 directional microphone for canopy insect recordings and the Boya Bymm-1 cardioid microphone for ground-dwelling, bush or edge-singing orthopterans. In each sound recording, we incorporated a verbal statement containing the information recommended by Kettle and Vielliard (1991), as well as guidelines from

Table 1. Sound recording parameters of the orthopterans sampled in State of Rio Grande do Sul, Brazil. PEI: Parque Estadual de Itapuã; TAIM: Estação Ecológica do TAIM; SFP: Floresta Nacional de São Francisco de Paula; SH: Parque Natural Municipal Saint-Hilaire; CL: collection location; PF: peak frequency in kHz; SP: stridulation period - period in which the insect was singing at the time of collection; H: height of the stridulation site in relation to the ground; OSF: data uploaded to the OSF.

Species	CL	PF (kHz)	Song Type	Temp (ºC)	SP	H	OSF
Caelifera							
Acrididae							
Euplectrotettix schulzi Brunner, 1900	PEI	10.2	Calling	30ºC	8~14h	soil	Song, image and distribution
Eutryxalis filata (Walker, 1870)	PEI	12.6; 9.8	Calling and alert	25ºC	9~10h	soil	Song, image and distribution
Neopedies taimensis Matiotti da Costa, 2021	TAIM	-	-	-	15h	1m	Images
Sinipta dalmani (Stål, 1861)	TAIM	9.7	Calling	19ºC	11~13h	0.2~0.4m	Song and distribution
Romaleidae							
Chromacris speciosa (Thunberg, 1824)	TAIM, SH and PEI	11.8	Calling	20ºC	17h	1.5m	Song and image
Xyleus discoideus discoideus (Serville, 1831)	TAIM and SH	16.6; 13.8	Calling and courtship	21ºC	11~15h	0.1~0.5m	Song
Ensifera/Grylloidea							
Gryllidae							
Anurogryllus patos Redü, 2017	near TAIM	5.6	Calling	21ºC	20~21h	soil	Song
Anurogryllus toledopizai (de Mello, 1988)	PEI	4.9	Calling	21ºC	23h	1m	Song and image
Anurogryllus sp.1	near SH	7.1	Calling	26ºC	20h	soil	
Anurogryllus sp.2	near TAIM	5.7	Calling	22ºC	19~20h	soil	
Anurogryllus sp.3	near SH	5.5	Calling	24ºC	19~21h	soil	
Anurogryllus sp.4	near TAIM	5.2	Calling	20ºC	19~21h	soil	
Gryllus sp.	TAIM	3.4	Calling	19ºC	21h	soil	
Miogryllus itaquiensis Orsini & Zefa, 2017	TAIM, SH and PEI	6.5; 6.1	Calling and courtship	18ºC	21h	soil	Song and image
Mogoplistidae							
Ornebius alatus (Saussure, 1877)	near SH	6.1	Calling	24ºC	10h	0.5m	Song and image
Oecanthidae							
Neoxabea brevippes Rehn, 1913	SFP	3.4	Calling	24ºC	19h	>2m	Song
Oecanthus lineolatus Saussure, 1897	TAIM	2.9	Calling	24ºC	22h	1.2~1.5m	Song and distribution
Oecanthus rubromaculatus Zefa, 2022	SFP	2.3; 2.34	Calling and courtship	17ºC	20h	>2m	Song and images
