

Exploration and testing of natural enemies of cogongrass

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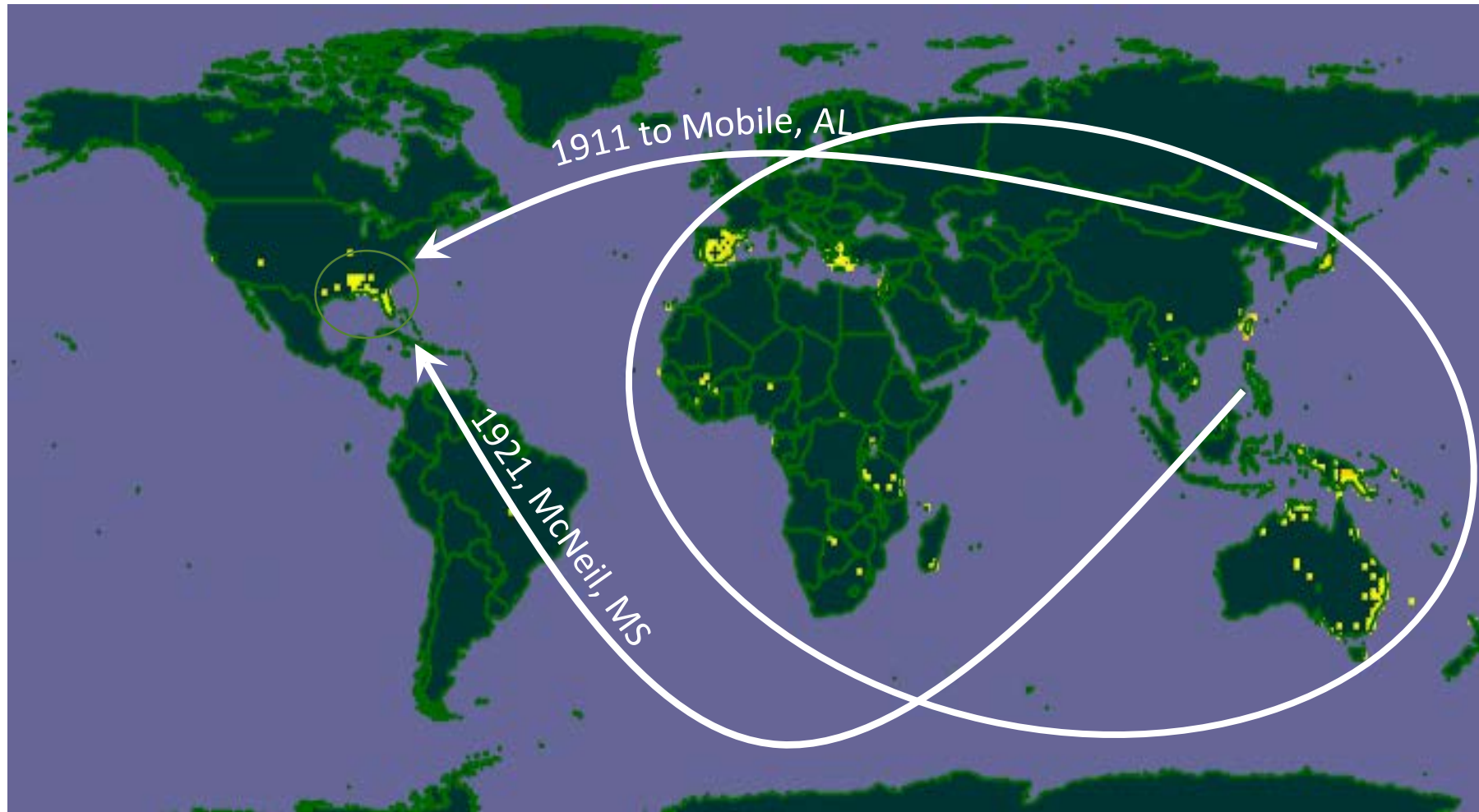
Objectives

- Identify natural enemies of cogongrass in its native range.
- Establish laboratory colonies of selected insect herbivores.
- Describe the biologies of laboratory colonized insect herbivores.
- Initiate host range testing of laboratory colonized insects.

