

REMOTE SENSING APPLICATIONS TO GRASSHOPPER MONITORING IN ARGENTINA

Report to “Global Perspectives,” College of Agriculture and Natural Resources

**by Alex Latchininsky, Associate Professor
Dept. of Ecosystem Science and Management**



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Award Period (e.g. Spring 2012): Fall 2011

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Project Title from Application:

Amount spent: \$4,000

SUMMARY

Alex Latchininsky made a trip to Argentina in February 2012 to study the habitats of two pest grasshopper species (*Dichroplus maculipennis* and *D. elongatus*) in Argentinean grasslands (pampas). A five-day field trip to three grasshopper-affected counties in Buenos Aires province was undertaken with colleagues from the National University of La Plata (UNLP). In total, 264 land cover points were taken with a GPS receiver to access earth surface features in grasshopper habitats. The next step, performed at UW, will be the classification of satellite images procured for the study region. To that end, discussions with specialists from the National Commission of Space Activities (CONAE) took place. Alex Latchininsky made two seminar presentations, one at Center of Parasitological and Vector Studies (CEPAVE): "*Remote Sensing and Locusts: the Space Technology vs. the Ancient Enemy of Agriculturists,*" another at the Museum of Natural History, University of La Plata: "*Peril in a Tropical Paradise: Grasshopper invasion impacts biodiversity on a tiny NW Hawaiian island.*" The total attendance was over 50 people. Future plans include: 1) production of "*Field Guide to Pest Grasshoppers of Argentina,*" 2) collaboration on NSF grant program "*Partnerships in International Research and Education*" (application deadline May 15, 2012), 3) development of a graduate level course on international range management based on project findings, and 3) collaboration on manuscripts for peer-reviewed journals on applications of spatial tools to comparative grasshopper ecology and distribution in Argentinean pampas and Northern Great Plains (Wyoming). Methods developed for Argentina will be applicable to Wyoming grasshoppers allowing to better predict their spatial distribution and population dynamics, in order to prevent rangeland damage from their outbreaks.

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Funds awarded: \$4,000 from Global Perspectives and
\$2,000 from UW Faculty International Travel Program.

Project Objectives. To develop efficient, predictive grasshopper risk assessment algorithm based on remotely-sensed and geospatial data coupled with ground observations. Geographically, this will be done in the Pampas region of Argentina by an international, synergistic and multi-disciplinary team of scientists led by UW entomologists.

Results.

A trip to Argentina in February 2012 was undertaken to study the habitats of two pest grasshopper species (*Dichroplus maculipennis* and *D. elongatus*) in Argentinean grasslands (pampas) in Buenos Aires province (Figure 1). In the course of a five-day field trip with colleagues from the National University of La Plata (UNLP) M.M. Cigliano, C. Bardi and Y. Mariottini, 264 land cover points were taken with a GPS receiver to access earth surface features in grasshopper habitats in Laprida, Benito Suarez and Tandil counties. Detailed information was collected on:

- (1) habitat distribution of the target grasshoppers;
- (2) vegetative aspect and composition of grasshopper habitats;
- (3) production agriculture in Buenos Aires province, with emphasis on livestock;
- (4) historical grasshopper damage in the region and factors contributing to pest outbreaks.

During discussions with a specialist from the National Commission of Space Activities (CONAE) Dr. S. Torrusio, the potential sources of satellite images were identified for the study region. After procurement of the images, their classification will be performed at UW using the land cover points collected in the field.

Seminar presentations made by Alex Latchininsky (total attendance over 50 people):

- (1) “*Remote Sensing and Locusts: the Space Technology vs. the Ancient Enemy of Agriculturists,*” February 13, 2012 at Center of Parasitological and Vector Studies (CEPAVE);
- (2): “*Peril in a Tropical Paradise: Grasshopper invasion impacts biodiversity on a tiny NW Hawaiian island,*” February 15, 2012, at the Museum of Natural History, University of La Plata.

Future plans:

- (1) production of “*Field Guide to Pest Grasshoppers of Argentina.*” This pocket-size publication is modeled after the similar “*Field Guide to Pest Wyoming Grasshoppers*” published by the University of Wyoming Extension (B-1161, 5th edition 2012). It will be developed jointly by UW and Argentinean entomologists and published at UW in Spanish with an acknowledgement of

“Global Perspectives” support. Work on the Guide already started (see figures 2-3, courtesy of Tana Stith, UW-Extension);

(2) collaboration on National Science Foundation program “*Partnerships in International Research and Education*.” Application for a \$4.3 million grant has been submitted to NSF-PIRE on May 15, 2012, with Argentinean colleagues as foreign collaborators (see the project summary attached). If funded, this grant will allow to develop sustainable and mutually beneficial research and education collaboration between UW and National University of La Plata. In particular, numerous joint activities for undergraduate and graduate students are planned in the framework of the NSF-PIRE project;

(3) collaboration on manuscripts for peer-reviewed journals on applications of spatial tools to comparative grasshopper ecology and distribution in Argentinean pampas and Northern Great Plains (Wyoming). Targeted journal: *Journal of Orthoptera Research*;

(4) the project findings will be used in developing a graduate-level class “Issues in International Range Management;”

(5) results of the current project will be reported at the 11th International Congress of Orthopterology in Kunming, China in August 2013.

