METALEPTEA

THE NEWSLETTER OF THE ORTHOPTERISTS' SOCIETY

President's Message

Dear Society members, I am glad to inform you that 2010 was a very productive year for our Society since many accomplishments have been successfully achieved.

Some of the most notable include:

Metaleptea: Thanks to the editor, Hojun Song, and co-editor, Sam Heads, our newsletter has been redesigned, resized for easier distribution and expanded to three issues per year.

Journal of Orthoptera Research: Thanks to a new feature implemented in our new website, articles can also be accessed on-line via BioOne through the society's website.

New OS Website: Thanks to Piotr Naskrecki our website has been entirely redesigned (http://140.247.119.225/OrthSoc/). In addition to the new look he has also implemented several new features that allow JOR subscribers to have access to the online version of the journal via BioOne. Members can pay their dues using secure PayPal and can update her/his record directly online. Piotr has also created an online bulletin board where members can post announcements and can also add new publications to the "Just published" database.

Facebook: As an initiative of Charles Bomar, the Society now has a presence on Facebook.

Since our last communication, some news occurred concerning the life of our Society.

Regional Representatives: Due to a significant increase in his teaching and administrative duties at the University, Karim Vahed has to step down as our Western European Representative. I am very happy to announce that Klaus Riede, from the Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn, Germany has accepted to take this place. I am confident that Klaus will be able to make an impact by bringing the various European orthopterological societies together and enhancing communication in the region. I would like to thank Karim for all his contribution towards the Society as the Western European Representative and welcome Klaus as our new Regional Representative for this active region of the world.

JOR: As it was announced in Metaleptea 30(3), Doug Whitman from Illinois State University, USA, will

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officially start as the Co-Editor of JOR with next year´s first issue, JOR 20 (1), 2011.

11th International Congress of Orthopterology: As I have previously announced in Metaleptea 30(2), the 11th International Congress of Orthopterology is going to be held in Kunming, China, under the chairmanship of Dr. Long Zhang (OS Regional Representative for China, North and South Korea). Dr. Long Zhang and the local organizers of the Congress have agreed to move the dates of the Congress to start on the 11th of August, 2013 and the organizational effort has already started.

Please update your contact information in the OS´s Website: In closing I would like ask you that each and every one of you, please update your contact information in the OS´s Website. In order to simplify communication among members of the Society, and to reduce expenses caused by mailing paper correspondence, we will be relying more and more on electronic communication. Thus, I would like to ask you to please visit your member record in the membership database and update your contact information. If you still do not have your login information, or do not know how to access your record, please contact Piotr Naskrecki (pnaskrecki@oeb.harvard.edu).

If you have any problems, ideas, constructive criticism, or other contribution to our Society please do not hesitate to contact me by e-mail (cigliano@fcnym.unlp.edu.ar) or post (División Entomología, Museo de La Plata, Paseo del Bosque S/N, 1900 La Plata, Argentina).

With best wishes,
María Marta Cigliano

The Orthopterists´ Society welcomes new members

Membership is at the cornerstone of keeping the Society fluid and vibrant, thus I am very happy to welcome our new members from Brazil, Argentina, USA, Germany, Ireland, France, Japan and Canada who has recently joined the Society.

Maria Marta Cigliano

Priscila G. Dias (Active) - National Institute of Amazonian Research, Av. André Araújo 2936, Manaus, AM, Brazil

Darcy G. Gordon (Student) - Illinois State University, 1513 Fell Avenue, Bloomington, Illinois 61701-1832 USA

Sherilyn G.F. Smith (Active) - LeMoyne College, Department of Biological Sciences, 1419 Salt Springs Rd., Syracuse, NY, USA

Catriona M. Dowling (S tudent) - University of Limerick, Sackville Ardfert, Tralee, Co. Kerry, Ireland

Luciano Martins (Active) - Instituto Nacional de Pesquisas da Amazônia, Av. André Araújo, 2936, Manaus/69060-001, Brazil

David Lightfoot (Sustaining) - Biology Department, 167 Castetter Hall, University of New Mexico, MSC03 2020, Albuquerque, NM 87131-0001, USA

Marcio Bolfarini (Student) - Universidade Estadual Paulista, Rua Thomaz Matheus, Nossa Sra de Fátima, Botucatu, São Paulo 18608-145, Brazil

Maya Ilieva (Active) - H. Dimitar, 107/B/39, 1510 Sofia, France

Dardo A. Marti (Active) - CONICET Félix de Azara 1552, 3300, Argentina

Nicholas DiRienzo (Student) -University of California - Davis, 510 Lake Blvd., Apt 254, Davis, CA 95616, USA

Bart J. Kensinger (Student) - Oklahoma State University, 809 1/2 S. Washington St., Stillwater, USA

Koutaro Maeno (Active) - National Institute of Agrobiological Sciences at Ohwashi (NIASO), 1-2 Tsukuba/305-8634, Japan

Martina Eugenia Pocco (Student) - Museo de La Plata, División Entomología, Paseo del Bosque S/N, La Plata – 1900, Argentina

Ingmar Landeck (Active) - Res. Inst. Post-mining Landscapes Inc. Brauhausweg 2, D-03238 Finsterwalde, Germany

Makio Takeda (Active) - Graduate School of Agricultural Science, Kobe University, 1-1 Rokkodai-cho, Nada-ku Kobe 657-8501, Japan

James Miskelly (Active) - 657 Beaver Lake Rd., Victoria, British Columbia, Canada

Schistocerca ceratiola (USA: FL, Putnam Co. Katherine Ordway Preserve) (Photo credit: Hojun Song)

Just published!

PSYCHE: Special Issue on Locusts and Grasshoppers: Behavior, Ecology, and Biogeography

As announced in Metaleptea 30 (2), a special issue of an online journal Psyche focusing on the subject of "Locusts and Grasshoppers: Behavior, Ecology, and Biogeography" is now published and available for free download. This special issue is a result of hard work by Alex Latchininsky who worked as a lead guest editor as well as Greg Sword, Michael Sergeev, Maria Marta Cigliano, and Michel Lecoq who worked as guest editors. Currently 8 interesting papers are included in this issue, but there are more articles to be published in this issue, so please stay tuned. You can access the articles at http://www.hindawi.com/journals/psyche/2011/si.lgbeb.html.

Regional Report - What is happening around the world?

West Europe

The latest changes to the geopolitical map had considerable effects on European scientists, and even affected taxonomists who always seem to lag behind. The good news is that an urgent need for integration of European research was felt and implemented through the potent funding schemes of the European Framework Programs (FPs), with the ambitious target to shape the European Research Area (ERA). Taxonomists got their share through the European Distributed Institute of Taxonomy (EDIT – http://www.e-taxonomy.eu), a Network of Excellence connecting 29 leading European, North American and Russian taxonomic facilities. The funding of 12 million Euros for 5 years will end in February 2011, but several initiatives will continue, probably under the umbrella of the Consortium of European Taxonomic Facilities (CETAF - http://www.cetaf.org), which aims to "improve the efficiency of their taxonomic facilities through co-operation" and "will act as a forum for the exchange of information and policies". Orthopterists have profited from these high-level initiatives by the SYNTHESYS funding scheme for researcher visits, providing access to the 337,204,000 specimens, and in particular, the 4,058,500 type specimens housed by SYNTHESYS institutions (see http://www.synthesys.info). In general, it would seem that considerable benevolence on the part of politicians, funding administrators and reviewers has prevailed and helped overcome somewhat the "taxonomic impediment." The failure to reach the 2010 target to "reduce biodiversity loss" was officially admitted during the Conference of Parties of the Convention on Biological Diversity (CBD – www.cbd.org) in Nagoya, and the European Community is now drafting its follow-up 2020 strategy. However, a closer look into some of the available strategy papers reveals that the SEBI process (Streamlining European Biodiversity Indicators) somehow moves away from species assessments to rather general ecological indicators (see http://www.epbrs.org/PDF/EPBRS_StrategyBDResearch_May2010.pdf and "Streamlining European 2010 Biodiversity Indicators" http://www.eea.europa.eu/publications/assessing-biodiversity-in-europe-84).

It is here where our society, and particularly its European members, will have to raise their hands and point out their promising on-going initiatives, such as the new "Orthoptera of Europe" web-

Fig. 1. *General design of the AmiBio acoustic monitoring scheme. The technology will be developed by the Wire Communications Laboratory, University of Patras, Greece, who also coordinates this 4-year project funded under the EU LIFE scheme. Associated partners are the Technological Educational Institute of Crete (TEIC), the Association for Protection and Development of Hymettus (SPAY) and the Zoological Research Museum Alexander Koenig (ZFMK), Bonn, Germany. See http://www.amibio-project.eu for further details.*

Fig. 2. *Deployment of programmable recorders (Songmeter, Wildlife Acoustics) at Hymettus by Stavros Ntalampiras and Klaus Riede (right) in November 2011. The most dominant grasshopper during this late autumn period is the bivoltine Chorthippus bornhalmi. Paul Grant, University of Stellenbosch, South Africa, joined us during this field trip and made all the photographs.*

site (http://www.ortheur.org/get?site=orthoptera), backed up by a facebook newsflash reporting on the progress of European Orthoptera Redlisting (http://www.facebook.com/pages/European-Redlisting-of- Orthoptera/113668121976752?v=box_3). At present, urgently needed country-level distribution lists will be drawn from Fauna Europaea (http://www.faunaeur.org), which is however, in urgent need of financial resources to guarantee its long-term maintenance. What is still missing is an integration of the multiple national and regional Orthoptera assessments - a first link collection can be found at http://www.ortheur.org/orthoptera/orthoptera/i000229.html, but there is much more information available which has to be integrated in an efficient manner.

A new approach for a more continuous, detailed monitoring of Orthoptera is tested within the AmiBio project (Acoustic Monitoring of Biodiversity – http://www.amibio-project.eu). Acoustic monitoring devices are deployed within the Hymettus Natura2000 site, near Athens, Greece. This mountain range reaches up to 1,200 m a.s.l. and is bordering to the metropolis of Athens and the new airport, hence under severe anthropogenic pressure. But it harbours a surprisingly rich flora and structurally diverse habitats including caves. The invertebrate fauna is probably rich, but insufficiently known, and up to now there is no regular zoological monitoring. The final goal of the AmiBio project is to record Orthoptera and other acoustically communicating species by wireless recorders and send the data to a central station for further automatic processing (Fig. 1).

At present we are using traditional assessments and programmable commercial recorders to get baseline inventories (Fig. 2). A first assessment of Orthoptera was made by Prof. Gerlind Lehmann (Humboldt University, Berlin) in April 2010 (Jahn et al., Amibio Newsletter 2010, http://www.amibio-project.eu/de/content/81-newsletter-jully-2010). First prototypes of wireless acoustic transmitters will hopefully be ready to be examined within a year from now. If successful, the technology will hopefully be cheaper than the commercial recorders and could be applied at many more sites.