Outline

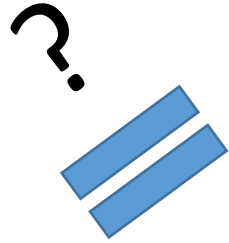
- **Background on cogongrass**
- **Areas to explore**
- **African stemborers**
- **Asian insects**
- **What's next**

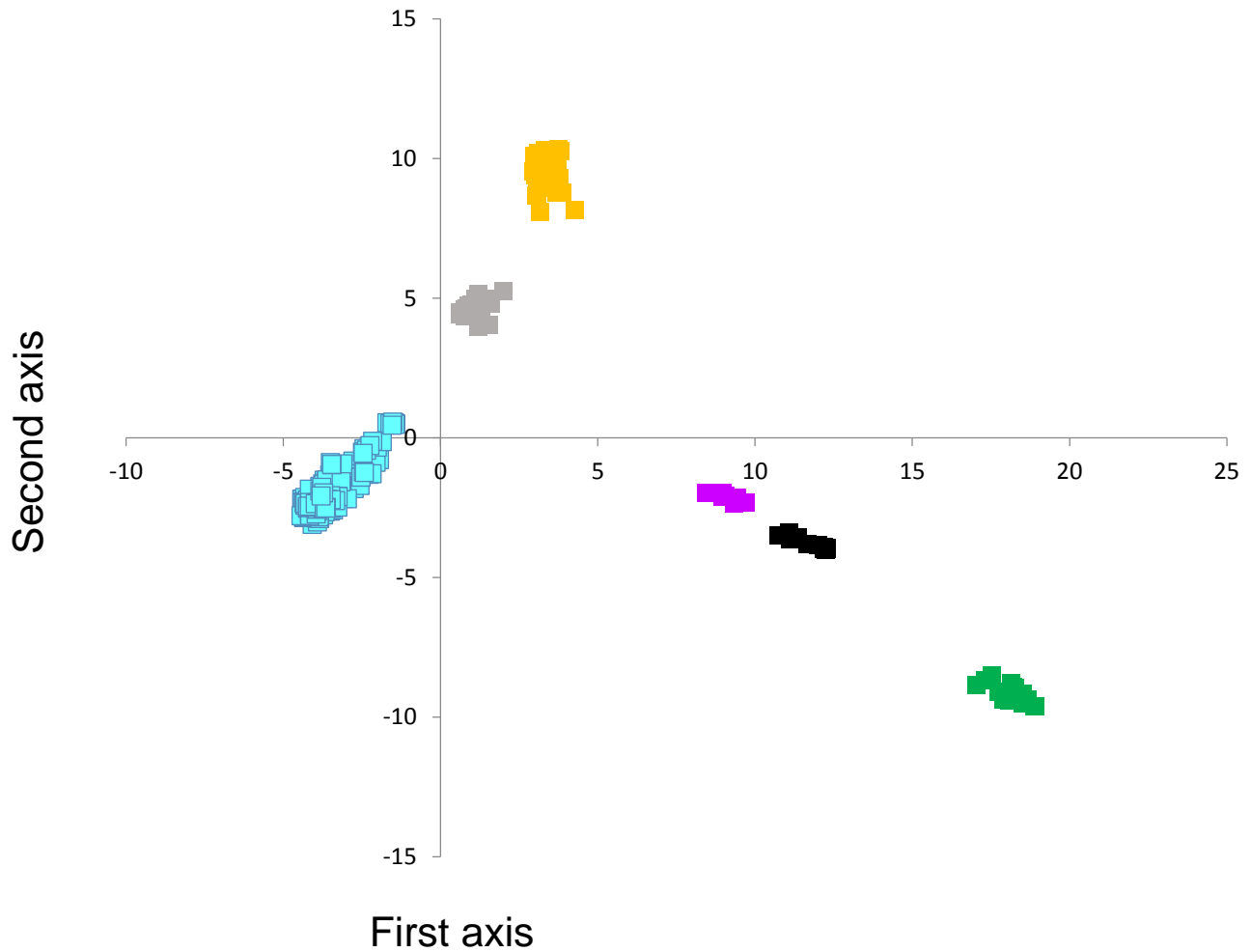
Distribution of *Imperata cylindrica*



Source: Global Biodiversity Information Facility (gbif.org)