Potential impacts to the College of Agriculture and Natural Resources:

A strong collaboration developed between UW entomologists and geospatial scientists and their colleagues at the University of La Plata will allow to jointly address problems of rangeland pest management in both countries. Geospatial methods applied to grasshopper ecology represent a cutting edge strategy of pest monitoring and forecasting. The project contributes to the College’s internationalization by providing great research and educational opportunities for both, U.S. and Argentinean faculty, graduate and undergraduate students.

Potential impacts to the University of Wyoming:

(1) the current project makes an important contribution to the Internationalization of both, the College of ANR and the University of Wyoming, outlined as one of the main priorities in the strategic Academic plans;

(2) the project contributes to the international leadership of the University of Wyoming in the domain of locust and grasshopper applied ecology and management.

Potential impacts to the State of Wyoming:

Argentinean pampas and Northern Great Plains rangelands are very similar in their landscape features. Because of that, the grasshopper risk assessment methods using satellite images developed for Argentina will be applicable to Wyoming grasshoppers allowing to better predict their spatial distribution and population dynamics, in order to prevent rangeland damage from their outbreaks.

Acknowledgements

Principal Investigator Alex Latchininsky gratefully acknowledges the financial support from “Global Perspectives” program and UW Faculty International Travel program, which made this exciting project happen.