Oecanthus sp.1	PEI	2.7	Calling	22ºC	20h	1m	
Oecanthus sp.2	SH	3.1	Calling	19ºC	20h	>2m	
Phalangopsidae							
Adelosgryllus rubricephalus Mesa & Zefa, 2004	near TAIM and PEI	6.4	Courtship	23ºC	20h	soil	Song
Endecous onthophagus (Berg, 1891)	near TAIM	5.29; 4.8; 4.9	Calling, courtship and aggressiveness	23ºC	19h	1m	Songs
Endecous sp.	TAIM	3.6	Calling	20ºC	22h	soil	
Lerneca inalata beripocone Lima, Martins & Lhano, 2016	PEI and SH	4.1; 4.2	Calling and courtship	21ºC	21h	<0.3m	Song and distribution
Paragryllus sp.	SFP	2.1	Calling	17ºC	20~21h	>4	
Trigonidiidae							
Anaxipha sp.1	PEI	6.6	Calling	21ºC	20h	1m	
Anaxipha sp.2	near TAIM	6.3	Calling	24ºC	19h	1m	
Anaxipha sp.3	SFP	4.7	Calling	19ºC	19h	1m	
Anaxipha sp.4	PEI	5.7	Calling	24ºC	8~14h	1m	
Anaxipha sp.5	SFP	5.1	Calling	26ºC	17~23h	1m	
Anaxipha sp.6	SFP	4.8	Calling	17ºC	8~15h	1m	
Anaxipha sp.7	SFP	4.2	Calling	22ºC	8~15h	1m	
Anaxipha sp.8	PEI	4.7	Calling	20ºC	23h	0.2m	
Cranistus colliurides Stål, 1861	TAIM, SFP and SH	7	Calling	23ºC	18~22h	1~2m	Song
Phylloscirtus amoenus Burmeister, 1880	near TAIM and SH	6.4	Calling	23ºC	21h	1~2m	Song
Pepoyara jagoi de Mello & Capellari, 2012	SFP	5.3	Calling	21ºC	12h	soil	Song
Ensifera/Tettigoniidae							
Conocephalus longipes (Redtenbacher, 1891)	PEI	10.1	Calling	18ºC	11h	0.2m	Song and image
Conocephalus saltator (Saussure, 1859)	SH	15.8	Calling	18ºC	11h	0.2m	Song and image
Conocephalus sp. 1	PEI	13.4	Calling	26ºC	8h	1.5m	
Conocephalus sp. 2	near TAIM	11.9	Calling	22ºC	8h	soil	
Conocephalus sp. 3	near SH	19.2	Calling	24ºC	21h	2m	
Copiphora brachyptera Karny, 1907	SH	7.5	Calling	21ºC	20~22h	>4m	Song, image and distribution
Neoconocephalus sp. 1	TAIM	14.4	Calling	19ºC	20~4h	1~2m	
Neoconocephalus sp. 2	TAIM	17.5	Calling	22ºC	20h	1~2m	
Neoconocephalus sp. 3	near TAIM	5.7	Calling	19ºC	20h	0.4m	
Neoconocephalus sp. 4	near TAIM	13.2	Calling	25ºC	21h	near 1m	
Neoconocephalus sp. 5	SH	12.7	Calling	22ºC	20h	>1m	
Cephalophlugis gaucho Tavares, Acosta & Timm, 2022	SH	22.1	Calling	21ºC	19~22h	>2m	Song and images
Dasyscelus normalis Brunner von Wattenwyl, 1895	near TAIM	20.9	Calling	17ºC	21h	2m	Song
Scaphura elegans (Serville, 1838)	near SH	12.3	Calling	25ºC	16h	3m	Song and distribution
Anaulacomera sp. 1	TAIM	14.9	Calling	24ºC	10~18h	>2m	
Anaulacomera sp. 2	SH	11.7	Calling	19ºC	22~3h	>3m	
Grammadera clara Brunner von Wattenwyl, 1878	near TAIM	21.4	Calling	20ºC	22h	1~2m	Song and image
Vellea cruenta (Burmeister, 1838)	TAIM	8.8	Calling	21ºC	22h	>3m	Song

