



Distributions, Landscapes and Conservation

MOD005246

Biodiversity conservation in an Amazonian plantation landscape

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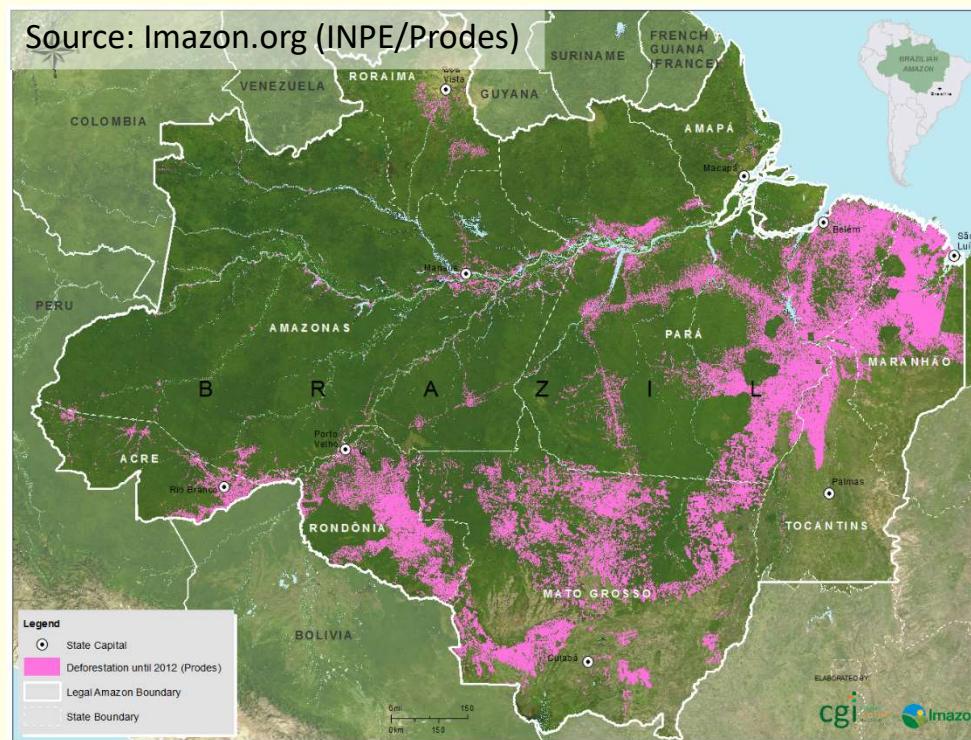
Learning outcomes

- Distinguish between habitat loss and fragmentation.
- Describe landscape restoration measure such as corridors.
- Consider study design to assess how species distributions are affected.
- Discuss biodiversity analyses including species richness and community composition.

Lecture outline

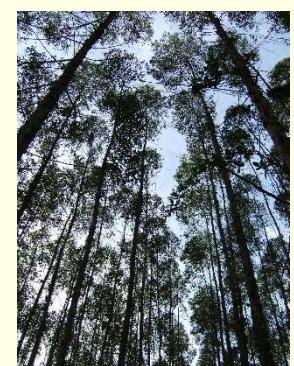
- Examples of tropical landscapes using examples from my MSc and subsequent other studies.
- Moths in a fragmented landscape of primary, secondary and plantation forests.
- How this contributed to a multi-taxa assessment.
- Birds in forest corridors between fragments in the same plantation landscape.
- Global datasets assessing how species distributions are impacted by habitat disturbance.

Deforestation of the Amazon



Deforestation of the Amazon

- Brazil holds 40% of the world's rainforest
- But almost 1/5th of Amazon now cleared



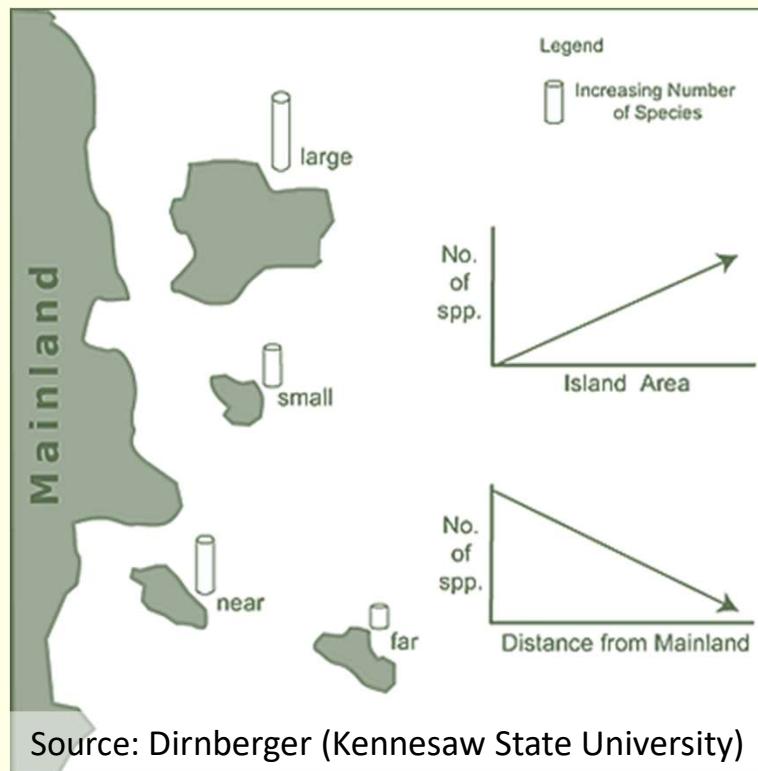
Habitat Loss

+

Fragmentation

Forest islands

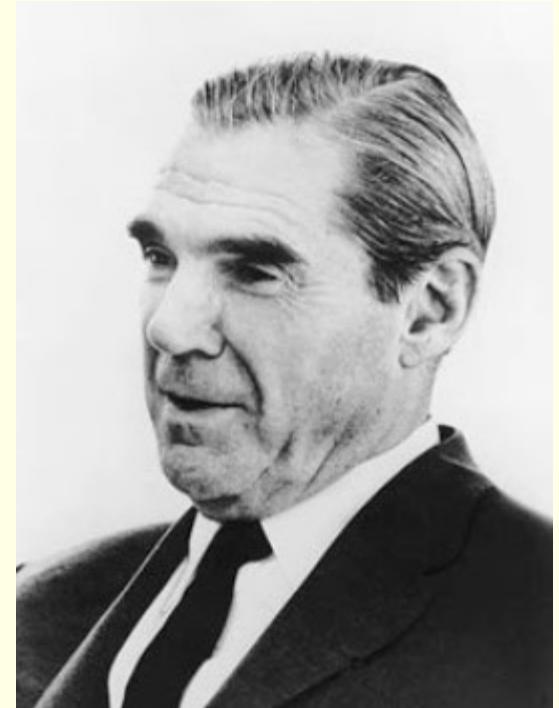
- Island biogeography
- Edge effects



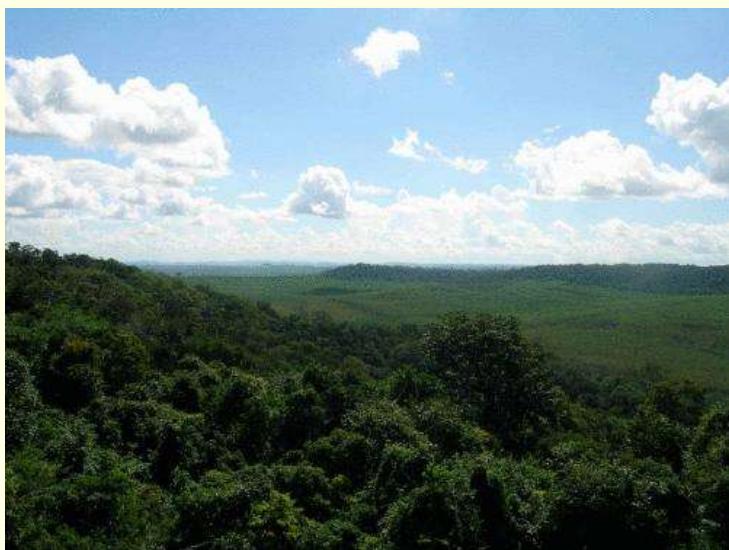
Source: PDBFF (INPA, Manaus, Brazil)