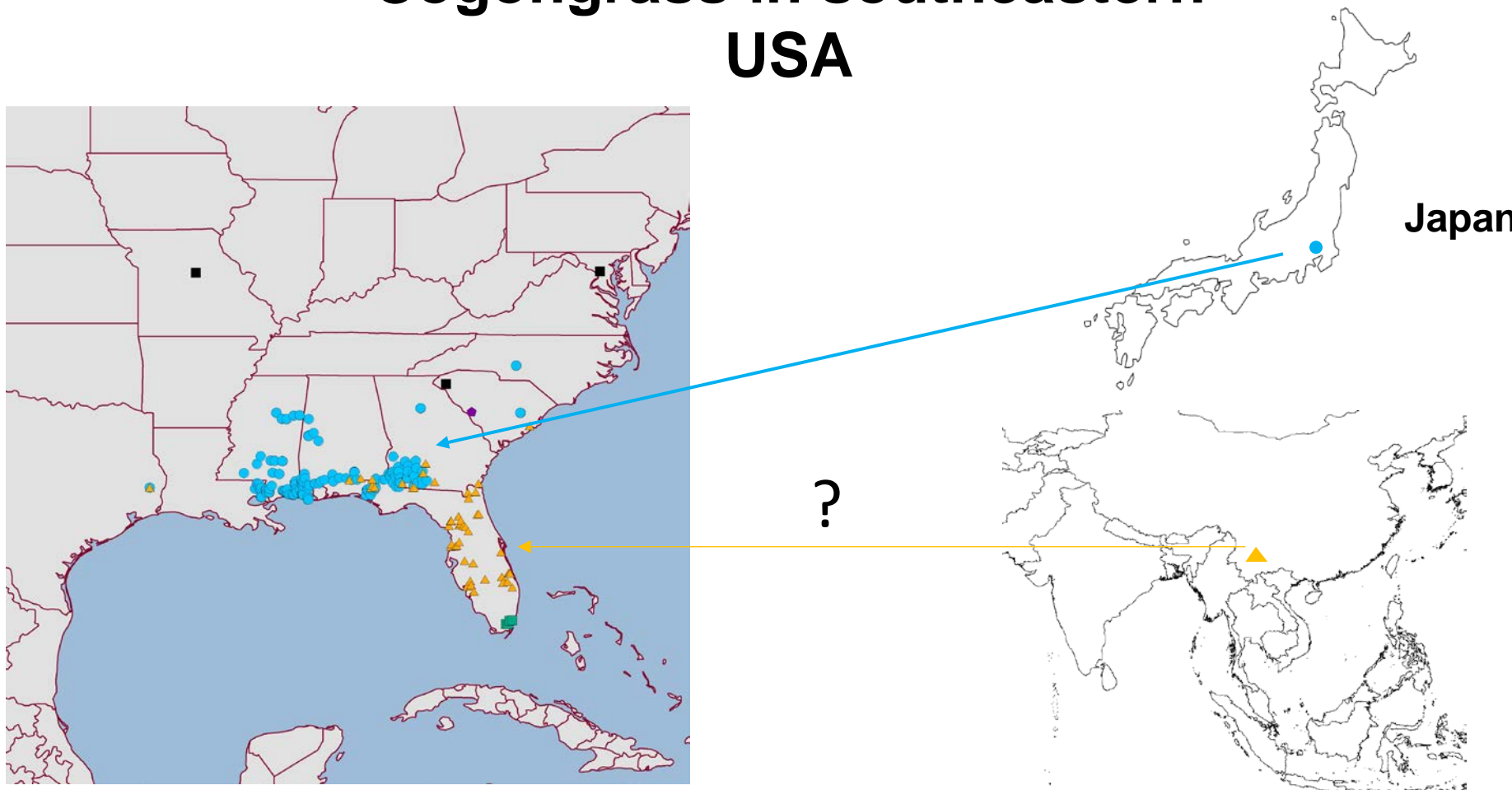
Imperata species in the USA





Burrell, M., A. E. Pepper, G. Hodnett, J. A. Goolsby, W. A. Overholt, A. E. Racelis, R. Diaz and P. E. Klein. 2015. Exploring origins, invasion history and genetic diversity of *Imperata cylindrica* (L.) P. Beauv. (Cogongrass) in the United States using genotyping by sequencing. (accepted).