Figures

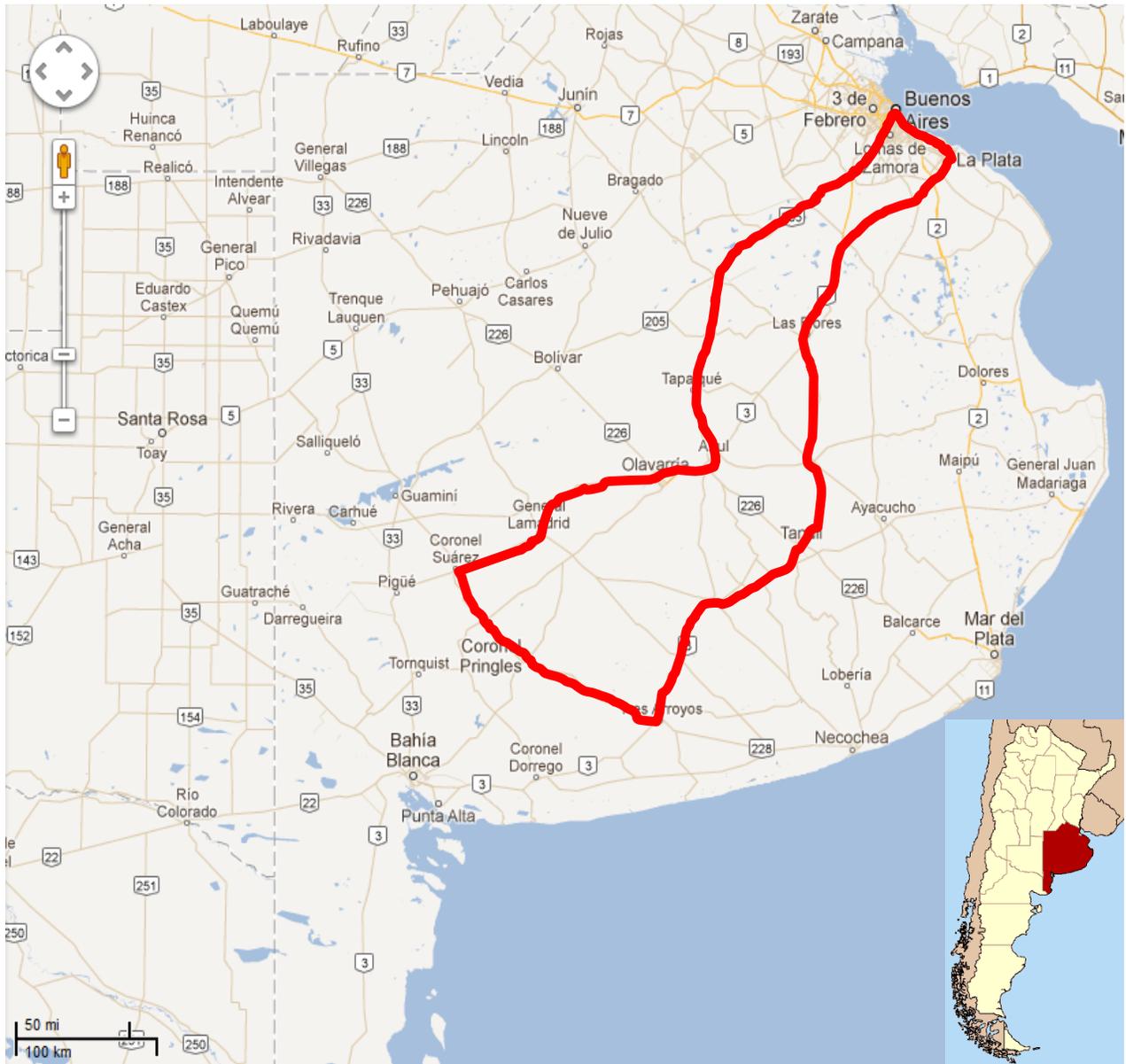


Figure 1. Map of Buenos Aires province, Argentina, with an outline of field trip itinerary by Alex Latchininsky and colleagues from the University of La Plata in February 2012.



***Dichroplus maculipennis* o tucura de alas manchadas.**

Tamaño. Macho: 19 a 29 mm, hembra: 23 a 35 mm. Presenta gran variación de tamaño en relación a su distribución geográfica. Los ejemplares de la Patagonia suelen ser de menor tamaño que los de la región Pampeana.

Diagnóstico del adulto. Coloración general variable, de castaño amarillenta a verdosa (menos frecuente) con manchas pardas en el campo lateral de las tegminas. Cabeza con banda postocular castaño oscura que se continúa en la mitad superior de los lóbulos laterales del pronoto. Disco del pronoto castaño oscuro limitado por dos bandas claras que se unen en el margen posterior. Fémur posterior con dos bandas transversas oscuras y una mancha basal castaño oscura en el área superior; cara interna naranja, área ventral amarilla. Tibias posteriores verde-amarillento. Cabeza más ancha que el margen anterior del pronoto. Pronoto con los bordes laterales subparalelos en la prozona y ampliamente expandidos en la metazona; metazona elevada con respecto a prozona; borde posterior del pronoto en ángulo agudo. Tegminas superando ampliamente los fémures posteriores. Cercos del macho cortos de base robusta, curvados hacia adentro, con el ápice redondeado.



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Figure 2. Sample pages from proposed “Field Guide to Pest Grasshoppers of Argentina.” Adult *Dichroplus maculipennis* grasshopper and its description.



Biología y ecología. Especie con diapausa embrionaria obligatoria. Los sitios preferidos para la oviposición son los suelos de campos bajos y compactos con cobertura vegetal relativamente escasa. En lugares favorables se han encontrado hasta 500 posturas/m² y en situaciones extraordinarias hasta 4000. Suelen colocar más de cinco posturas con 20 a 40 huevos cada una. El número de estadios ninfales es cinco o seis. En situaciones de baja densidad, los adultos tienden a ser sedentarios mientras que en años de explosión poblacional suelen desplazarse a lo largo de considerables distancias (hasta 40 km), invadiendo zonas de cultivo. Se conocen disminuciones de longevidad y fecundidad en individuos de poblaciones de alta densidad en relación con ejemplares de las mismas poblaciones pero de baja densidad. Suele ser abundante en los valles fértiles del Oeste de la Patagonia y en el Sur de la región Pampeana.

Hábito alimentario. Polífaga, siendo los pastos y las leguminosas sus plantas preferidas.

Perjuicio económico. Una de las tucuras más perjudiciales para el agro en el país, particularmente en zonas de las regiones Pampeana y Patagónica.

Especies similares. Similar a *Dichroplus pratensis*, de la cual se distingue por el pronoto ensanchado hacia atrás y en forma de silla de montar; la carena mediana longitudinal apenas indicada en metazona.

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Figure 3. Sample pages from proposed "Field Guide to Pest Grasshoppers of Argentina." Nymphs of *Dichroplus maculipennis* grasshopper and description of the species bio-ecology.



Figure 4. Cathedral of La Plata.



Figure 5. Argentinean pampas landscape.



Figure 6. Argentinean livestock.



Figure 7. Argentinean cowboy – gaucho.



Figure 8. Thistles.



Figure 9. Katydid (*Tettigoniidae* spp.)



Figure 10. Katydid (*Tettigoniidae* spp.).



Figure 11. Grasshopper *Dichroplus maculipennis*, one of the most important economic pest species in Argentina.



Figure 12. Grasshopper with ectoparasitic red mites.



Figure 13. Grasshopper from Proscopiidae family.



Figure 14. Argentinean collaborators – Yannina Mariottini, Maria Marta Cigliano, Christian Bardi



Figure 15. Presentation of Alex Latchininsky in La Plata Museum of Natural History.