TRANSFORMING ACCESSIBILITY TO THE RICH, SITE-BASED, MULTI-TAXON COLLECTIONS OF FIELD STATIONS

CASE STUDY FROM ARCHBOLD BIOLOGICAL STATION

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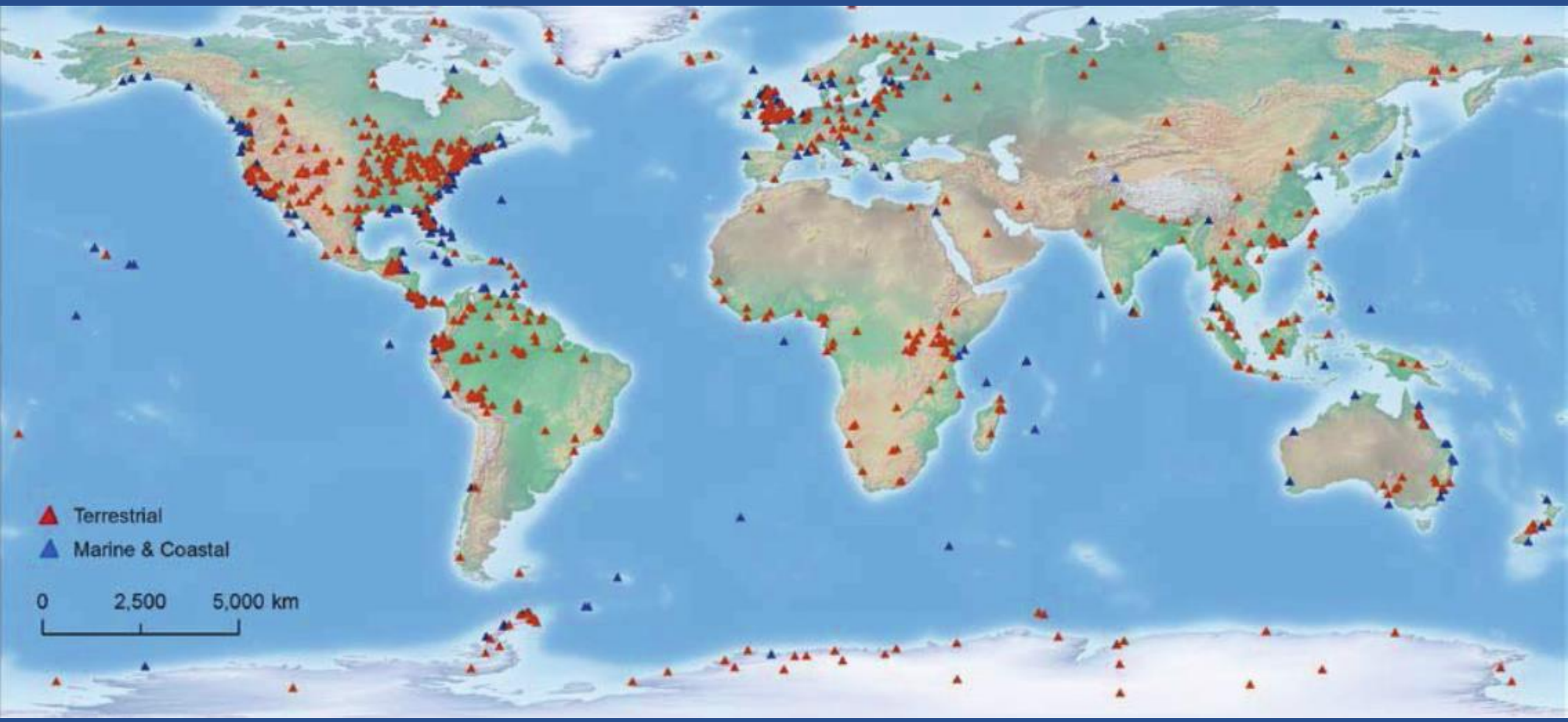
Photo by Reed Bowman

