Prospects for biological control of cogongrass

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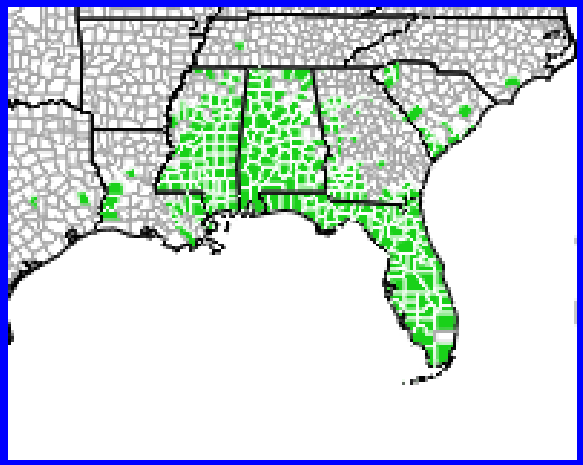
Outline

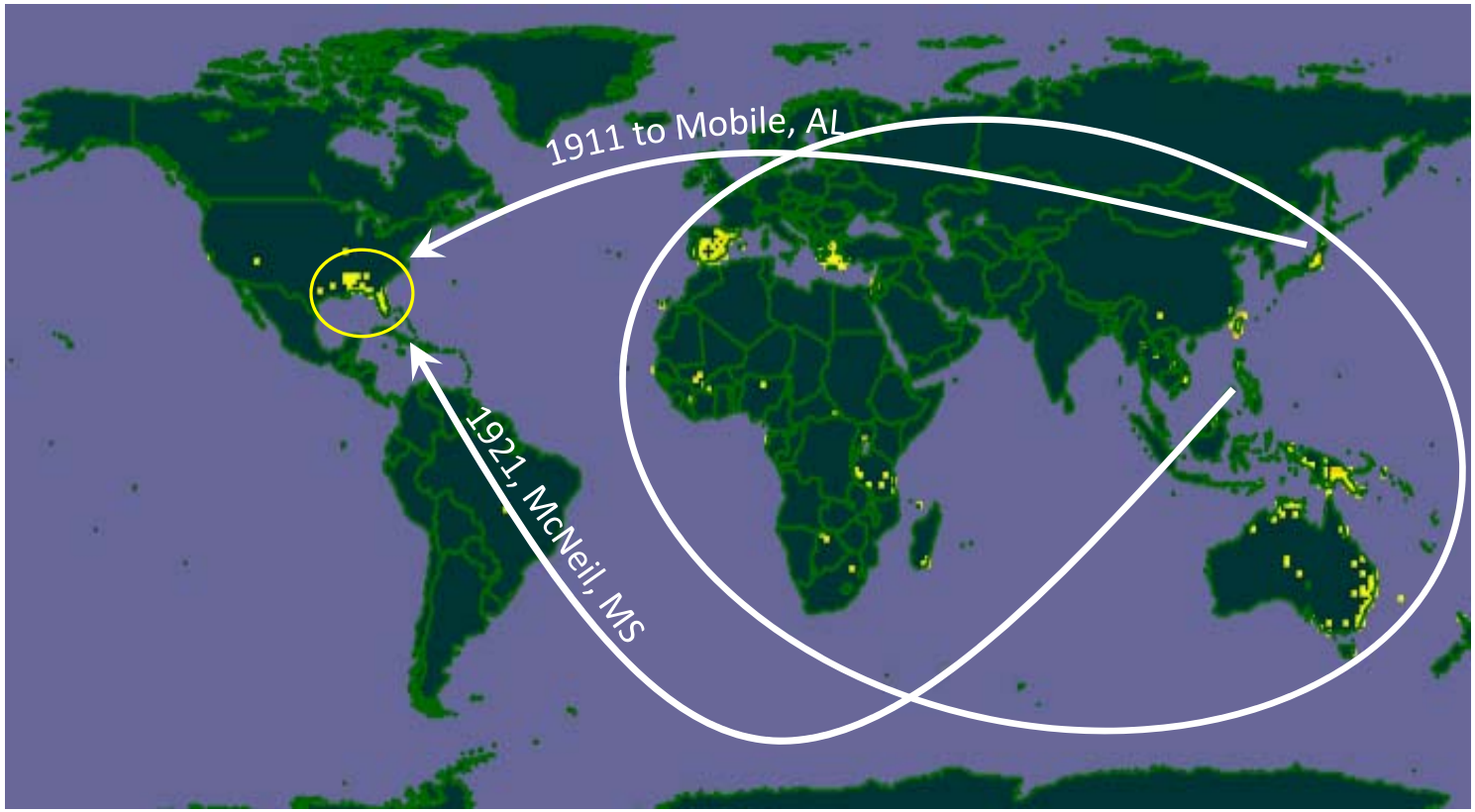
- **Background on cogongrass**
- **Areas to explore**
- **African stemborers**
- **Asian insects**
- **What's next**