Figure 2. Collection methods. A. Installation of autonomous recorder Audiomoth. B. Part of support team (from left to right, Edison Zefa, Riuler Corrêa Acosta e Vítor Falchi Timm). C. Collect of Horned Conehead *Copiphora brachyptera*. D. Search and collection of Anurogryllus individuals in their burrows. Photos by Vítor Falchi Timm.

the Fonoteca Neotropical Jacques Vielliard (FNJV), containing information about its location, including temperature, height above ground and time (hour). The calling song of the species-identified individuals can be accessed on the Orthoptera Species File website (http://orthoptera.speciesfile.org/).

Collections were actively conducted using a net or by visiting burrows where acoustic signaling was detected, such as those of Miogryllus Saussure, 1877 and Anurogryllus Saussure, 1877 (Fig. 2D). We photographed individuals in vivo, using a Benq GH650 (f = 4.0~104 mm, 1–3.1–59) digital camera.

In the collection sites, the autonomous recorder Audiomoth 1.2.0 were also deployed (Fig. 2A). A high sampling rate of 192 kHz/16 bit was utilized to capture all possible singers orthopterans. Among the recordings, we highlight those of the katydids *Copiphora brachyptera* Karny, 1907, *Scaphura elegans* (Serville, 1838), *Grammadera clara* Brunner von Wattenwyl, 1878, *Vellea cruenta* (Burmeister, 1838), and the crickets *Lerneca inalata beripocone* Lima, Martins & Lhano, 2016 and *Oecanthus lineolatus* Saussure, 1897. Of the katydids mentioned here, only *G. clara* was found in shrubs up to two meters high, while the crickets were found in locations close to the ground or on shrubby plants up to 1m in height.

We sampled 54 species of orthopterans, including six species grasshoppers, 18 katydids and 30 crickets (Table 1). Some species are in the Fig. 3. Noteworthy are the species descriptions derived from collections made under this grant, such as *Cephalophlugis gaucho* Tavares, Acosta & Timm, 2022 (Fig. 3B) (Tavares et al., 2022) and *Oecanthus rubromaculatus* Zefa, 2022 (Fig. 3H) (Zefa et al., 2022a), in addition to several species included in Zefa et al. (2022b).

Among the species found, we highlight more common genera such as katydids *Conocephalus* Thunberg, 1815 (Tettigoniidae: Conocephalini) and *Neoconocephalus* Karny, 1907 (Tettigoniidae: Copiphorini); the crickets *Anaxipha* Saussure, 1874 (Grylloidea: Trigonidiidae), *Anurogryllus* Saussure, 1877 (Grylloidea: Gryllidae) and *Oecanthus* Serville, 1831 (Grylloidea: Oecanthidae). Additionally, there were the only acoustic record of less common species like *Ornebius alatus* (Grylloidea: Mogoplistidae) and acoustic recordings of grasshopper species, like a courtship song of *Xyleus discoideus discoideus* (Serville, 1831).

The fauna of singing orthopterans varies according to the location. In TAIM, the predominant fauna consists of *Conocephalus* Thunberg, 1815 during the day, and *Neoconocephalus* Karny, 1907 katydids during the late afternoon and much of the night, in addition to *Oecanthus lineolatus* Saussure, 1897, the dominant cricket in the soundscape during the night. This low diversity may be attributed to the proximity of plantations and cultivated fields.

In PEI, acoustic biodiversity varies according to environments, with areas exhibiting acoustic synchrony among the crickets *Lerneca inalata beripocone* Lima, Martins & Lhano, 2016, *Oecanthus* Serville, 1831, and some *Anaxipha* Saussure, 1874, as well as the partitioning between crickets and the green shield cicada *Zammara tympanum* (Fabricius, 1803) in the late afternoon. In open field and canopy locations, the soundscape is dominated by cicadas, with orthopterans prevailing in edge habitats and shrubby regions in the open field. Generally, although the soundscape is predominantly dominated by cicadas, crickets continue to stridulate for a significant portion of the day.

In SFP, the acoustic biodiversity is concentrated towards the edge and canopy, with the nocturnal soundscape dominated by Oecanthidae crickets *Neoxabea brevipes* Rehn,

Figure 3. Some of the orthoperans' recorded species. A. *Anurogryllus* sp. (female in aggressive position protecting the burrow). B. *Cephalophlugis gaucho* Tavares, Acosta & Timm, 2022. C. *Eutryxalis filata* (Walker, 1870). D. *Conocephalus saltator* (Saussure, 1859). E. *Miogryllus itaquiensis* Orsini & Zefa, 2017. F. *Cranistus colliurides* Stål, 1861. G. *Copiphora brachyptera* Karny, 1907. H. *Oecanthus rubromaculatus* Zefa, 2022. Solid line black or white: 1 cm. Photos by Riuler Corrêa Acosta.

1913, and *Oecanthus rubromaculatus* Zefa, 2022. During the day, cicadas predominate the soundscape.