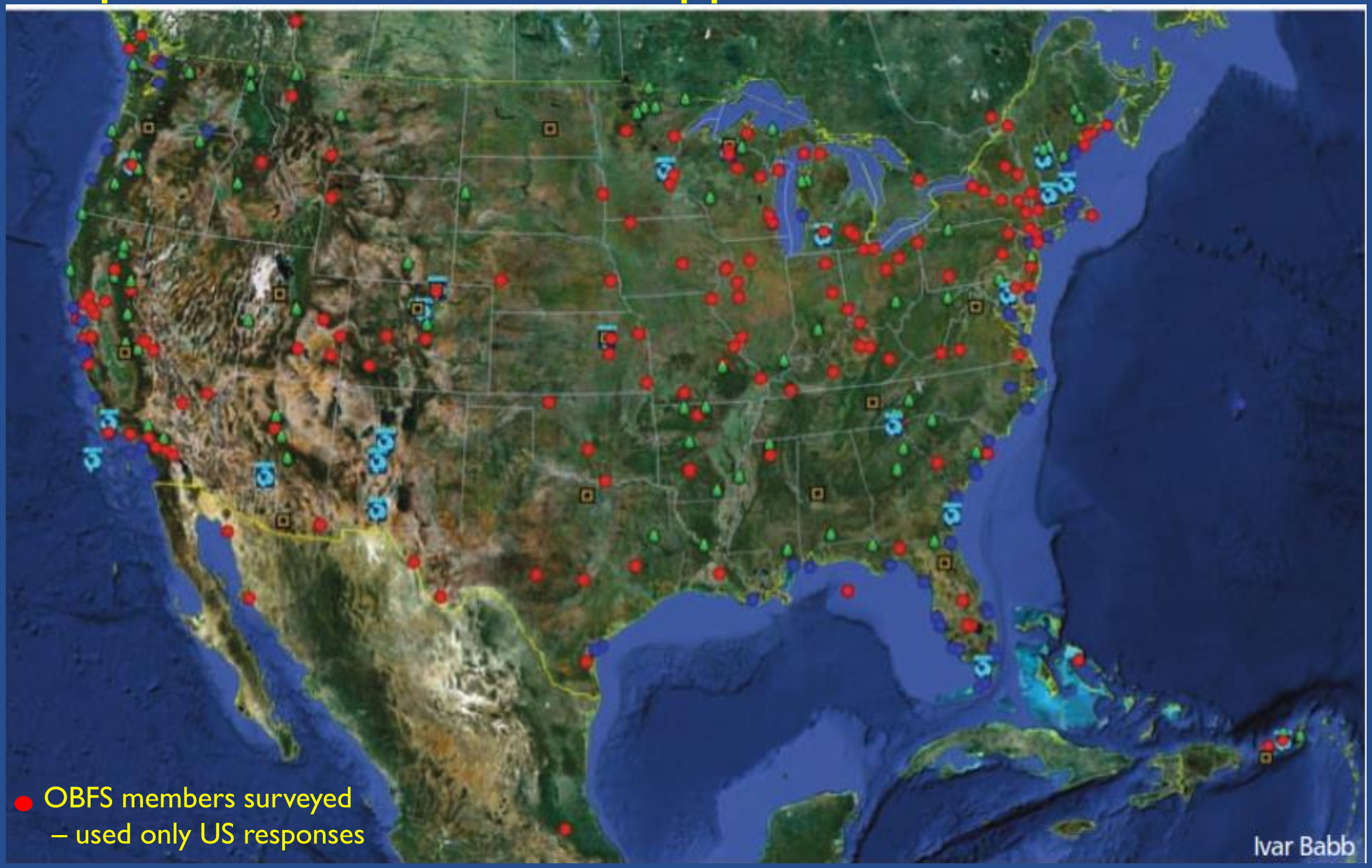
ARCHBOLD BIOLOGICAL STATION

Field stations and marine labs around the world

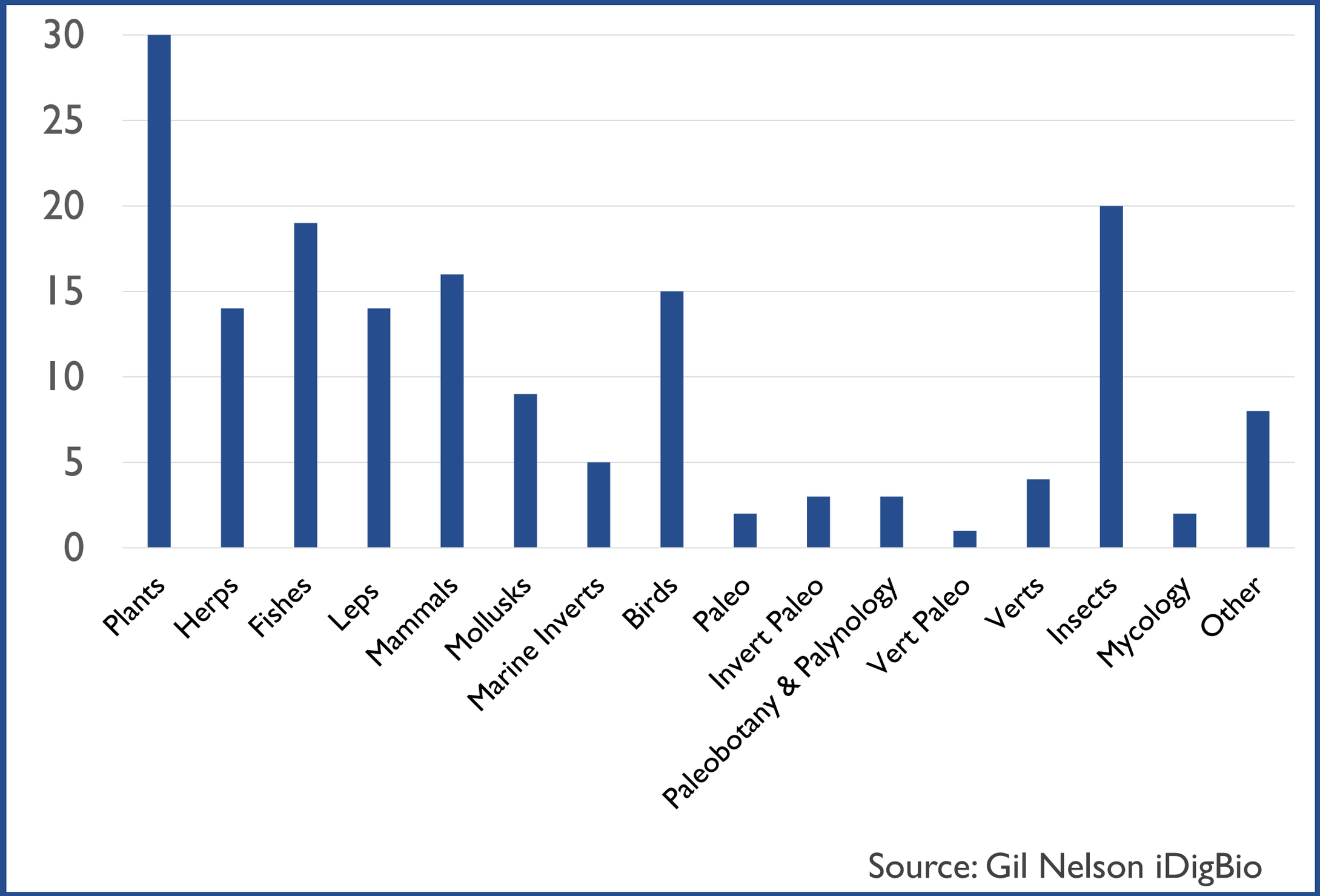


National Academy of Sciences. 2014
Enhancing the Value and Sustainability of Field Stations and Marine Laboratories in the 21st Cry.

Field stations in North America ...
iDigBio survey of OBFS (N=~172 in USA sent survey)
47 replied and 41 of these supported collections



Field stations in USA ….. iDigBio survey …. taxonomic representation for 41 w/collections