As orthopterists we are priviledged because we can build on an excellently managed taxonomic backbone, the Orthoptera Species File. It is among the few information systems which allows listing of species names with types available at a certain depository – as, for example, 1819 species and subspecies from the Muséum National d'Histoire Naturelle, Paris (http://orthoptera.speciesfile.org/Common/editTaxon/SearchForTaxon.aspx

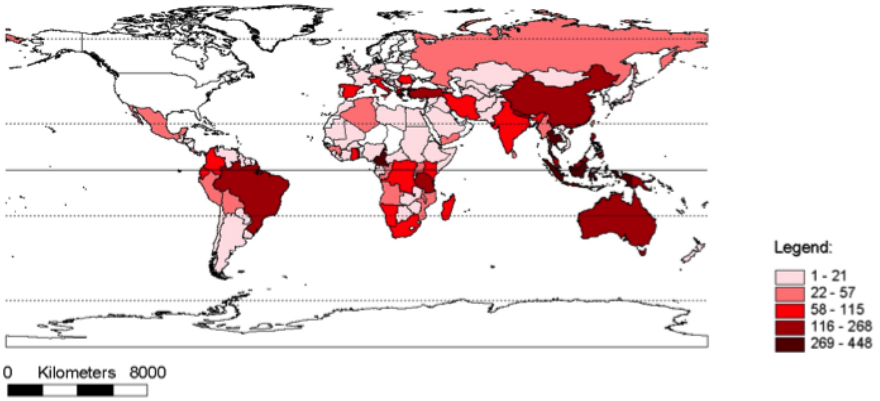

Fig. 3. *Distribution of Orthoptera type specimens (including Para- and Lectotypes) housed in German Museum collections. Note the high number of types from Africa, South East Asia and Australia, collected in the last centuries. German type material has been data-based and photographed within the DORSA project and is accessible through OSF (Ingrisch et al. 2004: DORSA – A "Virtual Museum" of German Orthoptera Collections. Memorie della Società Entomologica Italiana 82, http://www.dorsa.de/inlili/MSEI82_349.pdf). Map from Riede K. (2003): Biodiversity Informatics in Germany: ongoing projects and their possible contribution to the Global Taxonomy Initiative (GTI). In: Junko Shimura (ed): Global Taxonomy Initiative in Asia. National Institute for Environmental Studies, Japan, pp. 294-300; http://www.groms.de/data/riede/GTIriede.pdf*

, as of 30 December 2010). However, numbers shrink to 584 – less than a third – if you request an image. Similar data mining exercises can be done via the GBIF portal (www.gbif.org), demonstrating that Orthoptera collections from European museums are still waiting to be made accessible by georeferenced and properly illustrated specimen data. Europe´s colonial past is still alive in its museum collections, containing a huge precentage of types from tropical countries (see map).

Therefore, it should be among the top priorities to mobilise all information associated with this type material and make it available through the World Wide Web!

Thinking about the political borders of Europe, we should not forget that it includes species-rich tropical Overseas Territories, in urgent need of proper taxonomic exploration. A common European conservation strategy for these tropical areas is still lacking – it would be an ideal opportunity to demonstrate that economic development can be harmonised with adequate conservation of highly sensitive tropical habitats.

A quick look at the Orthoptera Society member database shows that there are probably not enough European members to deal with the research agenda outlined above. How could we recruit more members, and cooperate more efficiently? The web services cited above are certainly the way to attract more young researchers. Some orthopterological research fields are still underrepresented in the Society – particularly neurobiology and neuroethology, which have a strong tradition in Europe. Applied research and conservation biology could provide the over-arching themes bringing together hitherto unconnected research communities.

Klaus Riede
Regional Representative

The Orthopterists' Society Grant Reports

Does the quality of rival calls affect the structure of the aggressive song in house crickets, *Acheta domesticus*?

In order for communication systems to evolve and develop they must be based on honest signals (Johnstone and Grafen 1993). Crickets are well known for their ability to communicate with members of their species via acoustic signals produced by a file and scraper mechanism between their tegmina. Male crickets have several different types of song, which may present both females and rival males with information about their resource holding potential (RHP; Maynard Smith & Parker 1976). Male crickets, including the species we studied (the house cricket, *Acheta domesticus*) engage in aggressive encounters with rival males in order to obtain a particular resource, such as a female. The winner of those contests generally gains access to the resource. Previous work in our lab has shown that, prior to altercation, males provide information about fighting ability through aggressive song (Brown et al. 2006). Specifically, males that would go on to become winners of bouts had certain call parameter characteristics that differed from their loser counterparts, including longer pulse durations, shorter inter pulse intervals and more pulses per chirp on average (Brown et al. 2006). Using this information we synthesized artificial "winner" and "loser" calls, representing males with strong and weak RHP.

Our goal in this study was to determine if male house crickets alter their own aggressive songs in response to rival males they perceived acoustically as being strong or weak. There were three potential outcomes to this experiment. First, males may increase the energy of their songs in response to a strong rival, to acoustically escalate the contest. Alternatively, males may increase song energy in response to a weaker rival, to encourage quicker resolution of the contest and avoid physical escalation, which is energetically costly, compared to the energetic content of their song (Hack, 1997). The third possible outcome is that males may be physically constrained and unable to change their song parameters. This might occur if the songs evolved as strict indices of RHP.

Methods. Crickets were obtained from commercial sources. We isolated mature males from other males and females by placing them in individual terrariums with food and shelter for 3 d in order to increase aggression (see Brown et al. 2006). Following this isolation period, males were pre-tested for production of aggressive song. To do this, we paired males by size and allowed them to fight in the presence of an isolated stimulus female in a terrarium (Brown et al. 2006; Brown et al. 2007). Only vocal males were used for subsequent experimental trials. Vocal males were then tossed in the air 4-5 times to erase their memory of prior aggressive outcomes (Hofmann and

Stevenson 2000) and returned their individual terrariums.

Experimental trials consisted of a (previously vocal), focal male paired with a muted stimulus male in the presence of a female and playback of artificial aggressive song. Females served as a stimulus resource and were placed in a narrow tube of fiberglass mesh to allow contact with males but inhibit mating. We then placed the focal male in a terrarium (18.3 x 10.7 x 14.0 cm) with the female, and allowed the cricket to acclimate to its surroundings for 3 min. The focal male was then paired with a stimulus male of similar mass (within 0.050 g) taken from the source population. Stimulus males were muted by flipping their wings, effectively disrupting the file and scraper mechanism of the cricket, and applying a dab of white liquid paper as adhesive. The stimulus male was then tossed 4-5 times to erase memories of prior aggressive encounters within the source population. Synthesized songs were played back at 70 db measured 15 cm from the speaker. For each focal male, we conducted trials alternately in the presence of both "winner" and "loser" calls, in random order. The songs were artificially synthesized by WD Brown using Canary software (Cornell Laboratory of Ornithology). "Winner" songs contained pulse duration and pulses per chirp 1 standard deviation (sd) above that of an average male, and inter-pulse interval and inter-chirp interval 1 sd below that of an average male. "Loser" song parameters differed 1 sd in the opposite directions.

Synthetic calls were played simultaneous to the introduction of the muted male, and each time muted males came within 3 cm of the focal male. We then recorded the acoustic response of the focal male using a Sony Professional Walkman. We recorded only aggressive songs that were produced prior to actual fighting (Hofmann and Schildberger 2001). Finally, after recording aggressive song, we observed the subsequent aggressive behavior of the focal male toward the rival, specifically recording whether (1) the focal male acted aggressively toward the muted male, (2) physically held its ground when challenged, or (3) and the focal male fled when challenged by the muted male. Structure of aggressive songs were analyzed using Canary and statistically analyzed using a linear mixed model that included focal male identity as a repeated measure, song stimulus as a factorial variable, and the femur length and condition of both focal and stimulus males as covariates. We calculated condition the standardized residuals of a regression of mass and femur length.

Acheta domesticus (Photo credit: Joseph Berger, Bugwood.org)

Results and Discussion. We analyzed the data using a linear mixed model. There was a positive relationship between pulse duration and focal male femur length and condition, in agreement with previous results (Brown 2006). There was no correlation between male size and either inter-pulse interval or pulses per chirp. Males did not significantly alter call parameters between treatments. These findings do not support either of the hypotheses that predicted directional change. The results are consistent with the third hypothesis of physical constraints on song structure. We tested the prediction of no change between song structure between treatments by analysis of the confidence interval of effects sizes (Colegrave and Ruxton 2003). The confidence intervals of effect sizes for both pulse duration and inter pulse interval indicated that there are only minute changes in male call structure between treatments. These finding help to support the hypothesis of constraint. Honest signals are necessary components of the foundational construct for all communication systems (Johnstone and Grafen 1993, p.759), and based on the data we have collected, the calls males are producing are honest indicators of resource holding potential.

References:

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Brown WD, Chimenti AJ, Siebert JR (2007). The payoff of fighting in house crickets: motivational asymmetry increases male aggression and mating success. Ethology 113: 457-465.

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Hofmann HA, Stevenson PA (2000). Fight restores flight in crickets. Nature, 403, 613.

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Biting off more than you can chew: nonlinear effects of female postcopulatory choice on *Gryllodes sigillatus* spermatophylax amino acid composition

Nuptial feeding gifts generally benefit male reproductive success, but consuming these gifts may not necessarily be in the best interests of females. Although in many species females may receive nutritional benefits from nuptial gift consumption (1) in others, females may receive few direct benefits from consuming these feedings (2). In *Gryllodes sigillatus* decorated crickets, males produce a nuptial gift called a spermatophylax that is consumed by females after copulation and prevents females from interrupting sperm transfer. Moreover, the spermatophylax contains accessory gland products that may influence female behavior to favor male fertilization success: consumption of the spermatophylax of *Gryllodes sigillatus* has been found to lengthen female refractory period between matings, potentially delaying her from mating with a rival male (3). Further, the *G. sigillatus* spermatophylax contains numerous amino acids (4,5) that have phagostimulatory effects on insects (6,7,8). We propose that male *G. sigillatus* use this chemical manipulation to induce females to consume a "Medea gift" that benefits male fertilization success but has dubious benefits for the female (5).

Our goal was to determine the relationship between female spermatophylax consumption behavior and spermatophylax amino acid composition. We presented each female *G. sigillatus* with a spermatophylax and observed whether she rejected or consumed it. We collected each spermatophylax after 15 minutes (before "consumed" spermatophylaxes could be completely consumed). The concentration of the 19 most prevalent amino acids in each spermatophylax was determined using gas chromatography with flame ionization and an Agilent 7000 Triple Quadrupole GC/MS (Agilent Technologies UK Ltd., South Queensferry, West Lothian, UK) and an EZ:faast reagent kit (Phenomenex, Torrance, CA, USA). For a detailed description of methods, see Nozal et al. (6).

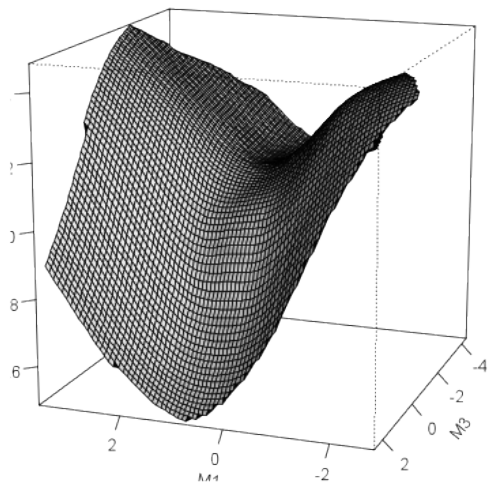

Fig. 1. *The fitness surface of the m1 and m3 eigenvectors of the M matrix from the canonical analysis of γ for the amino acid composition of the spermatophylax.*

Because the orthopteran spermatophylax is complex in its chemical composition and female feeding behavior may be caused by numerous components of the spermatophylax as well as relationships among chemical components, it is possible that female behavior may exert selection for optimal combinations of quantities of amino acids. Thus we reduced the 19 amino acids examined in this study to three principal components representing "size," the amount of amino acid in the sample, "taste," the combined taste profile of 5 amino acids that influence feeding behavior, and the "chewiness" of the spermatophylax. There was significant directional selection favoring less amino acids with polar side chains that contribute to taste, and less chewiness.

To measure selection on spermatophylax composition we used selection gradients with canonical rotation of the nonlinear selection gradient to find the major axes of the response surface (7,8) and correct for correlations among traits, estimating only the direct effects of selection (8). The canonical rotation analysis showed both linear and nonlinear convex selection in eigenvector m3 that contrasts PC1 (size) with PC2 (taste) and PC3 (chewiness). There was also nonlinear concave selection on eigenvector m1 that contrasts PC2 (taste) with PC1 (size) and PC3 (chewiness). The presence of positive and negative eigenvalues indicates a saddle-shaped fitness surface with two local fitness peaks. This surface shape suggests that a stationary point does not exist within the sampled space. Looking at the m1-m3 fitness surface, the peak at the extreme positive values of m1 and negative values for m3 represents the effect of PC1 (size). The peak at the extreme positive values for m3 and negative values for m1 represents the effect of PC2 (taste). The extreme positive values for both m1 and m3 at the area of lowest relative fitness represent spermatophylaxes that had the most PC3 and were thus the chewiest. The presence of a saddle in the fitness

surface of spermatophylax rejection indicates that there may be multiple ways for a spermatophylax to be acceptable for consumption. The two highest peaks are the "size" peak and the "taste" peak corresponding to spermatophylaxes that were largest as well as spermatophylaxes that had the most amino acids with polar side-chains contributing to taste.