In SH, the daily soundscape is also dominated by cicadas, but during the night the soundscape is dominated by the katydid *Copiphora brachyptera* Karny, 1907.

Some of the records provided here refer to organisms that had not been previously documented in Rio Grande do Sul or throughout Brazil. We believe that our study will significantly contribute to the understanding of the orthopteran fauna of the State of Rio Grande do Sul, Brazil. All acquired material will serve as a foundation for studies involving taxonomic analyses, acoustic monitoring, and even cytogenetics.

Acknowledgments

We express our gratitude to the Orthopterists' Society for granting the OSF Grant.

References

Cigliano, M.M., H. Braun, D.C. Eades & D. Otte. 2023. Orthoptera Species File. Version 5.0/5.0. Available from: <http://Orthoptera.SpeciesFile.org> (acessed 19 december 2023).

Hasenack, H., Weber, E., Boldrini, I. I., & Trevisan, R. 2010. Mapa de sistemas ecológicos da ecorregião das savanas uruguaias em escala 1: 500.000 ou superior e relatório técnico descrevendo insumos utilizados e metodologia de elaboração do mapa de sistemas ecológicos. Porto Alegre, UFRGS, Centro de Ecologia.

Kettle, R. & Vielliard, J. 1991. Documentation standards for wildlife sound recordings. Bioacoustics, 3(3), 235-238.

MMA. 2023. Ministério do Meio Ambiente. Disponível em: <https://www.gov.br/mma/pt-br> acessed 16 december 2023

Olson, D. M., Dinerstein, E., Wikramanayake, E. D., Burgess, N. D., Powell, G. V., Underwood, E. C., D'amico, J. A., Itoua, I., Strand, H. E., Morrison, J. C., Loucks, C. J., Allnutt, T. F., Ricketts, T. H., Kura, Y., Lamoreux, J. F., Wettengel, W. W., Hedao, P. & Kassem, K. R. 2001. Terrestrial Ecoregions of the World: A New Map of Life on Earth A new global map of terrestrial ecoregions provides an innovative tool for conserving biodiversity. BioScience, 51(11), 933-938.

Pillar, V.D.P., Müller, S.C., Castilhos, Z.M.S. & Jacques, A.V.A. 2009. Campos Sulinos: conservação e uso sustentável da biodiversidade. Ministério do Meio Ambiente.

Tavares, G.C., Acosta, R.C. & Timm, V.F. 2022. A new species of *Cephalophlugis* Gorochov, 1998 (Orthoptera: Tettigoniidae: Meconematinae: Phlugidini) from southern Brazil, with bioacoustics and cytogenetics. Zootaxa, 5182(6):567-581.

Zefa, E., Acosta, R. C., Timm, V. F., & Costa, M. K. M. D. 2022a. New species of tree cricket *Oecanthus* Serville, 1831 (Orthoptera: Grylloidea) from Southern Brazilian Atlantic Forest, with bioacoustics. Zootaxa, 5155(3), 439-448.

Zefa, E., Martins, L.P., Demari, C.P., Acosta, R.C., Centeno, E., Castro-Souza, R.A., Oliveira, G.L., Miyoshi, A.R., Fianco, M., Redü, D.R., Timm, V.F., Da Costa, M.K. & Szinwelski, N. 2022b. Singing crickets from Brazil (Orthoptera: Gryllidea), an illustrated checklist with access to the sounds produced. Zootaxa, 5209 (2): 211-237.

In Memoriam : Jean-François Duranton (September 14, 1945 to June 20, 2024)

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(Photo credit: Antoine Foucart)

The Orthopterists' Society recently lost one of its distinguished members in Jean-François Duranton, who devoted his life to research and development aid in the field of locust management worldwide. Jean-François Duranton, born on September 14, 1945 in Beaulieu-les-Fontaines (Oise, France), died on June 20, 2024, at the age of 78. He was an eminent scientist at CIRAD (Centre de coopération internationale en recherche agronomique pour le développement, Montpellier, France), having spent almost his entire career there, first within the PRIFAS team from 1975 to 1997, then with the "*Locust Ecology and Control*" unit from 1998 to 2010.

