On Interpreting Biotic Association Records

Entomology Collections Workshop @ Arizona State University
2022-06-20/22

Jorrit H. Poelen
https://jhpoelen.nl

presentation @ https://doi.org/10.5281/zenodo.6686306

https://jhpoelen.nl

Jorrit H. Poelen is an independent software/data engineer, Ronin research scholar, and UCSB CCBER research affiliate with an interest in open science and biodiversity informatics. He lives and works in ~~Oakland, CA (on Ohlone land)~~ Minneapolis, MN on land originally cared for by Dakota, Ojibwe, Northern Cheyenne and others.

He contributes to Global Biotic Interactions, Nomer, Preston, Elton, Terrestrial Parasite Tracker, Big Bee, and the Open Traits Network.

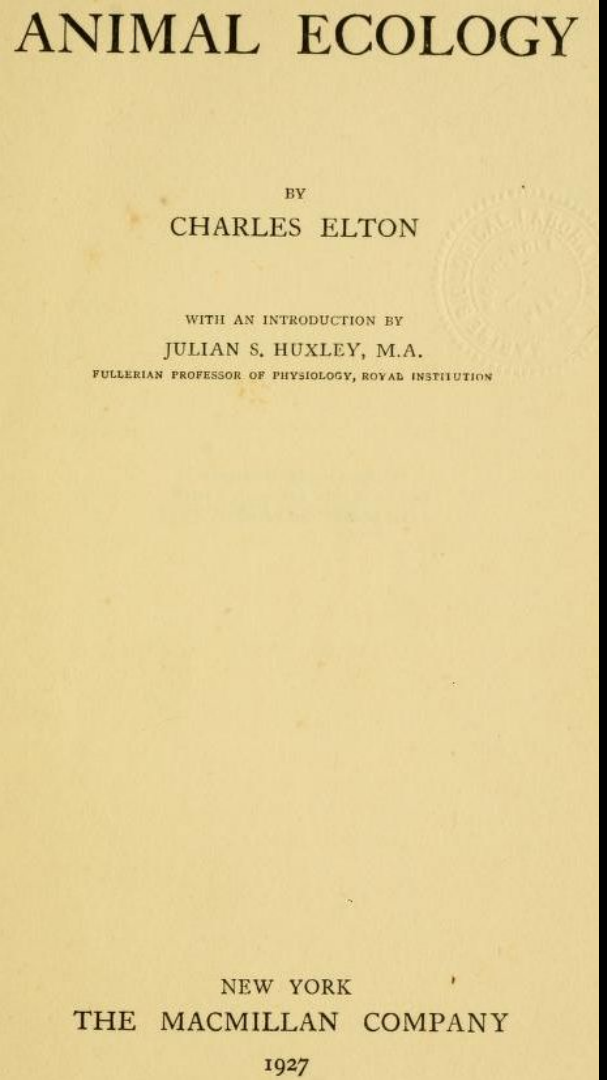
He also writes peer-reviewed papers, gives talks, and reviews data publications.

For more information, please have a look at Jorrit's CV, a 2020 NSF Biosketch, or a 2020 NIH Biosketch.

How do *you* **record** associations?

How do *you* record **interpretations** (or **reviews**) of these association records?

How do *you* **share** association records?


ANIMAL ECOLOGY

BY

CHARLES ELTON

WITH AN INTRODUCTION BY

JULIAN S. HUXLEY, M.A.

FULLERIAN PROFESSOR OF PHYSIOLOGY, ROYAL INSTITUTION

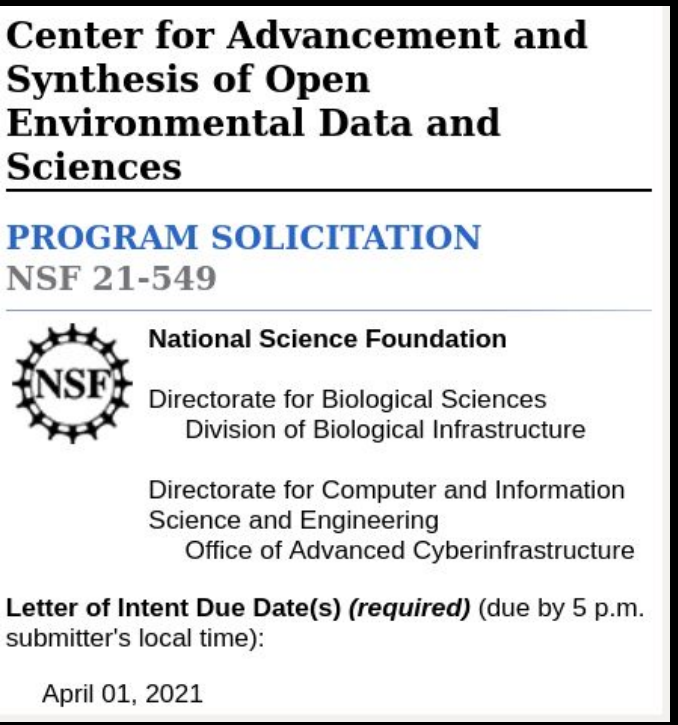
NEW YORK

THE MACMILLAN COMPANY

1927

"The advantage, and at the same time the difficulty, of ecological work is that it attempts to provide conceptions which can link up into some complete scheme the colossal store of facts about natural history which has accumulated up to date in this rather haphazard manner. [...] Until more organised information about the subject is available, it is only possible to give a few instances of some of the more clear-cut niches which happen to have been worked out."

Charles Elton, **1927**, *Animal Ecology*. pp 65-66.
https://biodiversitylibrary.org/page/7236467



Center for Advancement and Synthesis of Open Environmental Data and Sciences

PROGRAM SOLICITATION
NSF 21-549

National Science Foundation

Directorate for Biological Sciences
Division of Biological Infrastructure

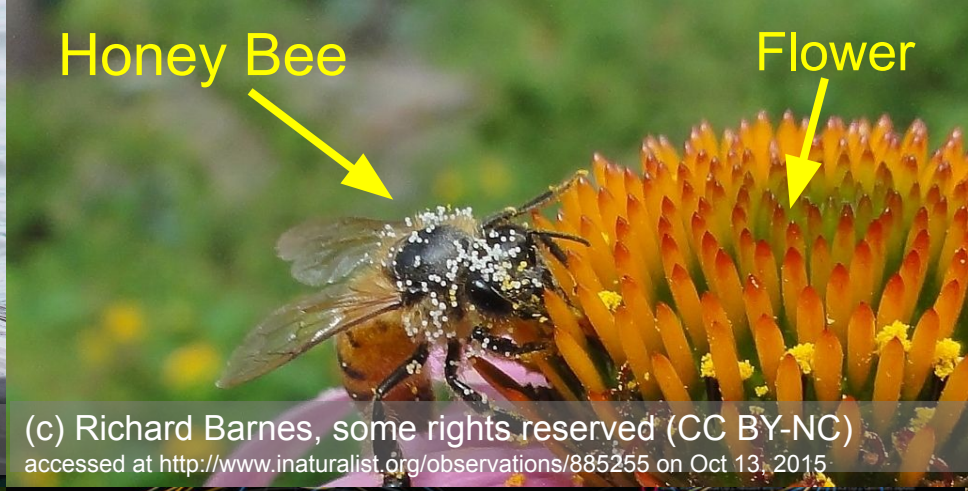
Directorate for Computer and Information Science and Engineering
Office of Advanced Cyberinfrastructure

Letter of Intent Due Date(s) ***(required)*** (due by 5 p.m. submitter's local time):

April 01, 2021

"NSF seeks to establish a Center fueled by open and freely available biological and other environmental data to catalyze novel scientific questions in environmental biology through the use of data-intensive approaches, team science and research networks, and training in the accession, management, analysis, visualization, and synthesis of large data sets. [...] The Center will provide vision for speeding discovery through the increased use of large, publicly accessible datasets to address biological research questions through collaborations with scientists in other related disciplines. [...]"

NSF 21-549. Accessed at 2021-04-11 at https://www.nsf.gov/pubs/2021/nsf21549/nsf21549.htm



Global Biotic Interactions (GloBI) is a **collaborative, open source, open data** project that makes **existing species-interaction datasets** easier to **discover and use.**

Background image: Slyusarev et al. (2015): Global Biotic Interactions food web map. figshare. http://dx.doi.org/10.6084/m9.figshare.1297762

http://globalbioticinteractions.org

a brief history

2011 - Jorrit meets Jim at Texas A&M College Station for Ecological Integration Symposium.

2013 - Encyclopedia of Life Rubenstein Fellowship / GloBI / GoMexSI born

2014 - Jorrit, Jim and Chris publish GloBI paper

... many citations, workshops, conferences, integrations later ...

2022 - Association Interpretation Sessions at Ecological Collection Management Workshop @ ASU

Jorrit H. Poelen, James D. Simons and Chris J. Mungall. (2014). Global Biotic Interactions: An open infrastructure to share and analyze species-interaction datasets. *Ecological Informatics*. https://doi.org/10.1016/j.ecoinf.2014.08.005.

in a nutshell

1. Existing openly accessible species interaction datasets in **any data format** are **registered** using https://globalbioticinteractions.org/contribute

2. **GloBI** continually and automatically **indexes and links** most recent species interaction datasets.

3. **Users discover, access and review** datasets via GloBI's many integrations, search pages, data archives or APIs.

