iDigBio
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3rd Annual Digital Data Conference

Identifying factors to boost species discoveries among museum specimens

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https://www.calacademy.org/scientists/herpetology-collection

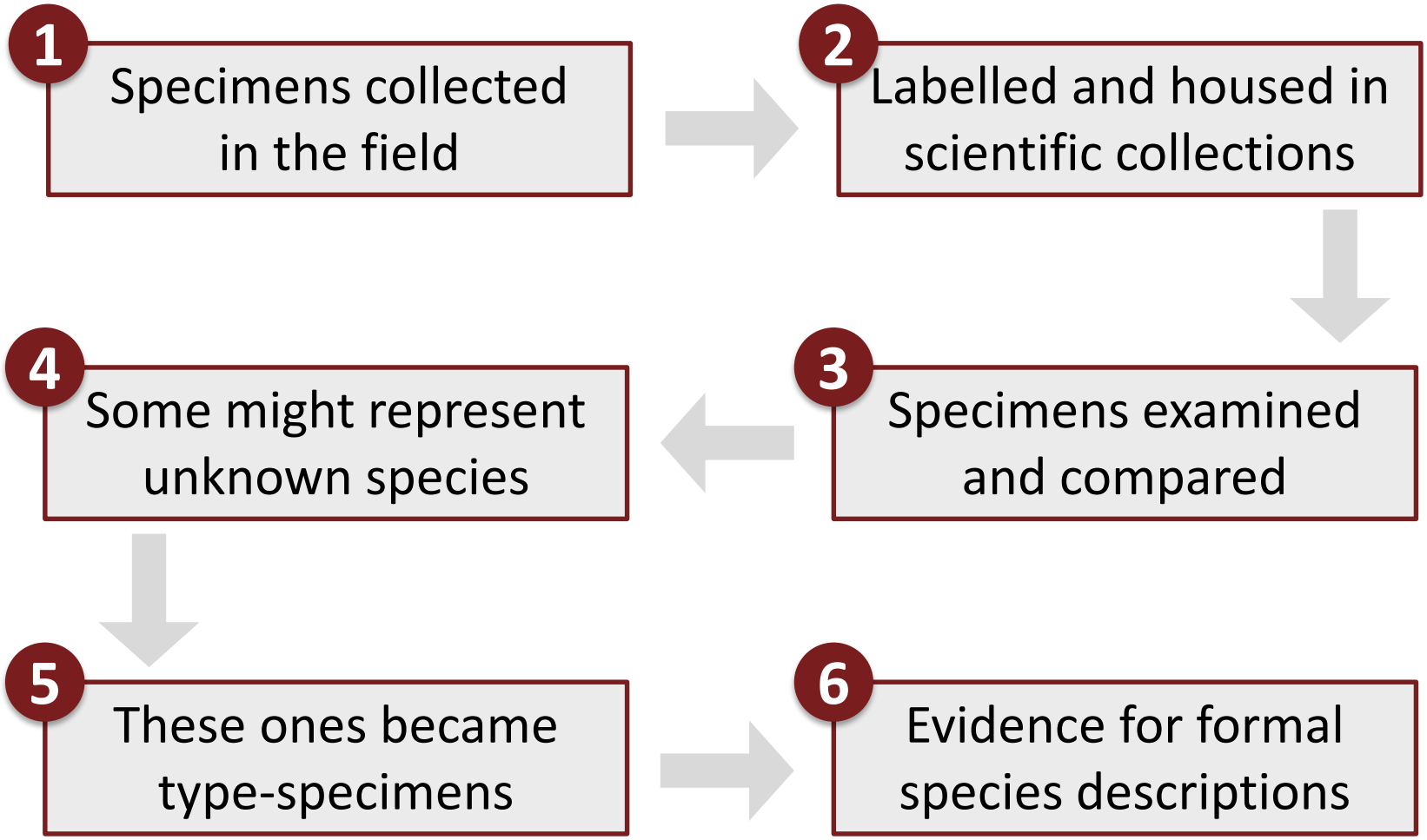
Biodiversity knowledge gaps

- Most species remain unknown to science (Linnean shortfall)
- Not included in conservation planning and decision-making
- Problem recognized through international agreements
  CDB, GTI

Taxonomic bottleneck

- Many collected specimens have never been studied
- Some will remain shelved for decades in the collections
- Lowering species' shelf life helps reduce the Linnean shortfall