Student of Marcel Guinochet, professor of botanics and phytosociology at the university of Paris-Saclay (Paris XI Orsay at the time), he began his professional career in Madagascar, where he made his first visit in 1969-70, his work leading to a post-graduate thesis. From 1971 to 1973, he returned to Madagascar as part of an FAO research project on the migratory locust, *Locusta migratoria*. The work carried out enabled him to defend a doctorate thesis in 1975 at the University of Paris-Saclay. Then, the same year, he created, with Michel Launois, My-Hanh Luong, and myself, the «*Programme de Recherche Interdisciplinaire Français sur les Acridiens du Sahel*» (French Interdisciplinary Research Program on Sahelian Locust and Grasshoppers), better known by its acronym PRIFAS. The four of us were then recruited by GERDAT (Groupement d'étude et de recherche pour le développement de l'agronomie tropicale).

Jean-François' first assignment was in Burkina Faso, at the Saria agronomic station, as part of a research project on grasshoppers in the West African Sahel, with a special focus on the Senegalese grasshopper, *Oedaleus senegalensis*, which had multiplied abundantly throughout the region following the great drought of 1973. We worked there together until 1977. Back in France, his skills as a botanist, ecologist. and acridologist (a specialist in pest locusts) led him to travel all over the world. In particular, he carried out numerous missions in Africa, in the desert habitats of the desert locust, *Schistocerca gregaria.* He was involved on numerous occasions in Madagascar, both for research and development operations in support of the national locust center, as well as for missions to coordinate operations to control a migratory locust invasion in 1997-99 and, in the following years, for assistance in developing tools for monitoring and preventing invasions. But his work has also taken him to many other places, to Brazil, Peru, the Cape Verde Islands, Siberia... and elsewhere, on all the continents.

In the 1990s, he took part in numerous locust control trials at a time when it was necessary to find substitutes for organochlorine pesticides, which are now banned, but had long been a strategic component in locust control operations, especially against the desert locust. On this occasion, a mission to Eritrea ended with a medical evacuation from which he recovered with difficulty. At the same time, in Montpellier, he was a key player in a desert locust modeling project, an adventure to which he was very attached and which left him with a bitter flavour. But above all, he was a man with a taste for and experience of the field. A great connoisseur of Saharan environments and an admirer of Théodore Monod, he crossed the Sahara several times, and nothing pleased him so much as a bivouac with his team, in the middle of nowhere, at the foot of a dune in the Mauritanian Adrar, or on the banks of a dry wadi in the Nigerian Tamesna.

His travels around the world have naturally led him to write a multitude of mission and expert reports. He is also the author or co-author of a number of scientific publications and communications at international congresses, as well as books, such as the *Manuel de prospection acridienne en zone tropicale sèche*, written over several years in collaboration with Michel Launois, My-Hanh Launois-Luong, and myself, and published in 1982 by the Ministère des relations extérieures in Paris (1506 p.); but also the *Etude écologique des biotopes du criquet pèlerin en Afrique Nord-Occidentale* in collaboration with Georges Basil Popov and Jérôme Gigault, published in 1991 by CIRAD (743 p.); or the *Florule des biotopes du criquet pèlerin en Afrique de l'Ouest et du Nord-Ouest* written with Antoine Foucart and Pierre-Emmanuel Gay, and published in 2012 in Rome by the FAO (487 p.).

Throughout his career, Jean-François Duranton has supervised the work of numerous students, both French and foreign, at master's and PhD levels, including, to name but two, Annie Monard who after a short period at CIRAD spent a large part of her career at the FAO, and M.A. Ould Babah Ebbe, current Executive Director of our Society, long-time Director of the Mauritanian Locust Control Center and, until very recently, Director of the Sahel Institute in Bamako. Jean-François has also contributed to the training of numerous locust prospectors and technicians, particularly in Africa and Madagascar. A cultivated and committed scientist, known for his human qualities and dedicated to locust research, mainly for the benefit of rural populations in developing countries, he will remain a pivotal figure in the field of locust ecology research at the crossroads of the 20th and 21st centuries.