The Jari Project

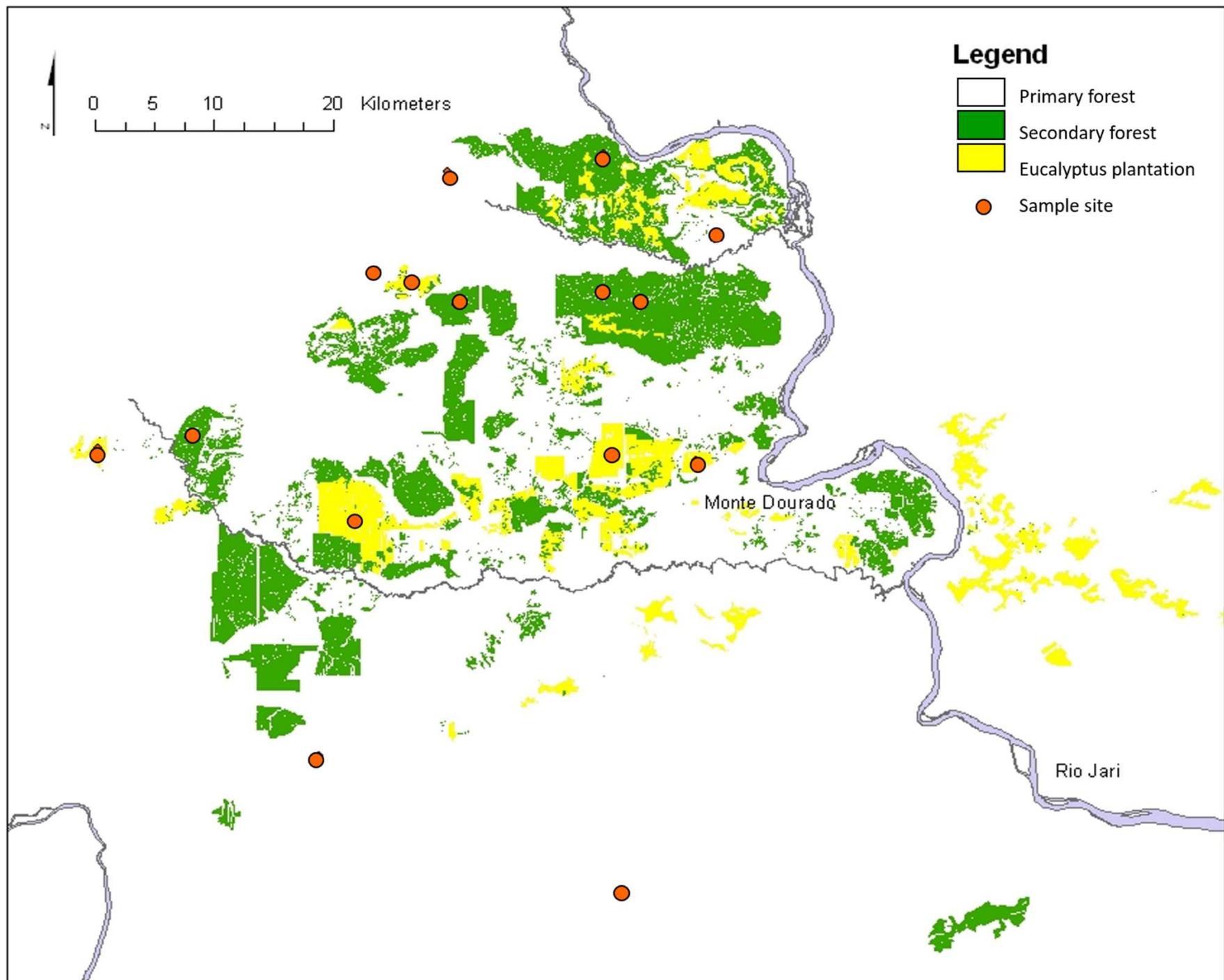
- Daniel K. Ludwig (1897-1992)
- Billionaire philanthropist
- 1967 – Purchased 1.6 million ha of the Amazon from the Brazilian government
- 1978 – Shipped factory to Jari
- 1982 – Project abandoned
Loss of ~ US\$ 1.2 billion











Hawkmoths and Emperor moths



Sphingidae

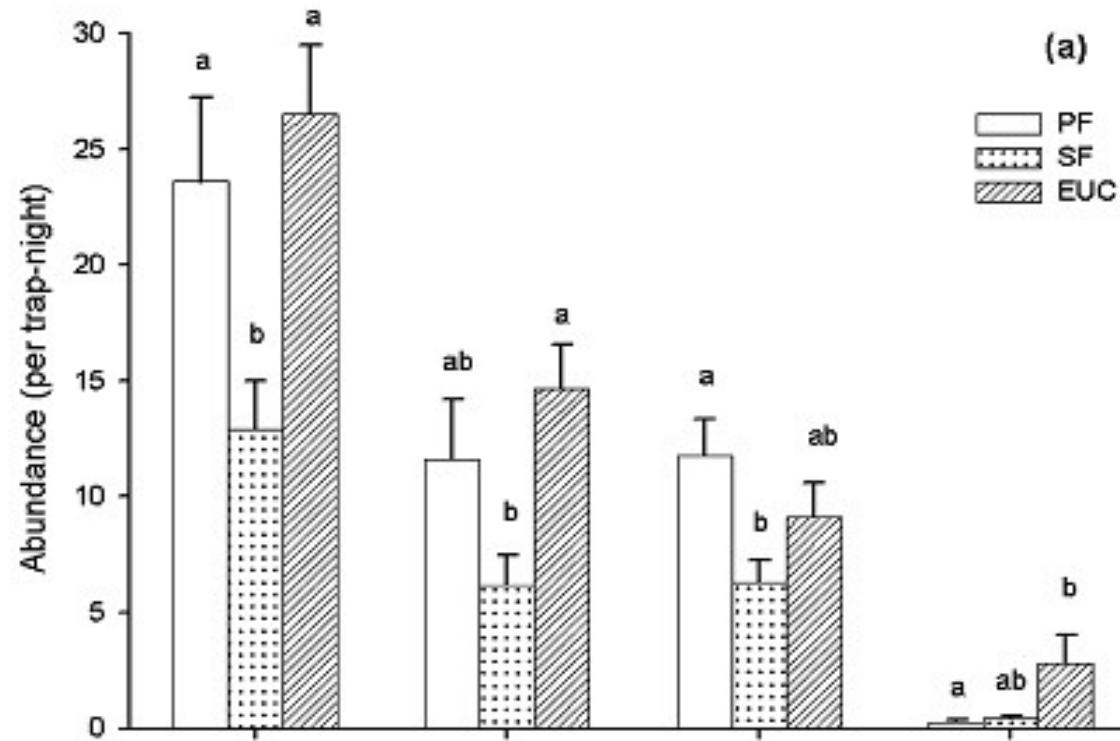


Saturniidae

Methods: moth surveys



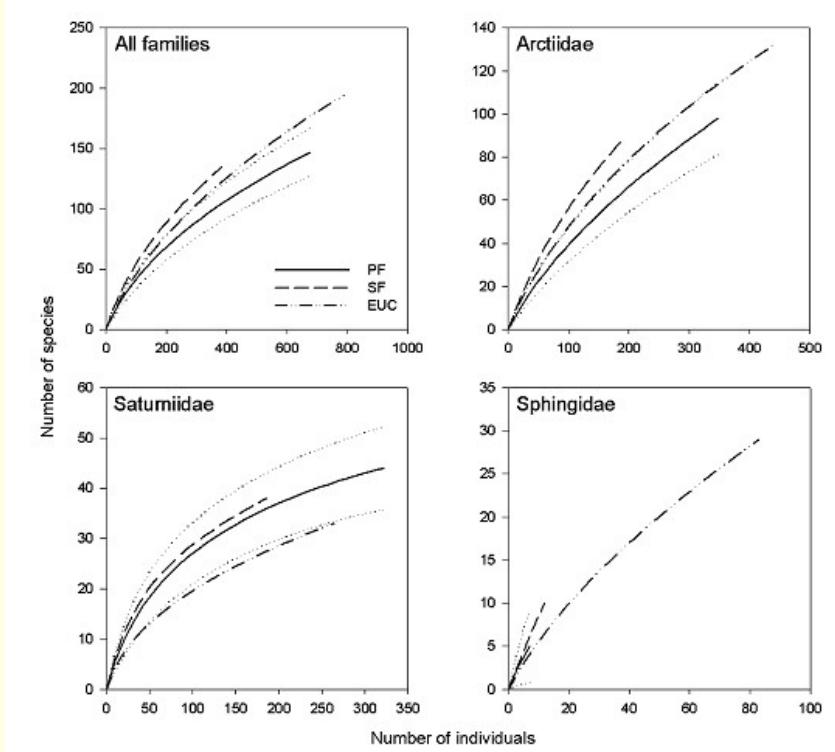
Patterns of abundance



- Lower catches in secondary forest but lower in plantations after standardising for light-trap area.