Path: from field to new species



Path: from field to new species

1. Specimens collected in the field
2. Labelled and housed in scientific collections
3. Specimens examined and compared
4. Some might represent unknown species
5. These ones became type-specimens
6. Evidence for formal species descriptions

THESE STEPS TAKE TIME

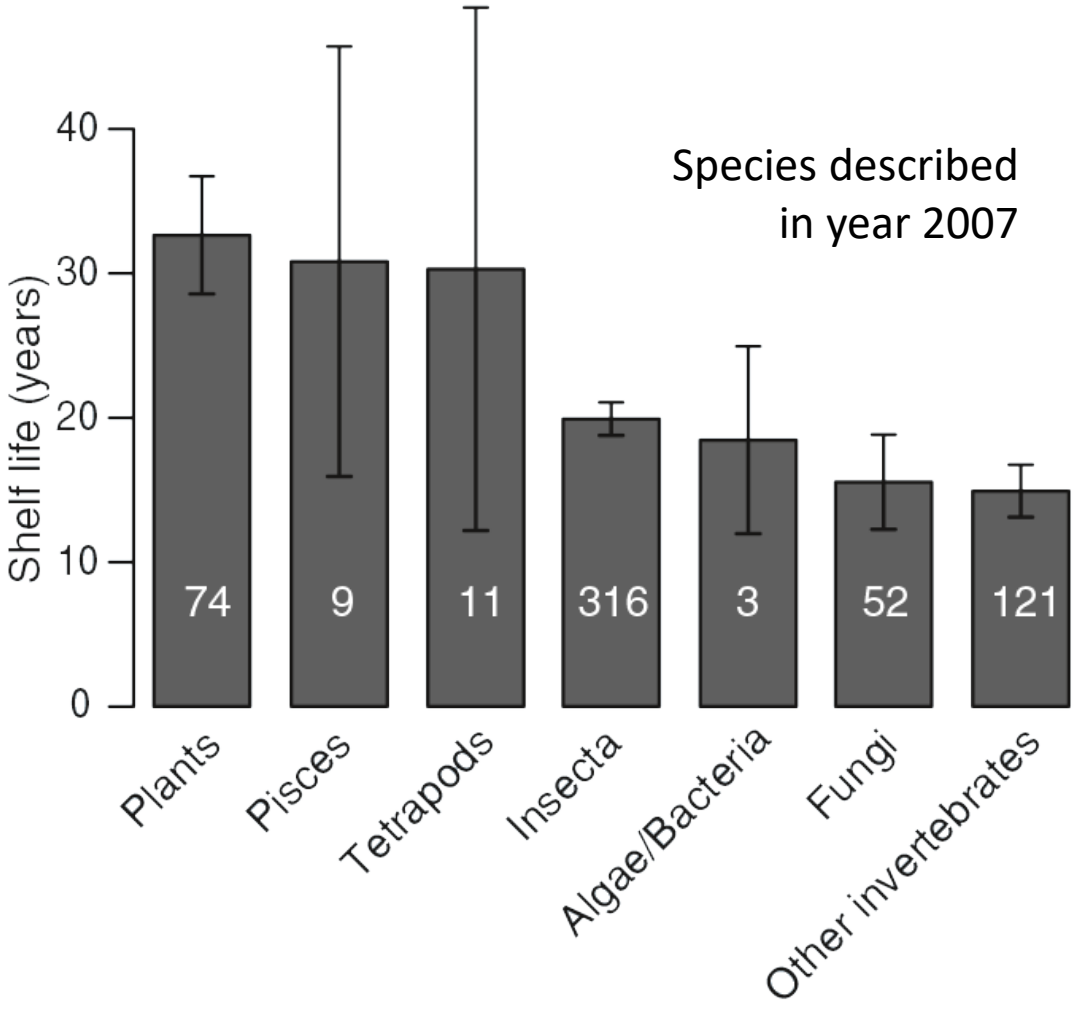
Time-lag: collection to description

Correspondence

21 years of shelf life between discovery and description of new species

Benoît Fontaine[1,*], Adrien Perrard[2], and Philippe Bouchet[3]