Cogongrass in southeastern USA



Related Andropogoneae in southeastern USA

<i>Polytris amaura</i>	Javanese grass	Exotic
<i>Microstegium vimineum</i>	Napalese browntop	Exotic/invasive in some areas
<i>Miscanthus sinensis</i>	Zebragrass	Exotic/invasive in some areas
<i>Sorghum bicolor</i>	Cultivated sorghum	Exotic
<i>Sorghum halapense</i>	Johnson grass	Exotic, weed
<i>Imperata brasiliensis</i>	Brazilian satintail	Native/exotic?
<i>Saccharum</i>		
<i>alopecuroides</i>	Silver plumegrass	Native
<i>baldwinii</i>	Narrow plumegrass	Native
<i>brevibarbe</i>	Bentawn plumegrass	Native
<i>coarctatum</i>	Sugarcane plumegrass	Native
<i>giganteum</i>	Sugarcane plumegrass	Native
<i>ravennae</i>	Ravennagrass	Exotic
<i>officinarum</i>	Sugarcane	Exotic

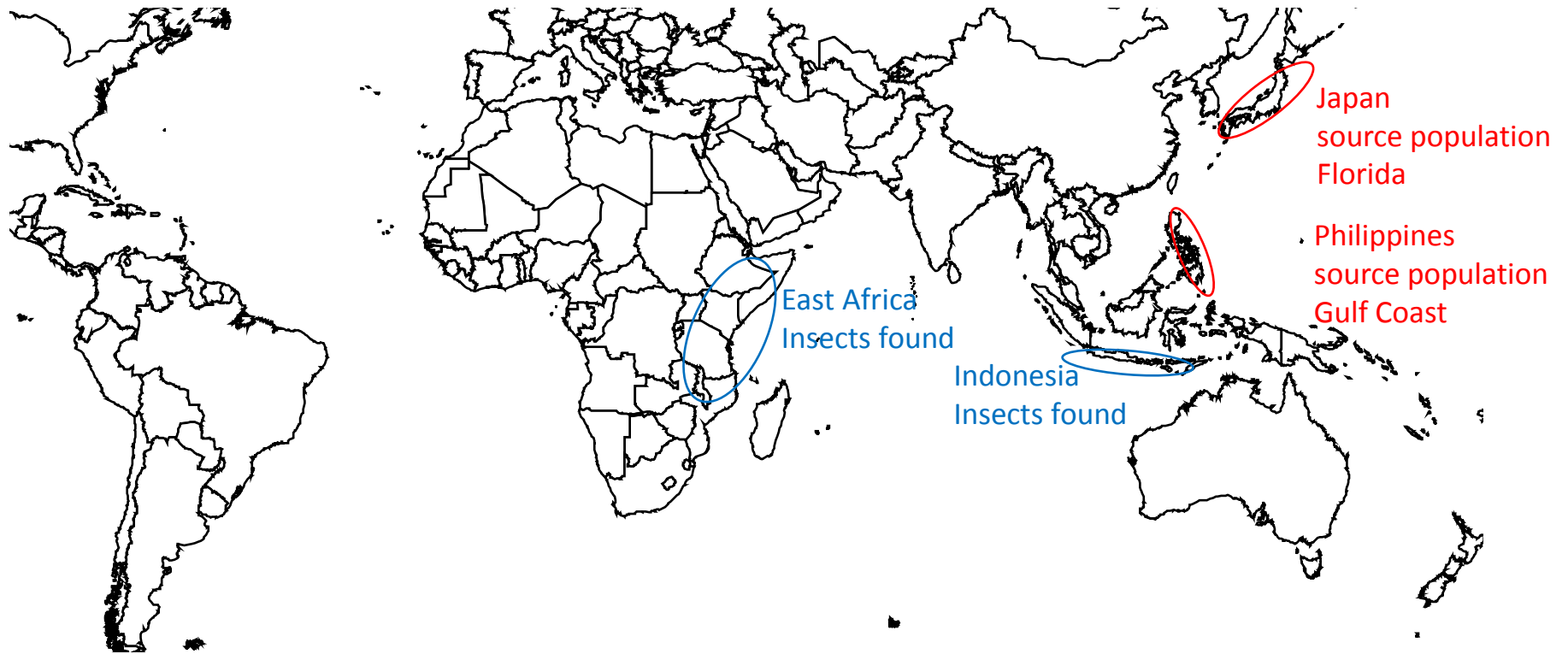
Grasses as biological control targets

- Often thought to have few specialized herbivores due to:
 - Simple architecture
 - Scarcity of secondary metabolites
 - Feeding deterrents (e.g. silica)
- Fear of non-target effects to crop grasses
 - 50% of human caloric intake from cereals

But, grasses may be better targets than we think

Grass	Insect	Reference
<i>Arundo donax</i>	<i>Tetramesa romana</i> (Eurytomidae)	Goolsby and Moran, 2009
	<i>Rhizaspidiotus donacis</i> (Diaspididae)	Goolsby et al. 2009
<i>Spartina alterniflora</i>	<i>Prokelisia martinata</i> (Delphacidae)	Grevstad et al. 2003
<i>Phragmites australis</i>	66 monophagous species outside of North America	Tewksbury et al. 2002
<i>Hymenachne amplexicaulis</i>	<i>Ischnodemus variegatus</i> (Blissidae)	Diaz et al. 2010

Where to look for natural enemies?