Source: Gil Nelson iDigBio

CASE STUDY
ARCHBOLD BIOLOGICAL STATION, FLORIDA

ARCHBOLD RESERVE

ESTABLISHED 2002

3,600 acres degraded restoration site

ARCHBOLD BIOLOGICAL STATION

ESTABLISHED 1941

5,200-acres pristine scrub preserve

MacARTHUR AGRO-ECOLOGY RESEARCH CENTER

ESTABLISHED 1988

10,500-acres Working cattle ranch

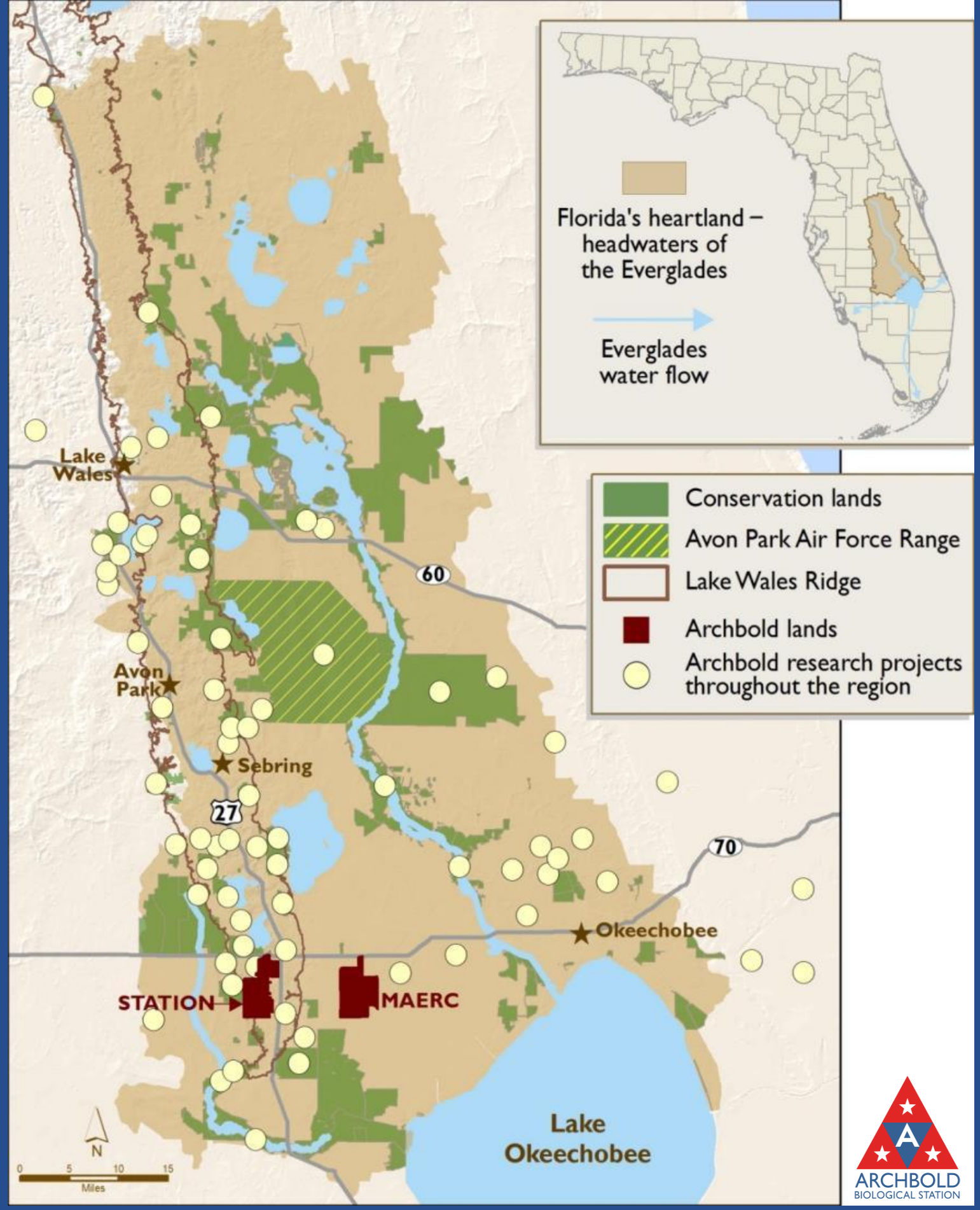
Photo by Kevin Main

Photo by Reed Bowman

Photo by Carlton Ward

Archbold provides access to a network of distributed research sites throughout a 2.6 million acre watershed

from Ridge…. to Ranch ….. to River ….



Rich biodiversity; many endemics

40

The number of new species described by Archbold scientists.

Hotspot of rare species:

- 44 species plus 9 subspecies globally imperiled
  - 29 federally Endangered and Threatened (+3 more not >=G3)
- Highlands County - among highest concentration of imperiled species in continental U.S.A.











History behind the Collection at the Archbold Biological Station

Founder: Richard Archbold, with his 1920s-30s experience of organizing the Archbold Expeditions to Madagascar and New Guinea with the American Museum of Natural History, believed that long-term ecological investment in a site required continual survey of the local species and their natural history, and management of a reference collection. We would call this a biodiversity survey. This work began in the late 1940's after he established the Station

Archbold's collection facilities – embedded on-site within a field station environment

Taxa	Specimens	Species	Ecologist Curator	Databased	OnLine
Plants	**4,276**	1,388	**Eric Menges** Betsey Boughton	**4,276** (1,000 more TB added)	**4,276**
Bryophytes	**538**	200	**Eric Menges** Joannes A. Janssens	**80%**	
Pollen slides	**300**		Barbara Hansen	**100%**	
Arthropods	**258,000**	7,993	**Mark Deyrup**	**3.9%**	**~6,000**
Herptiles	**2,068**	100	**Betsie Rothermel** Butch Norden	**100%**	
Fishes	**2,248**	45	**Betsie Rothermel** Butch Norden	**90%**	
Birds	**2,007**	512	**Reed Bowman**	**100%**	
Mammals	**73**	30	**Reed Bowman**	**100%**	

How representative is Archbold's field station collection?

	Plant	Herp	Fish	Lepi-doptera	Mammal	Mollusk	Marine Invert	Birds	Paleo	Invert Paleo	Paleo bot. & Palynology	Vert Paleo	Verts	Insects
N/41	30	14	19	14	16	9	5	15	2	3	3	1	4	20
ARCHBOLD	4,276	2,068	2,248	4,434	73			2,007						258,000
Smallest	40	5	4	95	20	1	50	10	100	50	100	100	20	44
Largest	18,000	10,000	5,000	10,000	1,000	10,000	100,000	4,000	228	100	1,000	100	100	258,000
Total	80,852	13,447	15,096	21,005	3,029	15,548	104,829	10,224	328	250	1,100	100	170	368,775
Average	2,526	896	755	1,500	789	1,728	20,966	639	164	83	550	100	57	18,439

Source: Gil Nelson iDigBio

Uses of the ABS Collection …….