Cogongrass

- Perennial
- Rhizotomous (60% of biomass in rhizome)
- C_4 photosynthesis
- Displaces native/desirable vegetation
- Evidence of alleopathy
- Increases frequency and severity of fires



Distribution of *Imperata cylindrica*



Source: Global Biodiversity Information Facility (gbif.org)

Imperata species in the USA

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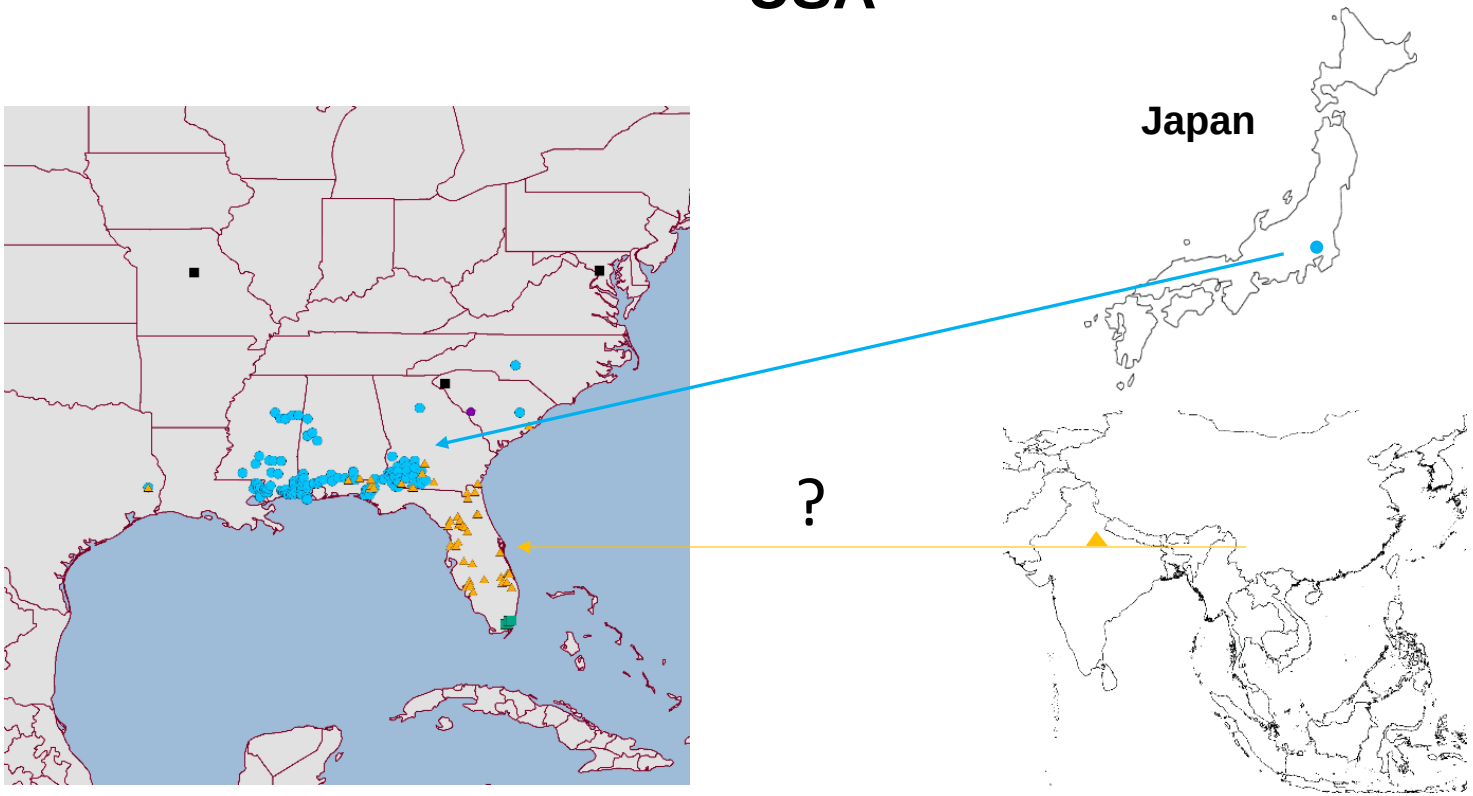
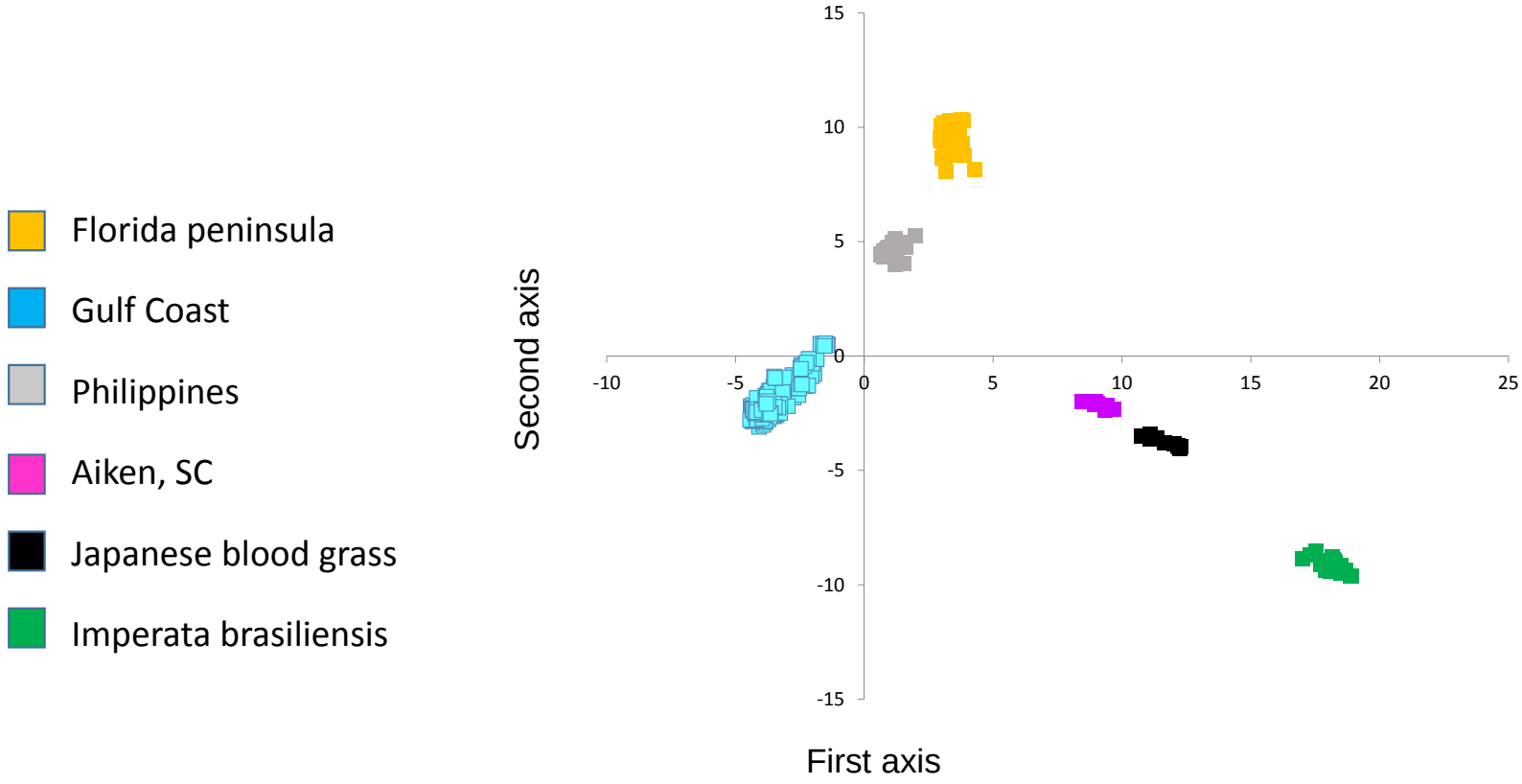
Cogongrass in southeastern USA