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Effects of Anthropogenic Noise on Orthopteran Communication

For many orthopterans, acoustic signals are important for mate attraction and territory defense. However, acoustic signals are susceptible to interference from biotic and abiotic sounds. One increasingly common source of acoustic interference is anthropogenic (human-generated) sound. Anthropogenic noise can reduce communication distance, interrupt calling synchrony, and alter conspicuousness to predators. These effects have been observed in a variety of taxa including marine mammals (Frantzis 1998, Jepson 2003), birds (Reijnen et al. 1996), and anurans (Lengagne 2008). Responses to noise included: change in the time of day used for communication, reduced call complexity, and changes in the dominant frequency and the rate of signaling (Wood and Yezerinac 2006, Parks et al. 2007, Lengagne 2008, Slabbekoorn and Ripmeester 2008, Parris et al. 2009). The majority of these changes are behavioral, but there is increasing evidence that anthropogenic noise represents a source of strong selection that may be producing evolutionary changes in animal communication (Parris et al. 2009).

Many species of orthopterans may be particularly susceptible to interference from anthropogenic noise because they live in environments that are heavily impacted by humans and may have relatively limited capacity to alter their calls in ways that would mitigate the impacts of acoustic interference. One of the most pervasive types of anthropogenic noise comes from cars and roads (Golmohammadi et al. 2009). Crickets are common in roadside environments such as ditches and open, grassy fields, and therefore have high potential interference from anthropogenic noise. Initially, we determined whether there was acoustic overlap between crickets and roads. Road noise covers a broad range of frequencies, including those at which ground crickets call (Fig. 1). While total noise level may negatively affect the transmission of cricket calls, interference at the frequency of their call is likely the most relevant aspect of road noise.

We investigated two of the ways

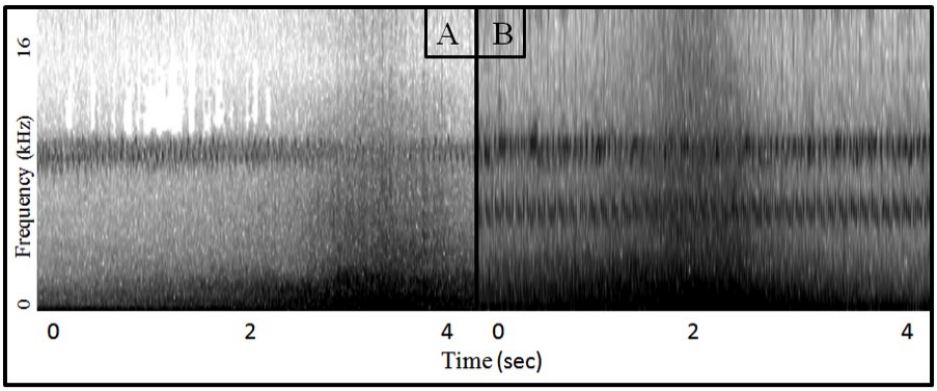

Fig. 1. *Spectrogram of ambient noise 5-10 m from two roadsides in Hanover, New Hampshire. Sound profile includes of Allonemobius allardi (panel A and B, dominant frequency approx. 8 kHz) and Eunemobius carolina (panel B, dominant frequency approx. 5 kHz). Peak car noise occurs at approximately 3.5 seconds (panel A) and 2.0 seconds (panel B). Recording was generated using a Marantz 661 and an omnidirectional Sennheiser ME62 microphone positioned approximately 20 cm above ground level. The spectrogram was generated using RavenPro (Cornell Lab of Ornithology). Darker colors represent higher sound intensity.*

in which anthropogenic noise may affect orthopterans. At the community level, we determined whether environments with high levels of anthropogenic noise were dominated by species with calls that were less likely to be masked by the ambient noise. Second, we compared high and low noise environments to assess whether there were intraspecific differences in call characteristics that would maximize the audibility of a signal in a given environment.

Community Composition

First, we examined whether species composition was different in high and low noise environments. Since road noise is more intense at low frequencies, we hypothesized that cricket species with low-frequency calls (perceived as low pitch) would experience more interference, potentially reducing signal transmission, pairing, and reproductive success. Sites with a higher level of road noise would therefore have lower relative abundance of cricket species with low-pitched calls. Species with slower calls (fewer pulses per unit time) provide fewer cues for mate localization and discrimination. We hypothesized that species with a lower signaling rate would suffer greater reductions in communication efficiency in the presence of acoustic interference and would be present at lower relative-abundance, due to direct effects such as lowered mating success and indirect effects such as expending more energy to signal over longer periods of time.

To test these hypotheses, we compared the species composition in four sites near Hanover, New Hampshire, USA. Two of these sites had average noise levels of 89 and 70 decibels and were considered "loud" sites. The other two sites had average noise levels of 41 and 58 decibels and were considered "quiet" sites.

To minimize confounding factors, we picked sites that varied in soil type, incline, sun exposure, and intensity of human usage. Sites differed within groupings in most characteristics other than road noise level. We determined species composition by haphazardly selecting and recording singing adult males and then examining the sound files to assign species. Identifications were confirmed, when possible, using captured specimens. The two dominant species in the sample were *Allonemobius allardi* (Allard's Ground Cricket), with a dominant frequency of approximately 7.5 kHz and pulse rate of approximately 16 pulses per second at 25°C, and *Eunemobius carolinus* (Carolina Ground Cricket) with a dominant frequency of approximately 5 kHz and pulse rate of 60 pulses per second at 25°C.

We compared the species composition in loud and quiet sites and found that the species composition was significantly different among sites (Pearson's $X^2 = 63.795$, DF = 6, $P < 0.0001$). This pattern remained when we limited the analysis to the two most dominant species (A. allardi, E. carolinus) (Pearson's $X^2 = 51.816$, DF = 1, $P < 0.0001$). A. allardi was much more prevalent in loud sites while E. carolinus was more common in quiet sites (Table 1).

A. allardi has a much higher frequency call than *E. carolinus*, and its dominance in environments with pervasive low frequency noise is consistent with the hypothesis that anthropogenic noise may influence community structure. It has a slower pulse rate than *E. carolinus*, which does not support the idea that species with higher signaling rates will be more successful in high noise environments. However, orthopteran hearing is often tuned to a relatively narrow range of frequencies, suggesting that the amount of interference experienced may be primarily dependent on the dominant frequency used in signaling and secondarily on the rate of signaling. In 2010, we re-examined one loud site (NH_K) and found that the species composition was similar to the composition in 2009. We also sampled an additional quiet site and found that the *A. allardi* was more common than *E. carolinus* in this site as well. These findings suggest a possible role of anthropogenic noise in structuring community composition. Further study with additional sites and manipulative experiments would help to refine these initial findings.

Intraspecific differences in call characteristics

In addition to studying species composition, we investigated intraspecific differences in call characteristics to determine whether calls differed among sites in a way that could reduce interference, either as a result of behavioral plasticity or evolutionary response. Road noise may affect individual crickets

Noise Level	Site	*A. allardi*	*E. carolinus*	*A. fasciatus*
Loud	NH_C	22	1	3
	NH_K	28	3	8
	Total	50	4	11
Quiet	NH_MB	1	3	0
	NH_GM	5	8	0
	Total	6	11	0

Table 1. *A comparison of the species composition of the loud and quiet sites near Hanover, NH, for A. allardi, E. carolinus and A. fasciatus, using the number of individuals recorded between September 24 and October 9, 2009.*

within a species in a similar fashion as it would affect interspecific differences. If crickets have a plastic or evolutionary response to road noise, we predict that crickets will call with a higher dominant frequency and higher pulse rate in noisier environments.

Due to the dramatic difference in species composition between loud and quiet sites, we lacked the statistical power to compare populations of the same species from loud and quiet sites. Therefore, to test whether there are intraspecific call differences based on ambient noise levels, we examined recordings made on a gradient from directly next to a high-traffic road to the far end of a field where road noise was nearly inaudible.

We haphazardly selected males in the field, obtained a short recording and temperature measurement, then determined the pulse rate and dominant frequency of the recordings. Over the recorded temperature range, the relationships between pulse rate and temperature and frequency and temperature were approximately linear. Therefore, we analyzed the data using linear regression models and included temperature as a random effect. We found a significant effect of road noise on both pulse rate and frequency in 2009 but not in 2010. The mixed finding is likely representative of the complexity of in situ ecological and evolutionary research. Clarifying this relationship will require sampling additional sites including more urbanized locations where high noise levels are prevalent over a larger area and local adaptation is not swamped by the effects of migration.

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Cooperative Rangeland Grasshopper Suppression in Wyoming (USA) in 2010

Each year, the U. S. Department of Agriculture, Animal Plant Health Inspection Service, Plant Protection and Quarantine (USDA-APHIS-PPQ) conducts a cooperative program to suppress rangeland grasshoppers in 17 western USA states when populations present an economic threat. Cooperators in this effort include the Federal and State land managers, County and State agriculture officials, and private owners of rangelands. The USDA-APHIS-PPQ responsibilities comprise three parts: (1) conducting population surveys of grasshoppers during nymph and adult phases, (2) providing technical assistance to land managers and owners on grasshopper population suppression, and (3) conducting Federal cooperative treatments to suppress grasshopper populations. The objective of the cooperative program is to protect native forage for grazing livestock and wildlife.

In most situations, nymphal surveys were conducted in May and June. Nymphal surveys provide information on grasshopper population densities and species composition to rangeland managers and owners for deciding if, when and what treatments are needed to protect forage within the same year. Adult surveys are usually conducted in July and August, and provide population information to project what the grasshopper hatch and subsequent population may be the following year. The surveys are conducted on rangelands in 17 States that comprise the Great Plains and Rocky Mountain states of the western United States.

The outreach part of the program provides information to rangeland managers and owners on: (1) population levels of grasshoppers, (2) projected loss of forage and (3) methods to suppress populations if needed. Information is provided through public meetings with land managers and owners, as well as through direct consultation.