I. **Reference:** Allows rapid on-site identification of plants & animals, including thousands of species of macroinvertebrates.
   A. Enable community-level studies and other multi-species research.
   B. Bypasses problem of decline in available taxonomic expertise

II. **Biodiversity documentation**: a permanent record of on-site biodiversity.
   A. One of very few North American sites where on-site diversity of macroinvertebrates is known in detail. e.g. 1, 592 species of beetles.
   B. Biogeographic comparisons: e.g. bee fauna with far fewer species of *Andrena* than found in sites farther north.
   C. Track changes in biodiversity.

III. **Repository for voucher specimens for research** projects.

IV. Specimens often have **unexpected or novel uses beyond data on labels**.
   A. Genetic studies. (BUT challenges of linking to dispersed databases of blood and other tissue data collected at Archbold)
   B. U.V. patterns
   C. Color, size, or structural polymorphisms, e.g. eumenine Vespidae

V. Not a teaching collection but used for training research interns

Number of visitor use days in the ABS Collection, 2009-2013				
	Herbarium	Arthropods	Birds/ Mammals	Fish/ Herps
Visiting Researchers	30	2,562	22	62
College Classes/ Workshops etc	12	8	17	5

In the last 10 years >100 publications based on work in the Archbold collection

And >60 papers based on material collected at Archbold but deposited in other collections including; 1 herp, 2 botany, 4 mammals, and the rest entomology

Use of the Archbold collection by visiting scientists and classes

Photo by Reed Bowman

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Photo by Nancy Deyrup

- Deyrup and Deyrup. 2011. Florida Entomologist. *Colletes francesae*, a new species of colletid bee (Hymenoptera: Colletidae) associated with *Sideroxylon tenax* (Sapotaceae) in Florida scrub habitat.

Gastrophryne carolinensis

Photo by Peter May

- Deyrup, et al. 2013. Southeastern Naturalist. Ant species in the diet of a Florida population of Eastern narrow-mouthed toads,. ***4,859 ants retrieved from stomachs***, *ants comprised 95% of food.* ***43 species*** *of ants, 77% from genera* ***known to contain venoms, repellents***, *etc* ***suggesting toads sequester exocrine secretions of ants for defense***.

Photo by R. Tucker

- Meshaka, W.E., Jr., and J.N. Layne. 2015. Herpetological Conservation and Biology. *The herpetology of southern Florida*.

Publications based in part on use of the ABS Collection
six recent examples (part 1)

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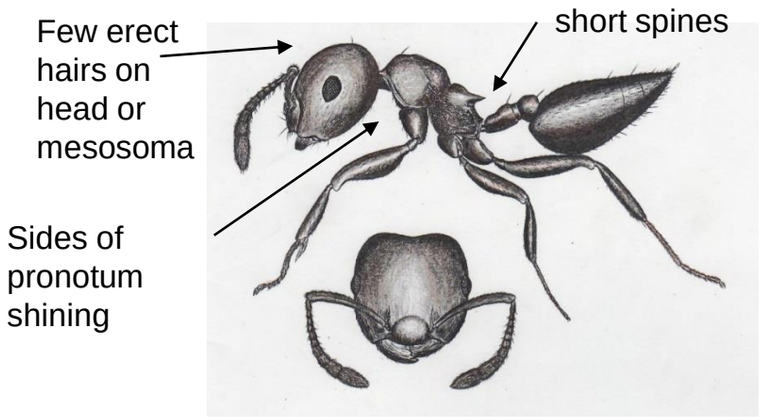
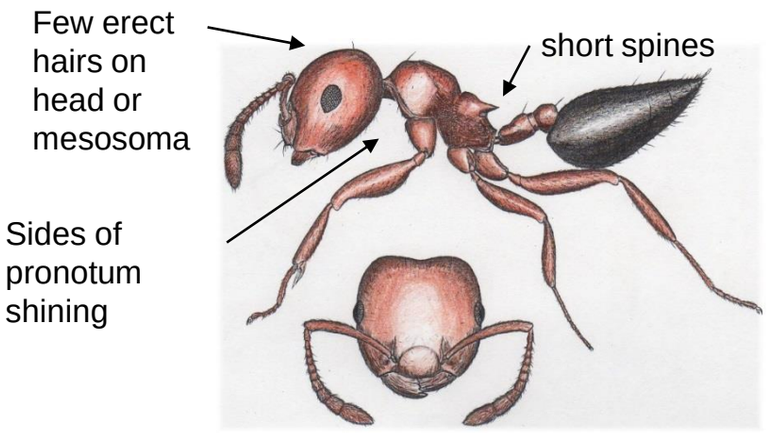
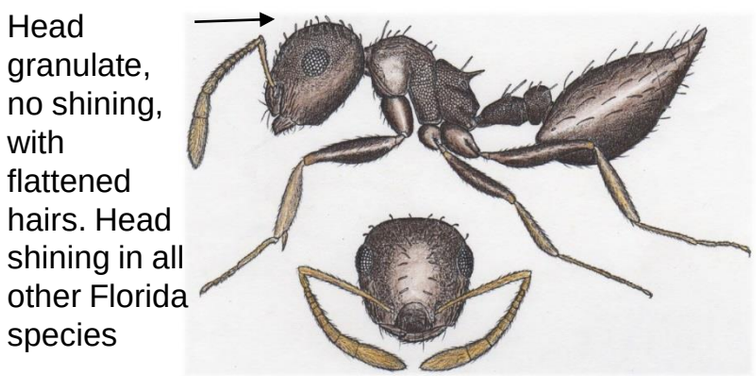
Florida *Crematogaster* (Acrobat Ants)