How do *you* **record** associations?

direct observation (e.g., specimen examination, field observation)

indirect observation (e.g., transcribe specimen labels, field notes)

How do *you* record **interpretations** (or **reviews**) of these association records?

Many interpretations may coexist by recording opinions of known origin.

Interpretation vs. indirect observation

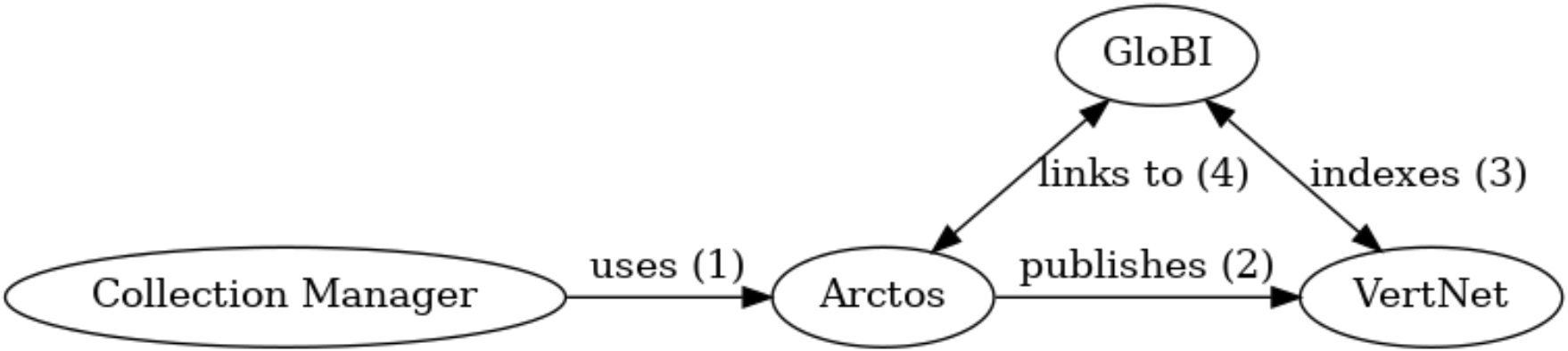
How do *you* **share** association records?

collection management system
data publications
data registries/ repositories

How do *you* **share** association records?

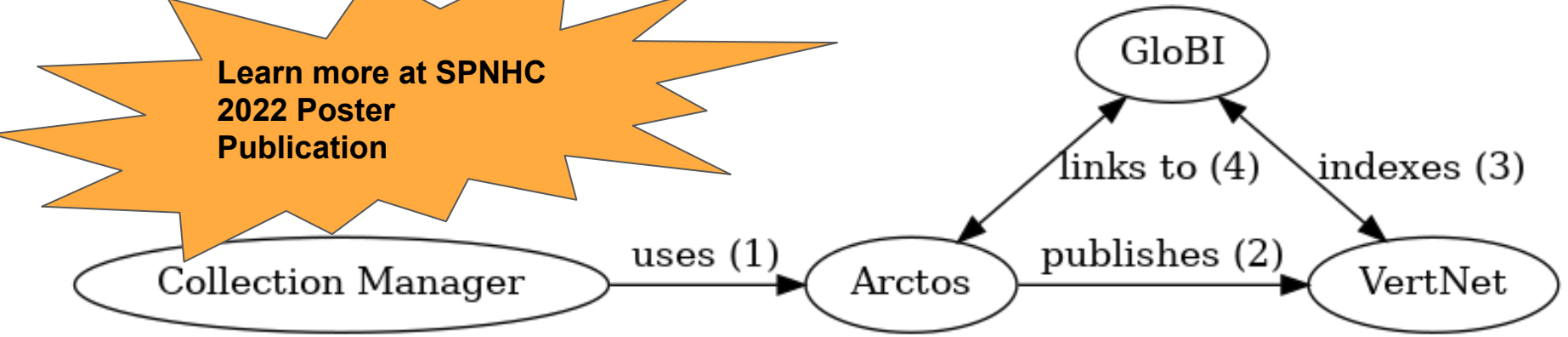
collection management system
data publications
data registries/ repositories

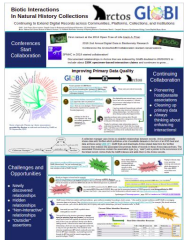
Use Case: Arctos Specimen Associations



Use Case: Arctos Specimen Associations

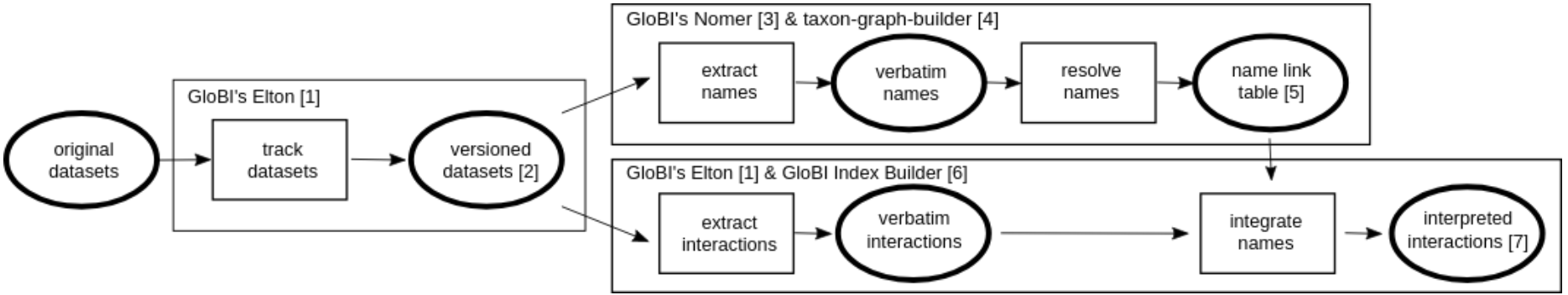
Learn more at SPNHC 2022 Poster Publication



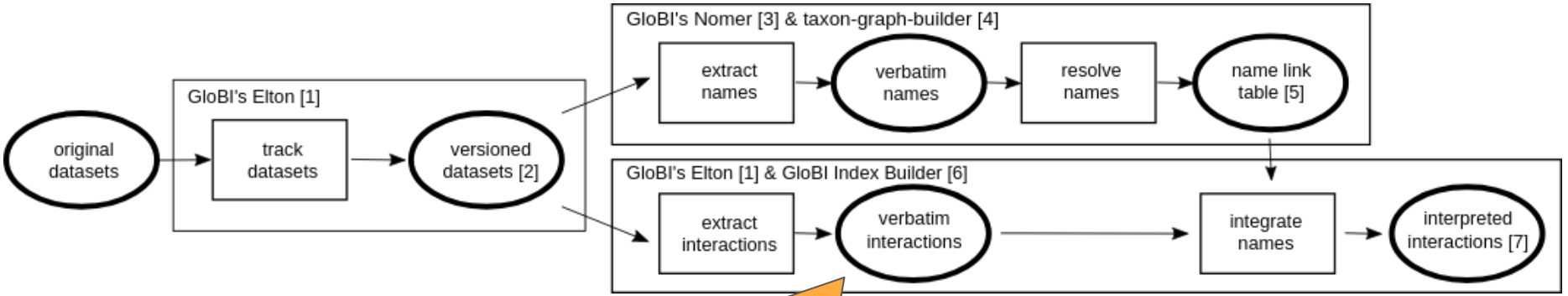


JH Poelen, EA Wommack, AC Doll, and TJ Mayfield-Meyer (2022). Biotic Interactions In Natural History Collections: Continuing to Extend Digital Records across Communities, Platforms, Collections, and Institutions. Zenodo. https://doi.org/10.5281/zenodo.6642868

https://globalbioticinteractions.org/process



https://globalbioticinteractions.org/process



Keep the Original Data,
Openly Share Interpretations
and Reviews

Use Case Museum of Southwestern Biology

Museum of Southwestern Biology, Parasite Collection (MSB:Para)

http://ipt.**vertnet**.org:8080/ipt/resource?r=msb_para
hash://sha256/68f846dfdef28d1b868beaa4b973e8ace40b7bc79c7c2585f21d740d60c2542c
seen at 2022-05-14T17:10:36.292Z

links to:

MSB Host Collection

http://ipt.**vertnet**.org:8080/ipt/resource?r=msb_host
hash://sha256/4217adfb4f79af7908f52ecfd17ee23b1a41d53a33af4e11a095f00e3598d393
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Museum of Comparative Zoology

http://digir.mcz.**harvard.edu**/ipt/resource?r=mczbase
hash://sha256/95b55c43633eb9c5d04550add6efeef7650f82db01de59dbc04dc8ffa9bea42c
seen at 2022-05-14T16:01:30.873Z

NMNH Extant Specimen Records

https://collections.nmnh.**si.edu**/ipt/resource?r=nmnh_extant_dwc-a
hash://sha256/c070dfa551fa5ebf42de023ab9a976943725849e5555ae9ea2a21b950d19fab7

and many more ...