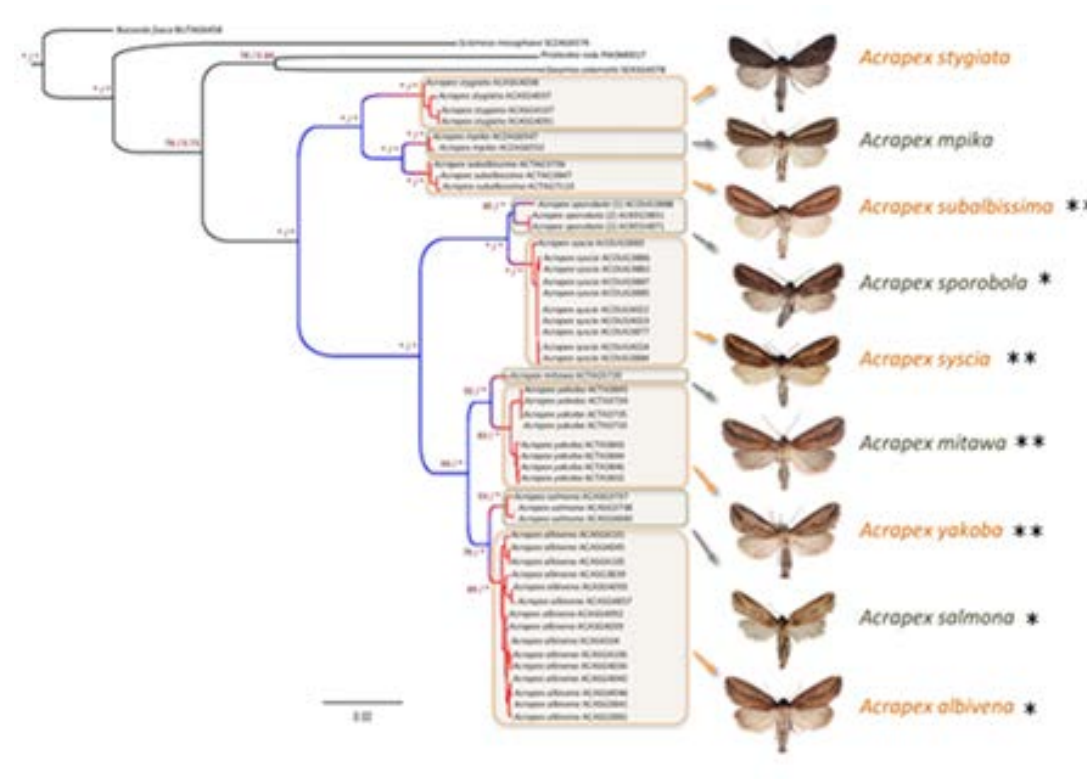
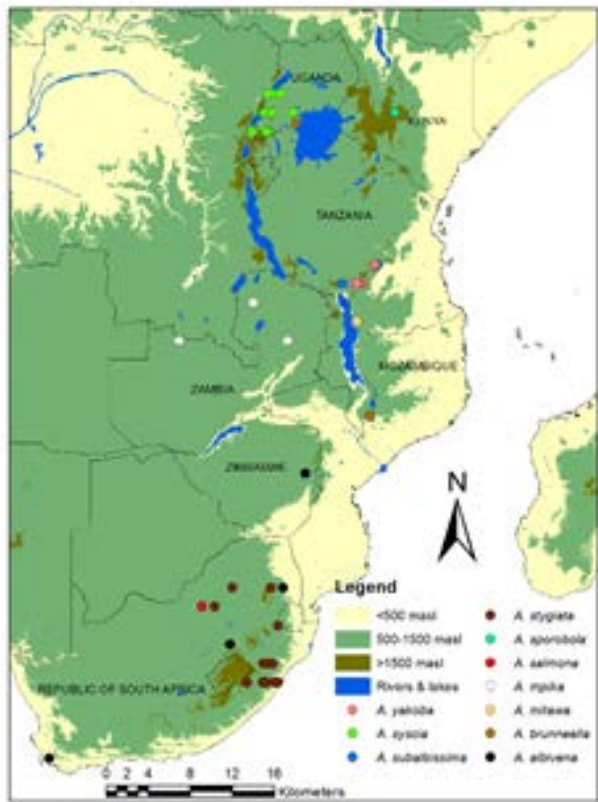
International Center of Insect Physiology and Ecology Nairobi, Kenya