Once a rangeland manager or owner decides to conduct treatments, they may conduct the

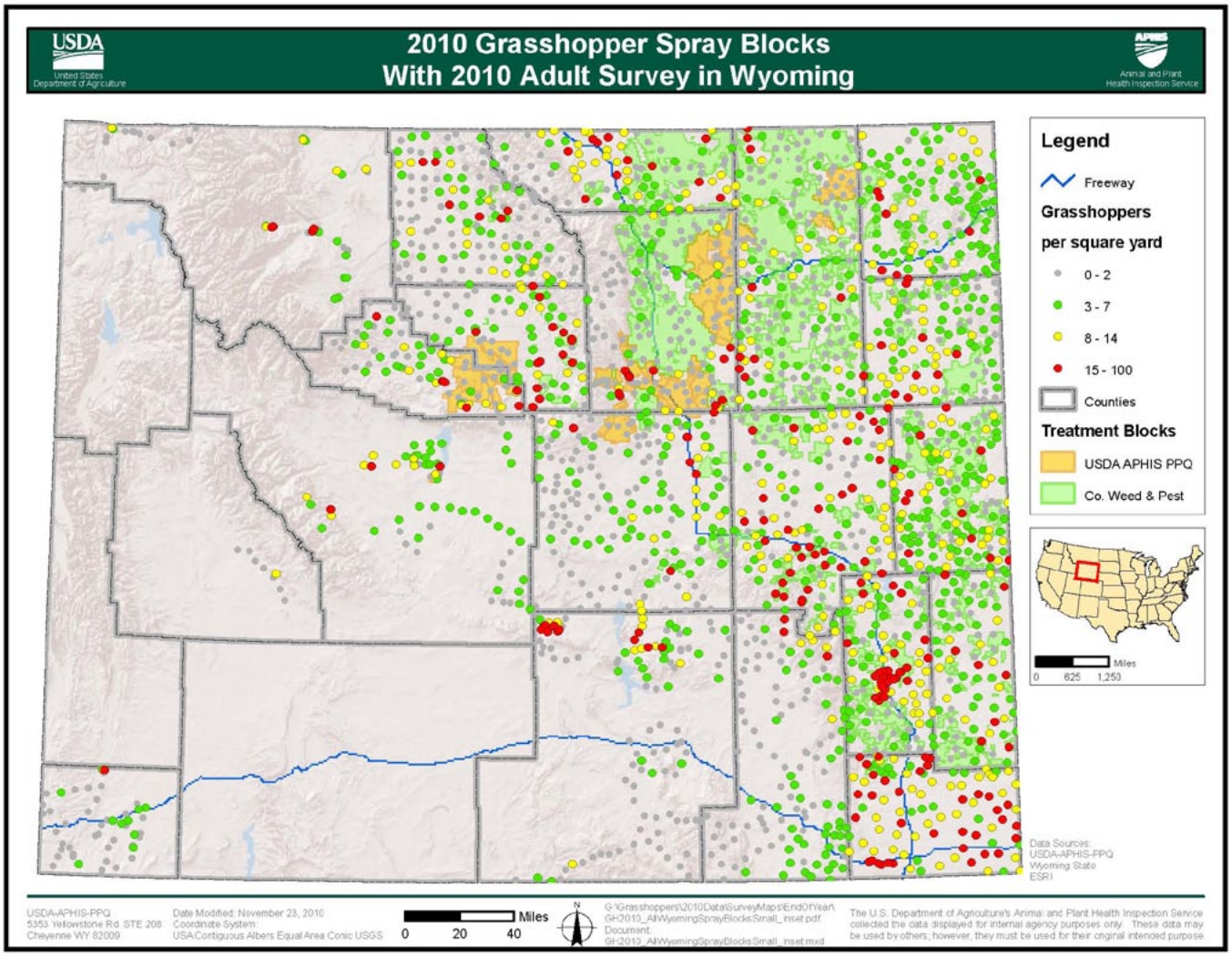

Fig. 1. *Populations of grasshoppers after treatments during the adult survey and the treated areas of Wyoming under County and USDA-APHIS-PPQ programs*

treatments privately, cooperate with County and State agriculture programs, or conduct treatments through the cooperative programs under the USDA-APHIS-PPQ. Specific information on the USDA-APHIS-PPQ cooperative programs can be found at: http://www.aphis.usda.gov/plant_health/plant_pest_info/grasshopper/index.shtml.

The results of the adult grasshopper survey in July and August 2009 indicated that grasshopper populations in 2010 would be much higher than they had been in many years. In particular, grasshopper populations had been growing for several years in areas within the northern Great Plains states of Montana, Wyoming, South Dakota and Nebraska. Other states in the western United States also had areas with increasing populations. Preparations were made by USDA-APHIS-PPQ to conduct large scale cooperative treatments in 2010. This included conducting analysis to protect the non-target environment, and preparing contingency for budgeting, staffing, pesticide supply, and application contracts. In June and July 2010, grasshopper suppression treatments covering 1,257,180 acres (508,762 ha.) were conducted by USDA-APHIS-PPQ in the States of Arizona, California, Idaho, Montana, North Dakota, Oregon, South Dakota, Utah and Wyoming.

One state with large areas of high grasshopper populations was Wyoming. Grasshopper population densities of over 9 per square meter covered 7,468,000 acres (3,022,200 ha) and area with population densities between 16 and 100 grasshoppers per square meter covered over 2,908,000 acres (1,176,800 ha) of rangeland. The major grasshoppers species present in Wyoming were *Melanoplus sanguinipes*, *M. infantilis*, *M. occidentalis*, and *M. angustipennis*, with some significant populations of *Ageneotettix deorum* and *Aulocara ellioti*. Many other species were present but were of comparatively minor importance.

In Wyoming, there was a combination of County and USDA-APHIS-PPQ treatments programs in 2010. Most of the USDA-APHIS-PPQ treatments were conducted on Federal rangeland managed by the U. S. Forest Service and the U. S.

Bureau of Land Management. Most privately owned rangeland was treated under County programs. Figure 1 shows the populations of grasshoppers after treatments during the adult survey and the treated areas of Wyoming under County and USDA-APHIS-PPQ programs. Treatments under the USDA-APHIS-PPQ programs covered 1,127,096 acres (456,119 ha) with treatments on 666,606 acres (269,765 ha). The difference between acres covered and acres treated is due to the use of RAAT's (Reduced Area Agent Treatments), a method of alternate swath treatments developed by the University of Wyoming in cooperation with USDA-APHIS-PPQ, Center for Plant Health Science and Technology, Phoenix Laboratory for treatments of grasshoppers. (http://www.uwyo.edu/grasshoppersupport/Html_pages/raats.htm). Treatments of private rangeland by County agriculture officials covered 4,479,751 acres (1,812,888 ha) with treatments on 2,239,976 acres (906,485 ha). This was the largest area of rangeland treated for grasshoppers in Wyoming since 1986.

The average population of grasshoppers in treated areas prior to treatments was 23 per square meter. After treatments most populations of grasshopper were reduced to less than 3 per square meter. Most treatments were conducted through aerial applications of chemical pesticides. Diflubenzuron (Dimilin 2L) and carbaryl (Sevin 4 oil) were used on both County and USDA-APHIS-PPQ treatment programs. Dimilin 2L was applied at rates between 0.75 and 1 ounce a. i. per acre treated (53 to 70 g a. i. per ha). Sevin 4 Oil was applied at 16 ounces a. i. per acre treated (1,121 g a. i. per ha). Approximately 16,500 gallons (62,60 l) of Dimilin 2L and 20 gallons (75.7 l) of Sevin 4 Oil were use throughout Wyoming to treat rangelands.

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Orthoptera Symposium in Brazil: Abstracts

From September 26th to 30th, 2010, the XXIII Brazilian Congress of Entomology was held in the city of Natal- northeast coast of Brazil. As a part of that event, the Third Orthoptera Symposium took place with the presence of orthopterists from Brazil, Argentina and students from both countries.

Two round tables were carried out with oral presentations by the following orthopterists: 1- Taxonomy, Reproduction, Acoustics and Ecology of Grylloidea (Francisco de Assis G. de Mello, Carina M. Mews, Marcio Perez Bolfarini, Luciano de Pinho Martins and Carlos Frankl Sperber); 2- Orthoptera, Acridoidea: Diversity and Taxonomy (Maria Marta Cigliano, Carlos E. Lange, Marcos G. Lhano, Fátima R. Jaloretto da Silva, Maria Laura de Wysiecki and Kátia Matiotti da Costa).

Several ongoing and concluded research projects were also presented in the poster session. Last but not least, a special opportunity was ensured for the South American orthopterists who attended the event to sit down and talk about collaboration efforts to improve orthoptera research in that part of the world. Below is a set of abstracts from the scientific contributions to the event.

Francisco de A. G. de Mello

ORAL PRESENTATION

BIODIVERSITY INFORMATICS IN ORTHOPTERA: A PROMISSORY FUTURE FOR TAXONOMY

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The global imperative for the conservation of biodiversity has brought into focus the needs for taxonomic research. However, the crisis facing the conservation of biodiversity is reflected in a parallel crisis in taxonomy. Species are rapidly going extinct and at the same time there is an enormous shortage of taxonomists who can identify and describe species. Moreover, revisionary taxonomy is frequently dismissed as merely descriptive and lacking a hypothesis driven nature. Phylogenetic classifications are optimal for storing and predicting information, but phylogeny divorced from taxonomy is unrealizable. Taxonomy, systematics, and phylogeny are interwoven, hypothesis-driven sciences with a theoretical base. Taxonomy needs to prepare to take advantage of new information technology capabilities. The rapid advances in biodiversity informatics have provided unprecedented opportunities to conduct and disseminate taxonom-

ic research more efficiently. Cybertaxonomy is emerging as an exciting new branch. The development of technology in digital imaging, databasing, and cyberinfrastructure has merged with taxonomy to result in what is referred to as cybertaxonomy. The potential of using the Orthoptera Species File online (OSF; http://orthoptera.speciesfile.org/) as a tool in systematic studies of Orthoptera is presented herein, as well as a way of integrating many of the most recent cybertaxonomic tools with species descriptions and taxonomic publications. The use of embedded hyperlinks to high quality images of the habitus and diagnostic characters of the species, specimen records maps, interactive keys and sound records in OSF brings vital additional information to a published taxonomic text. The semantic enhancements to biodiversity papers are expected to greatly extend the way taxonomic information is published, disseminated and used. An example of application of these newly developed technologies of OSF applied in the revisionary, cladistic and biogeographic study of the high Andean grasshopper genus *Jivarus* Giglio-Tos (Orthoptera: Acridoidea: Melanoplinae) will be presented.

Diponthus crassus (Photo credit: Maria Marta Cigliano)

FEMALE MONOPOLIZATION BY MALE CRICKETS (ORTHOPTERA; GRYLLOIDEA): FORCED COPULATION, GENITAL MUTILATION AND MALE-INDUCED FEMALE MONOGAMY

Monopolização da fêmea por grilos (Orthoptera, Grylloidea) machos: cópula forçada, mutilação genital e monogamia feminina induzida

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The first three cases of female monopolization by male crickets by means of mating plugs are presented, two of which among phalangopsids from Brazil, the other in a Venezuelan eneopterid. The origin of the plugs varies among the cases, i.e., they are not homologous. No evidences were found that females have developed mechanisms to remove the plugs, what leads one to believe that such a sexual monopolization strategy result in mating systems characterized by the occurrence of potentially polygamous males and male-induced monogamous females. It was observed the occurrence of forced copulation in one of the cases: an adult male did succeed in copulate with a teneral female immediately after moulting. Some hypothesis on the origin of male sexual monopolization strategies and of their probable evolutionary consequences are afforded.

TERMINALIA OF FEMALE CRICKETS (ORTHOPTERA: ENSIFERA: GRYLLOIDEA) PROVIDE USEFUL TAXONOMIC CHARACTERS?

Terminálias de fêmeas de grilos (Orthoptera, Grylloidea) são úteis para a taxonomia?

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The large number of crickets new species (Orthoptera: Ensifera: Grylloidea) collected and deposited in Brazilian museums and collections, associated with the large number of unidentified species, because they have only females and nymphs in the collections, configure an obstacle to research progress on these insects. There is an immediate need to develop methodologies for the females and nymphs crickets' identification. We evaluated whether female terminalia can be used to identify cricket's families, genera and species, examining 25 species, 13 genera and three families: Phalangopsidae, Eneopteridae and Gryllidae. The variation of the structures measured among families (ANOVA, $F_{7, 847} = 61.97$ $P < 0.0001$), genera ($F_{7, 847} = 7.18$ $P < 0.0001$) and species ($F_{7, 847} = 6.99$ $P < 0.0001$) are different. Species of the same genus present common patterns of shape of copulatory papilla, and in some cases, the spermatheca. Species of same family present common pattern in the shape of spermathecal duct and median valve of ovipositor. The female terminalia has proved an important tool for the identification of adult females to species, genera and families, both

qualitatively (morphology) and quantitatively (statistical). The characters found in morphologically distinct female terminalia are particularly useful in studies where there are few adult males collected, as in the ecology areas. Even when collecting adult males, identified by their genital characters, the identification of female crickets by associating them to their males, it is essential to ecological studies.