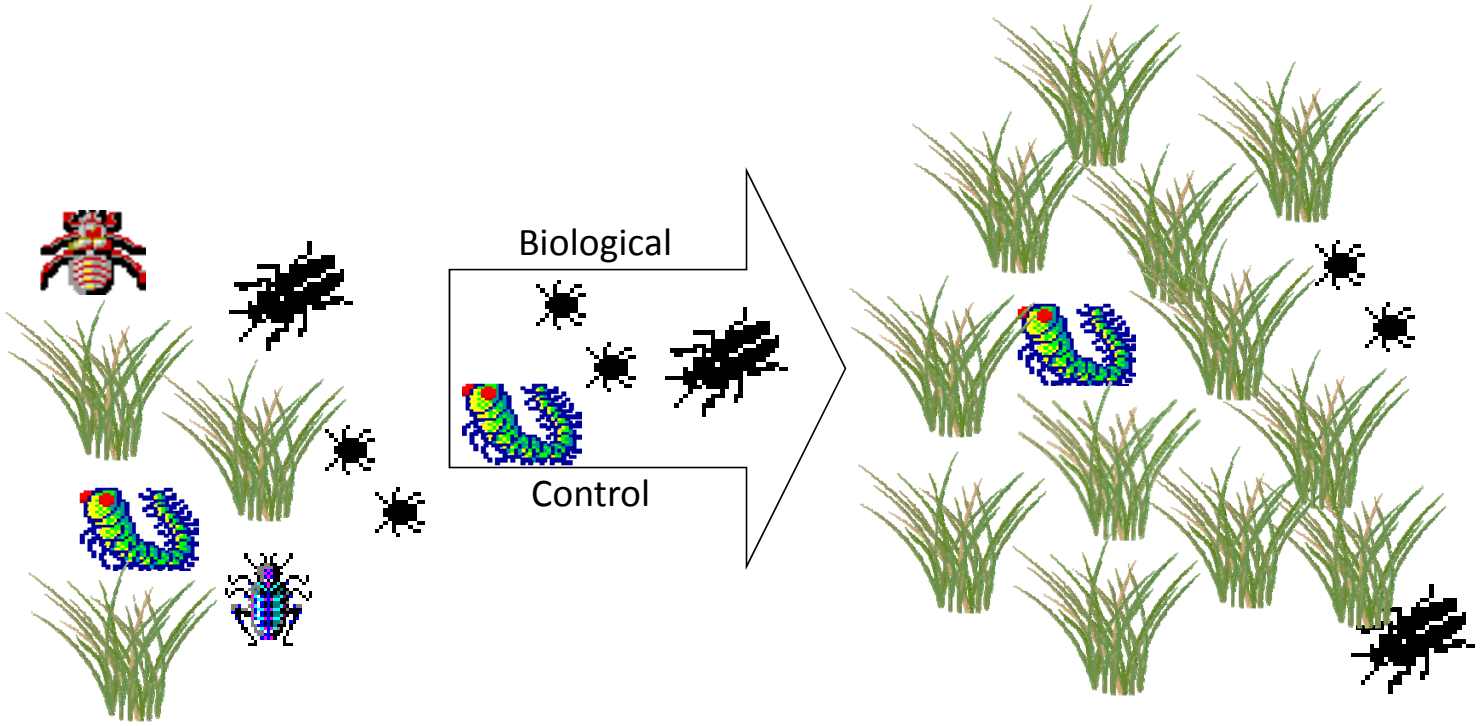




Burrell, M., A. E. Pepper, G. Hodnett, J. A. Goolsby, W. A. Overholt, A. E. Racelis, R. Diaz and P. E. Klein. 2015. Exploring origins, invasion history and genetic diversity of Imperata cylindrica (L.) P. Beauv. (Cogongrass) in the United States using genotyping by sequencing. Molecular Ecology. DOI: 10.1111/mec.13167.

