Modeling the distribution of odonates: from the pages of 20th century field notes to the shapefiles of the 21st century

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The Journey

Workflow

The Beatty Collection

Digitization

Field Notes & Associated Papers

COLLECTIONS IN MEXICO - 1962

COLLECTION #	DATE	LOCATION #
62406 El Salto, S.L.P.	17, 18, 19.V.62.	85
407 "Rancho Beatriz" 10 mi. S. of Valles, S.L.P.	20.V.	NEW
408 stream, etc. 3.6 mi. S. of Tamasunchale, S.L.P.	20.V.	92
409 Rio Moctezuma 1 mi. S. of "	21.V.	91
410 Arroyo 4.4 mi. N. of "	21.V.	90
411 Arroyo 5.5 mi. S. of "	21.V.	89
412 "Quarry-like ponds" near Encinal, Ver.	23.V.	143
413 stream, waterfall BELOW bridge 4.5 mi. N.E. of Huamantla, Ver.	23.V.	144B
414 Barranca de Metlac, Ver., near power plant	24.V.	140
415 near Barranca de Metlac, on rd. to Fortin	25.V.	NEW
416 Ojo de Agua, Orizaba, Ver.	25.V.	157
417 Rio Hondo, near Tierra Blanca, Ver.	26.V.	182
418 Rio Chospan, near Tuxtepec, Ver.	27.V.	56
419 Montañas de la Chinantla, Oax., STA.#12	27.V.	70
420 " " " " " STA.#12	28.V.	70
421 " " " " " STA.#15B	28.V.	near 73
422 " " " " " STA.#15	28.V.	71
423 " " " " " STA.#11	28.V.	69
424 " " " " " STA.#10	28.V.	68
425 Rio Chospan, near Tuxtepec, Oax.	29.V.	56
426 Arroyo, etc. near Sihuanpan, Ver.	30.V.	165
427 Sontecomapan, near Catemaco, Ver.	31.V.	NEW
428 Arroyo Frio, near Santiago Tuxtla, Ver.	31.V.	179
429 " " " " " " "	1.VI.	179
430 " " " " " " "	2.VI.	179
431 Arroyo Tatocapan, near " " "	2.VI.	177
432 " " " " " " "	3.VI.	177
* 433 Arroyo, etc. near Coatepec, Ver.	6.VI.	123
434 stream, etc. 3.6 mi. S. of Tamasunchale, S.L.P.	8.VI.	92
435 Arroyo de los Patos, 7.9 mi. N.E. of Tamasunchale	8.VI.	NEW
30 COLLECTIONS (23 by GWS)		
24 COLLECTING LOCATIONS (18 by GWS)		
23 DAYS FROM FIRST TO LAST COLLECTION		
19 " OF COLLECTING		
14 " " " BY GWS!		

* 7.VI. Arroyo de Sta. Maria, HGO., visited but nothing collected. GWS saw no *Omata*; M&M saw what was probably *A. DUBESI*.

Georeferencing

[TODO map](#) Sqed depiction: [16227](#) [Original image](#) [Depiction breakdown](#)

click to navigate

this record

6205 Boqueron 25.12.61 in the road in between water to Kert water with with the Till

highlight to copy | [edit in place](#)

Edit collecting event

Verbatim locality
6205 Boqueron 25.12.61 in the road in between water to Ke

Geographic area
Boquerón

Namespace Identifier
Select a namespace

[Save changes](#) [Save and next](#)
[Skip to next](#)

Collecting event details

[Show collecting event](#)

Geographic area: [Boquerón](#)

Field notes:

Md5 of verbatim label:

Cached:

Labels

Verbatim label:

Print label:

Document label:

Verbatim

Verbatim locality: 6205 Boqueron 25.12.61 in the road in between water to Kert water with with the Till

Verbatim date:

Verbatim latitude:

Verbatim longitude:

Verbatim elevation:

Verbatim datum:

Verbatim geolocation uncertainty:

Verbatim trip identifier:

Verbatim collectors:

Hypotheses

- Inclusion of the Beatty Odonata Collection data can add coverage and power to ecological niche models generated
- Digitized collections in conjunction with field notes can be combined to provide data points for distribution analyses
- Georeferenced collections data incorporated with recent specimen data can show change in distributions over time, such as northward shifts from warming temperatures

Taxa

Argia moesta (Hagen, 1861)

[Photo by Aaron Carlson \(CC BY-SA 2.0\)](#)

Calopteryx maculata (Palisot, 1805)

[Photo by Andrew C \(CC BY 2.0\)](#)

Epitheca cynosura (Say, 1839)*

[Photo by Jason Forbes \(CC BY-NC-ND 2.0\)](#)

What can we learn from ecological niche models partitioned into several time periods versus one model for all georeferenced specimens?

MaxEnt Modeling

Argia moesta (Coenagrionidae)

[Photo by Aaron Carlson \(CC BY-SA 2.0\)](#)

Prior to 1964

n=369

Variable: mean temperature
of warmest quarter

1964-1989

n=52

Variable: mean temperature of
warmest quarter

1990 - 2015

n=1423

Variable: mean
temperature of the
warmest quarter

Argia moesta Overall

Calopteryx maculata (Calopterygidae)

Photo by Andrew C (CC BY 2.0)

Prior to 1964

n=210

Variable: mean precipitation
of warmest quarter

1964-1989

n=103

Variable: mean precipitation of
warmest quarter

1990 - 2015

n=1394

Variable: mean
temperature of warmest
quarter

Calopteryx maculata Overall

Epitheca cynosura (Corduliidae)

Photo by Jason Forbes (CC BY-NC-ND 2.0)

Prior to 1964

n=198

Variable: precipitation of
warmest quarter

1964-1989

n=77

Variable: precipitation of warmest
quarter

1990 - 2015

n=737

Variables: precipitation of
warmest quarter &
annual mean
temperature

Epitheca cynosura Overall

What is driving the change in predictions?

Data

Increase in data points: Up to 56%

Average number of records in each partition:

Prior to 1964: 138.4

1964-1989: 49.7

1990-2015: 882

Average number of unique localities in each partition: 597.6

Average year of collection: 1992.9

Conclusions

- The Beatty Collection of Odonata can be used in identifying patterns in the distribution of mid-20th century odonates
- Digitized collections data are critical for identifying species distribution changes
- Niche models should address the biases, variables, and numbers of specimens

Future Directions

- Georeference other collections
- Incorporate larvae
- Use surface water data
- Combine edaphic factors data
- Look at other possible disturbances

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TaxonWorks

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Matt Yoder

Questions?