Use Case MSB:Para:27368

Museum of Southwestern Biology, Parasite Collection (MSB:Para)

http://ipt.**vertnet**.org:8080/ipt/resource?r=msb_para

hash://sha256/68f846dfdef28d1b868beaa4b973e8ace40b7bc79c7c2585f21d740d60c2542c

seen at 2022-05-14T17:10:36.292Z

links to:

Museum of Comparative Zoology

http://digir.mcz.**harvard.edu**/ipt/resource?r=mczbase

hash://sha256/95b55c43633eb9c5d04550add6efeef7650f82db01de59dbc04dc8ffa9bea42c

seen at 2022-05-06T11:24:36.100Z

Not secure | arctos.database.museum/guid/MSB:Para:27368

Division of Parasites
Museum of Southwestern Biology

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Detail: https://arctos.database.museum/collection/MSB:Para
Loan Policy: Loan Policy

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MSB:Para:27368
Tetrabothrius

Amukta Island
North America, United States, Alaska, Aleutian Islands
2002-09-01

Parts:
whole organism

Comment or report b

[expand all] [collapse all]

Identifications [expand]

Tetrabothrius
Tetrabothrius
Animalia, Platyhelminthes, Cestoda, Eucestoda, Cyclophyllidea, Tetrabothriidae, Tetrabothrius
Identified by Eric P. Hoberg
Nature of ID: features
Remarks: former nature of id: coarse features

Cestoda
tapeworms
Identified by Douglas Causey

Media

Location (1 Events)

BerkeleyMapper

highlight linked components
Event Type: collection
assigned by Douglas Causey on 2002-09-01
Event Date: 2002-09-01

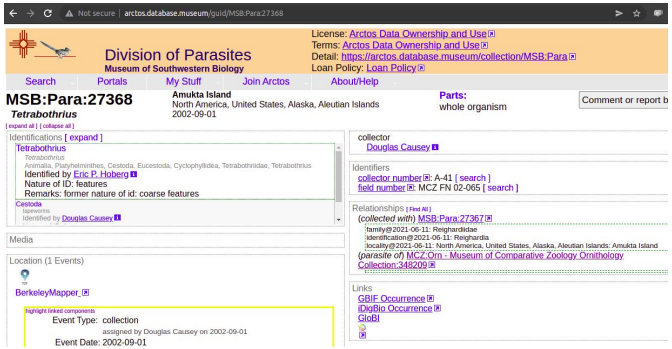
collector
Douglas Causey

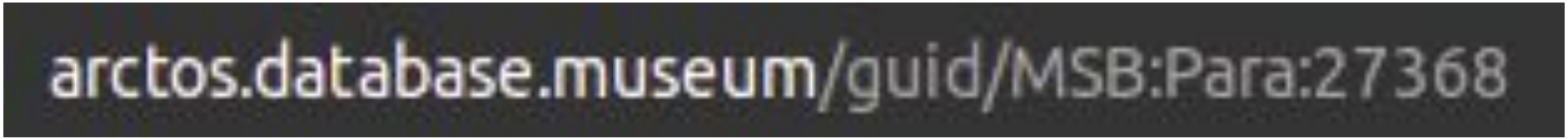
Identifiers
collector number: A-41 [search]
field number: MCZ FN 02-065 [search]

Relationships [Find All]
(*collected with*) MSB:Para:27367
family@2021-06-11: Reighardiidae
identification@2021-06-11: Reighardia
locality@2021-06-11: North America, United States, Alaska, Aleutian Islands: Amukta Island
(*parasite of*) MCZ:Orn - Museum of Comparative Zoology Ornithology Collection:348209

Links
GBIF Occurrence
iDigBio Occurrence
GloBI

According to Arctos http://arctos.database.museum/guid/MSB:Para:27368





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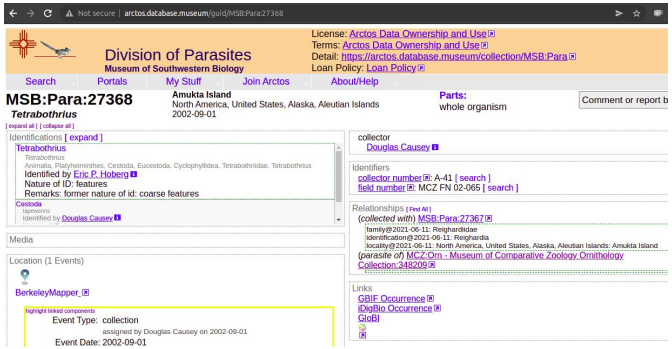

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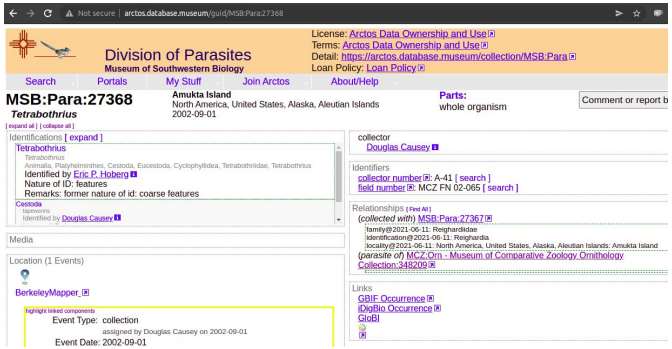

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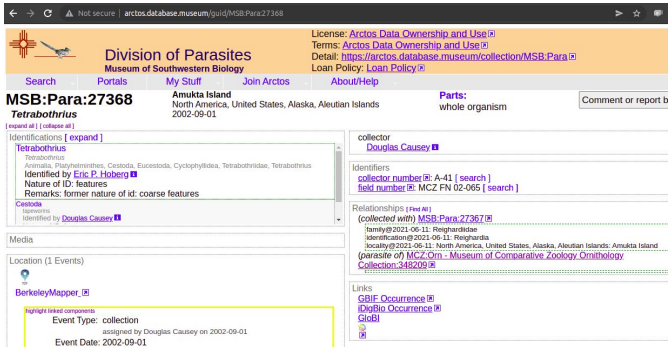
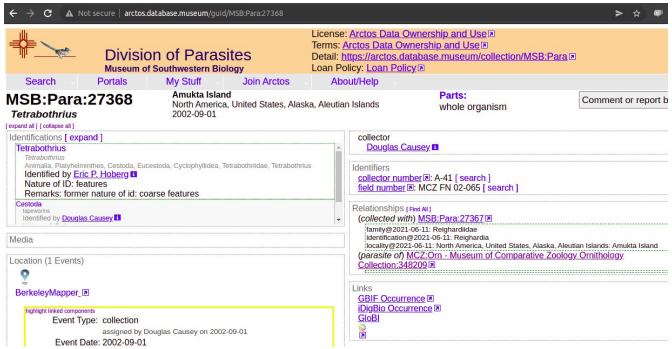
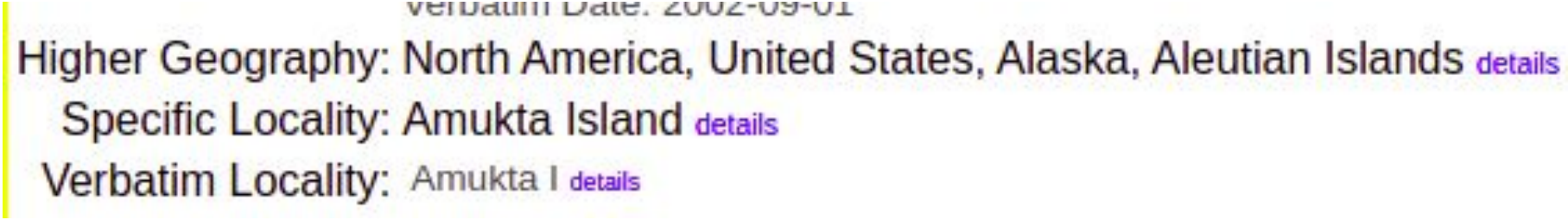


Attributes

Attribute	Value	Determiner	Date	Method	Remark
age class	adult	Douglas Causey	2002-09-01		
location in host	caecum (or cecum)	Douglas Causey	2002-09-01		
verbatim host ID	Rissa tridactyla	Douglas Causey	2002-09-01		

