

# Abundance and range size of Panama's trees

Early results on assessing status

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# The mission: plot abundance and geographic ranges

## **Data**

Sparse specimen data

Sparse plots

Species checklists

## **Caveats**

Scales do not match

Plots capture few species

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## Data

Sparse specimen data

Sparse plots

Species checklists

## Caveats

Scales do not match

Plots capture few species

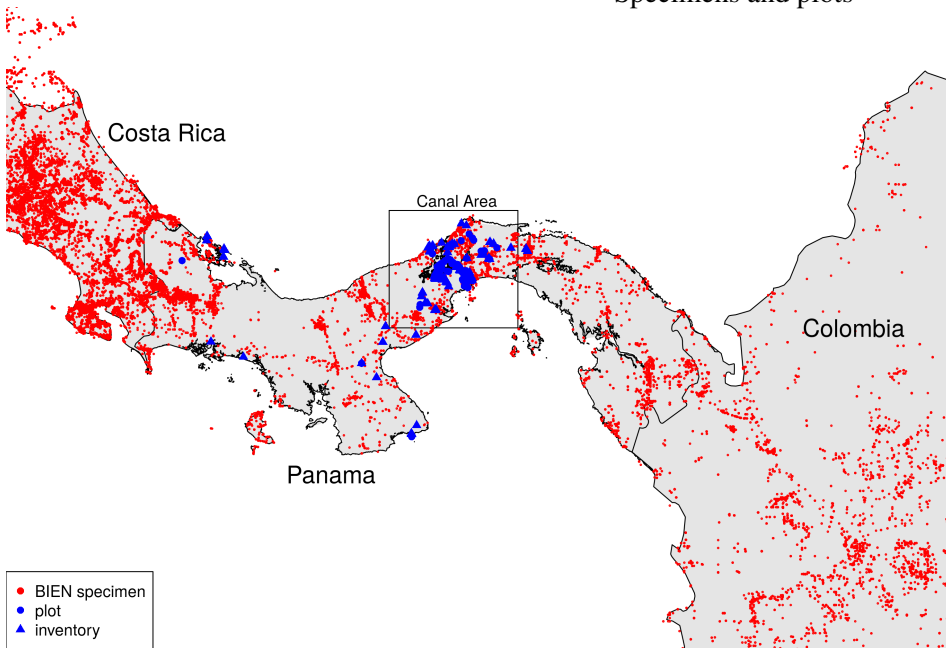
1. Risk assessment must include all species
2. Abundance comes only from plots at few locations
3. Ranges are extrapolated from occurrences at other locations





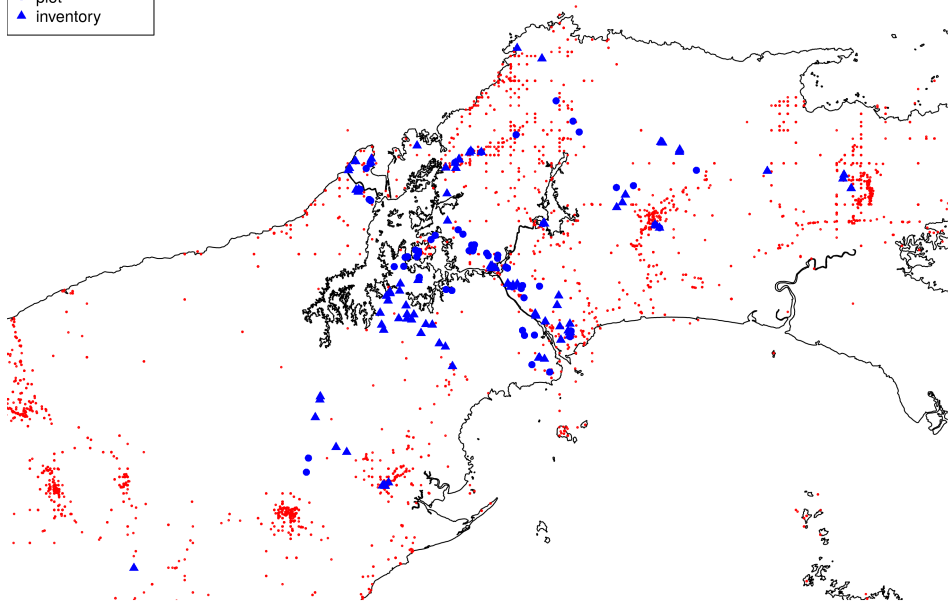


# Specimens and plots



# Specimens and plots

- BIEN specimen
- plot
- ▲ inventory



# The tree?

## Including species

- ▶ sometimes reaching 10 m tall (as trees)
- ▶ sometimes reaching  $\sim 3$  m tall or 1 cm dbh (as treelets)
- ▶ usually free-standing as reproductive (stranglers included)
- ▶ any number of stems (ie clonal or not)