Current Biology Vol 22 No 22
R944



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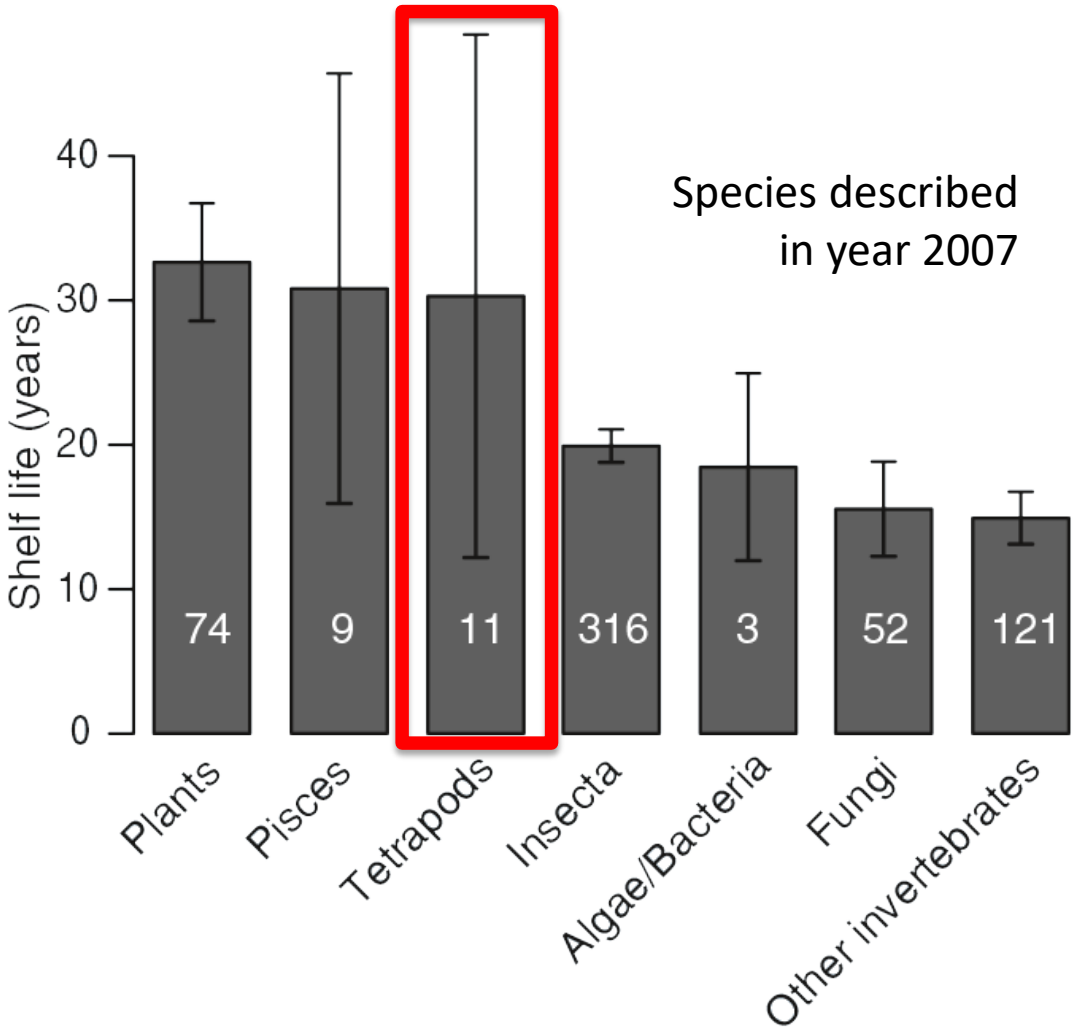
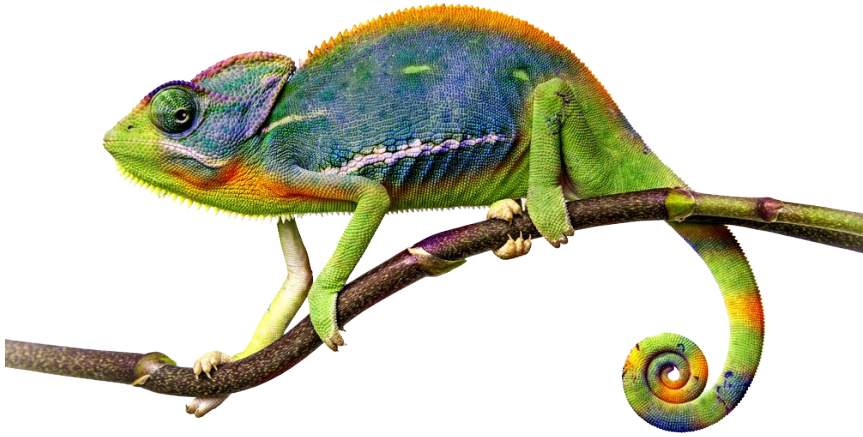