According to Arctos http://arctos.database.museum/guid/MSB:Para:27368





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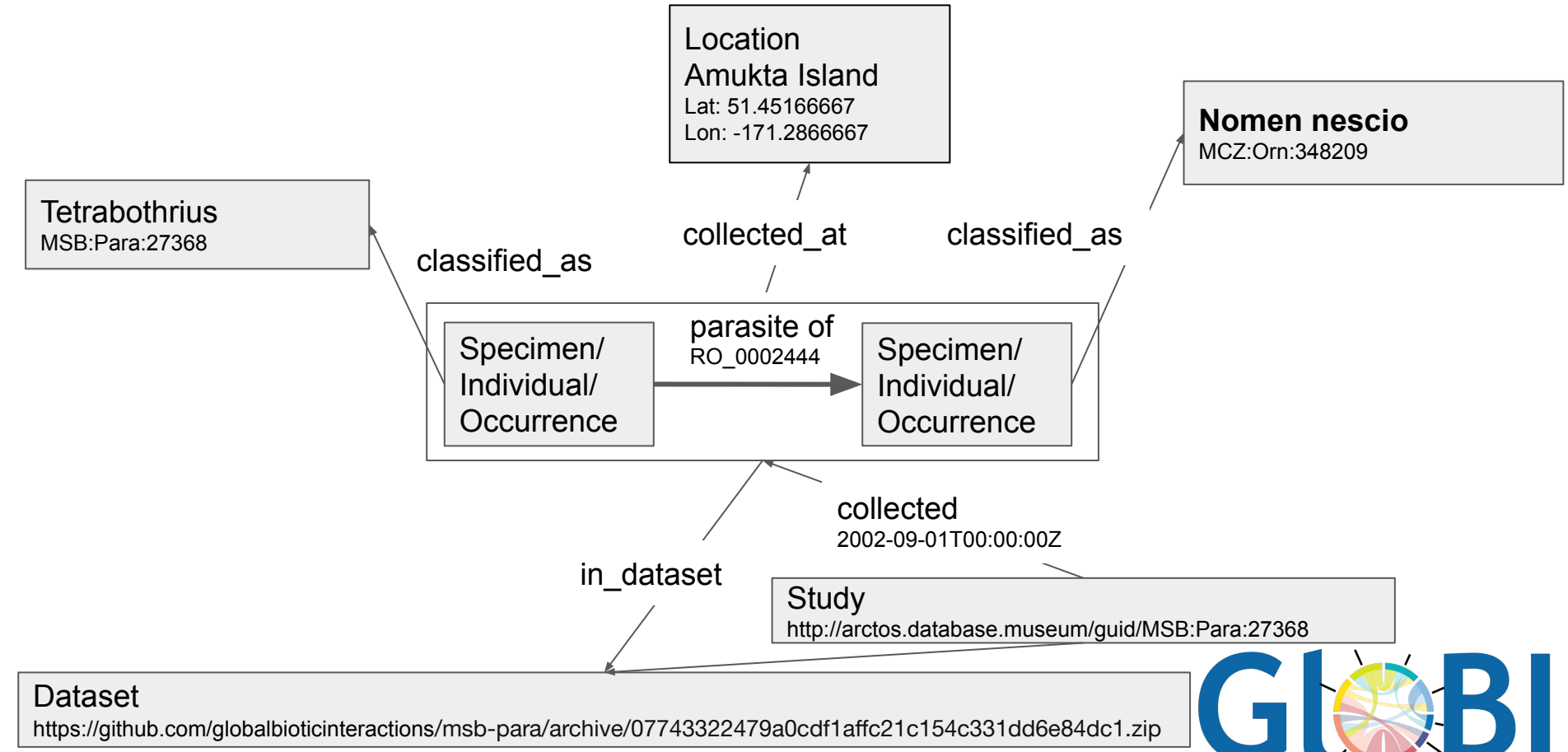
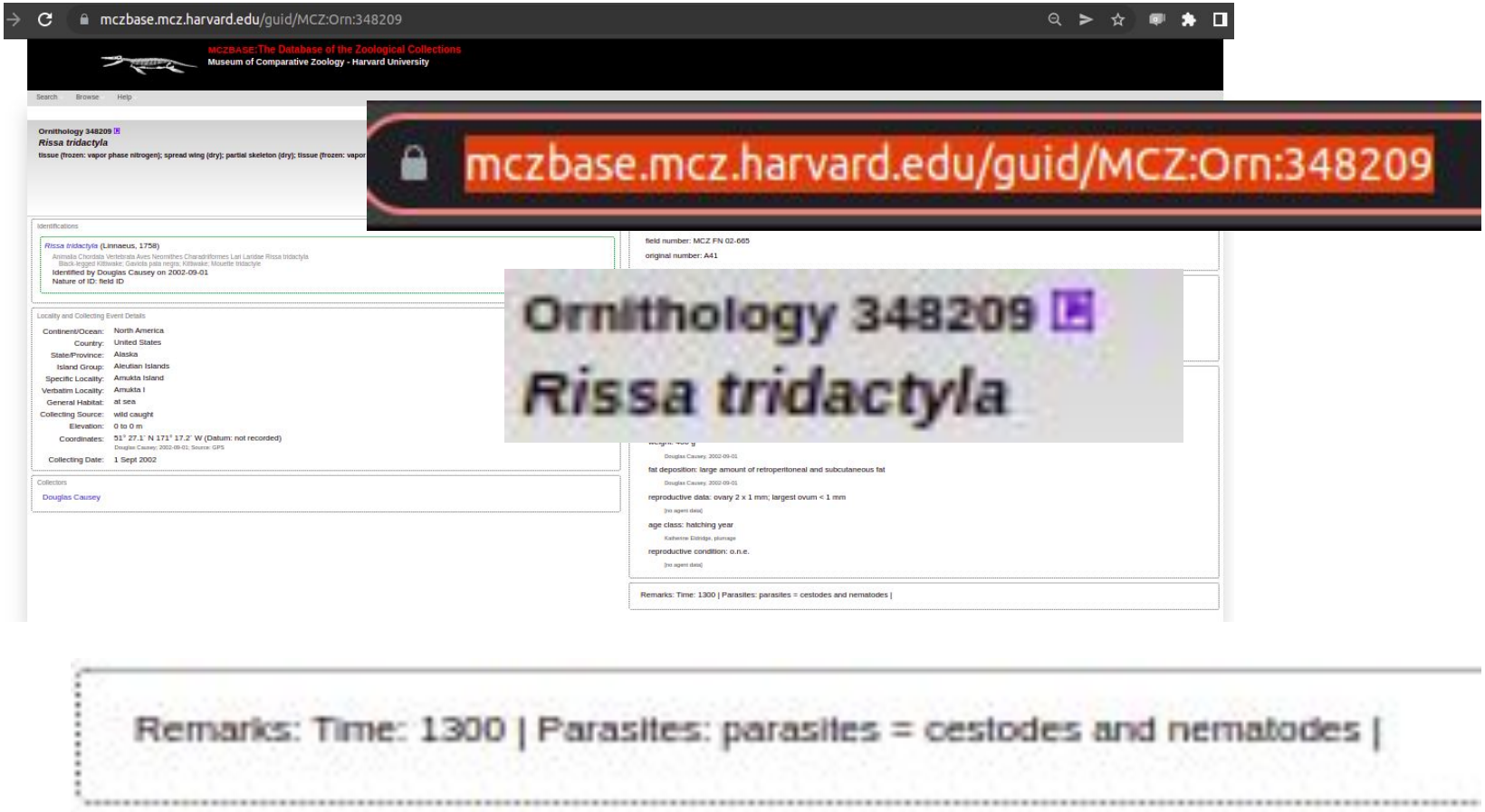
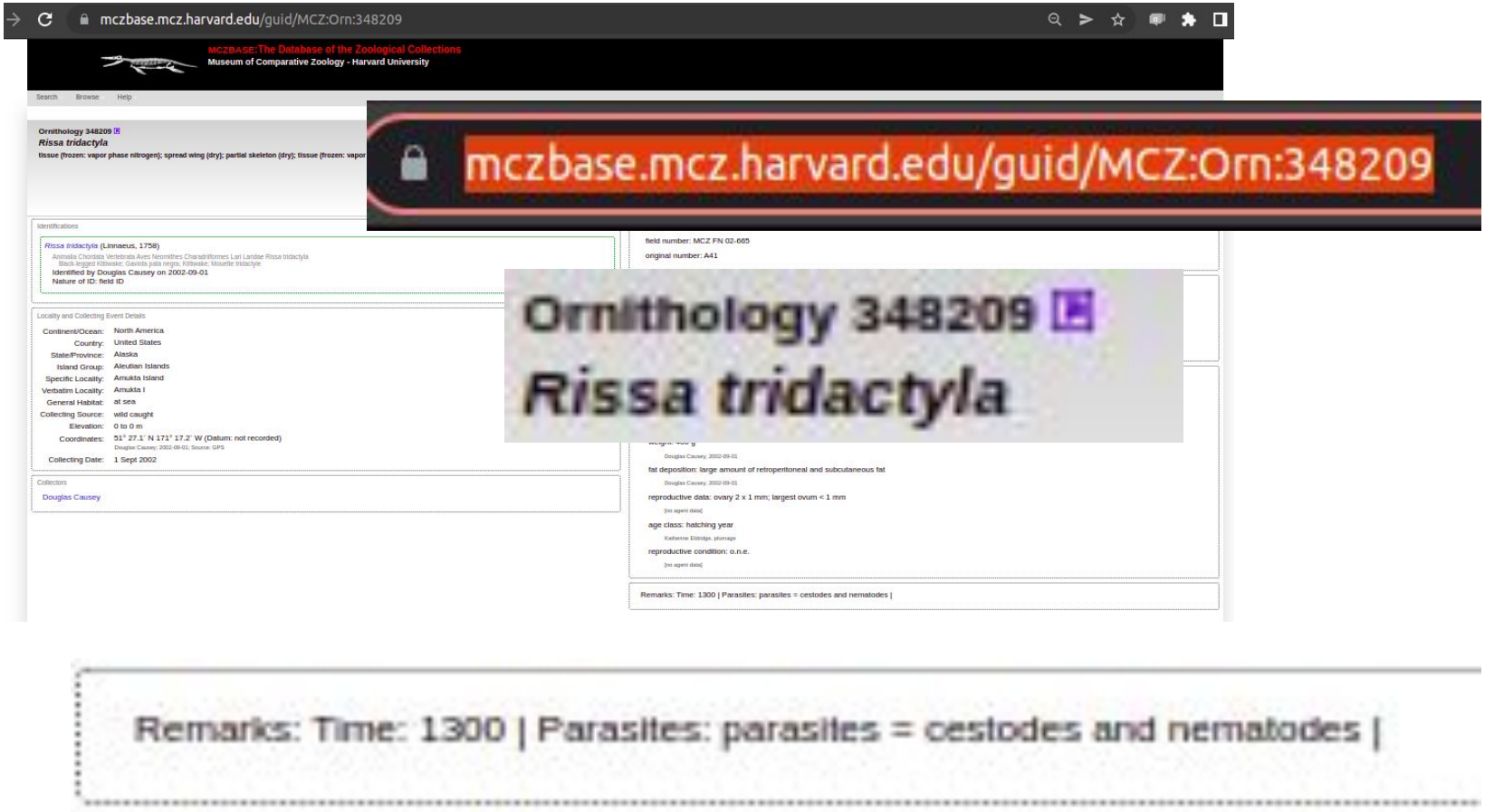


Simplified internal data model used by GloBI to integrate interaction data.