Biodiversity of lepidopteran stemborers of African grasses



Acrapex spp., a noctuid genus associated with *Imperata cylindrica* and related species in East and southern Africa

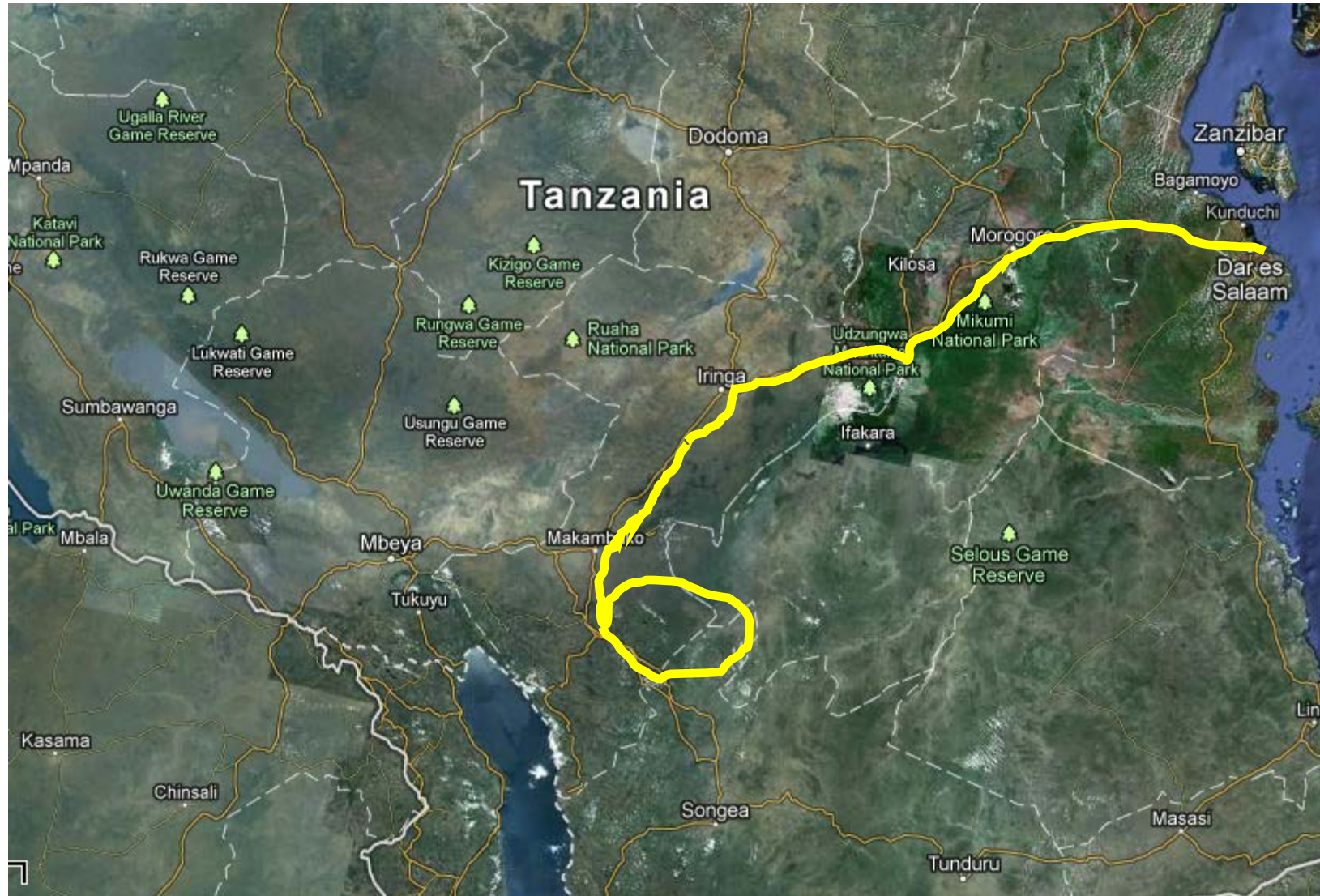


** found only on cogongrass

* found on cogongrass and one other species

Le Ru, B. P., C. Capdevielle-Dulac, E. F.A. Toussaint, D. Conlong, J. Van den Berg, B. Pallangyo, G. Ong'amo, R. Molo, W. Overholt, J. Cuda and G. J. Kergoat. 2014. Molecular phylogenetics and Systematics of *Acrapex* stem borers (Lepidoptera, Noctuidae, Apameini). *Invertebrate Systematics* (accepted May, 2013).