## Excluding species

- ▶ usually reproducing as lianas
- ▶ usually epiphytes
- ▶ shrubs  $< \sim 3$  m tall

- All beg for precise records of many individuals
- But data either do not exist or are buried on specimen labels

# Tree Species of Panama

A complete list

2637 species in checklist

- ▶ 127 families
- ▶ 1644 trees and 879 shrubs
- ▶ 1076 of the species are in our plots (40.6%)

They need thorough vetting since last update 2004

- ▶ Working here since August, I have checked 723 species in monographs
- ▶ 150 species added, 63 eliminated during vetting

W. D'Arcy (1987)

M. Correa et al. (2004)

Robin Foster

Rolando Pérez

# Narrow-range tree species

723 species with taxonomy vetted

- ▶ 95 endemic to Panama (13%)
- ▶ 94 in one other country (13%)  
(usually Costa Rica, some Colombia, one in Ecuador\*)

\* *Tapirira rubrinerva*:

- Formerly endemic and on Ecuador's red list
- Now known in Panama and probably Peru

## Proportion of endemics

Proportion endemic to Panama varies among 12 families...

Family	Endemic	Not endemic	% endemic
Anacardiaceae	1	13	7.1
Annonaceae	24	67	26.4
Fabaceae	28	207	11.9
Moraceae	1	68	1.4
Minor*	1	25	3.8
Guttiferae**	5	31	13.9

\* Adoxaceae, Alzateaceae, Cannabaceae, Combretaceae, Fagaceae

\*\* Calophyllaceae, Clusiaceae, Hypericaceae

## Proportion of narrow ranges

... likewise proportion with narrow ranges  $< 20 \cdot 10^3 \text{ km}^2$

Family	Narrow	Wide	% narrow
Anacardiaceae	0	13	0.0
Annonaceae	29	56	34.1
Fabaceae	21	199	9.5
Moraceae	2	66	2.9
Minor*	2	23	8.0
Guttiferae**	5	30	14.3

\* Adoxaceae, Alzateaceae, Cannabaceae, Combretaceae, Fagaceae

\*\* Calophyllaceae, Clusiaceae, Hypericaceae



## Species found in plots

Proportion of all Panama tree species found in our plots...

Range (countries)	Found in plots	Not found	% found
1	27	67	28.7
2	26	69	27.4
>2	223	271	45.1