TAXONOMY OF CAVE CRICKETS (ORTHOPTERA, GRYLLOIDEA)
Taxonomia de grilos (Orthoptera, Grylloidea) cavernícolas

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The first representation of a cave animal was a cricket carved in a fragment of a bison bone dated from ca. 30,000 years B.P. Crickets are associated mainly with humid and warmer regions of the earth, although also represented in temperate areas and absent in the higher latitudes and altitudes; they occur in almost all types of terrestrial environments. Species belonging to several genera of the Phalangopsidae are common components of the cave fauna. The species association to the hypogean environment, coupled with its extremely restricted vagility and thus low dispersal ability makes the knowledge of endemism in underground ecosystems a point of special zoogeographical interest. In Brazil, the cave-associated phalangpsids have been just about not studied at all; most of the information available other than species descriptions are citations on faunal lists. Evolutionary biology studies are very rare. There are several biospeleologists working on fauna inventory, some of which have also brought out data on cave-phalangopsid reproductive biology, developmental biology or biological rhythms; all of them in urge of taxonomic studies, with good descriptions and keys to identify species that may substantiate their work. The existence of many undescribed species and the lack of a compilation of basic knowledge about diversity and geographical distribution impose serious limitations on these professionals` work.

THE IMPORTANCE OF BIOACOUSTICS FOR TAXONOMY IN GROUPS OF CRYPTIC SPECIES IN GRYLLOIDEA
A importância da bioacústica para a taxonomia de grupos de espécies crípticas de Grylloidea - Orthoptera, Ensífera

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Since 1950 the acoustic data has been intensively used by North-American researchers in the taxonomy of Grylloidea revealing many morphologically defined species as groups of cryptic species. The calling song emission is a fundamental step in the reproductive process of many Grylloidea. It is produced by mature males to attract females for mating. Variations in acoustic parameters operate as reproductive isolating mechanisms, and sometimes the calling song is the only characteristic distinguishing cryptic species. Consequently, the characteristics of the songs let us to the initial identification of most crickets species. The improvement and popularization of recorders and sound analyzers allowed identification of various genera with groups of cryptic species, such as *Allonemobius* Hebard, *Anaxipha* Saussure, *Cycloptilum* Scudder, *Eunemobius* Hebard, *Gryllus* Linnaeus, *Laupala* Otte, *Oecanthus* Serville and *Teleogryllus* Chopard. The importance of acoustic data for taxonomy of Grylloidea is consensual, nevertheless this tool is still very little used by researchers from South America. This paradox reflects the small number of experts working with crickets in South America resulting in a smattering of local fauna. The acoustic characterization should be included in taxonomic works for initial detection of cryptic species, and provide a useful and noninvasive tool for monitoring of the diversity of crickets in habitats threatened by global changes. To this end, strategies need to be drawn for the training of personnel and optimization of data sampled in South America.

DETECTING EMERGENT PROPERTIES IN CRICKET COMMUNITIES
Propriedades emergentes e coletivas de comunidades e populações de grilos em hábitat fragmentado

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Here I present an analytical methodology to detect emergent properties in insect communities. I suggest that to detect emergent processes that regulate species richness, we could use the accumulated abundance of individuals as a biological null hypothesis, to explain variation in number of species. To detect direct effects of potentially explanatory variables on species richness, we should adjust analyses of covariance or multiple regressions, in which the interac-

tion of accumulated abundance with the working hypothesis variable would indicate if the emergence of regulatory processes on species richness. Ecological theory predicts that increasing number of collected individuals will increase the estimated number of species, both because the chance of sampling more species increases, as because collecting more individuals increases the probability to collect rare species. Differences in the slope of the curve of accumulated species richness may be interpreted as evidence for differential biological processes regulating diversity. I used this approach to compare cricket diversity among geomorphologies within the same region, in the Parque Estadual do Rio Doce. I detected that, while number of species increased with accumulated number of individuals in crest and colu-vial slope, number of species was not affected by accumulated number of individuals in paleochannel. There was no difference in species composition (NMDS, $P > 0.05$). I interpret this results as evidence for community saturation in the palechannell, determined by local environmental drivers. The three geomorphologies are interspersed, have no physical barrier separating them, and therefore hindering cricket dispersal, and are all interconnected by continuous forest. Therefore the regional species pool is probably the same for all sampled areas. In another data set, resource availability was manipulated, through the offering of sugar-cane syrup, and I detected a significant interaction between resource availability and accumulated number of individuals, on cricket species richness. With lower resource availability, species richness increased steeply with abundance, but the slope of this species-abundance curve diminishes with increasing resource availability, up to absence of effect of abundance on species richness. I interpret this as evidence of competitive interaction, in which resource availability favors some, competitively superior, species, which exclude the remaining species locally, determining a ceiling for local species diversity.

PHENOLOGICAL AND MORPHOMETRIC ASPECTS OF *Cornops aquaticum* (BRUNER, 1906) (ACRIDIDAE: LEPTYSMINAE) IN THE PANTANAL OF POCONÉ MATO GROSSO, BRAZIL

Aspectos da fenologia e morfometria de *Cornops aquaticum* (Bruner, 1906) (Acrididae, Leptysminae) no Pantanal de Poconé, Mato Grosso, Brasil

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The grasshopper *Cornops aquaticum* (Bruner, 1906) (Orthoptera: Acrididae: Leptysminae) is of Neotropical origin and develops its life cycle on aquatic macrophytes of the *Eichhornia* Kunth genus which are used not only for food but also for endophytic oviposition. Due to its close relationship with these plants, this grasshopper is recommended as a possible natural biological control agent. However, data on its natural history show high ecological plasticity, thereby justifying the need to broaden knowledge on its means of adaptation so that it does not become a pest in locations where it is to be introduced. Based on this premise, several studies have been made in different parts of the world to assess the efficiency of their use and the possible impacts on aquatic macrophyte control. Among these studies is the "Host-Insect Coevolution on Waterhyacinth" Project which defines the protocol for this paper which seeks to assess the possible co-evolution of *C. aquaticum* with its host plants within the gradient of its natural distribution. This study assessed the phenology and morphometry of a population of *C. aquaticum*, associated with *Eichhornia azurea* Kunth (Pontederiaceae), in the Piuval lagoon on the Ipiranga farm in the Poconé Pantanal (MT). For this, monthly collections were made between March 2006 and February 2007 of 50 individuals using an entomology net on a moving boat, making a collection total of 600 individuals of which 261 were adults and 339 were nymphs. It was found that this population is composed of adults and nymphs throughout the year thus suggesting the occurrence of continual reproduction. The morphometric characteristics

Cornops aquaticum (Photo credit: S. Neser, PPRI, http://dnr.state.il.us/stewardship/cd/biocontrol/4WaterHyacinth.html

of this population are similar to other populations studied in South America both in terms of nymph development and the adult phase. The morphometric measurements assessed varied between the seasonal periods with the highest means in the flood period, although no predominant characteristic was found. Fresh weight variation was only significant for the average fresh weight of females (f = 6,43; p= 0, 001), with the highest values recorded in the flood period.

ANALYSIS OF THE DIVERSITY OF SEMI-AQUATIC GRASSHOPPERS (ACRIDIDEA, LEPTYSMINAE) OF BRAZIL
Análise da diversidade de gafanhotos semi-aquáticos (Acrididae, Leptysminae) do Brasil

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In Brazil the group of semi-aquatic grasshoppers is represented by the Family Acrididae, and its subfamilies Mareliinae, Pauliniinae and Leptysminae. While Mareliinae and Pauliniinae are formed by one mono-specific genus, the subfamily Leptysminae presents the largest diversity and was established by Amedegnato in 1974. This group was erected based on the base of the tribe Leptysmini proposed by Rehn & Eades in 1961, which initially included mainly the Neartic genera. After the Amedeganto' study the subfamily becomes formed by the tribes Leptysmini, Chloropseustini and Tetrataeniini. Actually Leptysminae includes 20 genera, 77 species and 30 subspecies. Chloropseustini is typically from the Amazonian biome, Leptysmini is distributed at the Neotropical region and Tetrataeniini is spread from the South of México until the temperate latitude of Argentina. Despite of Chloropseustini is being distributed at the Amazonian biome, only three species of this genus formed by ten species are reported to Brazil. The tribe Leptysmini is actually formed by 9 genera, 38 species and 13 subspecies and was reported to Brazil 9 genera, 27 species e 4 subspecies. For Tetrataeniini is reported in the National territory 9 of 10 genera, 21 of 29 species and 9 of 17 subspecies. Distribution maps were made and this analysis showed the biggest diversity in the south of the Amazonian Basis, which is suggested by some authors as the center of origin and dispersion of this subfamily. Also it's clearly the lack of data at the Northeastern of Brazil, induced by a few registers of fieldwork at this region. The country needs policies and incentives for the knowledge of the biodiversity of semi-aquatic grasshoppers that occur in the region, allowing one better understanding of this group and providing subsidies for conservation practices.

GRASSHOPPER DIVERSITY PATTERNS (ORTHOPTERA: ACRIDOIDEA) IN THE PAMPAS, ARGENTINA
Patrones de diversidad de acridios (Orthoptera, Acridoidea) en la región pampeana

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Grasshoppers are the most important native herbivores and their diversity in grasslands is related to the heterogeneity of vegetation and the environment. The Pampas biogeographic province represents 15% of the Argentinian area. The landscape of this region was changed by the intensification of agricultural activities and livestock industry, affecting the diversity of organisms (decreasing or increasing the number of individuals). Out of the 201 species of Acridoidea known in Argentina, 110 live in grasslands. Grasshopper diversity in the southern Pampas Region (Laprida, Benito Juárez, Tandil, Lobería, Balcarce and Mar Chiquita counties) was estimated in different plant communities during 2009 and 2010 summers. Cumulative species richness, Simpson´s index (λ), Shannon-Wiener index (H '), Uniform index (E) and the Jaccard similarity coefficient (I) were estimated. The cumulative richness of grasshopper species was 21 (20 Acrididae and 1 Romaleidae), with an average of 13.7 ± 0.9 species (ranging from 17 species in Tandil to 11 in Laprida). From a taxonomic perspective, within the Acrididae, the Melanoplinae was the most abundant and diverse subfamily, followed by the Gomphocerinae, Acridinae, Copiocerinae and Leptysminae. Only 1 species of Romaleidae was recorded in Tandil. *Dichroplus elongatus, Dichroplus maculipennis, Borellia bruneri and Covasacris pallidinota* were the most abundant and frequently registered species. Balcarce had the highest diversity of grasshoppers (H´= 2.06), the lowest Simpson´s index (0.14), and the greatest uniformity (0.80). Laprida had the lowest diversity (H'= 1.32), the highest Simpson´s value (0.38) and the lowest value of Uniformity (0.55). Similarity coefficient ranged from 0.70 (Benito Juárez and Lobería) to 0.41 (Lobería and Mar Chiquita). Cumulative species richness varied among plant communities, recording the highest values in native grasslands and lowest ones in pastures and crops. Species richness at each site and time of sampling was low (4.8 ± 0.2 species). Native grasslands had the highest diversity of grasshoppers, which may be linked to their high diversity of plants and highest spatial heterogeneity (higher availability of niches). Pastures and crops were less diverse and the structure was simpler. In order to analyze these results with the patterns recorded in the western Pampas 11 years ago, we estimated the same parameters. The cumulative richness of grasshopper spe-

Diponthus paraguayensis (Photo credit: Maria Marta Cigliano)

cies was 34 (29 Acrididae and 5 Romaleidae), with an average of 14.2 ± 1.9 species (ranging from 20 species in Santa Rosa to 4 in Villa Sauri). Within the Acrididae, the Melanoplinae was the most abundant and diverse subfamily, followed by the Gomphocerinae, Acridinae, Copiocerinae and Leptysminae and 5 species of Romaleidae were recorded. *Dichroplus elongatus, Dichroplus pratensis and Staurorhectus longicornis* were the most abundant species. Ojeda had the highest diversity of grasshoppers (H´= 1.95), Castex had the lowest Simpson´s index (0.17), and El Durazno the greatest uniformity (0.81). Similarity coefficient ranged from 0.66 (Santa Rosa and Pehuajó) to 0.09 (General Acha and Ojeda). Differences and similarities in grasshopper assemblages between the two districts were detected. The western Pampas had more species than the southern. Both districts shared less than 50% of grasshopper species (0.48 southern and western Pampas and 0.37 Tandil and Santa Rosa). The dominant species was *Dichroplus elongatus* in both sites, followed by *Dichroplus pratensis* and *Staurorhectus longicornis* in the west and by *Dichroplus maculipennis*, *Borellia bruneri* and *Covasacris pallidinota* in the south. Historical, geographical and evolutionary factors play a strong role in determining the contemporary diversity patterns of a region.