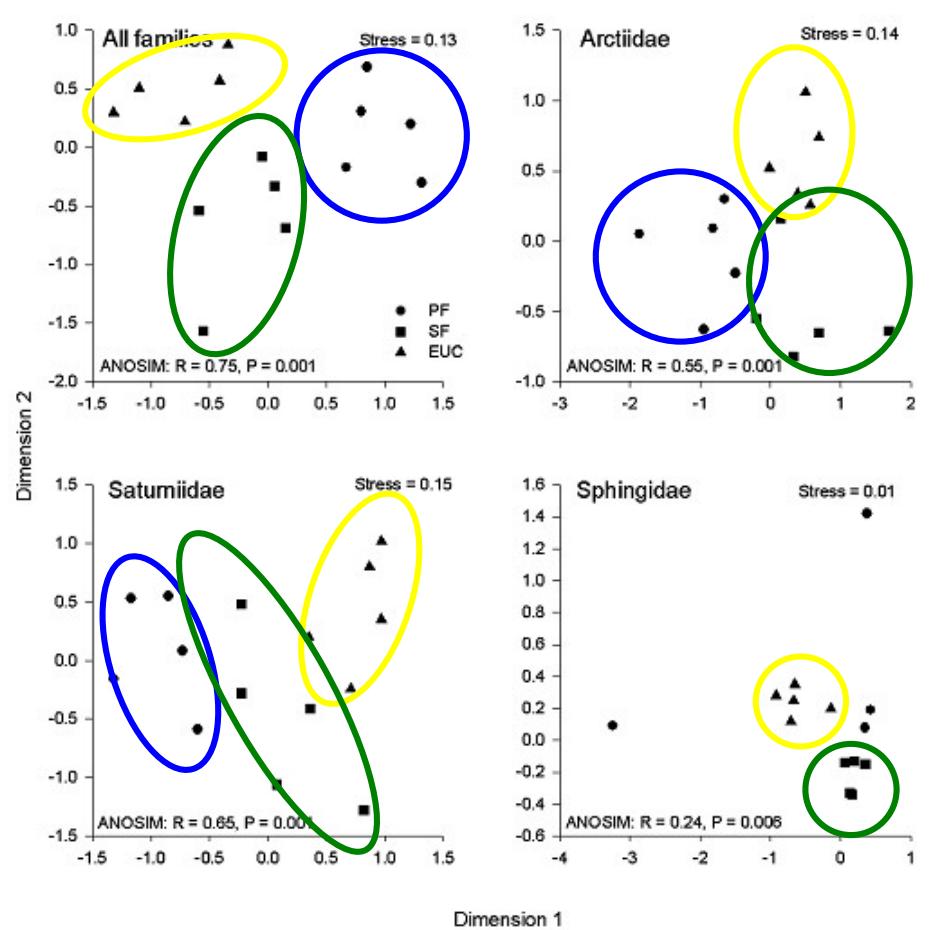
Patterns of species richness

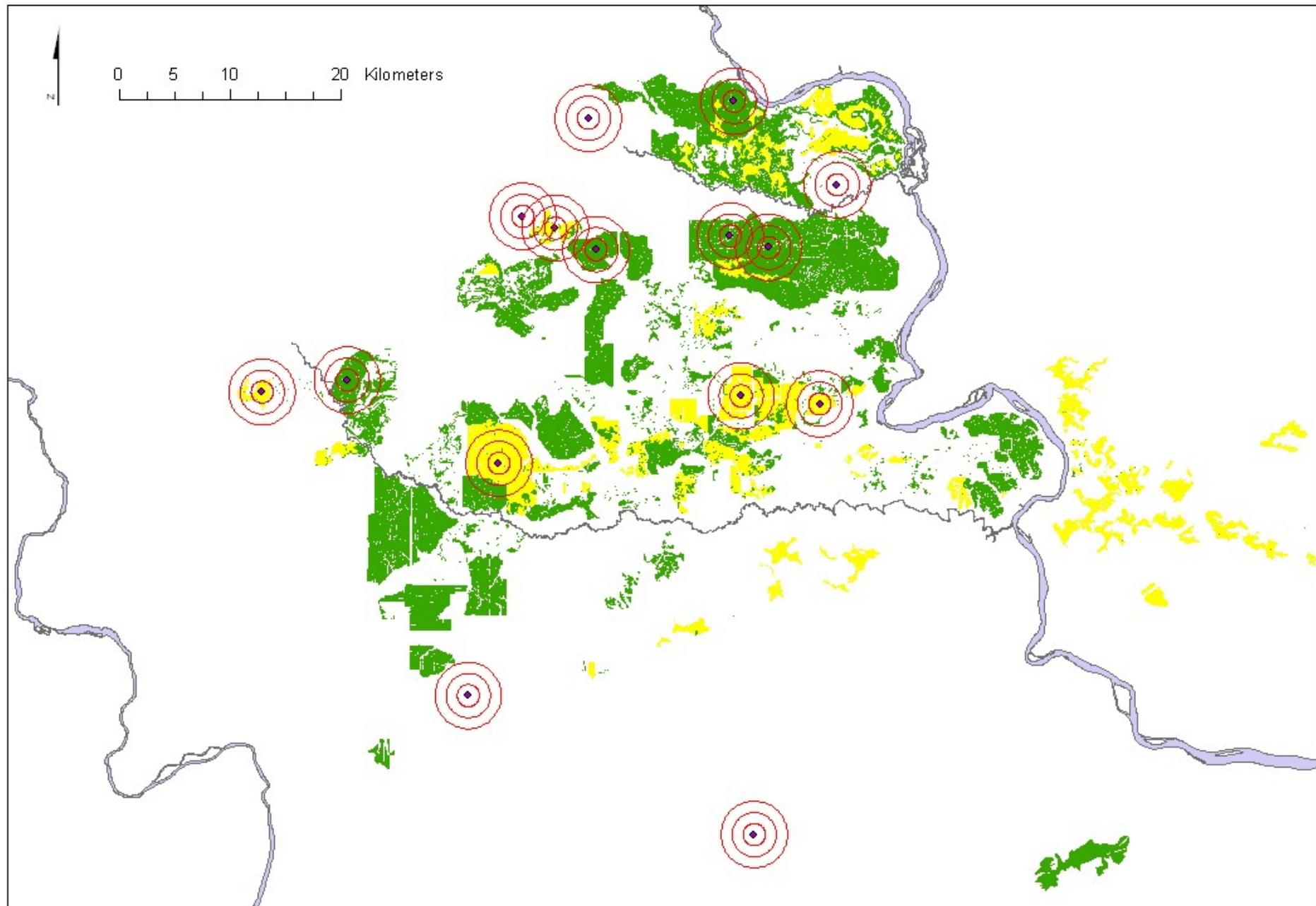
- Slightly higher species richness in plantations and secondary forest than in primary forest
- Variation in response between families
- Need to consider effectiveness of light traps in different forest habitats



Community structure/composition

- High species turnover between forest habitats
- Distinct communities in primary, secondary and plantation forests