Tanzania – Feb 2013



Acrapex yakoba



Kenya and Uganda, May 2014



Acrapex syscia



Philippines



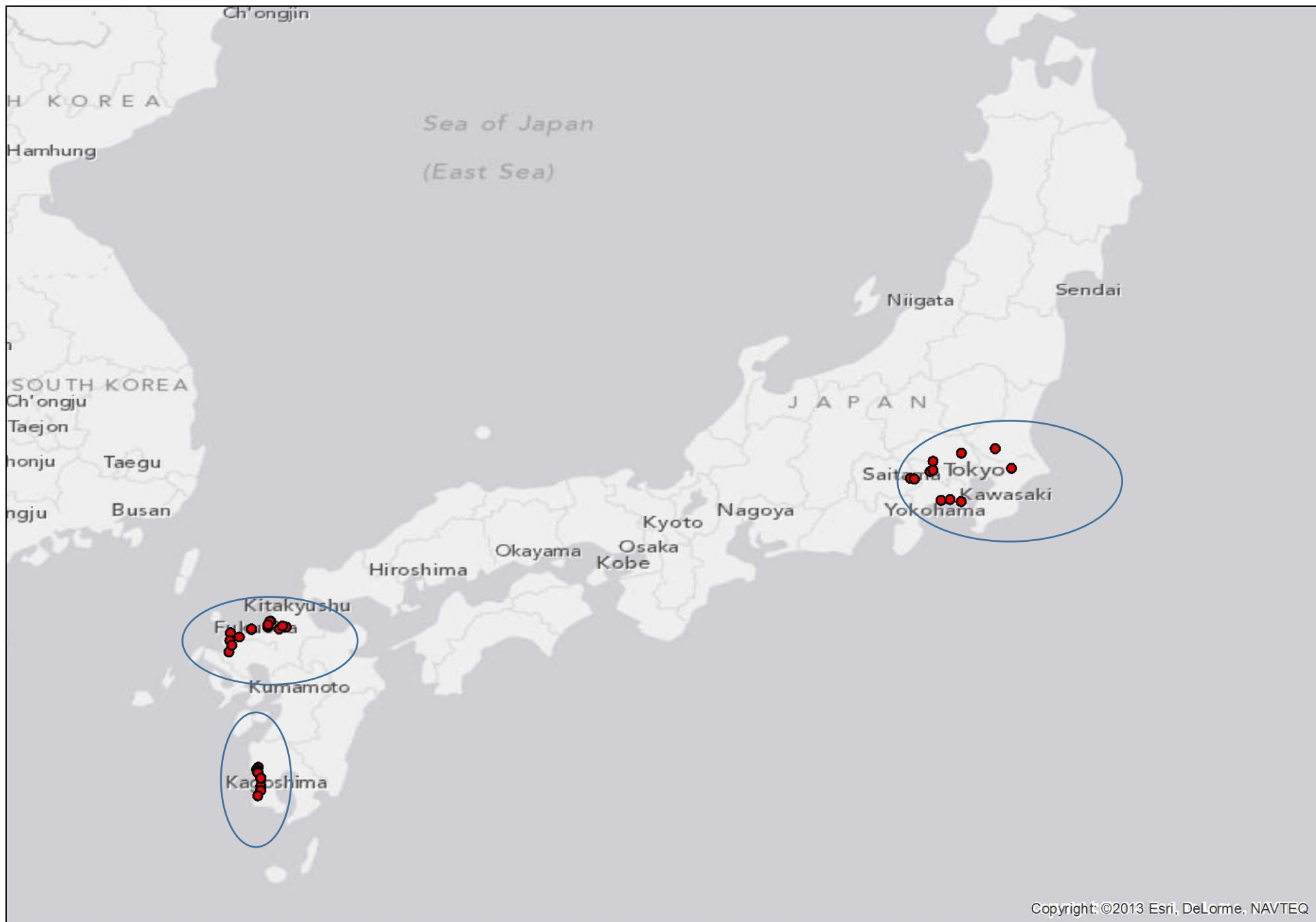


Atherigona orientalis



Pyralid stemborer





Kyushu University



Contarinia sp.