DIVERSITY OF GRASSHOPPERS (ORTHOPTERA, ACRIDOIDEA) FROM SOUTHERN BRAZIL
Diversidade de gafanhotos (Orthoptera, Acridoidea) da região sul do Brasil

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As a contribution to knowledge of the diversity of the grasshoppers in the southern of Brazil and characterize all families occurring in the State of Rio Grande do Sul, an inventory in this region of Brazil is being realized. The biome of the RS has a great diversity of species of grasshoppers, until this present moment has record of 146 species belonging to three families: Acrididae, Romaleidae and Ommexechidae. Studies of this nature to contribute increase knowledge of the group assess the richness and abundance of species as well as the development of a field guide and the formation of a reference collection of Acridoidea. A qualitative and quantitative analysis is being conducted in 11 physiographic zones of the state, including the main vegetation types ones of such as fields, grasslands, tropical rain forest and mixed riparian forest. Sampling started in February 2010 with completion in January 2011, covering the following areas: Alto Uruguai, Campos de Cima da Serra, Missões, Planalto Médio, Encosta Superior do Nordeste, Encosta Inferior do Nordeste, Litoral, Depressão Central, Campanha, Serra do Sudeste and Encosta do Sudeste. Six zones have been sampled a total of 5.276 specimens collected, consisting of active collecting with sweeping net in transects of 1000 m. Until moment have record to 10 new occurrences of grasshoppers in the region, as well as new species to be described. The high diversity of species of grasshoppers found in the physiographic zones indicates that the species are important for conservation, once the set of species occurring in each environment is essential for the maintenance of regional diversity. The Field Guide is intended to avoid collecting unnecessary, enabling the realization of inventories of minor impact. Moreover, the formation of a reference collection of Acridoidea for the State of Rio Grande do Sul will provide subsidies for correct identification of the insects used in other studies.

INTRODUCED DISEASE MAY THREATEN NATIVE GRASSHOPPER DIVERSITY

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The microsporidium *Paranosema locustae*, a pathogen of the adipose tissue of grasshoppers isolated and developed in the USA as a long-term biocontrol agent, was introduced several times in Argentina. The disease caused by *P. locustae* is not acute. Rather, it debilitates the affected individual grasshopper, depleting it of vital energy for normal growth and

reproduction. Transmission is efficient. Infection occurs either by ingestion of spores or from parents to offspring. Since all grasshopper species inhabiting Argentina are indigenous and *P. locustae* is exotic, the introductions are clear cases of "New Association or Neoclassical" biological control. From an applied point of view, at least some of the introductions appear to have been successful because in areas where the pathogen became established serious grasshopper outbreaks have not been reported thereafter while outbreaks are recurrent outside of establishment areas. However, from the perspective of biodiversity conservation, the situation might be different. Although *P. locustae* affects almost exclusively species of Acridoidea, within this group the pathogen exhibits a wide host range. Since generalist pathogens may alter, through differences in host susceptibility, the structure of communities in which they were not previously present, *P. locustae* may disrupt grasshopper assemblages in new establishment areas, possibly causing declines and even extinctions of grasshoppers. Pathogens having multiple hosts may amplify their epizootics. Likewise, the absence of co-evolutionary history in newly-associated pathogen-hosts systems usually leads to a higher impact of the pathogen on hosts. The presentation will focus on the current status of *P. locustae* in establishment areas of Argentina, will identify grasshopper species at particularly high risk, and will discuss benefits and costs of the introductions.

POSTER

DISTRIBUTION AND ABUNDANCE OF GRASSHOPPER SPECIES (ORTHOPTERA: ACRIDOIDEA) IN THE SOUTHERN PAMPAS REGIONS

Distribución y abundancia de las especies de acridios (Orthoptera: Acridoidea) presentes en el sur de la región pampeana

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The distribution and abundance of grasshopper species were studied in the southern Pampas region (Laprida county) from samples taken over three seasons (2005-06 to 2007-08). The samplings were carried out from mid-spring to mid-autumn in the most common plant communities of the area. Sites were classified into four categories: native grasslands (greater coverage of native grasses), halophilous grasslands (more coverage of halophilous species), implanted pastures (mostly pastures of the genus *Agropyron*), and disturbed grassland (under grazing), each with three replicates, yielding a total of 12 sites. At each site the species composition was determined from 200 net sweeps. The distribution of species was determined taking into account two aspects. First, the number of sites at which a given species was recorded in relation to the total number of sites, and second, the relative abundance of the species over the total sampling times, for each plant community, and for all sites. The distribution and abundance of each species were characterized by generating two scales, each with five categories. The cumulative richness of grasshopper species was 22. Considering all sites/years (n= 241), three species were widely distributed (*Borellia bruneri*, *Dichroplus elongatus* and *Covasacris pallidinota*) Most species had a more restricted distribution (*Parorphula graminea, Cocytotettix argentina, Aleuas vitticolis, Tucayaca gracilis, Baeacris punctulatus, B. pseudopunctulatus, D. pratensis, Scotussa lemniscata, Leiotettix pulcher, Scyllinula variabilis, Staurorhectus longicornis, Amblytropidia australis, Orphulella punctata* and *Diponthus argentinus*), and five species had an intermediate distribution (*A. lineatus, D. conspersus, D. maculipennis, B. pallida* and *Sinipta dalmani*). Results of regression analysis performed between the abundance and number of sites occupied by each species was highly significant ($p < 0.0001$) in each of the plant communities and in all sites. The results suggested that the few species that were widely distributed were the most abundant.

THE MORPHOMETRIC CHARACTERISTICS OF *Cornops aquaticum* (BRUNER, 1906) (ORTHOPTERA: ACRIDIDAE) ASSOCIATED WITH *Eichhornia azurea* (SW) KUNT (PONTEDERIACEAE) IN THE PANTANAL OF POCONÉ, MATO GROSSO

Características morfométricas de *Cornops aquaticum* (Bruner, 1906) (Orthoptera: Acrididae) associado à *Eichhornia azurea* (Sw) Kunt (Pontederiaceae) no Pantanal de Poconé, Mato Grosso

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Insects possess morphometric variations associated with environmental conditions which may be the results of both phenotypical responses and genetic inheritance. Therefore, research that emphasizes the variability in body size of these organisms is of great importance for the understanding of the dynamics of ecological systems. *Cornops aquaticum* is a semi-aquatic grasshopper widely distributed throughout Latin America and it has demonstrated an intimate association with aquatic macrophyte species such as *Eichhornia* and *Pontederia*, and has been recommended as a biological control agent of these plants. The variation in its biological cycle and morphometric differences suggest the existence of both a geographical and host plant influence. This study aims to find out the morphometric characteristics of this species in the Poconé Pantanal (MT) using the "HICWA – Host-Insect Coevolution on Waterhyacinth" protocol as well as assessing possible differences at each development stage between the sexes and between the different seasonal periods. During 12 months, collections were made monthly of 50 grasshoppers totaling 600 in all, of which 261 were adults and 339 were nymphs. The measurements taken were; total length; body length; wing length and size of the rear femur. The results obtained provide the morphometric characteristics of this population with nymphs similar to the standards described in Uruguay and Argentina and indicate morphometric variations in individual adults. Although the multivariate analyses show significant differences in the size of males (Wilk's lambda = 0, 58, Pillai trace = 0, 48, F = 7,32, $p < 0.001$), and females (Wilk's lambda = 0, 58, Pillai trace = 0,47, F = 4,61, $p< 0.001$), these results are not sufficient to define a standard size for the individuals at any seasonal time period. It can be inferred that this population has adults of variable size in all the periods analysed.

CONSUMPTION AND FOOD PREFERENCE OF *Cornops aquaticum* (ORTHOPTERA: ACRIDIDAE: LEPTYSMINAE) IN NATIVE AREAS

Consumo y preferencia alimentaria de *Cornops aquaticum* (Orthoptera: Acrididae: Leptysminae) en áreas nativas

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The semi-aquatic grasshopper *Cornops aquaticum* BRUNER (Orthoptera: Acrididae) is native of South America and inhabits in the lowlands from southern Mexico to Central Argentina and Uruguay. It is host specific on Eichhornia crassipes, a worldwide important weed of water bodies. Since *C. aquaticum* is one of the most important herbivores in native floating meadows of *E. crassipes*, it is being considered as a potential biological control agent to be released in non-native ecosystems invaded by this macrophyte. Despite the promissory importance of this grasshopper, quantitative data of consumption and food preference are non-existent for native areas in Argentina. In order to provide information about feeding behaviour, the aims of this study were: 1) to evaluate the growth, consumption rates and efficiency of food conversion of *C. aquaticum* adults (both sexes) and 2) to estimate the feeding preference of this grasshopper, under controlled conditions. The tests were carried out with *C. aquaticum* populations from Santa Fe and Corrientes (Argentina). For objective 1), in each feeding trial, individuals were confined in cages and feeding rations were offered to the insects for 24 h. The feeding ration consisted of a fresh mature leaf of *E. crassipes*. Grasshoppers and leaves were weighed at the beginning of the experiment and at the end, including the remaining food. The weight difference between the initial ration and the remaining food was the food consumed during the test. For objective 2), feeding preference was assessment by multiple choice tests, using nymphs (V and VI) and adults (males and females). Native macrophytes (*Oxycaryum cubense, Salvinia biloba, Pistia stratiotes, Jaborosa integrifolia* and *Ludwigia peploides*) were used in choice tests with *E. crassipes* (the host plant) present or absent. Preference was estimated from the consumption plants. The plant most consumed was the plant most preferred. The average consumption per individual ranged from 0.060 g in males to 0.127 g plant/individual/day in females, being higher in the latter. The relative consumption per individual was similar in both sexes, ranged from 1.26 g in males to 1.46 g of ingested food/g of individual/day in females. The relative growth per individual ranged from 0.024 g in males to 0.071 of biomass gained/g of individual/day in females and the efficiency of ingested food conversion range from 0.030 g in males to 7.44 g in females. *Cornops aquaticum* nymphs and adult individuals, in both sexes, showed a high preference by *E. crassipes* (Kruskal Wallis Test, $p < 0. 05$). *Pistia stratiotes* was the plant preferred when *E. crassipes* was absent in the choice tests. This study contributes to basic information respect to *C. aquaticum* consumption and also demonstrates the specificity of nymphs and adults per *E. crassipes*, their host plant.

COMPARISON OF PROVENTRICULAR STRUCTURE AMONG ADULTS AND NYMPHS OF SIX CRICKET SPECIES (ORTHOPTERA: GRYLLOIDEA)

Comparação do proventrículo de adultos e ninfas de seis espécies de grilos (Orthoptera: Grylloidea)

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Crickets proventriculus present six longitudinal lobes with variable number of sclerotized transversal plates and has been adaptively associated with insect diet. Many studies have suggested the use of proventriculus morphology for taxonomy studies in different insect groups. This study evaluated if the proventriculus morphology can be used to distinguish adults and nymphs of six cricket species. Male and female proventriculus for adults and nymphs were species-specific; four of them, presented 12 transverse sclerotized plates or appendices, one presented 11 transverse sclerotized plates and one species presented 14 transverse plates, distributed along its longitudinal axis. Each transverse plate was dominated by one central tooth with small denticles and two projections with lateral teeth, which varied among the analyzed species, in number and size. The results indicated that morphology of the proventriculus can provide auxiliary characters for the taxonomy of adults and nymphs of Grylloidea. However, it must be associated with external morphology, because we did not find morphological pattern between species of the same genus and family.