Target group: reptiles

- Most diverse vertebrate group, +11,000 known species
- At least 3.7 millions of preserved specimens, 12% unidentified*
- Many of those specimens are likely new species, waiting descriptions

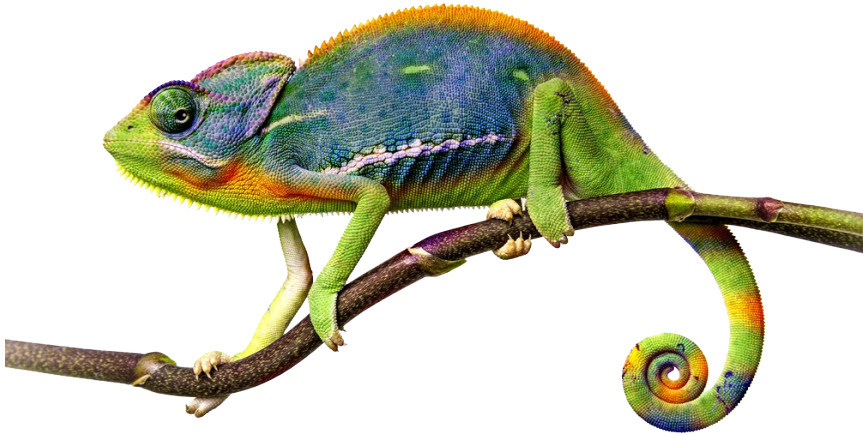


Potential drivers of time-lag

1. Species body size
2. Latitude of the collection site
3. Number of authors/species
4. Number of type-specimens/species
5. Number of species/genus
6. Was the collector an author?
7. Was it described in a taxonomic review?
8. Did the authors use molecular analysis?

How did we test it?

- Data compiled for 2661 species described from 1992 to 2017
- Time-to-event analysis in a model averaging framework
- Sensitivity analysis to account for potential influence of old specimens



What did we find?