According to Harvard MCZ https://mczbase.mcz.harvard.edu/guid/MCZ:Orn:348209



According to Harvard MCZ https://mczbase.mcz.harvard.edu/guid/MCZ:Orn:348209

Highlevel Parasite Description

Remarks: Time: 1300 | Parasites: parasites = cestodes and nematodes |

According to Harvard MCZ https://mczbase.mcz.harvard.edu/guid/MCZ:Orn:348209

Not secure | arctos.database.museum/guid/MSB:Para:27368

Division of Parasites
Museum of Southwestern Biology

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Terms: Arctos Data Ownership and Use
Detail: https://arctos.database.museum/collection/MSB:Para
Loan Policy: Loan Policy

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MSB:Para:27368
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Amukta Island
North America, United States, Alaska, Aleutian Islands
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Parts:
whole organism

Comment or report b

[expand all] [collapse all]

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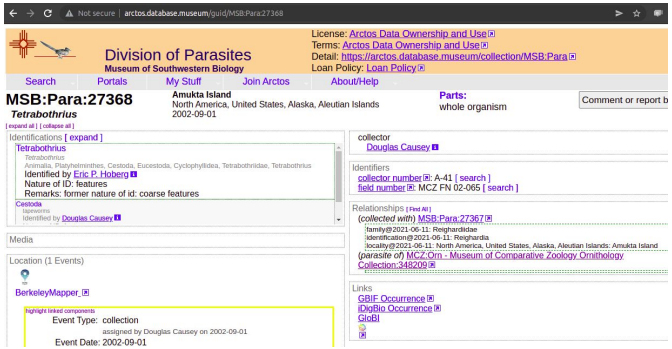


According to Arctos http://arctos.database.museum/guid/MSB:Para:27368

Kittiwake, Black-legged Kittiwake

(Rissa tridactyla)

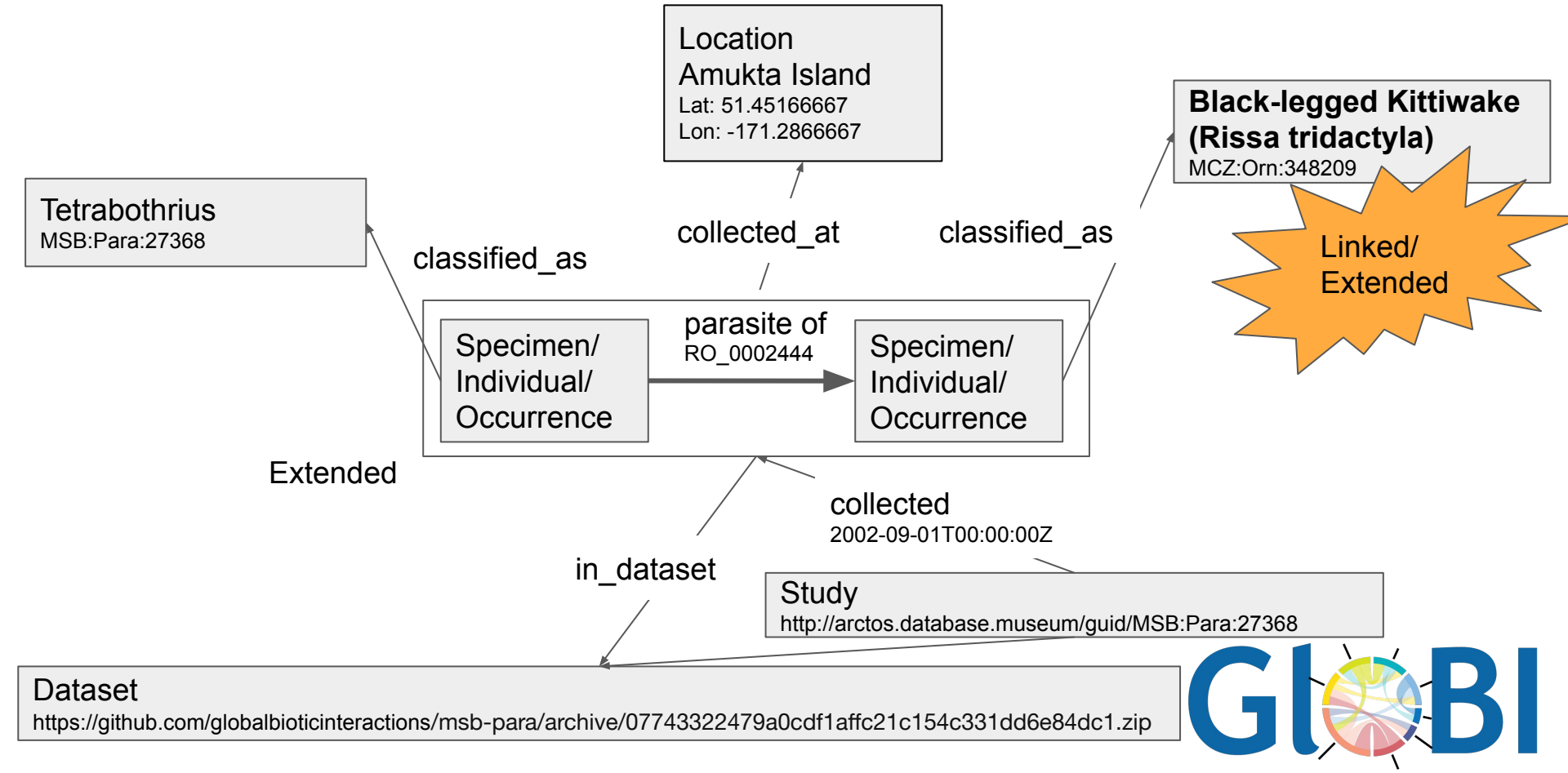
host of Tetrabothrius

Supported by:

http://arctos.database.museum/guid/MSB:Para:27368 Provider: Natural History Collections managed by Arctos (https://arctosdb.org) accessed via https://vertnet.org . Accessed via <https://github.com/globalbioticinteractions/vertnet/archive/411bd21192e50ddccd51381a731444f74b032ffb.zip> at 2022-05-15T07:09:05.354Z. review discuss...

GloBI Web Interface

https://globalbioticinteractions.org/?accordingTo=http%3A%2F%2Farctos.database.museum%2Fguid%2FMSB%3APara%3A27368



Simplified internal data model used by GloBI to integrate interaction data.

linking all the data

Bidirectional links include Encyclopedia of Life, Gulf of Mexico Species Interactions, NCBI Taxonomy, World Register of Marine Species, iNaturalist, Fishbase, SeaLifeBase, and Arctos.

Outgoing links include UBERON (body parts, life stage, physiological state), EnvO, GeoNames, CMECS, FEOW, MEOW, TEOW, doi.org, ITIS, Open Tree of Life, NBN and ALA.

Link services include Global Names and CrossRef.