How biological control works

Native home **Invaded area**



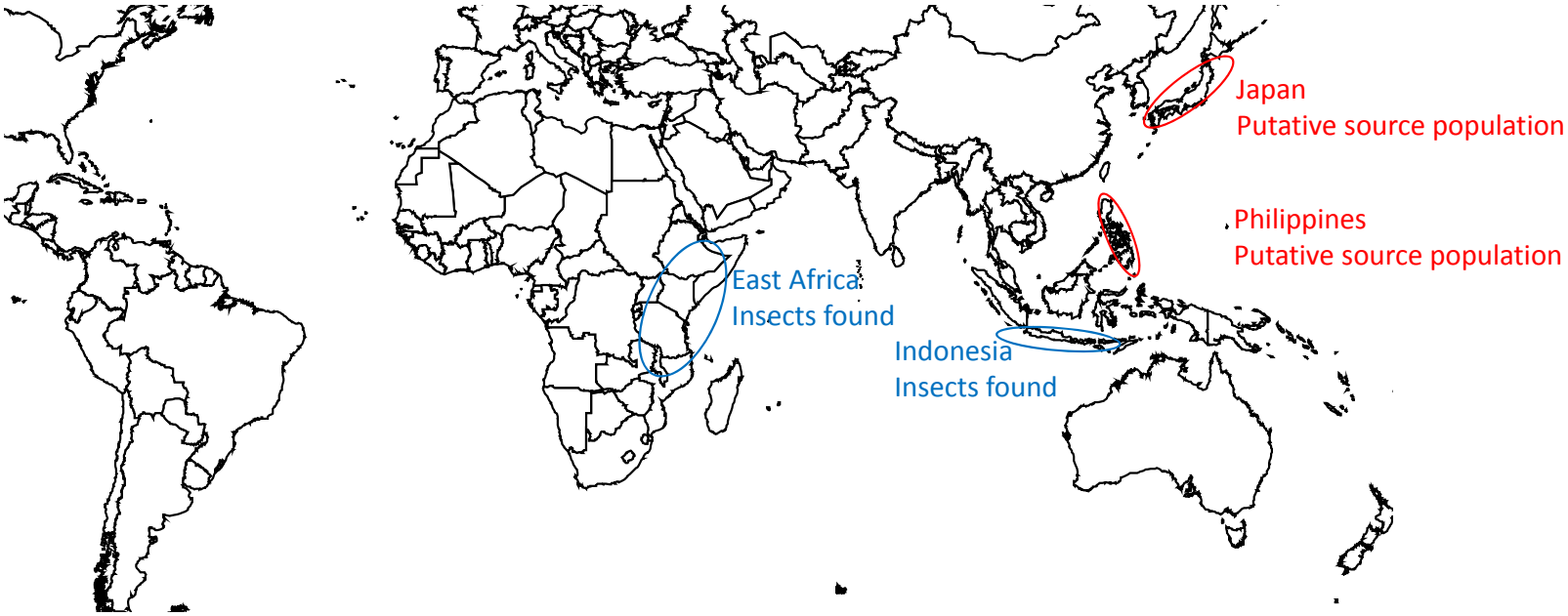
Grasses as biological control targets

- 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

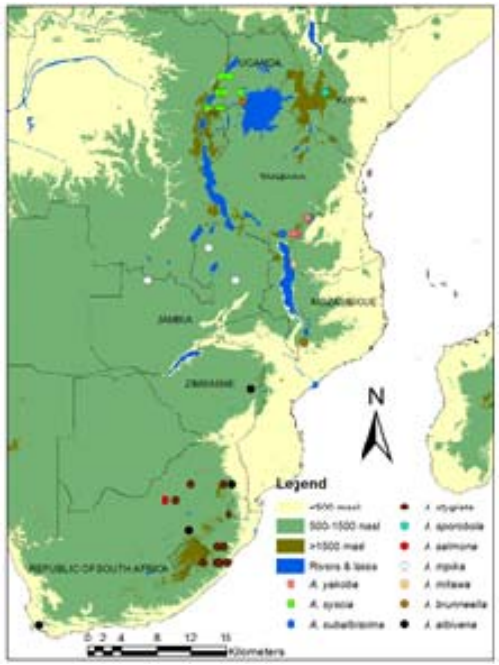
Grass	Insect	Reference
Arundo donax	*Tetramesa romana* (Eurytomidae)	Goolsby and Moran, 2009
	Rhizaspidiotus donacis (Diaspididae)	Goolsby et al. 2009
Spartina alterniflora	*Prokelisia martinata* (Delphacidae)	Grevstad et al. 2003
Phragmites australis	66 monophagous species outside of North America	Tewksbury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