ashmeadi



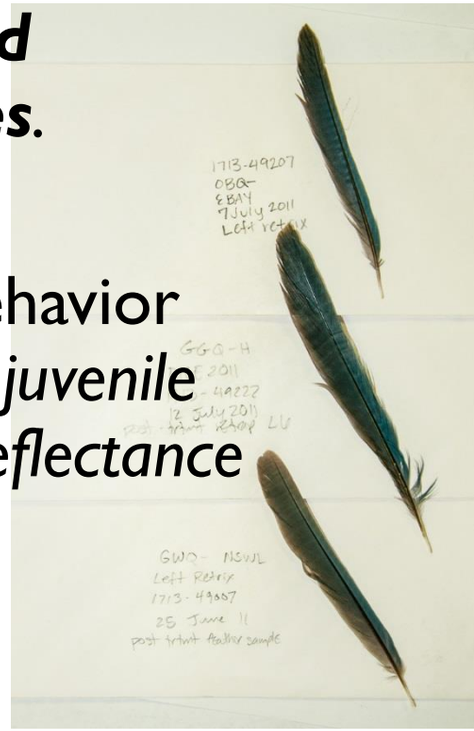
pinicola



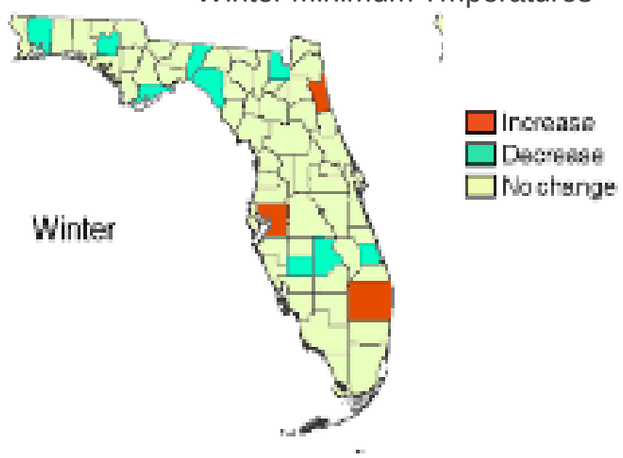
obscurata

- Wiescher et al. 2012. Oecologia ***Correlations between traits of ants*** *(leg length, thermal tolerance and desiccation resistance)* ***and ecosystem or community properties***.

- Tringali and Bowman. 2012. Animal Behavior ***ABS's feather collection***. *Plumage of juvenile Florida Scrub-Jays has variability in UV reflectance correlated with dominance.*



- Von Holle, et al. 2010. PLOS. ***Herbaria and climate change***. *Specimen information from ABS and other collections document trend for delayed seasonal flowering in Florida.*



Publications based in part on use of the ABS Collection

six recent examples (part 2)

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Photo by Reed Bowman

Archbold Collection; importance for rare species:

- **5 Threatened and 7 federally Endangered birds** (plus 3 extinct birds)
- **4 Threatened reptiles**
- **3 Threatened and 10 Endangered plants** and one Endangered lichen, many specimens of state listed species

Collection's value for resource management:

1. First county or regional record for **many non-natives** e.g. *Strumigenys rogeri*, an African ant; *Dieuches armatipes*, an African seed bug and pest of peanuts; and first Florida record of *Cnestus mutilatus*, an ambrosia beetle

2. Specimens that later become a treasure trove for conservation. E.g. **Florida ziziphus *Ziziphus celata***. Only 2 specimens (Archbold and FL State Museum) were identified as *Z. celata,* believed to be extinct. Rediscovered in wild in 1987. Archbold staff spearheaded massive effort to save *Z. celata* - land acquisition, off-site collection at Bok Tower Gardens, research, population monitoring, and translocation.