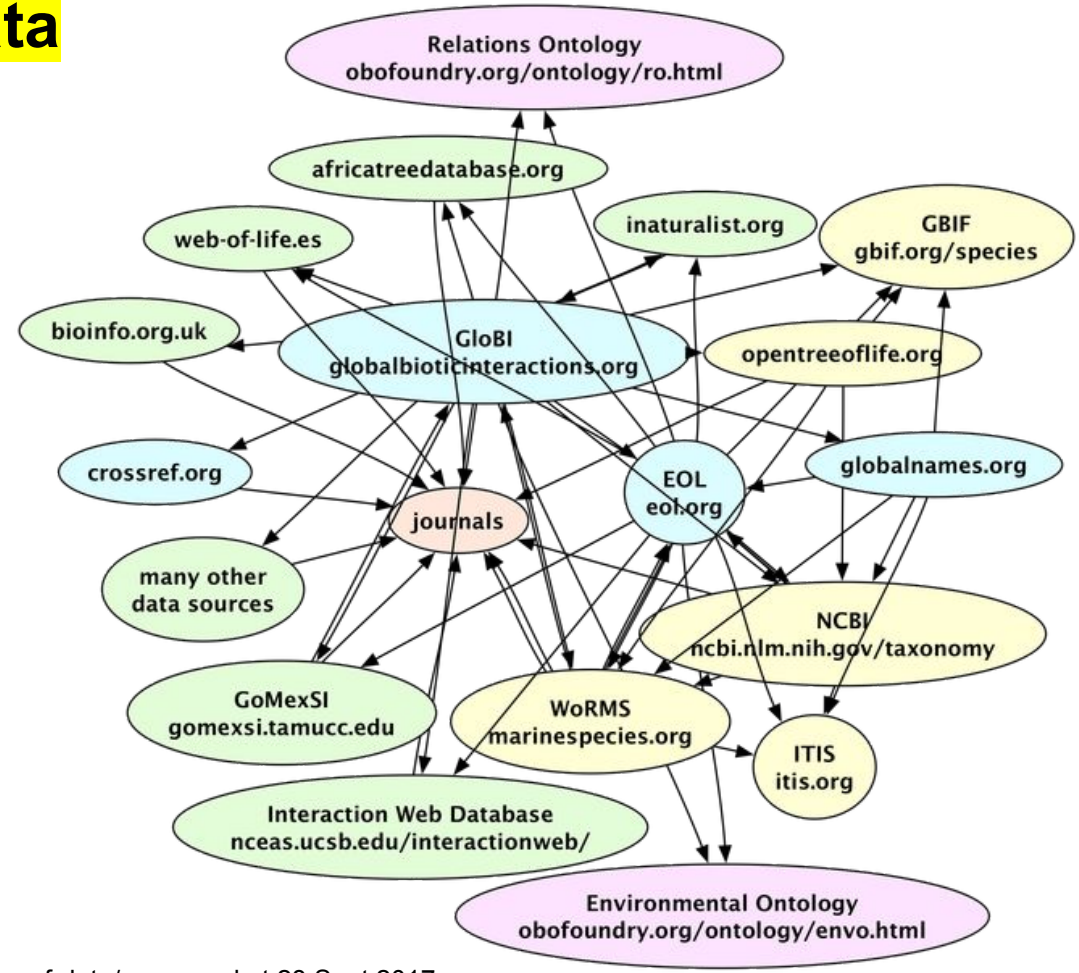


Figure from http://globalbioticinteractions.org/2016/02/08/ecology-of-data/ accessed at 28 Sept 2017

linking all the data and their curators

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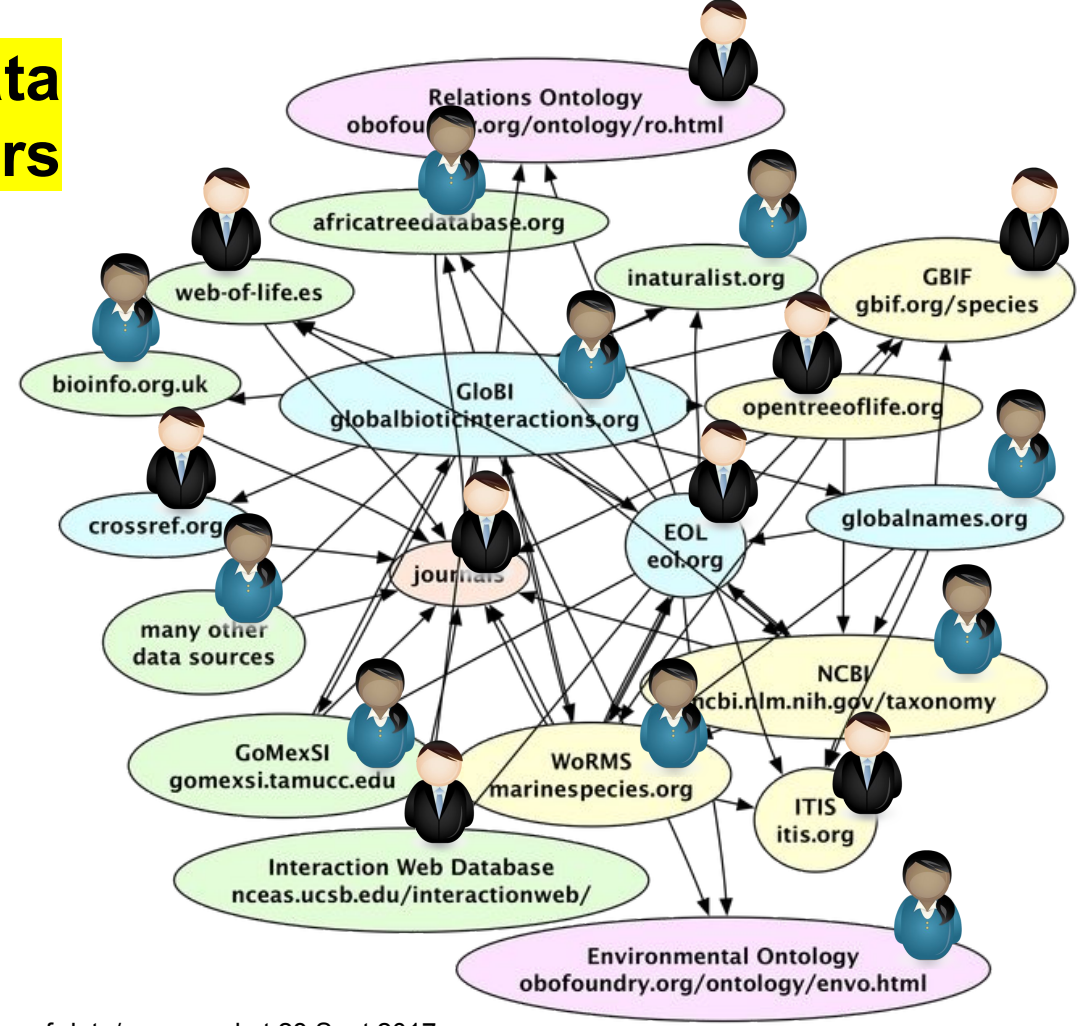

Figure from http://globalbioticinteractions.org/2016/02/08/ecology-of-data/ accessed at 28 Sept 2017

it takes a village to keep and share a record

Data Providers

Data Integration

GLOBI

Data Mobilizers

Data Users

Ontology & Standards Communities

Taxonomists

Ecologists

OBO Foundry

partners

GloBI

TEXAS A&M UNIVERSITY-CORPUS CHRISTI
GoMexSI
CENTER FOR COASTAL STUDIES

eol
Encyclopedia of Life

CCBER

lab
Heitlinger
Ecology
Evolution
molecular
Mechanism
Interaction
parasites
of host and

Terrestrial
Parasite
Tracker

BDMY
BioDiversidad
Marina de
Yucatán

Arctos

Acknowledgments

an incomplete list in no particular order

These projects would not have been possible without the many contributions (big and small) of folks like Jen Hammock, Katja Schulz, Pepper Luboff, Chris Mungall, Katja Seltmann, Brian Hayden, Ken-ichi Ueda, Jim Simons, Theresa Mitchell, Emanuel Heitlinger, Kathy Kwan, Deng Palomares, Josephine “Skit” Barile, Anne Thessen, Allen Hurlbert, Dmitri Mozzherin, Malcolm Storey, Michael Elliott, José Fortes, Quentin Groom, Nathan Upham, Deb Paul, Mariya Dimitrova, Lyubomir Penev, Donat Agosti, Alex Ioannidis, Marcus Guidoti, Jen Zaspel, Carl Boettiger, Erika Tucker … and thousands of others that have collected and shared biodiversity data and related tools.

Jorrit Poelen @ https://jhpoelen.nl

Thank you!

Works presented are funded in part by grants OAC 1839201, DBI 1901932, DBI 1901926, DBI 2102006 from the National Science Foundation, 1-R21-AI164268-01 from the National Institutes of Health, the Encyclopedia of Life Rubenstein Fellows Program (CRDF EOL-33066-13/F33066, 2013), EOL David M. Rubenstein Grant (FOCX-14-60988-1, 2014), and the Smithsonian Institution (SI) (T15CC10297-002, 2016).