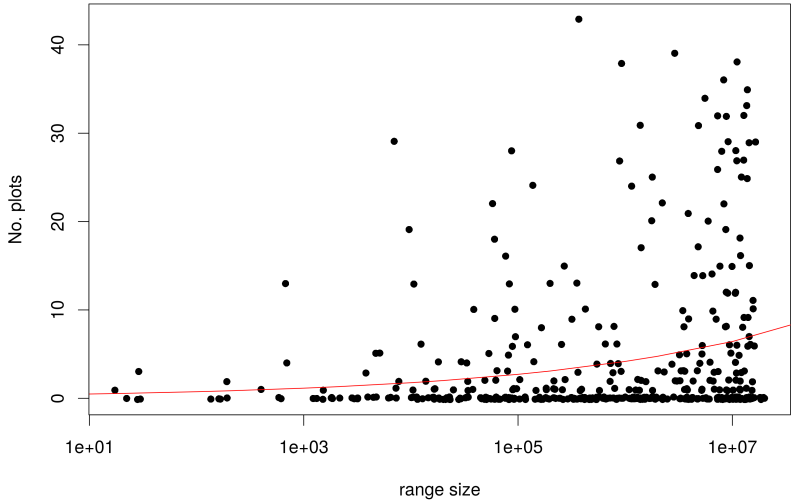
## Species found in plots

...by range size

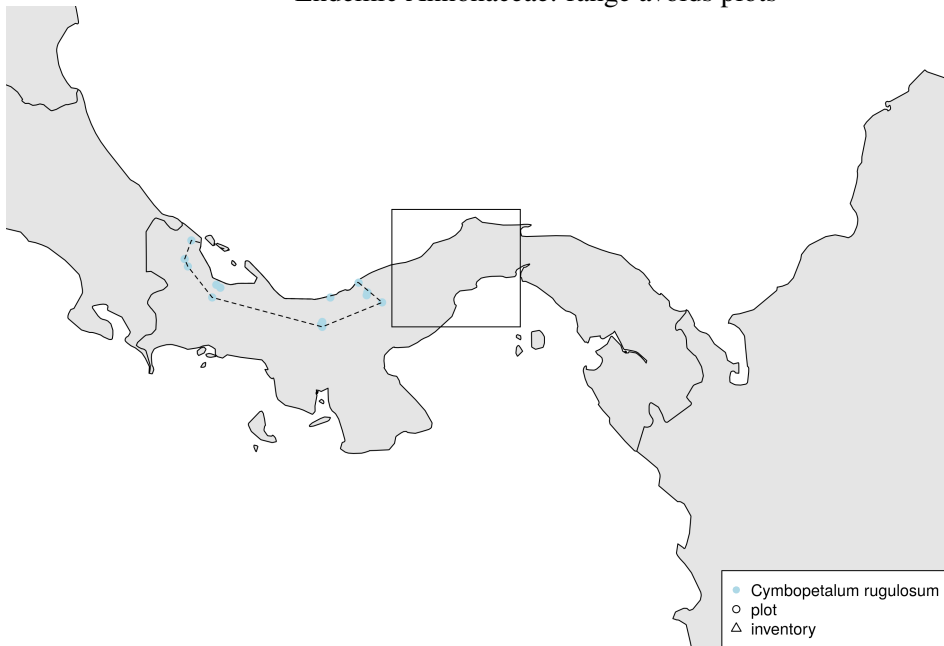
Range (km <sup>2</sup> )	Found in plots	Not found	% found
<1e4	14	27	34.1
1e4-1e5	32	57	36.0
1e5-1e6	37	54	40.7
>1e6	114	111	50.7

# Plot occurrence vs. range

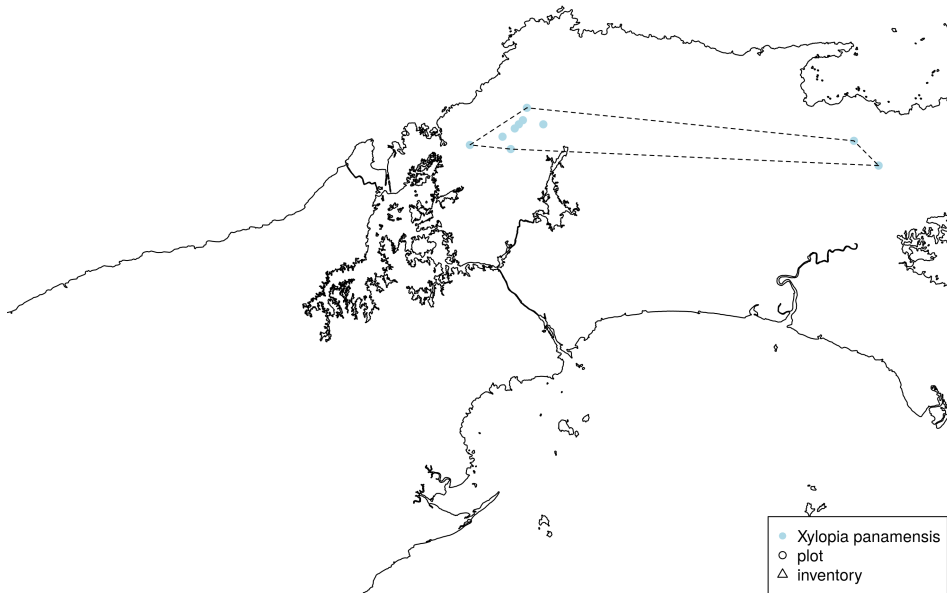
Among 492 in 12 carefully-vetted families