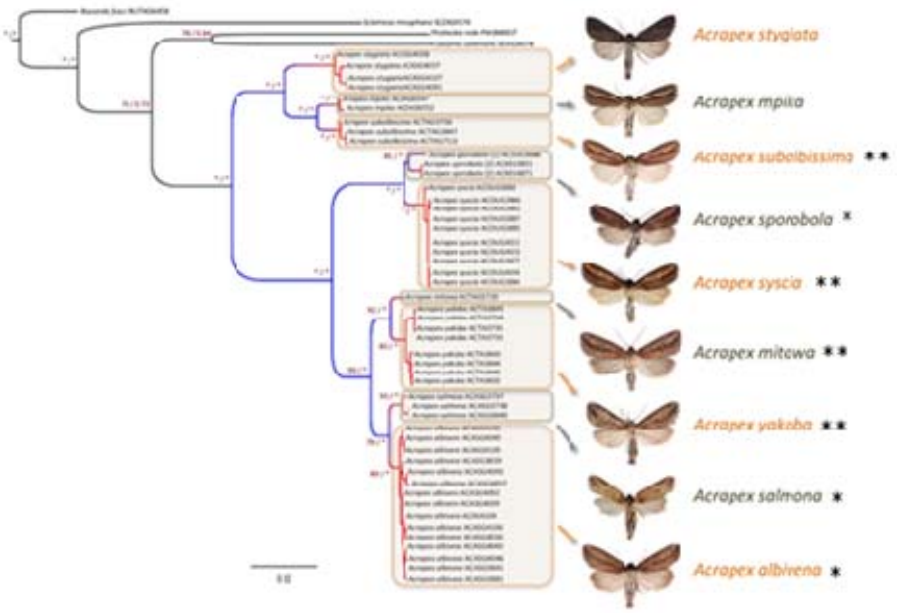
Where to look for natural enemies?