REVISION OF THE NEOTROPICAL GENUS *Aegimia* Stål, 1874 (ORTHOPTERA, TETTIGONIIDAE, PHANEROPTERINAE)

Conhecimento taxonômico do gênero neotropical *Aegimia* Stål, 1874 (Orthoptera, Tettigoniidae, Phaneropterinae)

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Aegimia Stål, 1874 occurs from Gulf of Mexico to the state of Espírito Santo, Brazil and has three described valid species: *A. cultrifera* Stål, 1874 (Mexico), *A. elongata* Rehn, 1903 (Costa Rica, Panama and Colombia) and *A. catharinensis* Piza, 1950 (Brazil). The genus is characterized by the frontal fastigium produced dorso-anteriorly into a long, horn-like projection and strongly flattened medial and posterior femora and tibiae. Presently descriptions of *Aegimia* specimens are succinct and without any illustration, which makes difficult specimen's identification and description of new species. The aim of this work was redescribe all species in a standardized and detailed way, and the characterization of important taxonomic morphological structures to identify the specimens. Redescriptions are based on the holotype and additional specimens from Brazilian and International collections. 102 specimens were examined under a stereomicroscope with "camera lucida" and photomontage system. It was photographed and illustrated: (1) genitalia, including phallus and ejaculatory vesicle, (2) forewing, detailing the region of the stridulatory apparatus - stridulatory file's shape, tooth number and shape of the mirror, (3) median and posterior legs. Measurements were taken in order to obtain indexes to help differentiate species. Two new species were discovered and the *Aegimia*'s distribution was enlarged. This study increases the knowledge of the genus, expanding the geographical distribution and helping future systematic and environmental monitoring works.

COMPARATIVE MORPHOLOGY AMONG SPECIES OF *Xiphiola* BOLÍVAR, 1896 (ORTHOPTERA, ACRIDIDAE, OMMATOLAMPINAE, ABRACRINI)

Morfologia comparada entre as espécies de *Xiphiola* bolívar, 1896 (Orthoptera, Acrididae, Ommatolampinae, Abracrini)

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Xiphiola Bolivar, 1896 consists of two valid species with Neotropical distribution. The species of this genus have been poorly studied in relation the systematic and morphology, since from the original description of the genera was not mentioned by other authors on the basis of new citations always referencing the original publications. This work aimed to study the morphology of the main characters of the species of the genus, providing subsidies for their identifica-

tion through complete characterizations and illustrations, as well as serve as a basis for future research. For the study was taken into account the characteristics related to external morphology and genitalia of both sexes. We conducted a comparative morphological study of the species: *Xiphiola borellii* Giglio-Tos, 1900 and *Xiphiola cyanoptera* (Gerstaecker, 1888). These species show the distribution among the countries of Venezuela, Peru, Bolivia, Ecuador, French Guiana, Brazil and Paraguay. We examined specimens coming from the following: National Museum of Rio de Janeiro, Museum of Zoology, University of São Paulo, Museum Goeldi and the private collection of Alejo Mesa. Drawings were made of the various body parts that characterize the species. The genitalia were dissected and drawn with the aid of a microscope equipped with lucid camera. Also photographs of the head and pronotum were taken with digital camera connected to the stereomicroscope. The important characters in the recognition of the species were compared, among which the most relevant were those of external and internal genitalia. Several characters, not previously mentioned in the original descriptions of species have been observed here, such as the phallic complex stressing the importance of morphological studies. As a result of this study, new features were added to the genus, allowing differentiating it from others in Abracrini.

NEW BRAZILIAN SPECIES OF *Phoremia* DESUTTER-GRANDCOLAS, 1993 AND Zucchiella DE MELLO, 1990 (ORTHOPTERA: GRYLLOIDEA)

Novas espécies brasileiras para os gêneros *Phoremia* Desutter-Grandcolas, 1993 e Zucchiella de Mello, 1990 (Orthoptera: Grylloidea)

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The subfamily Nemobiinae has a worldwide distribution and present 51 valid genera, being 12 in South America. *Phoremia* Desutter-Grandcolas, 1993 has *P. tabulina* as type species, whose holotype was collected in the Peruvian Amazon, Loreto State. Subsequently Mesa et al. (1999) described two new species, *P. nigrofasciata* and *P. circumcincta*, with holotypes collected in the São Paulo State, Brazil, in Cerrado and Atlantic Forest, respectively. *Zucchiella* de Mello, 1990 is a monospecific genus (*Z. atlantica* type species); the holotype was collected in the Serra do Mar region of the Atlantic Forest in State of São Paulo, Brazil. In this work, we present two new species for *Phoremia* and one new species of *Zucchiella*, collected in several Atlantic Forest remnants, Minas Gerais state, Brazil. The small variation founded in the external morphology and genitalia of *Phoremia* species also occurs in species of *Zucchiella*. Thus we suggest that new studies should be made to establish other diagnostic characters, for example, sperm morphology that is less studied in the Orthoptera, but shows variation in suprageneric level and morphology of the proventriculus, which has proven useful for some groups of Orthoptera.

NEW SPECIES OF *Amanayara* DE MELLO & JACOMINI, 1994 (ORTHOPTERA: GRYLLOIDEA) FOR ATLANTIC FOREST, MINAS GERAIS, BRAZIL.

Novas espécies de *Amanayara* de Mello & Jacomini, 1994 (Orthoptera: Grylloidea) para a Mata Atlântica, Minas Gerais, Brasil

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Actually, there are 25 mil valid species of Orthoptera, divided in two subordens: Caelifera and Ensifera. Among Orthoptera that inhabiting in litter of Neotropical Forest, the subfamily Nemobiinae (Orthoptera: Grylloidea) present a most abundance. In the world are 293 species of this group, distributed in six tribes and 51 genera, being only seven species registered for Brazil (*Argizala* Walker, 1869; *Hemigryllus* Saussure, 1877; *Pteronemobius* Jacobson & Bianchi, 1904; *Hygronemobius* Hebard, 1915; *Zucchiella* de Mello, 1990; *Phoremia* Desutter-Grandcolas, 1993 e *Amanayara* de Mello & Jacomini, 1994). In Minas Gerais State, only three of seven genera (*Amanayara, Phoremia* and *Zucchiella*) had confirmed occurrence, but there aren't new species described. This work presents three new species of *Amanayara* (*A. ribasi, A. bernardesi* and *A. helenae*) collected in the Atlantic Forest remnants of *Minas gerais*, representing the first record of this genus for the State. So far, Amanayara has been shown as restricted to dense forest environments,

and wasn't found in open or disturbed areas. Its occurrence is limited to the Atlantic Forest, which suggests a possible endemism of the genus for this biome, strengthening the necessity of specific field work to knowledge of this group diversity.

NEW HOMOLOGY PROPOSAL FOR THE PHALLIC COMPLEX OF PROSCOPIIDAE (ORTHOPTERA, CAELIFERA, EUMASTACOIDEA) AND ACRIDOIDEA

Propostas de homologias primárias entre o complexo fálico dos Proscopiidae (Orthoptera, Caelifera, Eumastacoidea) com o dos Acridoidea

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The assignment of homologies between the phallic complex of proscopiids and the other acridomorphs is essential for morphological studies about the phyllogenetic relationships of the Caelifera. However, the genitalia of those grasshoppers is quite peculiar. Jago (1989, Eos 65: 249-307) presented an exclusive terminology for the proscopiids phallic complex which allowed it to be better understood and described at the taxonomic studies that followed him. Nevertheless, the author did not attempt to deduce the homologies between the phallic complex of Proscopiidae and acridoids. The proscopiids genitalia is unique among the acridomorphs because part of its endophallus is everted during the copula, such as the genitalia of Tetrigidae and some Ensifera. I believe that the difficulty in the definition of homologies between the male genitalia of proscopiids and acridoids originates from the drastic modification in the phallic complex during its evertion and I suggest that the phallic complex of the Acridoidea would correspond to that of the Proscopiidae in the everted, or semi-everted position. From the comparison of the phallic complex of proscopiids and ommexechids (which exhibit the simplest genitalia morphology among the Acridoidea) the following homologies are suggested: the proscopiids plate 4 corresponds to the sclerite of lateral lobe of the acridoids, and it can be easily verified when the genitalia is everted. The proscopiids phallotreme, as defined by Jago (op. cit.), is not homologous to that of the acridoids. Actually, their true phallotreme is located at the end of the proximal endophallic duct. The distal endophallic duct is equivalent to the acridoids ectophallic membrane (Kevan et al. 1968, Eos 44: 165-266), without the cingulum sclerites which are absent in the proscopiids. The acridoids aedeagal sclerites are also absent in the Proscopiidae, but they would be equivalent to sclerotized plates of the proximal endophallic duct. The proscopiids valvular sclerite (Bentos-Pereira 2003, J. Orthop. Res. 12: 159-171) is homologous to the acridoids gonopore process. The acridoids spermatophore sac corresponds to the most distal part of the proscopiids proximal endophallic duct and the ejaculatory sac is homologous to the ventrally expanded proximal portion of that same duct. Finally, the proscopiids plates 10, 5 and 4b have been lost in the acridoids.

***Taroba elephantina*: A NEW GENUS AND SPECIES OF CRICKET FROM THE IGUAÇU NATIONAL PARK, BRAZIL (ORTHOPTERA, GRYLLOIDEA, PODOSCIRTIDAE)**

***Taroba elephantina*: um novo gênero e espécie de grilo (Orthoptera, Grylloidea, Podoscirtidae) do Parque Nacional do Iguaçu-PR**

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Podoscirtidae comprises five subfamilies: Podoscirtinae, Hapithinae, Euscyrtinae, Pentacentrinae and Pteroplistinae. Of these, Podoscirtinae, Hapithinae and Pentacentrinae are present in the Americas. In Desutter's works (1987, 1988, 1990), Hapithinae earns two tribes: Hapithini and Neomorphini, this last created to place *Neomorpha*, a new genus erected from *Aphonomorphus cearensis* Rehn, 1917 and *A. novus* Rehn, 1917. Neomorphini is a South American endemic tribe and defined by the following characteristics: absence of stridulatory apparatus; five internal (sometimes six) and five external dorsal spurs on hind tibia; endophallic cavity dissymmetrical, irregularly-shaped; ectophallic invagination sclerified; rami circular. Is presented here a new genus and species of Neomorphini from Southern Brazil, comparing it with specimens of *Neomorpha*, the other genus of this tribe, collected at the Atlantic Forest of São Paulo State. The specimens of *Taroba elephantina*, n. gen. n. sp. were manually collected over bushes or trunks or captured by pitfall traps on trails of Iguaçu National Park. *Taroba* n. gen. differs from *Neomorpha* in the following characters: more robust body; tegmina and hind wings short, not passing the first abdominal tergite (in *Neomorpha* the wings

cover the entire abdomen); metanotal structures sclerotized; main lobe of pseudepiphallus with a pair of median, long, juxtaposed distal projections; ectophallic fold vertical; anterior extremity of each ramus juxtaposed, not fused. Type-species: *T. elephantina*. Main characteristics: Abdominal blackish on dorsum with a pair of broad longitudinal yellowish bands on the sides and another pair of blackish bands running along the ventral margins of each tergite; gena, frons, clypeus and base of mandibles yellowish; three ocelli present, lateral ones much larger than median; maxillary palps yellowish, the apical truncation nearly white; fore and median legs yellowish, the apex almost light brown; hind tibia brownish on dorsum and ventrally dark brown, bearing several strong spines before and between the dorsal spurs..