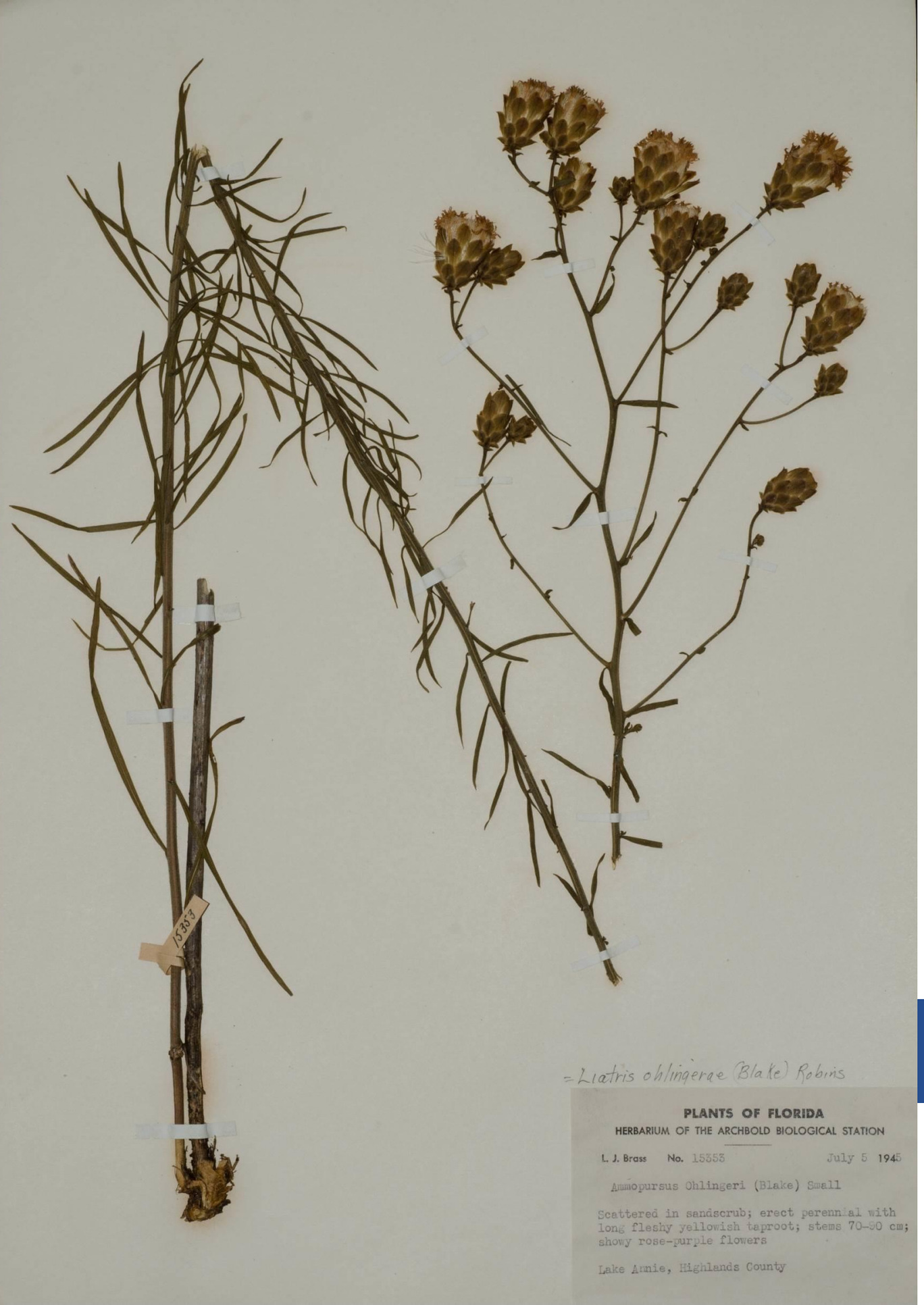
3. **Scrub Invertebrate Species of Greatest Conservation Need** FL State Wildlife Grant (2010-2012) Sampled 23 LWR conservation preserves for 93 endemic arthropods. 19,952 site occurrences and >900 specimens databased.

Value for Conservation

ARCHBOLD BIOLOGICAL STATION

Status of the ABS Collection is representative of many natural history collections reviewed by the Interagency Working Group on Scientific Collections (2009) and NSF (Skog et al. 2009)

- dearth of information available online
- limited interoperability of data with regional, (inter)national, collections.
- example of "dark data" by the collections community, i.e.
  - small institution without extensive IT expertise
  - no dedicated full-time curators (except entomology)
  - Lacking wherewithal to link their important regional collections to global networks (Billick et al. 2013, NRC 2014).



iDigBio Weekend Digitization Blitz Yields 4,276 Specimen Images for Archbold Biological Station

http://nansh.org/portal/collections/index.php

Status of databasing and OnLine

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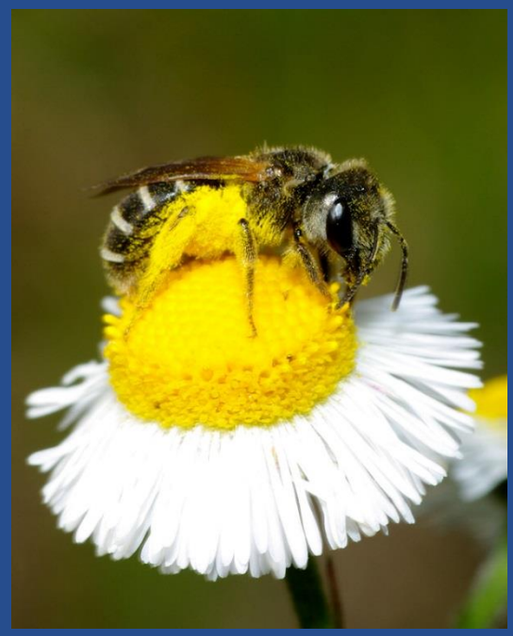