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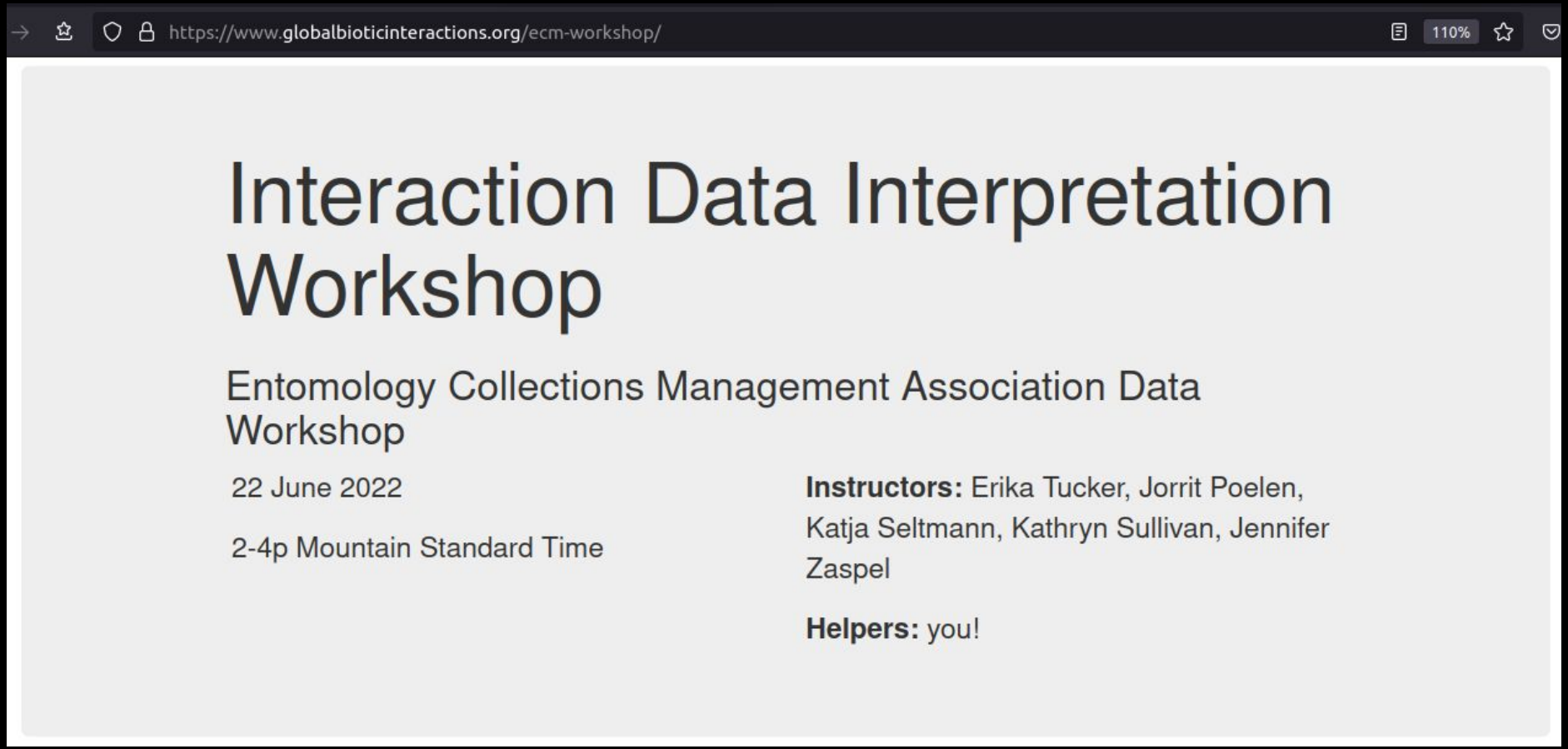
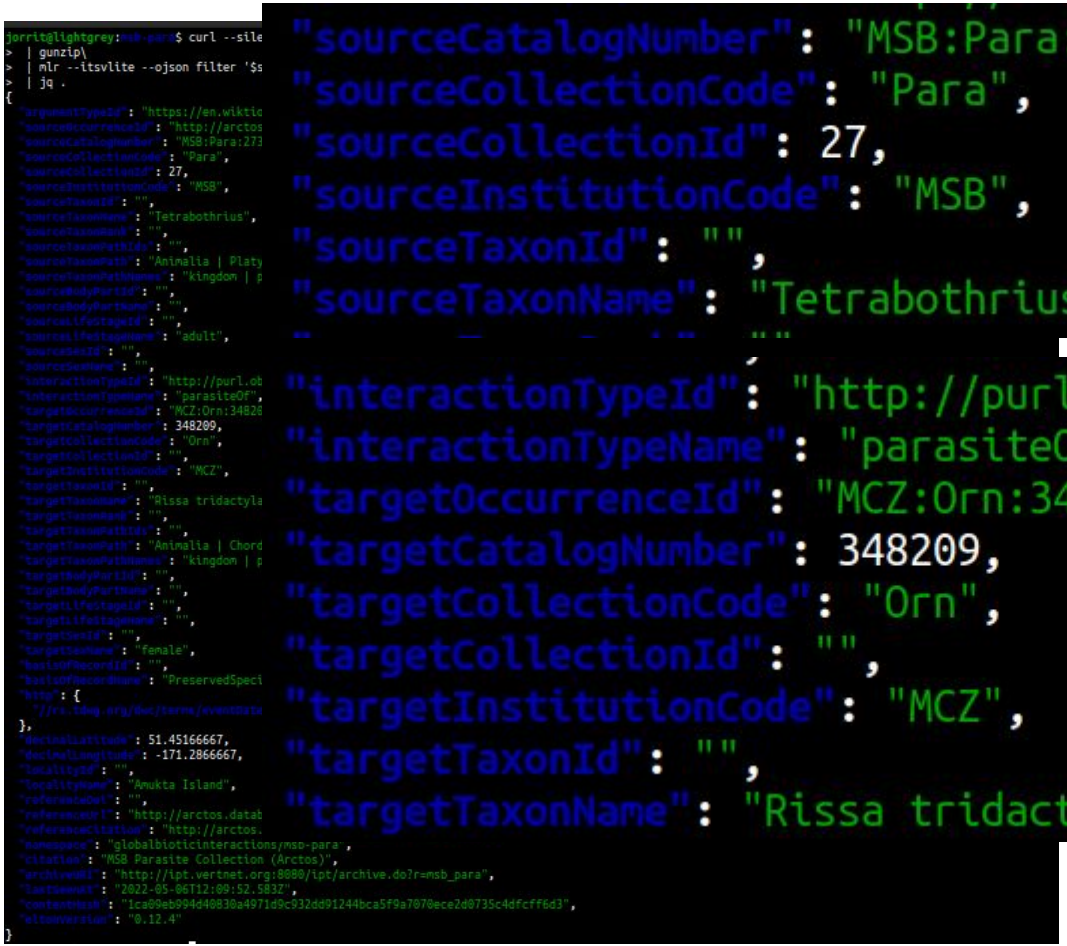
https://www.globalbioticinteractions.org/ecm-workshop/



Extra



Extracted from MSB Para Review By Elton in JSON format using MLR

503 Service Not Available

Use Case MSB:Para:28915

Museum of Southwestern Biology, Parasite Collection (MSB:Para)

http://ipt.**vertnet**.org:8080/ipt/resource?r=msb_para

hash://sha256/68f846dfdef28d1b868beaa4b973e8ace40b7bc79c7c2585f21d740d60c2542c

seen at 2022-05-14T17:10:36.292Z

links to:

NMNH Extant Specimen Records

https://collections.nmnh.**si.edu**/ipt/resource?r=nmnh_extant_dwc-a

hash://sha256/c070dfa551fa5ebf42de023ab9a976943725849e5555ae9ea2a21b950d19fab7

seen at 2022-05-06T11:24:36.100Z

arctos.database.museum/guid/MSB:Para:28915

80%

Division of Parasites
Museum of Southwestern Biology

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Detail: https://arctos.database.museum/collection/MSB:Para
Loan Policy: Loan Policy

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MSB:Para:28915

Arostrilepis insperata

Monogehela National Forest, Elleber Sods Road (US Forest Service Rd. 1681) 3282 ft elevation
North America, United States, West Virginia, Pocahontas County
2016-08-26

Parts:
whole organism; whole organism; whole organism

Comment or report bad data [0][0]

[expand all] [collapse all]

Identifications [expand]

Arostrilepis insperata
Arostrilepis insperata sensu Makarikov et al. 2020
Arostrilepis insperata, Eukaryota, Metazoa, Platyhelminthes, Cestoda, Eucestoda, Cyclophyllidea, Hymenolepididae, Arostrilepis
sensu Makarikov et al. 2020
Identified by Kurt Egan Galbreath, Eric P. Hoberg, Ralph P. Eckerlin and Arseny A. Makarikov
on 2020-01-04
Nature of ID: features
Remarks: PARATYPE; former nature of ID = expert

Citations

paratype of Arostrilepis insperata , page 11 in Makarikov et al. 2020 DOI:10.1007/s00436-019-06584-4

Media

Location (1 Events)

BerkeleyMapper

highlight linked components

Event Type: collection
assigned by Alfred L. Gardner on 2016-08-26

Event Date: 2016-08-26
Verbatim Date: 2016-08-26

Higher Geography: North America, United States, West Virginia, Pocahontas County details

Specific Locality: Monogehela National Forest, Elleber Sods Road (US Forest Service Rd. 1681) 3282 ft elevation details

Verbatim Locality: Monogehela National Forest, Elleber Sods Road (US Forest Service Rd. 1681) 3282 ft elevation details

Associated Names : United States, United States of America, West Virginia, Pocahontas, Nicholas, NORTH AMERICA MAINLAND

Coordinates: 38.4419 / -79.7174666667
As Entered: 38d 26.514m N/79d 43.048m W

collector
Ralph P. Eckerlin
Alfred L. Gardner

Identifiers

collector number: Mgap [search]
field number: ALG-15615 [search]

Relationships [Find All]

(*parasite of*) ARK:65665/3777ecb64-7edc-4479-8486-a0b584092bd0
(*parasite of*) USNM: National Museum of Natural History:602540

Links

GBIF Occurrence
iDigBio Occurrence
GloBI

Attributes

Attribute	Value	Determiner	Date	Method	Remark
age class	adult	Ralph P. Eckerlin	2016-08-26		
experimental	no	Ralph P. Eckerlin	2016-08-26		
location in host	intestine	Ralph P. Eckerlin	2016-08-26		
verbatim host ID	Myodes gapperi	Ralph P. Eckerlin	2016-08-26		

Remarks: Voucher specimen, Semichons, Canada balsam; in mixed infection with A. gardneri; field number corrected from ALG-15640 to ALG-15615 per Makarikov et al. 2021 by campmlc on 2021-05-27

Accession

View 2019.003.Para

According to Arctos @ http://arctos.database.museum/guid/MSB:Para:28915

https://collections.nmnh.si.edu/search/mammals/?ark=ark:/65665/3777ecb647edc44798486a0b584092bd0