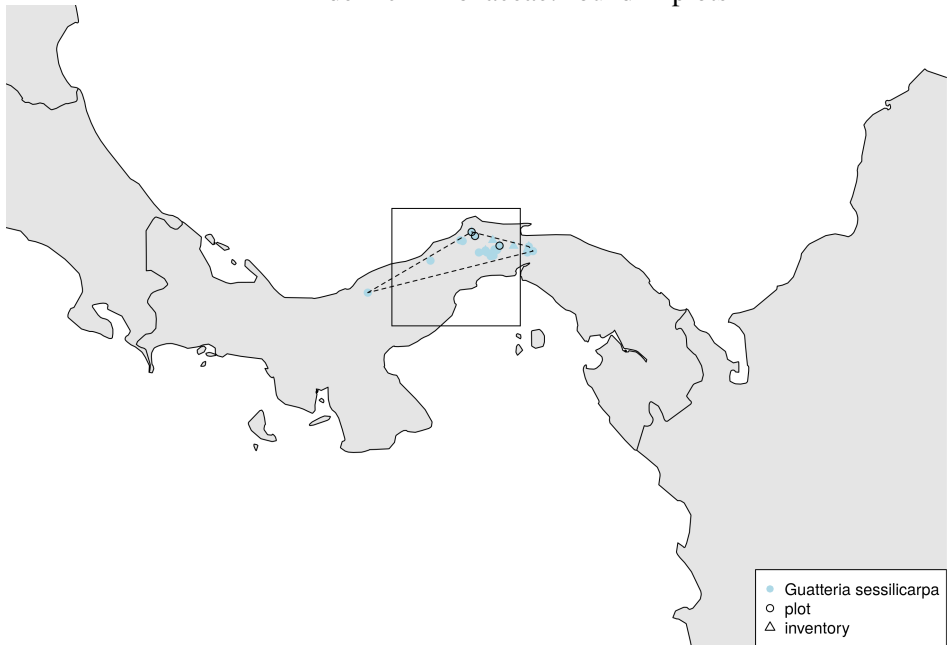
## Endemic Annonaceae: range avoids plots



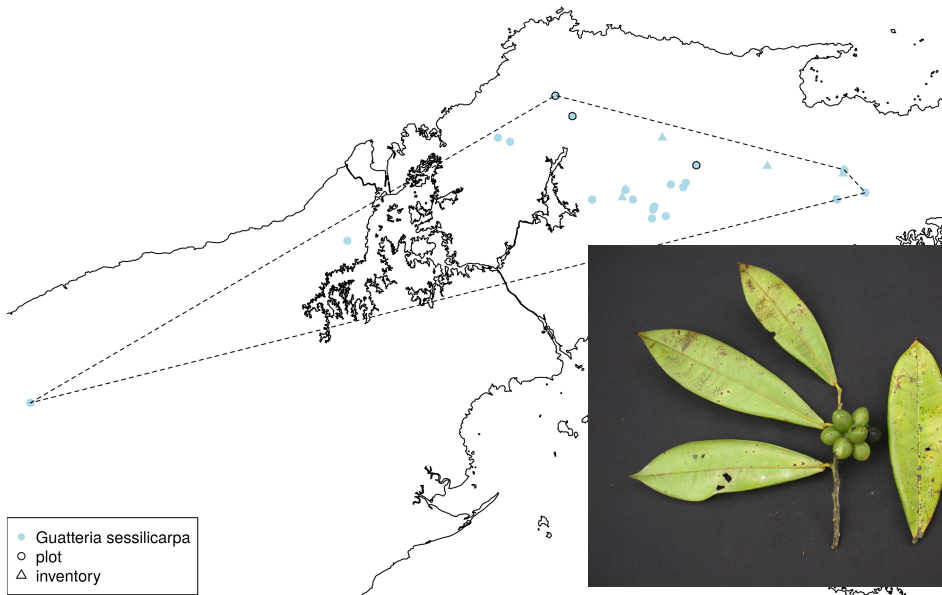
# Endemic Annonaceae: not found in plots