Phytosanitary Technical Seminars:
Management of Emergencies in the Event of Possible Outbreaks of Central American Locust

By RAIXA LLAUGER[1], CARLOS URIAS[2], JAIME CARDENAS[1], XAVIER EUCEDA[2], MARIO POOT[3], HÉCTOR MEDINA[4], LINA POHL[5]
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Reactions to phytosanitary threats are much more costly than anticipatory actions. It is essential to advance in preparation and other critical stages of the risk management cycle, without neglecting the response to emergencies in each country. Vulnerability to this type of threat is due to technological limitations in epidemiological surveillance systems, action protocols, and prior training, among other factors.

Threats, such as the Central American locust, have a high impact on communities when outbreaks occur, so joint work will allow the region's capacities to be strengthened through assistance and training to improve early warning, system prevention, biosecurity and management of anticipatory action. For this reason, different organizations, such as FAO Mesoamerica, FAO México, OIRSA

(International Organization for Plant Protection and Animal Health), SENASICA-México (National

Service for Plant Health, Safety and Agri-Food Quality), and CESVY (Yucatan Plant Health) organized from June 17 to 21 2024 in Yucatan, Mexico, the "Pyhytosanitary technical seminary: Management of Emergencies in the event of possible outbreaks of Central American Locust," which took place over 5 days with different activities:

- Regional forum on emergency management for Acrididae.
- Simulations of action in the event of a possible outbreak of Central American locusts.
- Workshop related to epidemiological analysis in areas at risk for locusts and other Acrididae.
- Hybrid meeting of the GICSV (Inter American Coordinating Group in Plant Protection).
- Seminar on biology and epidemiological surveillance of locusts.

The development of this event was supported by technical and scientific sources from various institutions, such as Texas A&M University (Greg Sword), CIRAD (Cyril Piou & Lucile Marescot), and regional experts on locust management as SENASA Argentina and Mexico.

There were 58 people from different parts of Latin America in attendance. Mexico, being the host country, had the largest number of participants, with 16 out of 32 states attending, which highlighted the importance of the topic. Participants from South and Central American countries gave great prominence to the event.

In each of the meetings, workshops, seminars and simulations, local and regional situations were analyzed, proposals were made, and agreements were reached.

Editorial

By **HOJUN SONG**
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I finalized this issue in a hotel room in Dresden, Germany. I traveled to Germany to attend the 10th Dresden Meeting on Insect Phylogeny, which took place at Senckenberg Naturhistorische Sammlungen. This meeting is one of my favorite (after ICO meetings, of course) because it's a three-day marathon of talks focusing solely on the latest findings in insect phylogenetics. It's a small meeting with about 80 participants, and everybody gets to listen to all of the talks since there is no concurrent session. It was my third time attending this meeting and, as always, I came away with many ideas.

A major theme of this year's meeting was the phylogenomics of insects. For those of you who are not familiar with this concept, it's simply the application of molecular phylogenetics using genome-scale data. So, rather than using a few loci, phylogenomicists use hundreds or thousands of genes or even whole genomes to infer phylogeny. It was quite interesting and exciting to hear what the leading experts in insect phylogenomics had to say because I'm also trying to develop phylogenomic toolkits that can be applied to Orthoptera. What was intriguing was that even with enormously large amounts of phylogenomic data, some of the major relationships in many insect orders are still quite challenging to resolve. We used to think that more data would yield more resolutions, but it seems that more data actually leads to more problems.

Orthoptera is a challenging group to apply phylogenomics because the genome sizes are enormous, and there is not a large community of molecular systematists working on the group. I was the only orthopterist among the participants (except my previous student Ricardo Mariño-Pérez, who showed up to the meeting completely unannounced). Nevertheless, I'm happy to report that the advances that we've made in the phylogenomics of Orthoptera in the last few years are actually on par with what the specialists on other groups have done for their groups. I'm very interested in sharing what I've learned with our community so that we can take advantage of this new tool to understand the evolution of our beloved insects.

This issue of *Metaleptea* is relatively small compared to previous issues and does not contain any Cohn grant reports. The effect of COVID seems to be lingering since many students asked for an extension. I hope the next issue will feature research highlights from our young orthopterists! I want 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**]. The next issue of *Metaleptea* will be published in January of 2025, so please send me content promptly. I look forward to hearing from you soon!