Acrapex azumai Sugi



- Before we found *A. azumai* in cogongrass, the host plant was unknown
- Therefore, unlikely to attack sugarcane or major cereals

K. Takasu, Y. Yoshiyasu, A. M. Burrell, P.E. Klein, A. Racelis, J. A. Goosby and W. A. Overholt. 2014. First host record for *Acrapex azumai* Sugi (Lepidoptera: Noctuidae). Lepidoptera Science (submitted)

Another borer, not yet identified



Indonesia

- Collaboration established with Bogor Agricultural University
- Trip planned for May 2015 at collect *Orseolia javanica* and survey for other insects

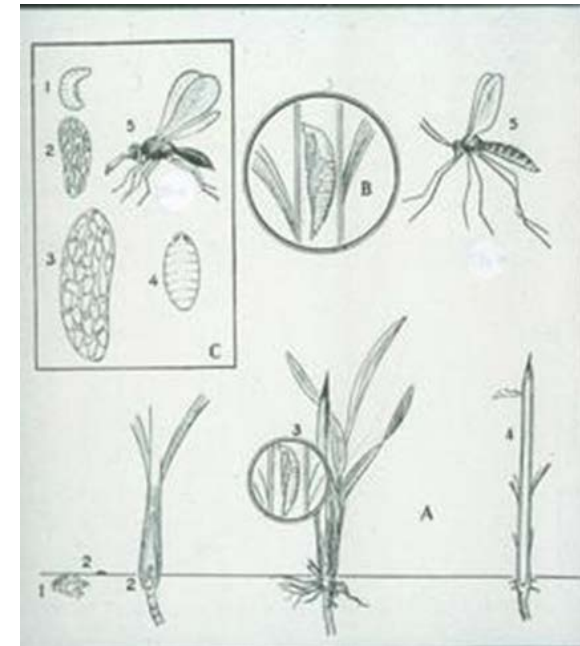
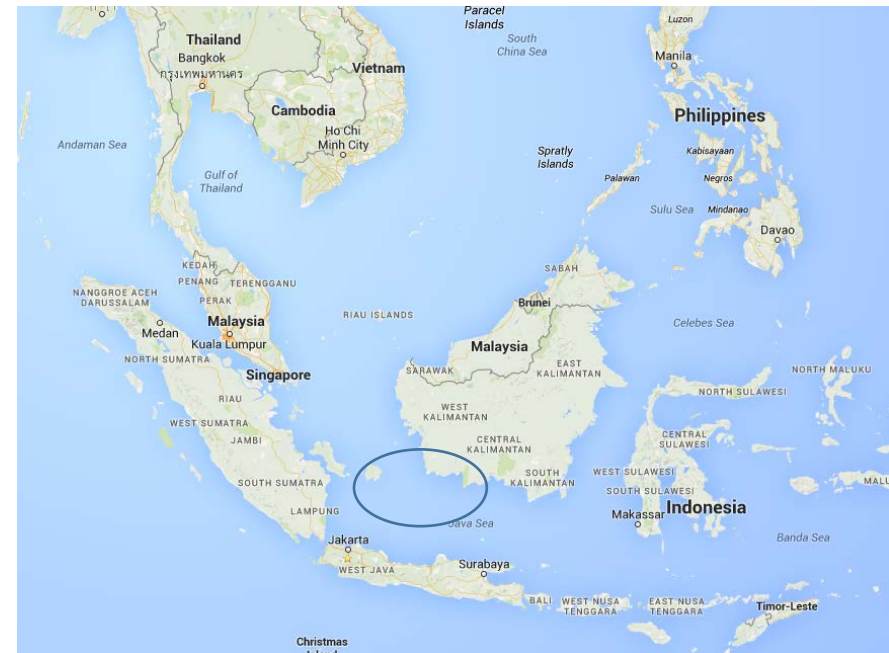


Photo credit: Ragil Irianto, Ministry of Forestry, Bogor, Indonesia



Photo credits: Ragil Irianto, Ministry of Forestry, Bogor, Indonesia

Summary

- Insect herbivores of cogongrass found in Asia and Africa
- Lepidopteran stemborers and gall midges may be particularly damaging
- No success in establishing laboratory colonies of three *Acrapex* spp.
- Collaborators in Japan and Kenya will continue to work on colonization of *Acrapex* spp.
- My lab will focus on collection and laboratory colonization of *Orseolia javanica*

QUESTIONS ?