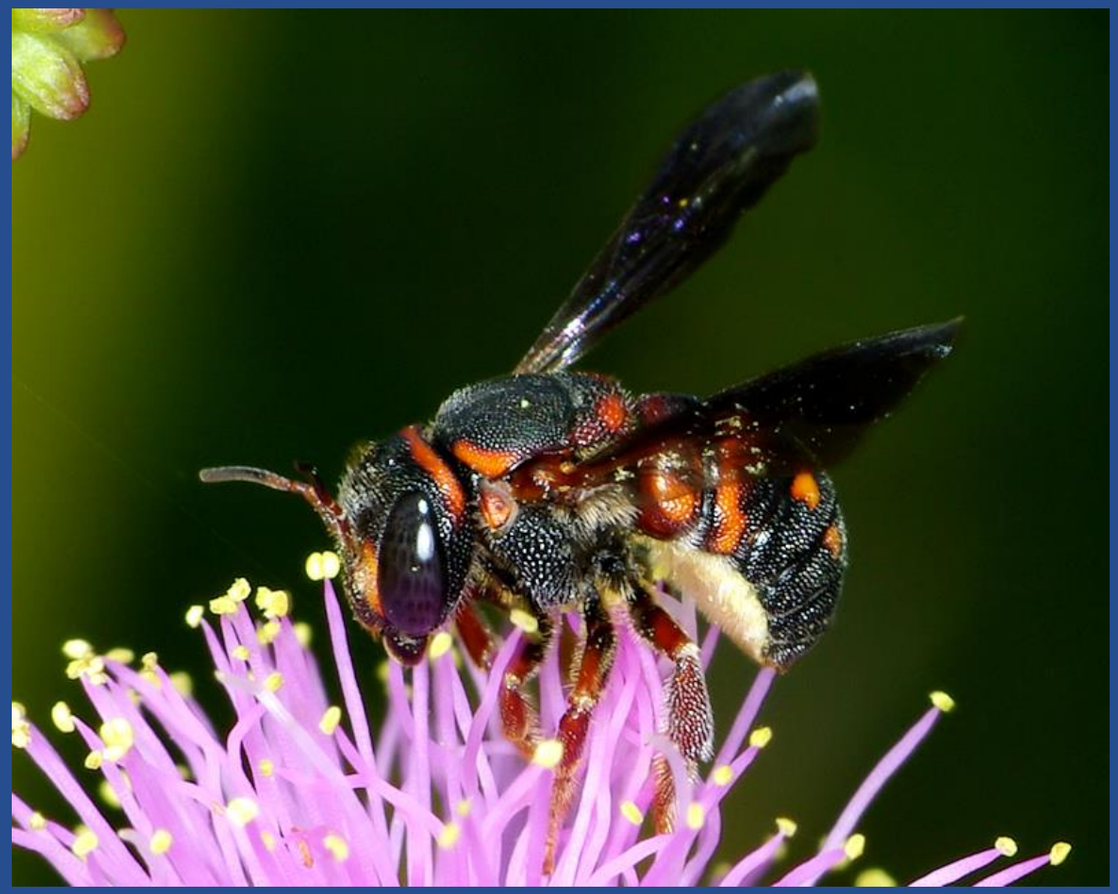

Flower Insect Visitors

Archbold collection has an estimated 10,000 insect specimens with flower visitor information on labels

Approximately 6,000 records now databased and online

No current interoperability with flower specimen records

Photos by Tim Lethbridge (Archbold Volunteer)

Photo by Tim Lethbridge

Recommended for NSF funding: Collections in Support of Biological Research (CSBR):

Databasing and imaging specimens to make data internet-accessible with www-based portals.

- Emphasis will be on the arthropods:
  - Arthropod holdings list (8,000)
  - Ants (database 50,000 of 120,000)
  - Scrub endemics (900 done, +~500)
  - Flower-insect visitors (6,000 done, + 4,000)
  - Dead wood insects (~5-6,000)
- Vertebrates
  - Birds, mammals, herptiles, fishes
- Herbarium
  - Bryophytes

Partner with iDigBio to effectively database, image and migrate specimen data to the internet. Symbiota-linked portals will be linked to the ABS website.

NEXT STEPS

ARCHBOLD BIOLOGICAL STATION

In closing …..

Photo by Tim Lethbridge