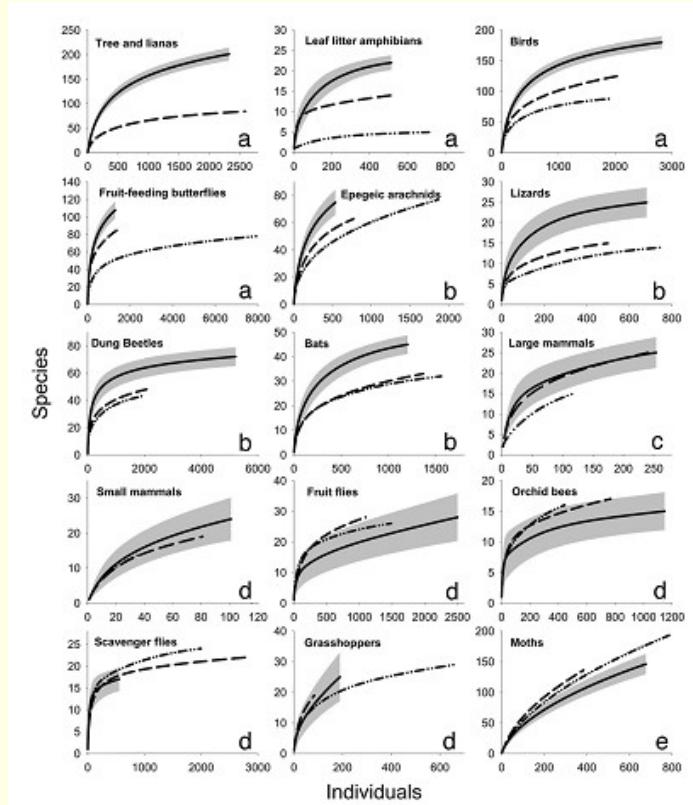
Multi-taxa assessment



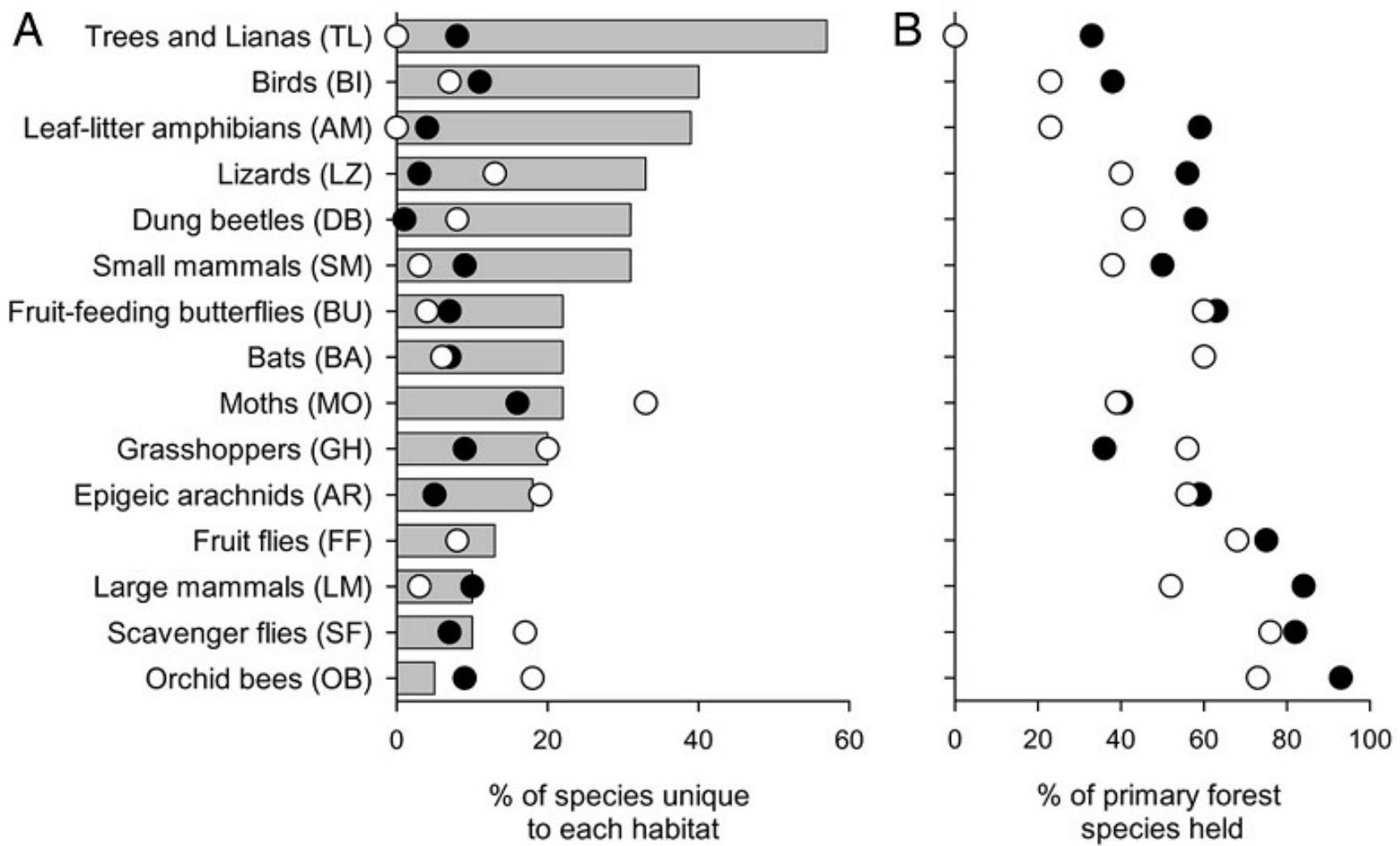
- Barlow et al. 2007 PNAS

- Conservation value of primary, secondary and plantation forests for 15 taxonomic groups.

- Results also show irreplaceable value of primary forests

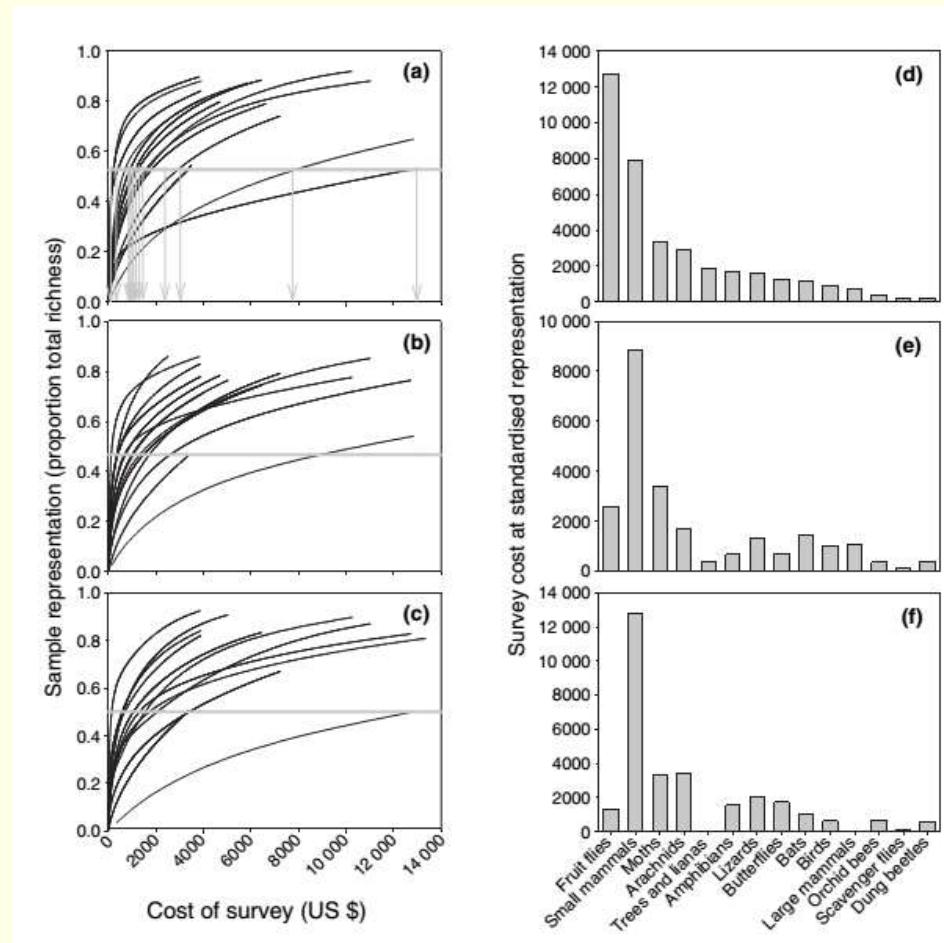


Multi-taxa assessment



Multi-taxa assessment

- Which taxa are most appropriate for landscape biodiversity surveys?
- Gardner et al. 2008
Ecology Letters
- Birds and dung beetles