Smithsonian
National Museum of Natural History

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NMNH Home | NMNH Research & Collections | Vertebrate Zoology

Search the Division of Mammals Co

Keyword Search Results - Gallery View

USNM 602540
Myodes gapperi carolinensis

Page 1 of 1 | Clear Selections | Export All Res

Mammals Collections | Keyword Search | Search by Field | Whale Coll

Mammal Collections

The Division of Mammals, National Museum of Natural History, Smithso
world's largest mammal collection with over 600,000 specimens. The ta
USNM (acronym derived from our former name United States National
globe, with especially strong representation from North America, Centra
and southeast Asia. The research value of this collection to mammalogi
specimens preserved, a number exceeded only by The Natural History

Myodes gapperi carolinensis : Cricetidae : Rodentia : Mammalia : Chordata

Specimen/Lot

Museum:	NMNH
Catalog Number:	USNM 602540
Special Collections:	Biological Survey Specimen
Specimen Count:	1
Current Identification:	**Myodes gapperi carolinensis**
Date Collected:	26 Aug 2016
Country:	United States
Province/State:	West Virginia
District/County:	Pocahontas County
Precise Locality:	Elleber Sods Road at bridge over north fork Greenbriar River, Monongahela National Forest

Other Numbers:

Type	Value
Mammals Field Number	ALG 15615

Sex/Stage:

Sex	Stage	Remarks
Female		

Preparation Details:

Preparation	Remarks
Skin	
Skull	

Measurements:

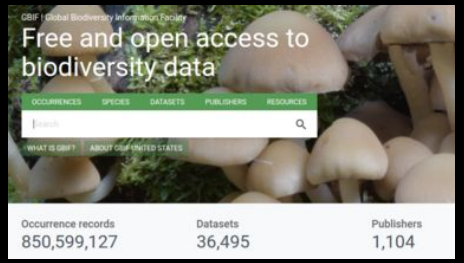
Of	Type	Value	Unit	Remarks
Specimen	Weight	21	g	
Total	Length	130	mm	
Tail	Length	37	mm	
Hind Tarsus	Length	20	mm	
Ear Notch	Length	14	mm	

EZID: http://n2t.net/ark:/65665/3777ecb64-7edc-4479-8486-a0b584092bd0

According to SI @ http://n2t.net/ark:/65665/3777ecb64-7edc-4479-8486-a0b584092bd0

http://globalbioticinteractions.org/references
Accessed at 28 Sept 2017

GBIF Global Biodiversity Information Facility



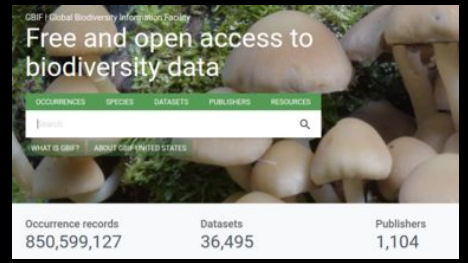
https://gbif.org
Accessed at 28 Sept 2017

2.8M records	950.6M records
0.1k datasets	36.5k datasets
~100k **taxa**	~1-2M **species**

Eltonian shortfall*: a lack of species-interaction records

*Hortal, J. et al., 2015. Seven Shortfalls that Beset Large-Scale Knowledge of Biodiversity. Annual Review of Ecology, Evolution, and Systematics, 46(1). Available at: http://dx.doi.org/10.1146/annurev-ecolsys-112414-054400.

http://globalbioticinteractions.org/references
Accessed at 26 Feb 2018



https://gbif.org
Accessed at 26 Feb 2018

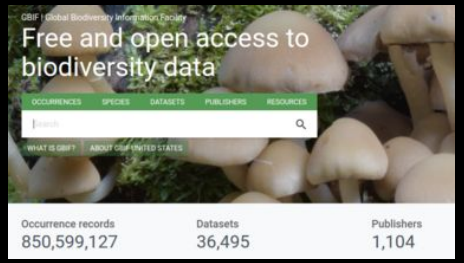
3.4M records	972.7M records
0.1k datasets	38.1k datasets
~100k **taxa**	~1-2M **species**

Eltonian shortfall*: a lack of species-interaction records

*Hortal, J. et al., 2015. Seven Shortfalls that Beset Large-Scale Knowledge of Biodiversity. Annual Review of Ecology, Evolution, and Systematics, 46(1). Available at: http://dx.doi.org/10.1146/annurev-ecolsys-112414-054400.

http://globalbioticinteractions.org/references
Accessed at 9 Jan 2020

GBIF Global Biodiversity Information Facility



https://gbif.org
Accessed at 9 Jan 2020

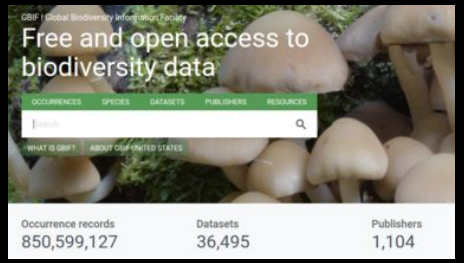
4.4M records	**1.4B records**
0.2k datasets	50.0k datasets
~0.2M **taxa**	~1-2M **species**

Eltonian shortfall*: a lack of species-interaction records

*Hortal, J. et al., 2015. Seven Shortfalls that Beset Large-Scale Knowledge of Biodiversity. Annual Review of Ecology, Evolution, and Systematics, 46(1). Available at: http://dx.doi.org/10.1146/annurev-ecolsys-112414-054400.

http://globalbioticinteractions.org/references
Accessed at 11 April 2021

GBIF Global Biodiversity Information Facility

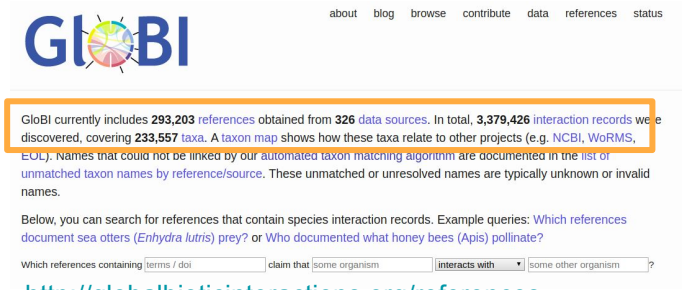


https://gbif.org
Accessed at 11 April 2021

6.8M records	**1.7B records**
0.3k datasets	57.6k datasets
~0.7M **taxa**	~1-2M **species**

Eltonian shortfall*: a lack of species-interaction records

*Hortal, J. et al., 2015. Seven Shortfalls that Beset Large-Scale Knowledge of Biodiversity. Annual Review of Ecology, Evolution, and Systematics, 46(1). Available at: http://dx.doi.org/10.1146/annurev-ecolsys-112414-054400.



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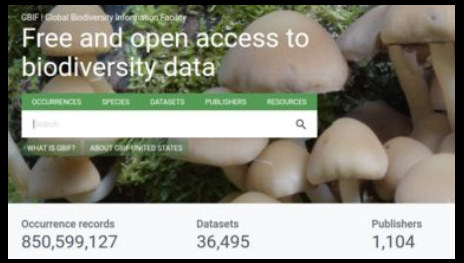
Accessed at 24 Oct 2021

GBIF Global Biodiversity Information Facility



https://gbif.org
Accessed at 24 Oct 2021

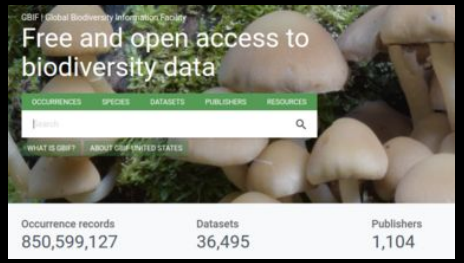
10.2M records	**1.9B records**
0.3k datasets	62.8k datasets
~0.7M **taxa**	~1-2M **species**

Eltonian shortfall*: a lack of species-interaction records

*Hortal, J. et al., 2015. Seven Shortfalls that Beset Large-Scale Knowledge of Biodiversity. Annual Review of Ecology, Evolution, and Systematics, 46(1). Available at: http://dx.doi.org/10.1146/annurev-ecolsys-112414-054400.

http://globalbioticinteractions.org/references
Accessed at 22 May 2022

GBIF Global Biodiversity Information Facility



https://gbif.org
Accessed at 22 May 2022

13.9M records	**2.2B records**
0.3k datasets	69.4k datasets
~0.8M **taxa**	~1-2M **species**

Eltonian shortfall*: a lack of species-interaction records

*Hortal, J. et al., 2015. Seven Shortfalls that Beset Large-Scale Knowledge of Biodiversity. Annual Review of Ecology, Evolution, and Systematics, 46(1). Available at: http://dx.doi.org/10.1146/annurev-ecolsys-112414-054400.

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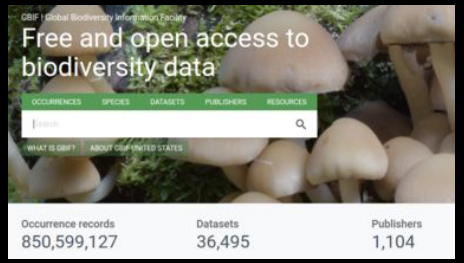

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Accessed at 22 May 2022

13.9M records	**2.2B records**
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