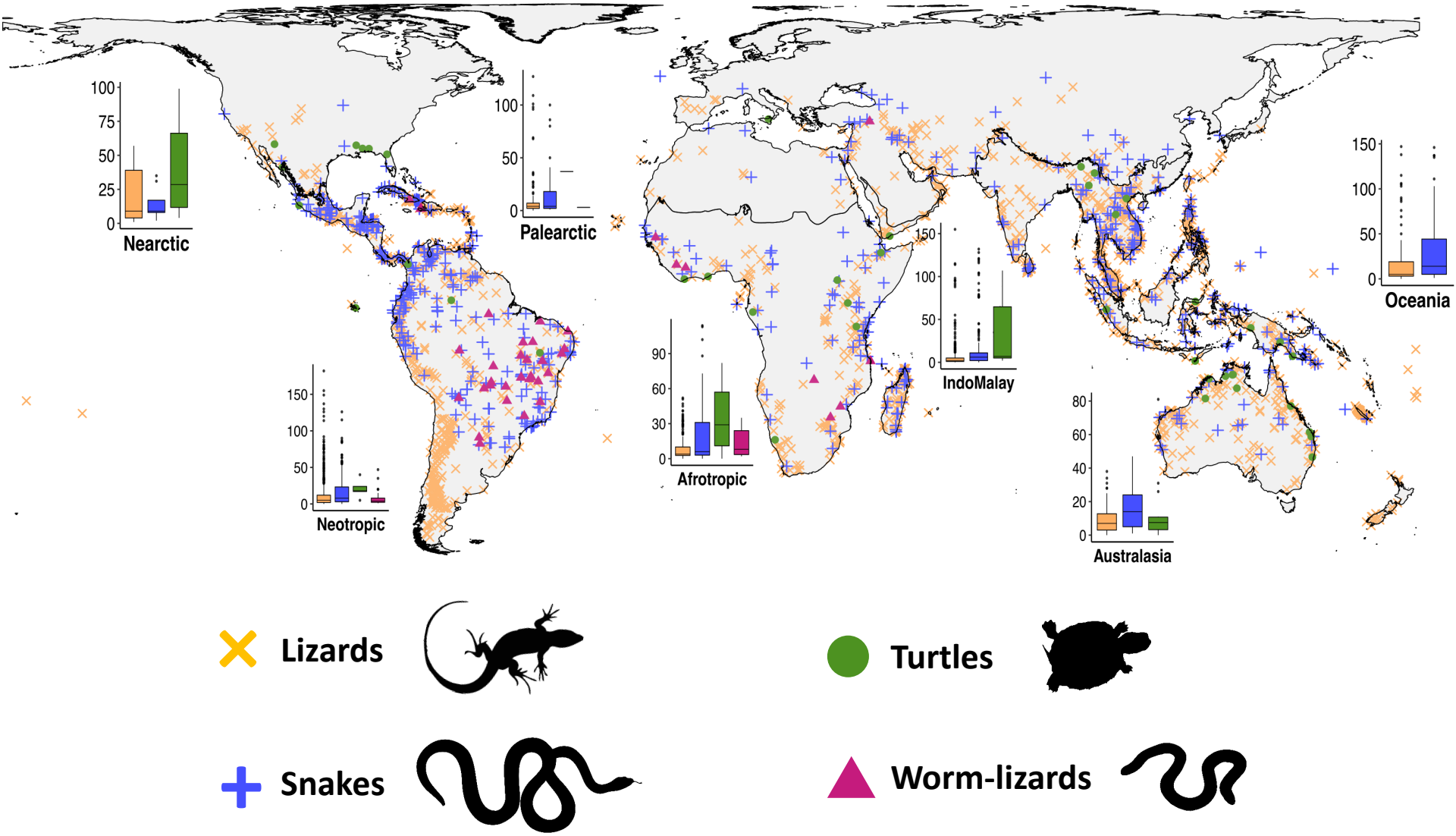
- Median time-lag = 5 years
- 25% of species waited > 12 years
- Time-lag ranged from 0 to 151 years

Scincid lizard