Biodiversity of lepidopteran stemborers of African grasses

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



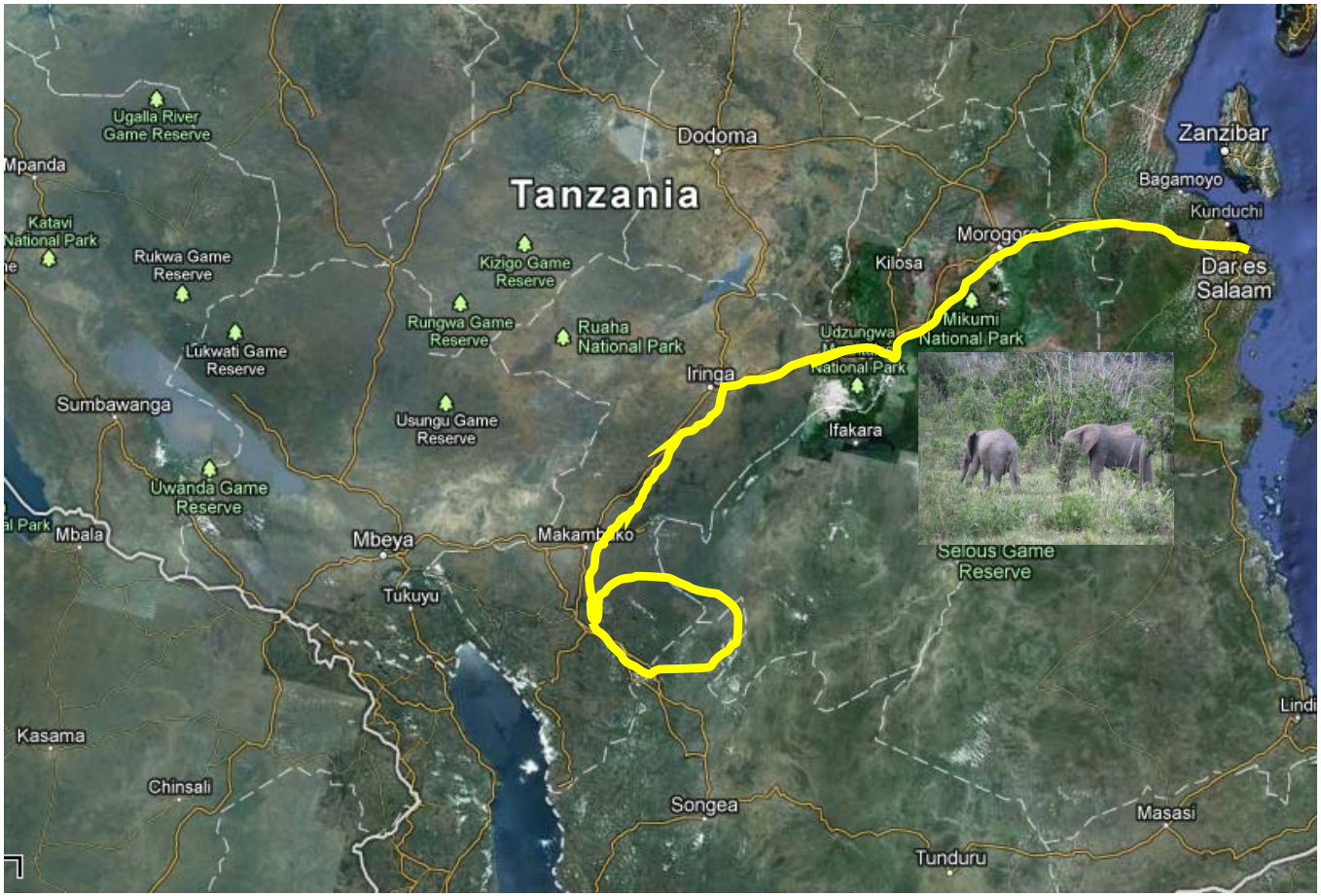


** found only on cogongrass

* 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 Systematics28: 451–475.