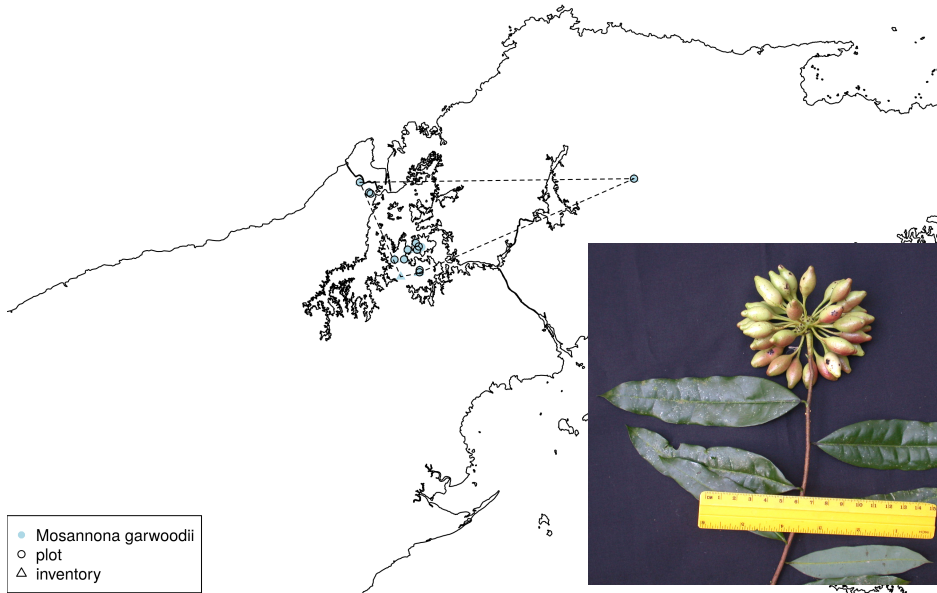
## Endemic Annonaceae: found in plots



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# Endemic Annonaceae: found in plots





## Annonaceae most vulnerable

24 Annonaceae endemic to Panama

6 appear in plots allow estimate of density  $\rho$  per ha  $\geq 1$  cm dbh:

- ▶ *Mosannona garwoodii* described (1997) from 50-ha plot  
Numerous in many plots near the Canal in Panama,  $\rho = 4.4$   
Core range 70 km<sup>2</sup>  $\sim$  30,000 individuals

## Annonaceae most vulnerable

24 Annonaceae endemic to Panama

6 appear in plots allow estimate of density  $\rho$  per ha  $\geq 1$  cm dbh:

- ▶ *Guatteria sessilicarpa*

Appears in 3 plots in wet Caribbean forest,  $\rho = 0.62$

Abundance over 13,000 km<sup>2</sup>  $\sim 794,000$  individuals

## Annonaceae most vulnerable

24 Annonaceae endemic to Panama

6 appear in plots allow estimate of density  $\rho$  per ha  $\geq 1$  cm dbh:

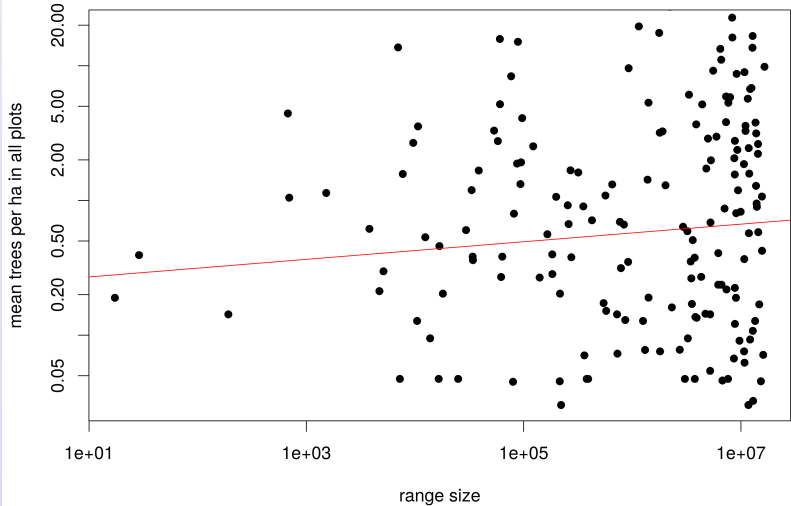
- ▶ *Guatteria alata*

Appears in 1 plot in wet Caribbean forest,  $\rho = 0.047$

Abundance over 19,000 km<sup>2</sup>  $\sim$  88,700 individuals

# Abundance vs. range

Among 492 in 12 carefully-vetted families



# Conclusions and hypotheses for future work

- ▶ Checklist and occurrence
  - Problems maintaining an updated taxonomy
  - Many taxonomists involved in revisions
  - All ( $\pm$ ) species examined
- ▶ Plots and the checklist
  - In Panama, one-third of known trees appear in plots
  - But only 25% of narrow endemics are in plots
  - Without thousands of plots, most species will be missed
- ▶ Range size plus abundance
  - Endemic species abundance  $\sim 0.4$  per ha
  - Widespread species abundance  $\sim 1.1$  per ha
  - But abundances vary orders of magnitude  
so predictions for unknown species are poor

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