Capitellum mariagalantae
Collected: 1861
Described: 2012

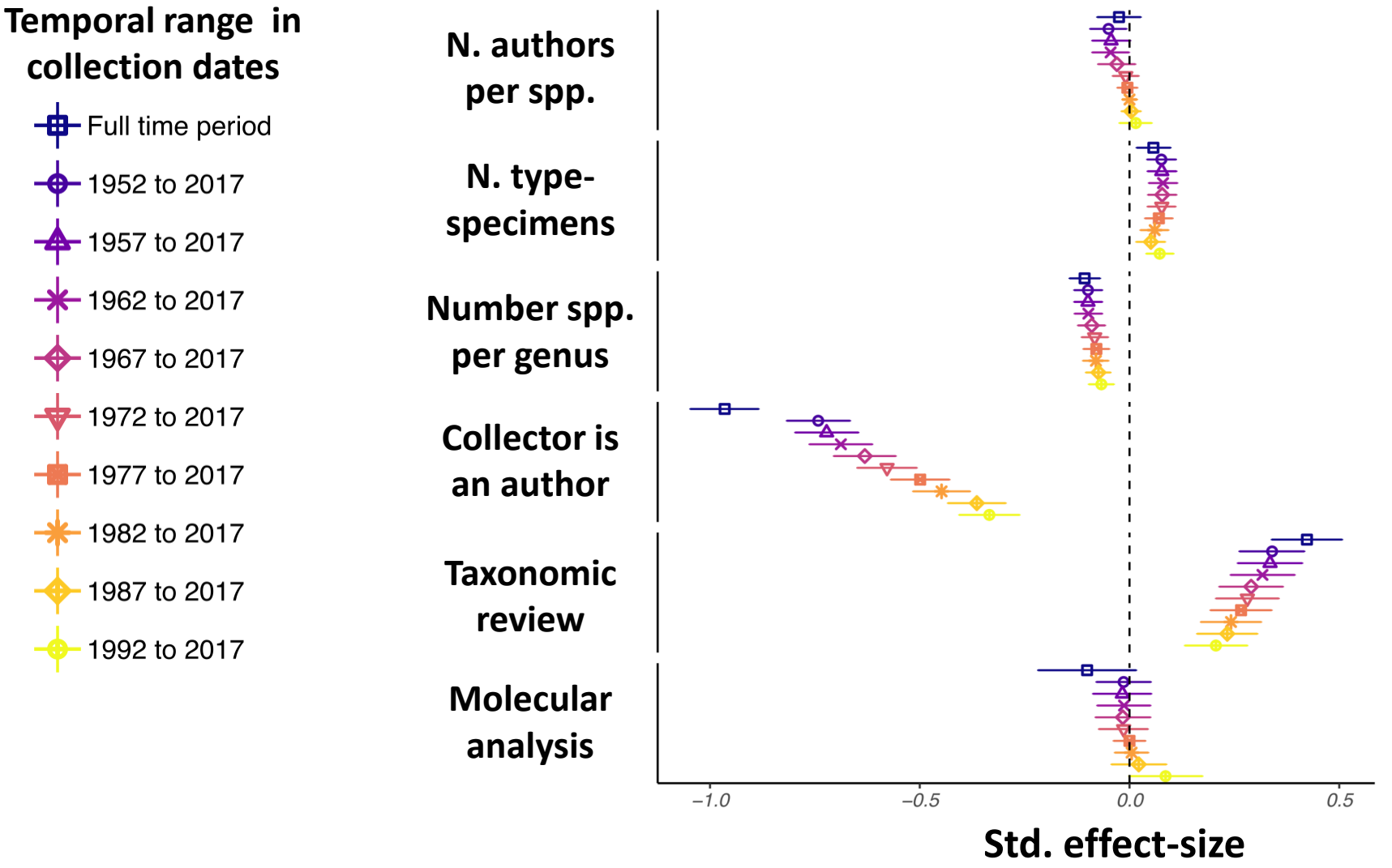
Snake
Dendrelaphis grismeri
Collected: 1862
Described: 2008