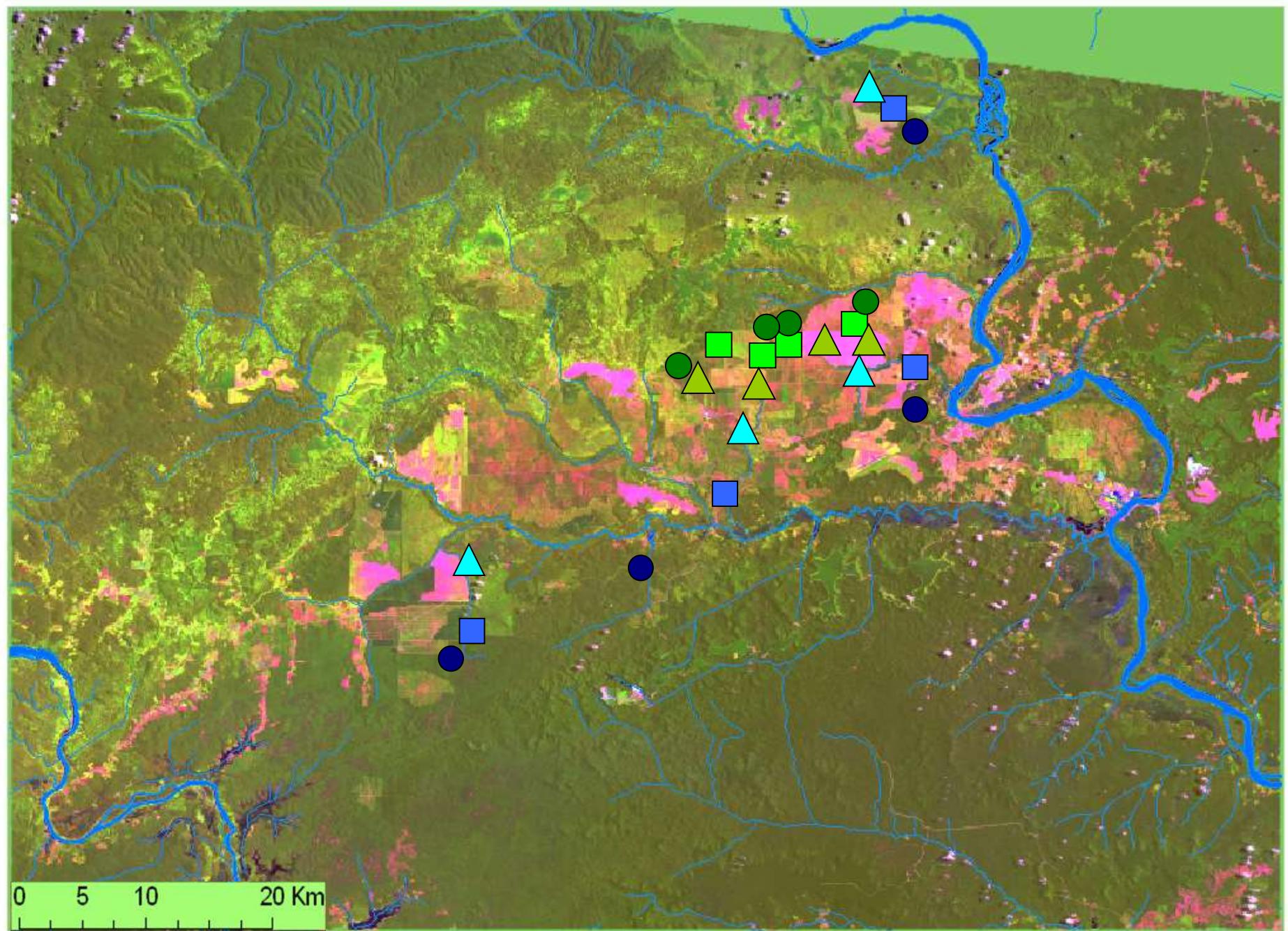
Connectivity in the Countryside

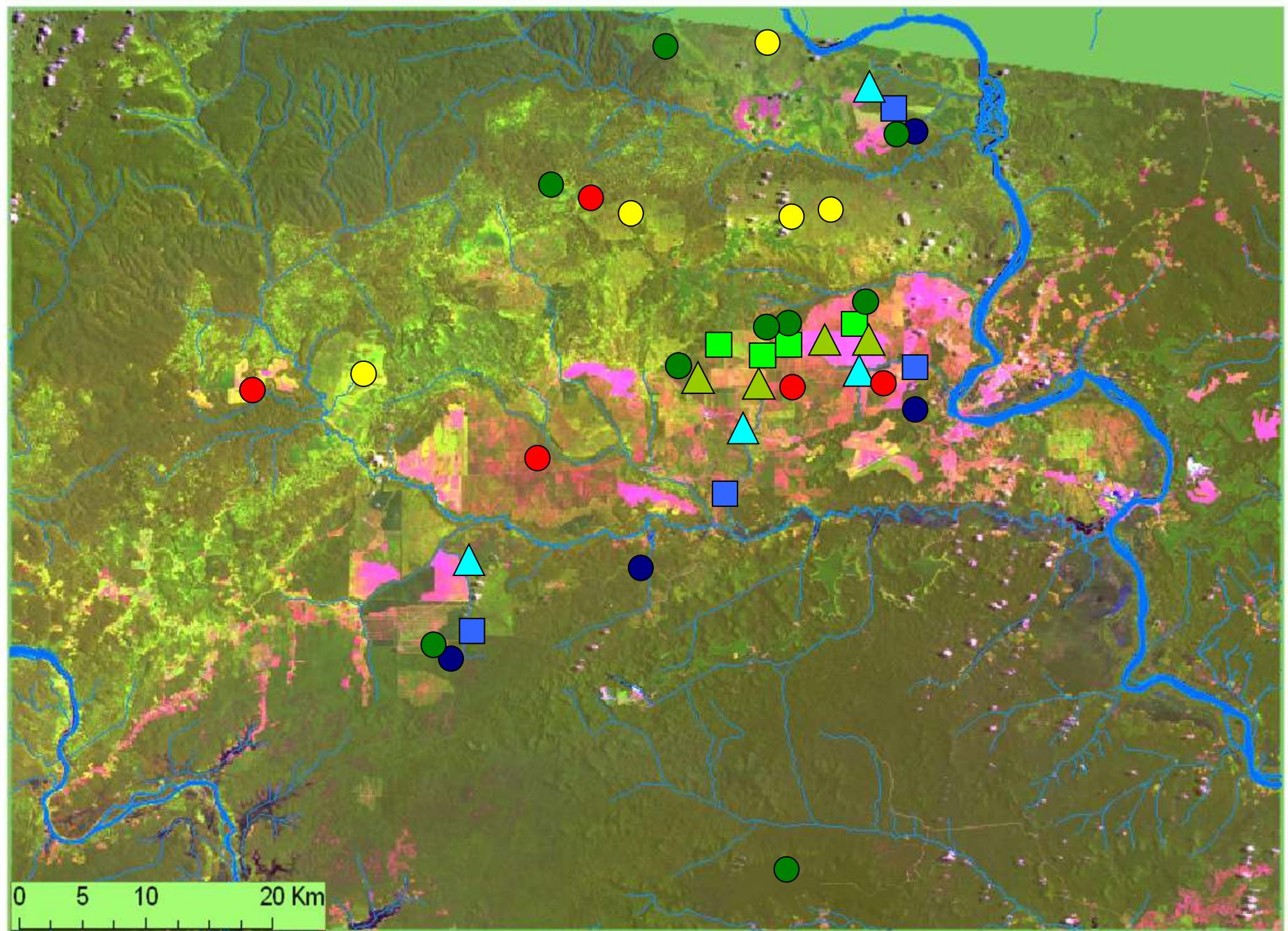
Forest Corridors / Linear Forest Remnants

30-500m wide forest strips often persist in heavily disturbed environments

- Protecting water courses
 - e.g. Brazilian Forest Code since 1965
- Dividing agricultural/silvicultural plots
 - Firebreaks
 - Pest control

But are they valuable for conservation?