THREE NEW SPECIES OF *Amanayara* DE MELLO & JACOMINI, 1994 (ORTHOPTERA, TRIGONIDIIDAE, NEMOBIINAE, PTERONEMOBIINI) FROM THE BRAZILIAN ATLANTIC FOREST

Três novas espécies de *Amanayara* Mello & Jacomini, 1994, da Floresta Atlântica Paulista (Trigonidiidae, Nemobiinae, Pteronemobiini)

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The Pteronemibiini is composed of 12 genera distributed throughout the Pacific (Australia and Japan) and the Americas (from Canada to Argentina). The following genera occur in Brazil: *Argizala* Walker, 1869; *Pteronemobius* Jacobson & Bianchi, 1904, *Phoremia* Desutter-Grandcolas, 1993; *Amanayara* de Mello & Jacomini, 1994. So far, the genus *Amanayara* bears five species, two of which from forests of the Serra do Mar fault escarpment: *A. piuna* and *A. jacutinga* de Mello & Jacomini, 1994. Pereira et al. (2010) described the other three species from Atlantic Forest remnants in Minas Gerais state: *A. ribasi, A. bernardesi* and *A. helenae*. Three new species are now described from the Mantiqueira fault escarpment from the state of São Paulo. For the descriptions, specimens were examined and drawn under a stereomicroscope. Measurements were performed under a dissecting microscope with a graduated ocular and subsequently converted into millimeters. Phallic complex pieces terminology follows the proposal of Desutter (1990) with the modifications pointed out by that author in a later article (Desutter-Grandcolas, 2003).

A NEW CRICKET SPECIES (ORTHOPTERA, GRYLLOIDEA, ENEOPTERIDAE) FROM THE IGUAÇU NATIONAL PARK, BRAZIL

Uma nova espécie de grilo (Orthoptera, Grylloidea, Eneopteridae) do Parque Nacional do Iguaçu-PR

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Eneopteridae comprises two subfamilies: Eneopterinae and Tafaliscinae. Among the Tafaliscinae, four tribes are recognized: Paroecanthini, Diatrypini, Neometrypini and Tafaliscini. Tafaliscini is a monogeneric tribe, distinguished by the following characteristics: robust body; fifth joint of maxillary palp rounded in the apex; tegmina and hind wings well developed; loss of stridulatory apparatus and tegmina with strong longitudinal venation; tympanum absent and hind tibia with four internal and five external spines. *Tafalisca* contains 18 species widely distributed in Neotropical region, being found in Costa Rica, Guadalupe, West Amazonia, Guiana, Bahia State and Southeast of Brazil. Although is a widely distributed genus, most of descriptions do not point the type locality. Is presented here a new species of *Tafalisca* from the Iguaçu National Park, the southernmost distribution of this genus so far, providing a comparison with *T. paulista* Rehn, 1918, a species found in Sao Paulo State. The specimens of *Tafalisca* sp. n. were collected manually at night in trails of Iguaçu National Park over leaves and shrubs and were not observed on leaf litter. *Tafalisca* sp. n. differs *T. paulista* in the following characters: relatively smaller size; margins of pronotum lightly curved; shorter tegmina, reaching the half of abdomen (covering the entire abdomen in *T. paulista*); fore tibia with 5 spurs on inner face and 4 on outer (*T. paulista* presents five on both faces); membranous area of pseudepiphallus dorsum with almost straight post-lateral angles; pseudepiphallic parameres robust, like an ax.

CRICKET DIVERSITY RECOVERY ON ATLANTIC FOREST REMNANTS

Diversidade de grilos coletados em remanescentes de Floresta Atlântica

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In tropical ecosystems, large areas of primary forest were deforested, causing losses in biodiversity, furthered by remnant isolation, as well as environmental and human disturbance. The abandonment of human remnant use enables forest regeneration, allowing partial recovery of biodiversity. These processes generate a landscape of forest remnants with different regeneration times, which can be analysed as a chronosequence of ecological succession. Here we aimed to analyse the response of cricket species richness to forest regeneration time, and evaluate potential environmental drivers of this patterns. We used canopy cover and litter structure as environmental variables, and remnant area and isolation as covariables. We collected 1154 individuals belonging to five families and 19 species. Cricket species richness increased with time of regeneration, up to 130 years, when species richness stabilized. There was no correlation of cricket species richness with remnant area and isolation. Cricket species richness increased with canopy cover and litter depth, and canopy cover and litter depth increased with regeneration time. Our results suggest that forest regeneration, and the consequent increase in canopy cover and litter accumulation, may promote recovery of cricket biodiversity. The environmental drivers of this patterns may be related to habitat productivity. These drivers may be linked to maintaining a stable microclimate, especially conserving soil humidity. Humidity is important for metabolic functions and also to pre- and post-copulatory mechanisms. We conclude that the crickets species richness increases with forest regeneration, and the environmental drivers that determine this increase involve resource availability and environmental conditions. In addition, humidity may be the mechanism behind these variables.

Was cricket phenology selected by the flood pulse? †
A fenologia de grilos é selecionada pelo pulso de inundação?

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In Central Amazon, river levels vary annually, generating seasonally inundated biotopes (igapó and várzea). It is usually considered that the flood pulse selected adaptations for tolerance or escape of the terrestrial arthropod fauna living there. We analyzed the phenology of the cricket *Aclodes* sp. Nov. (Grylloidea: Phalangopsidae), that inhabits igapó litter. We mounted 28 pitfall traps, along different distances from the river, and emptied them each six to 15 days, along the forest emersion period. We tested if cricket phenology was synchronized to the flood pulse, allowing anticipation to inundation. We adjusted generalized additive and linear, as well as mixed effects, models. Emersion time, distance to river and an interaction term were explanatory variables, abundance was the response variable. If phenology was selected by flood pulse, we expected an interaction of time and distance. Variation in cricket abundance with time differed among female and male adults and nymphs. Female abundance decreased with time, in an almost linear shape (GAM, edf = 1.37; chisq = 14.36; P = 0.0003); males presented non-linear reduction (GAM, edf = 4.6; chisq = 6.70; P = 0.205); nymphs increased at the end of emersion time (GAM, edf= 3.77; Q = 11.46; P = 0.0184). There was an interaction of time with distance on adult female captures (GLM binomial corrected for underdispersion, F(1, 363)=5.23; P = 0.02) and on nymphs (F(1, 363) = 12.58; P = 0.0004), but not on adult males (F(1, 363) = 0.08; P = 0.77). Female captures decreased with time, but this reduction was softened buy distance to river. For nymphs, capture increased with time in the sites most distant to river, but this response was the opposite in those sites nearest to river. Male captures decreased with time (F(1,364) = 12.74; P = 0.0004) and increased with distance to river (F(1,364) = 42.22; P < 0.0001). Mixed effects models corroborated the results for nymphs (interaction, P = 0.01) and refuted the results for females (P=0.11) and for males (P = 0.84). The analyses that we performed allowed to detect effects of river distance on phenological responses, and are, to our knowledge, an original approach that enables testing adjustment of phenology to local environment.

† Dedicated to Prof. Dr. Joachim Adis, in memoriam

Taxonomic revision of the species of Tettigoniidae (Orthoptera, Ensifera) described by Salvador de Toledo Piza Jr. and availability of information and images of the type material in Orthoptera Species File Online
Revisão taxonômica das espécies de Tettigoniidae (Orthoptera) descritas por Salvador de Toledo Piza Jr. e disponibilização da informação e imagens

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The Brazilian entomologist Salvador de Toledo Piza described between 1950 and 1984 192 species of Tettigoniidae, 178 of them collected in Brazil, representing approximately a third of all species of this family described from the country. Piza published about 90% of his papers in the journal "Revista de Agricultura (Piracicaba)", and his descriptions look as if inspired by old European authors who worked on the same family: ambiguous Latin diagnoses without any figures. Over the years some species have been synonymized. All the descriptions are little detailed and do not present a careful study of the specimens, so that the diagnostic characters as well as the general appearance of the species remained dubious. A grant from the Orthoptera Species File (OSF) facilitated the revision of the type material deposited in the collection of the Escola Superior de Agricultura "Luiz de Queiroz". All tettigoniid specimens were photographed and the images made available in OSF. The corresponding bibliography was revised, corrected and completed in the database. A checklist was prepared, containing all valid and non-valid species names, along with type data, references, and localities. As a result of the revision several species were moved to different genera and two species to different subfamilies, 20 genera and 10 species were synonymized, and one species was resurrected from synonymy. Two instances, where Piza misplaced unique species into already existing genera, instead of creating new ones, provided the opportunity to name two new genera after him: *Toledopizia* gen. nov. (Conocephalinae: Copiphorini) and *Pizatettix* gen. nov. (Pseudophyllinae: Platyphyllini). A little reconciliation for synonymizing so many genus names of this, after all, pioneer in documenting the tettigoniid diversity of Brazil from within the country itself.

Highlighting New Species of Orthoptera!

***Pachytrachis tumidus* Ingrisch & Pavićević, 2010**
The genus *Pachytrachis* is distributed with five species over southeastern Europe, reaching the very south of Switzerland and Austria in the North and Greece and Ukraine in the South and East but does not occur in Anatolia. Two species are widespread throughout that range while three species, including the recently described *Pachytrachis tumidus* Ingrisch & Pavićević, 2010, are with certainty only known from restricted areas within the Dinaric Alps. The female is characterised by the downcurved ovipositor. Males of *Pachytrachis* have the cerci without internal tooth; in *P. tumidus* there is also no tooth but a small internal swelling where a tooth may be found in other genera as e.g. *Pholidoptera*. That makes the species also interesting on an evolutionary point of view.

***Poecilimon albolineatus* Ingrisch & Pavićević, 2010**
The genus *Poecilimon* contains contains many groups of similar looking species with vicariate distributions. Until recently, the species *Poecilimon elegans* (Brunner von Wattenwyl, 1878) was thought to occur from Istra along the Adriatic coast to Montenegro but was also reported from Macedonia and Bulgaria. Recent studies suggest that it is restricted to the area along the northern part of the Adriatic coast, while from the mountains of Montenegro the similar looking species *Poecilimon albolineatus* Ingrisch & Pavićević, 2010 was described. It clearly differs from *P. elegans* in the stridulatory file and stridulation but shows also slight differences in external morphology and coloration. Striking are the well expressed white lateral bands on pronotum and abdomen, after which the species was named.

***Poecilimon pseudornatus* Ingrisch & Pavićević, 2010**
The genus *Poecilimon* occurs with roughly 150 species in south-eastern Europe and western Asia. All species are colorful and short-winged. Due to the restricted mobility, most species occupy restricted ranges. The *P. ornatus*-group contains nearly 20 species and subspecies living on the Balkan peninsula. Most of them are similar in general appearance and a few are thought to be widespread in this area. However variation between populations exist and two or even three forms of the group may be found in the same locality making it likely that they belong to different species. *Poecilimon pseudornatus* Ingrisch & Pavićević, 2010 described from Montenegro and southwestern Serbia differs from P. *ornatus* (Schmidt, 1850) from the southern Alps (type locality) by differences in the stridulatory file and stridulation.

Reference:
Ingrisch, S. & Pavićević, D. 2010. Seven new Tettigoniidae (Orthoptera) and a new Blattellidae (Blattodea) from the Durmitor area of Montenegro with notes on previously known taxa. – Zootaxa 2565: 1–41.

Editorial

I wish you the best in the year 2011. This is my second year as the Editor of Metaleptea and I am so thankful to our members who have contibuted intersting articles and photographs for this issue. I also thank my associate editor Sam Heads who always provides excellent editorial support in a timely manner.

In this issue, Metaleptea features the abstracts from the recent Orthoptera Symposium in Brazil. Our newsletter is an excellent outlet for publishing meeting proceedings and I hope that our members can keep this in mind as new meetings take place in the future. Also new in this issue is a section to highlight the discovery of new species of Orthoptera. New species are described all the time, but there may not be a good outlet for sharing this exciting discovery. If you have a nice photograph and some remarks on natural history of the new species, Metaleptea can definitely make your species shine!

As always, please send me new collecting techniques, distribution maps, new ideas and controversies, travel logs, personal reflections, stories about famous orthopterists, short stories and poems, or anything related to Orthoptera.

To be published in Metaleptea, please send me articles/photographs at song@mail.ucf.edu with a subject line starting with [Metaleptea]. MS Word document is preferred and images should be in JPEG or TIFF format with a resolution of at least 144 DPI. Please do not embed images into a word document, but send me as separate files. The next issue of Metaleptea will be in May 2011 and please send me the articles promptly. Also, please do not hesitate to send me feedback regarding Metaleptea. I look forward to hearing from you soon.

Hojun Song
Editor

Officers of the Orthopterists' Society