Enigmatic leaf turtle
Cyclemys enigmatica
Collected: 1901
Described: 2008

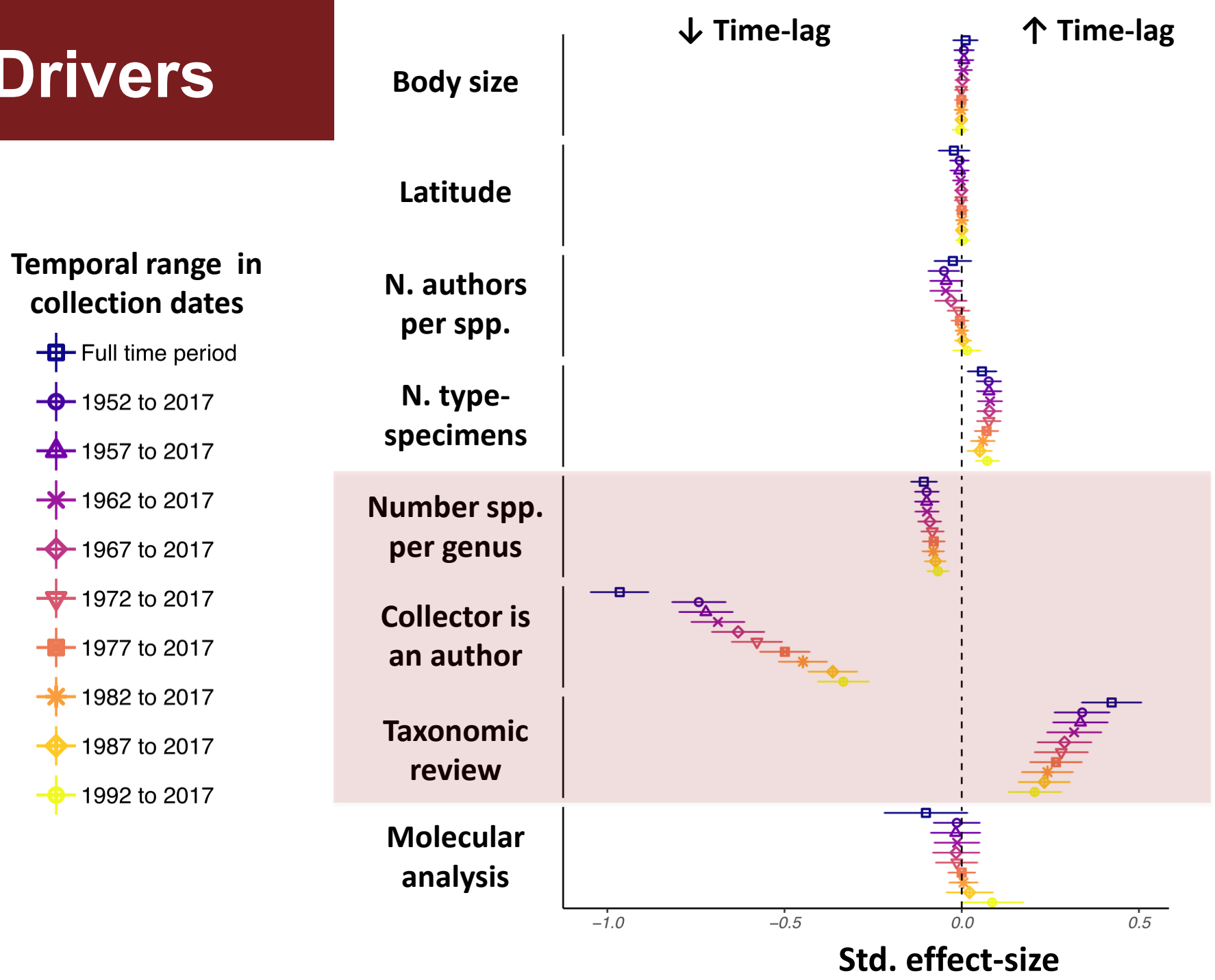
Geographical representation



Drivers


Temporal range in collection dates
Full time period
1952 to 2017
1957 to 2017
1962 to 2017
1967 to 2017
1972 to 2017
1977 to 2017
1982 to 2017
1987 to 2017
1992 to 2017
↓ Time-lag
↑ Time-lag
Body size
Latitude
N. authors per spp.
N. type-specimens
Number spp. per genus
Collector is an author
Taxonomic review
Molecular analysis
−1.0
−0.5
0.0
0.5
Std. effect-size

Drivers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Collector is an author

- Specimens collected by non-taxonomists tend to remain shelved longer
- They may not reach an expert immediately
- Important to make taxonomic expertise available to depository institutions

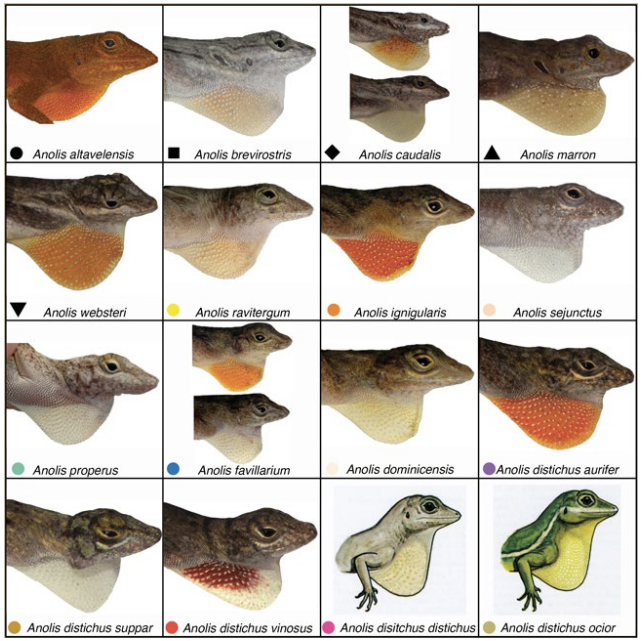
Taxonomic reviews

- Revisionary studies compare hundreds of specimens from several museums
- Allows the rescue of old specimens stored since long ago
- Act synergistically with efforts provided by non-taxonomists and citizen scientists

Abronia smithi collected by locals 15 years before its description in a taxonomic revision

Speciouse genera are ‘faster’

- Shorter time-lag for species belonging to speciose genera
- Many recent taxonomic updates
  - Improve the knowledge on distinguishing traits of each known species
  - Positive feedback that ultimately boosts the discovery process



Concluding

Preserved specimens belonging to less speciouse genera, and collected by non-taxonomists, should receive priority in taxonomic revisionary studies!

Acknowledgements

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