What makes a good ‘remnant’?

1. Remnant width



2. Remnant length



- Near and Far from connected primary forest

3. Remnant type



- Riparian and *terra firme* remnants

Assess long-term (30+ yrs)
suitability of remnants
for understorey birds



Methods: bird surveys

- 24 mist nets
- 06h30-12h30 for 3 days
- 10,368 net-hours



Why birds?

- Good indicators of habitat quality and efficient to sample

Barlow et al. (2007) PNAS

Gardner et al. (2008) Ecol. Lett.

- Well documented ecology
- Previous knowledge of the value of surrounding matrix habitats for birds

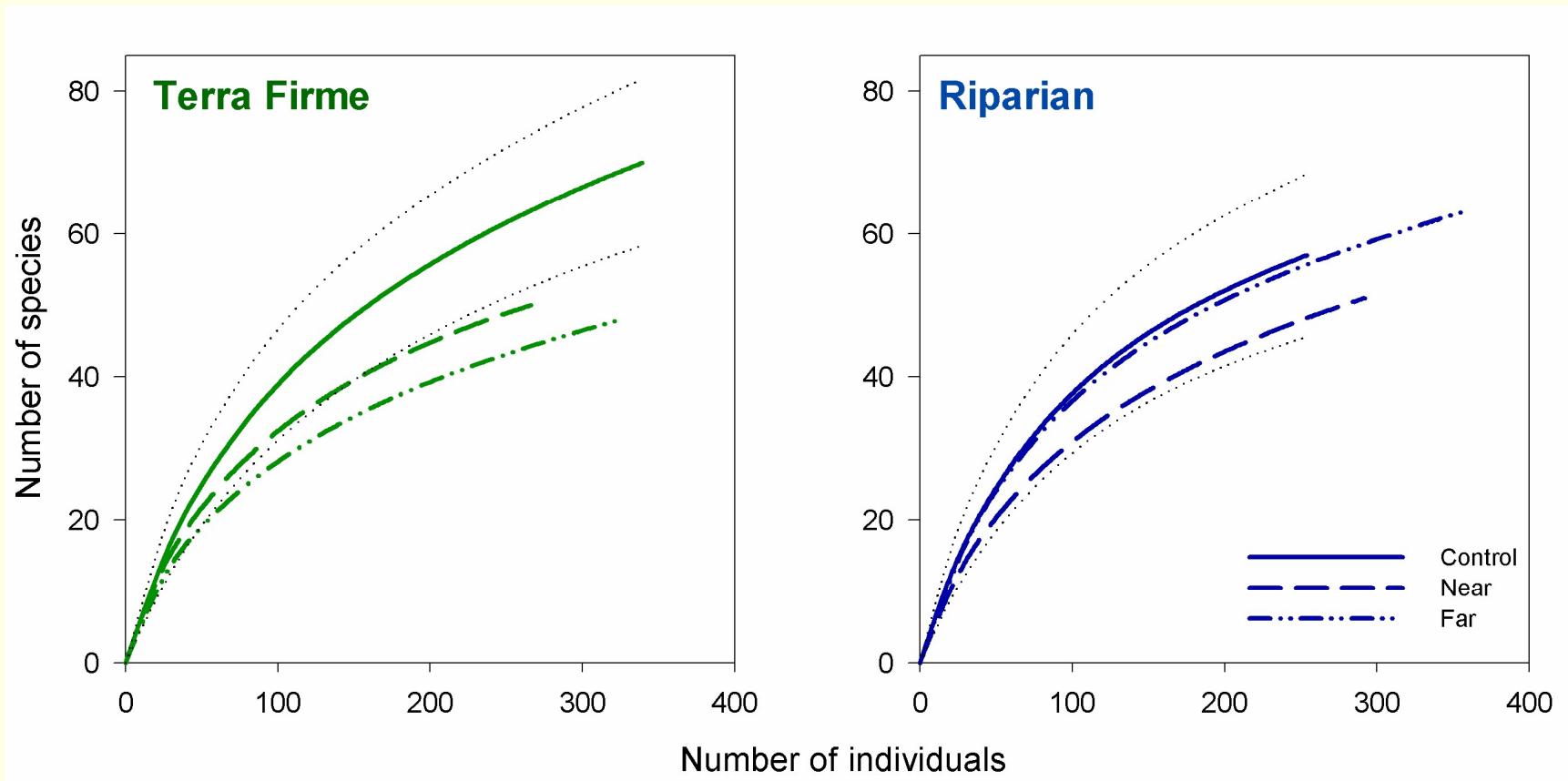
Barlow et al. (2007) Biol. Cons.

1910 individuals from 117 species

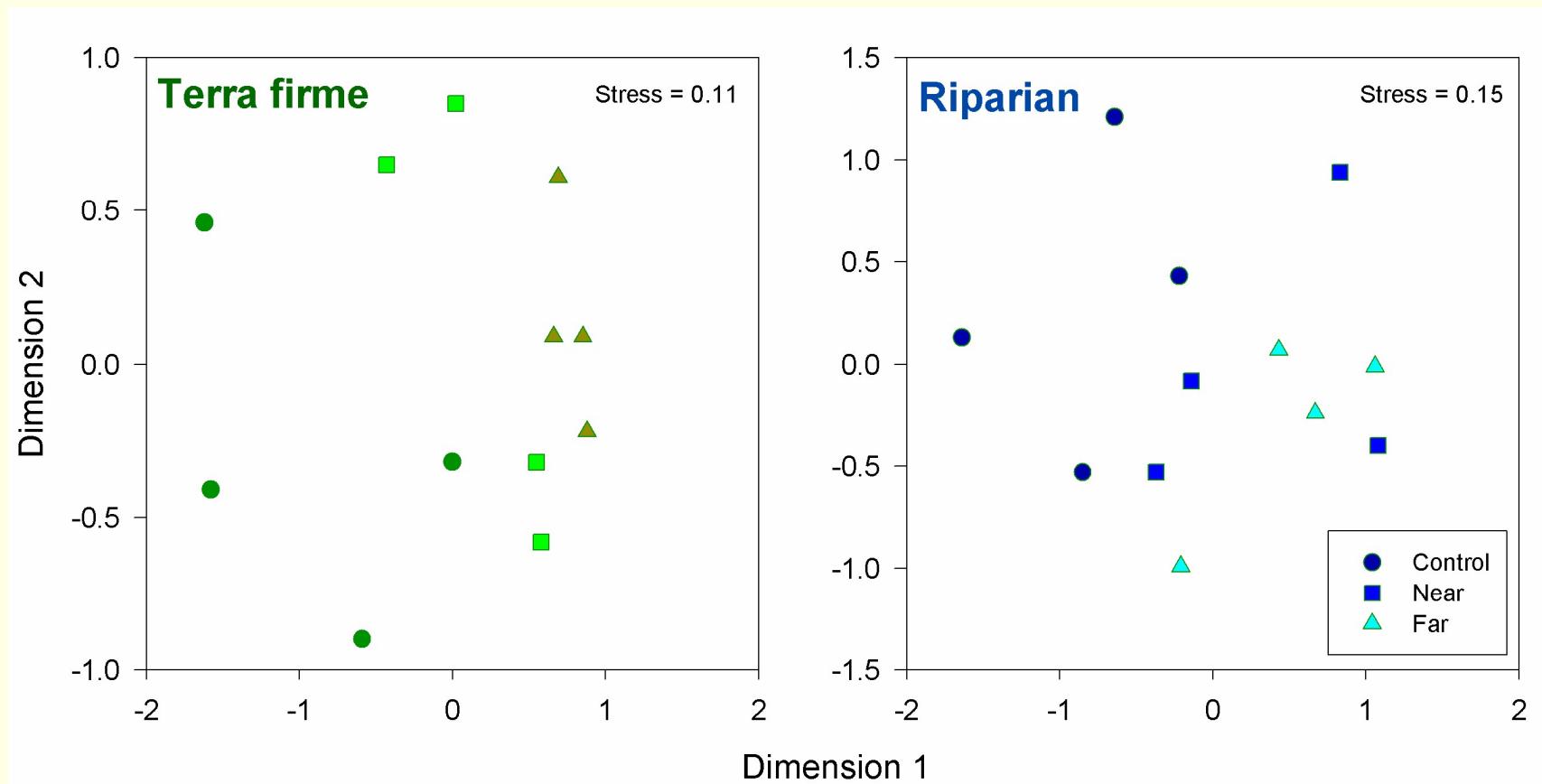
Terra firme: 967 birds 93 spp
Riparian: 943 89