Tanzania – Feb 2013



Acrapex yakoba

Kenya and Uganda, May 2014

Acrapex syscia

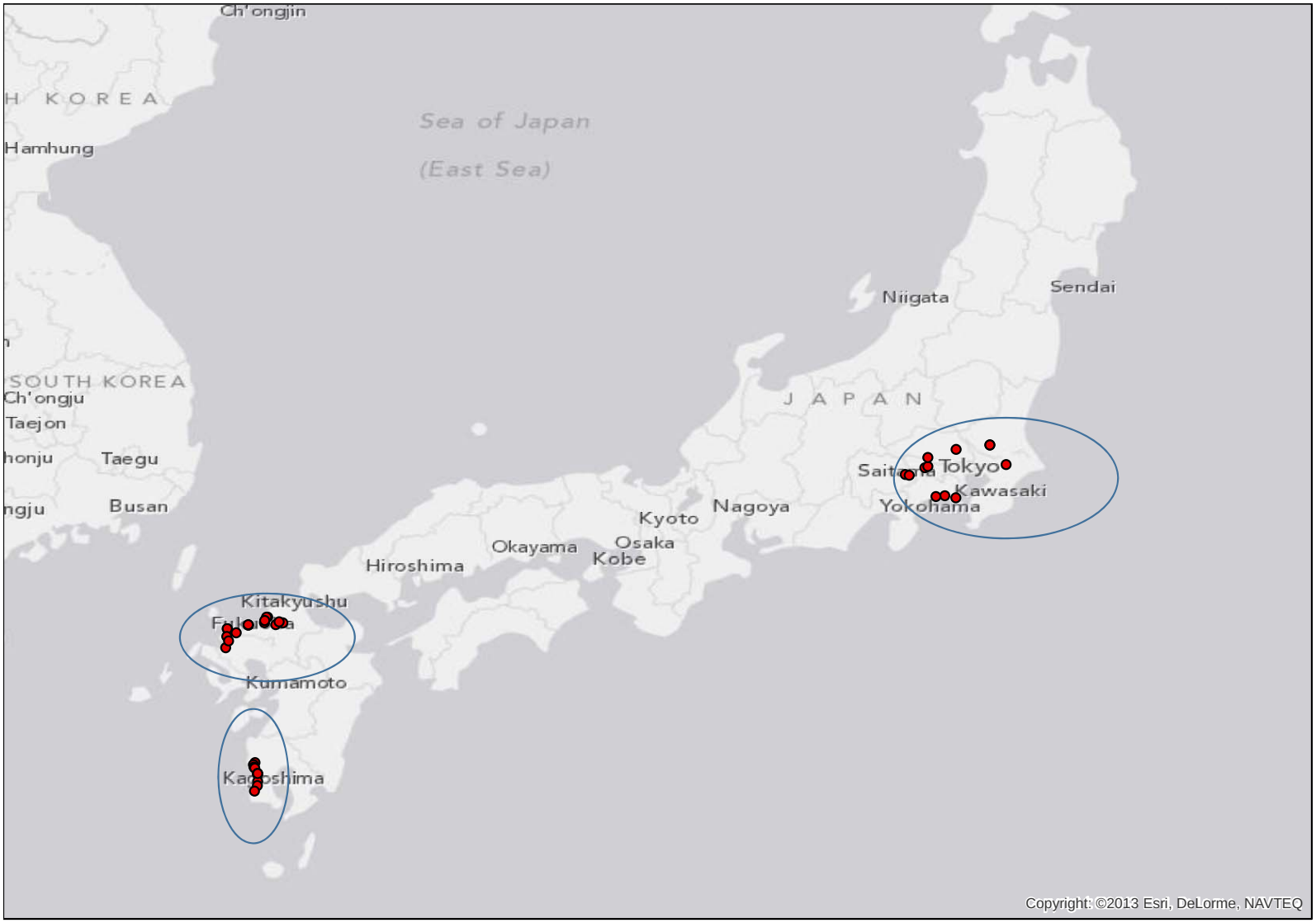
Philippines

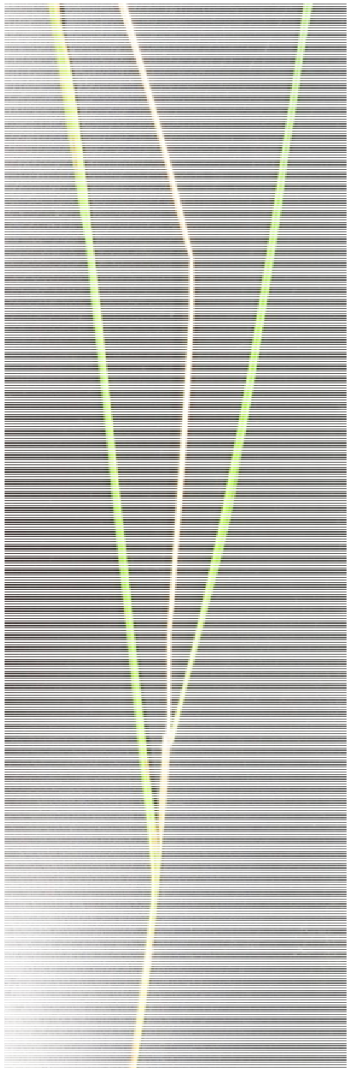
July 2013
March 2015

Pyralid stemborer

Japan

July 2013
August 2014





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 65: 30-35.

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

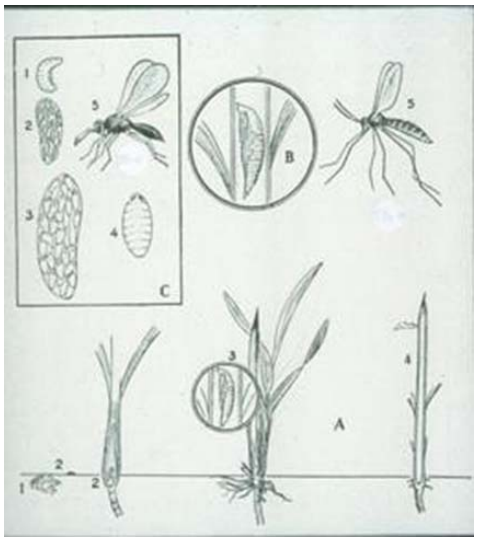


Photo credit: Ragil Irianto, Ministry of Forestry, Bogor, Indonesia

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 specialized and particularly damaging
- No success in establishing laboratory colonies of three *Acrapex* spp.
- Currently attempting to rear a pyralid borer from the Philippines
- Collaborators in Japan and Kenya will continue to work on colonization of *Acrapex* spp.
- Will travel to Indonesia in May to collect *Orseolia javanica*

QUESTIONS ?