	Terra firme	Riparian
Control	356	268
Near	276	299
Far	335	376

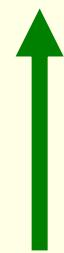
Remnant length and species richness



Remnant length and community structure



Terra firme species responses to length



+1500%



+483%



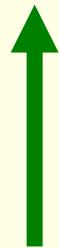
+667%



-95%



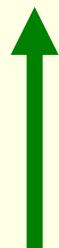
Riparian species responses to length



+825%



-57%



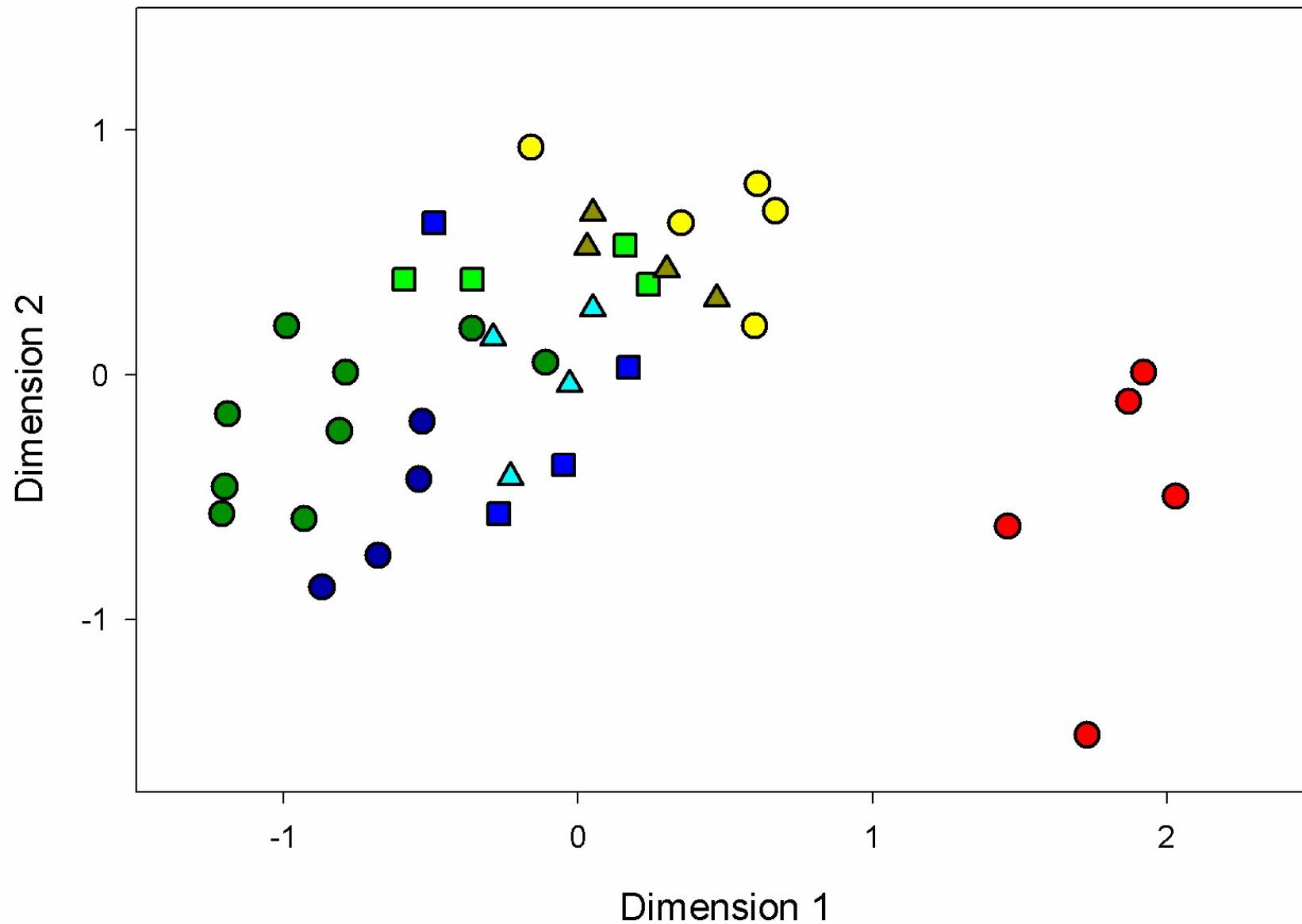
+300%



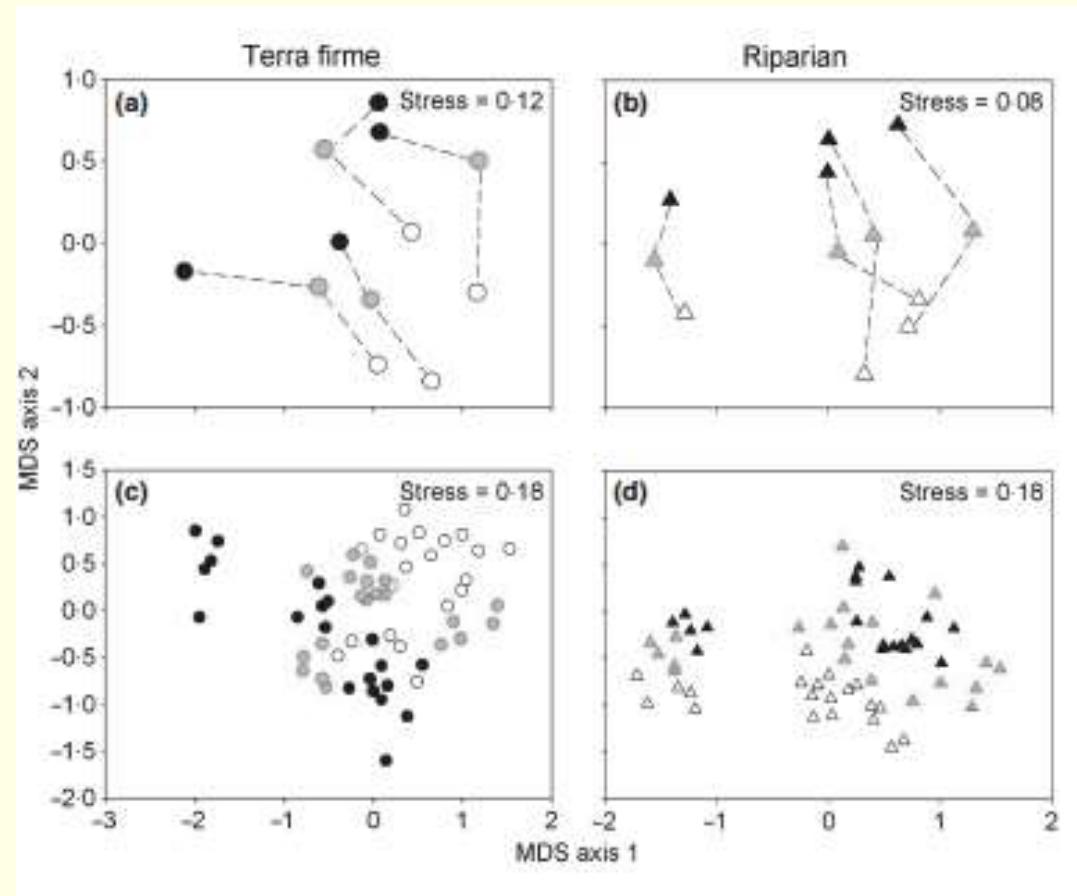
-67%



Forest strips and matrix habitats



Dung beetles and forest strips



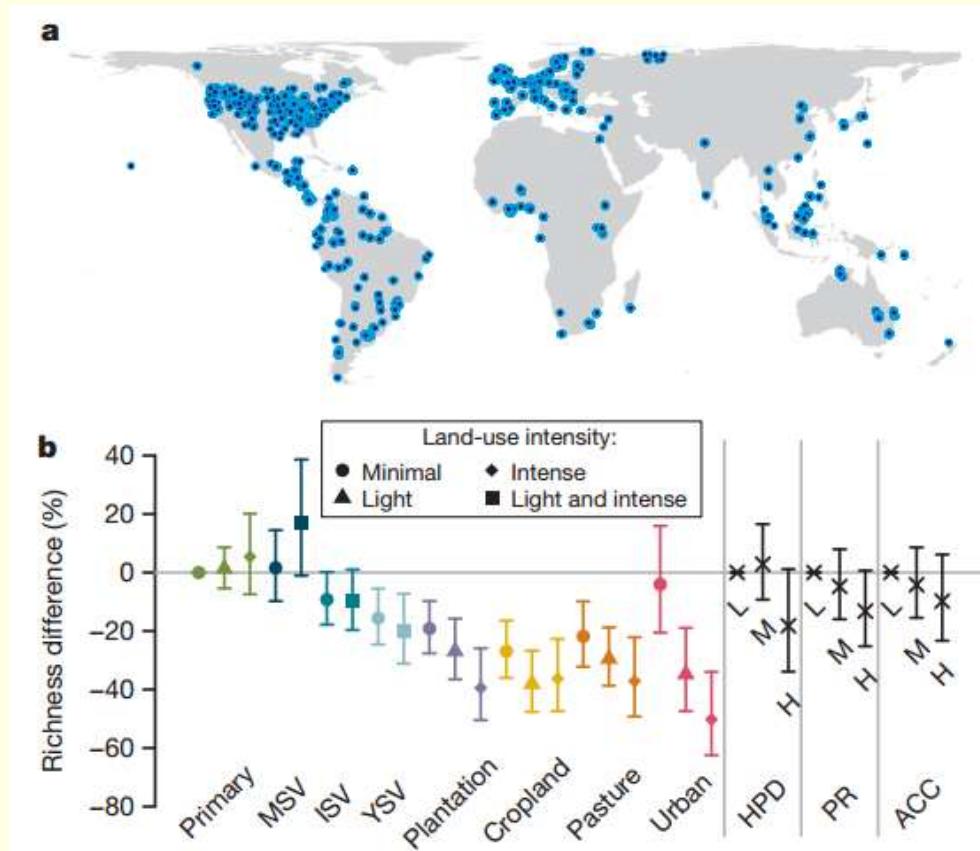
- Barlow et al. 2010 J. Appl. Ecol.

Birds and beetles



- Both terra firme and riparian forest strips contain an appreciable component of the native forest fauna.
- But forest strips are not sufficient for the conservation of many primary forest specialists.
- The full complement of species was not retained at distances > 2.5 km from continuous primary forest.

PREDICTS www.predicts.org.uk



- Hudson et al. 2014 *Ecol. Evol.*
- Newbold et al. 2015 *Nature*
- Hudson et al 2017 *Ecol. Evol.*

BIOFRAG www.biofrag.wordpress.com

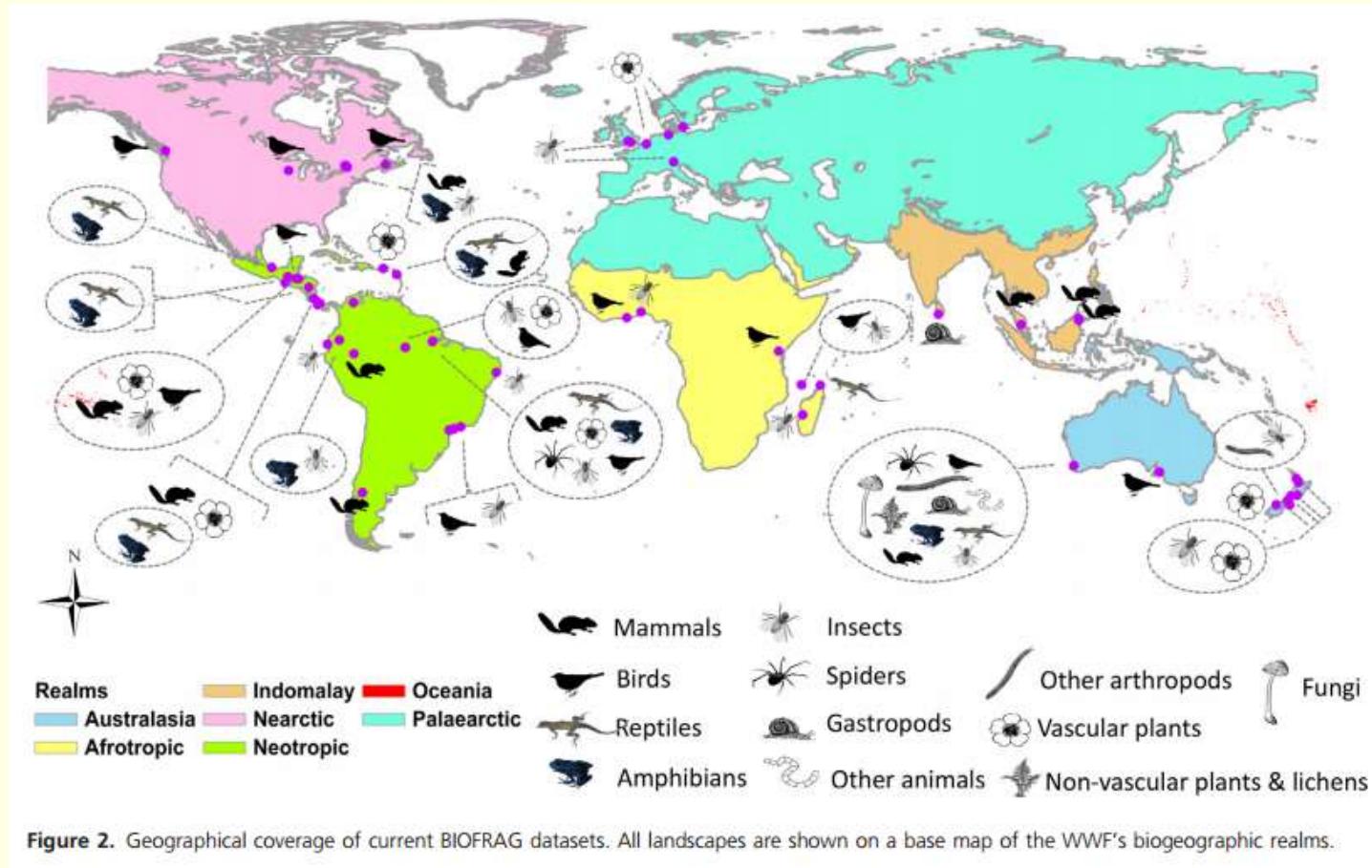


Figure 2. Geographical coverage of current BIOFRAG datasets. All landscapes are shown on a base map of the WWF's biogeographic realms.

- Pfeifer et al. 2014 Ecol. Evol.
- Pfeifer et al. 2017 Nature

The Jari Project today

- Daniel K. Ludwig (1897-1992)
- Billionaire philanthropist
- 1967 – Purchased 1.6 million ha of the Amazon from the Brazilian government
- 1978 – Shipped factory to Jari
- 1982 – Project abandoned
- 2000 – Control passed to Grupo Orsa, Jari Celulose
- 2004 – FSC certification



References

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- Newbold, T., Hudson, L.N., et al. (2015). Global effects of land use on local terrestrial biodiversity. *Nature* **520**, 45-50.
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- Pfeifer, M., Lefebvre, V., et al. (2017). Creation of forest edges has a global impact on forest vertebrates. *Nature*.

Links

- Jos Barlow, Lancaster University
 - Toby Gardner, Stockholm Environment Institute
 - Carlos Peres, University of East Anglia
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- Grupo Jari www.grupojari.com.br
 - Jari Celulose, Jari Florestal
-
- BIOFRAG www.biofrag.wordpress.com
-
- PREDICTS www.predicts.org.uk

