

Linking specimens and DNA sequences through BOLD

ADRIANA RADULOVICI



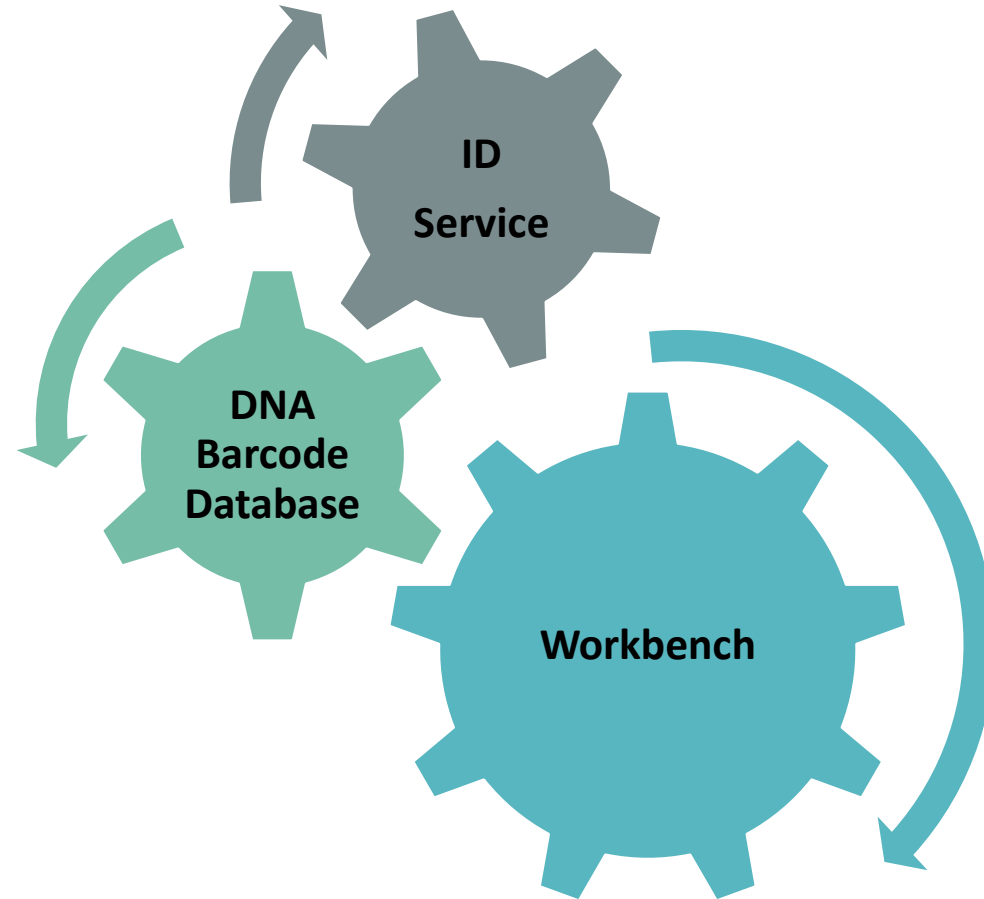
BARCODE OF LIFE DATA SYSTEM ^{v4}

Advancing biodiversity science through DNA-based species identification.

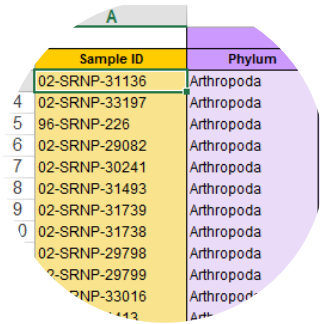
EXPLORE THE DATA

DESIGNED TO SUPPORT THE GENERATION & APPLICATION OF DNA BARCODE DATA

BOLD components



BOLD core data

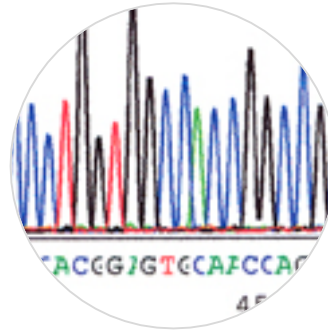


Sample ID	Phylum
02-SRNP-31136	Arthropoda
4 02-SRNP-33197	Arthropoda
5 96-SRNP-226	Arthropoda
6 02-SRNP-29082	Arthropoda
7 02-SRNP-30241	Arthropoda
8 02-SRNP-31493	Arthropoda
9 02-SRNP-31739	Arthropoda
0 02-SRNP-31738	Arthropoda
02-SRNP-29798	Arthropoda
2-SRNP-29799	Arthropoda
NP-33016	Arthropoda
NP-33016	Arthropoda

Specimen
Data



Specimen
Images

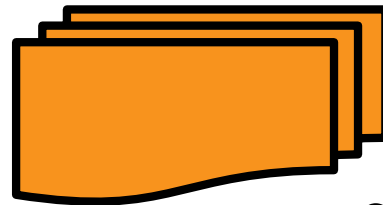


Trace
Files



```
1 ccatggacaa  
61 atccgcacag at  
121 cttaggcaaa aca  
181 tccgtgetta ttaa  
241 acaaactggt tact  
301 caaagcagca ggg  
361 tggtagttg at  
ggggg-gcac
```

Sequences



Custom Fields

IDENTIFIERS

Sample ID: L90AR4-01
 Process ID: WW160-07
 Institution Storing: Université du Québec à Rimouski
 Field ID: L90AR4-01
 Museum ID:
 Collection Code:

TAXONOMY

Identification: *Anonyx sarsi*
 Rank: Species
 Identifier: Jean-Marc Gagnon
 Identification Method:
 Identifier Institution: Canadian Museum of Nature
 Identifier Email: jmgagnon@mus-nature.ca
 Taxonomy Note:

Rank: Current Record (L90AR4-01)

Phylum: [Arthropoda](#)
 Class: [Malacostraca](#)
 Order: [Amphipoda](#)
 Family:
 Subfamily:
 Genus: [Anonyx](#)
 Species: [Anonyx sarsi](#)

SPECIMEN DETAILS

Voucher Status: morphological voucher
 Tissue Descriptor:
 Sex:
 Reproduction: Sexual
 Life Stage:
 Extra Info: FAO-21
 Note:
 Associated Taxa:
 Associated Specimens:
 Reference Link:

PHOTOGRAPHS



Creative Commons Attribution NonCommercial ShareAlike (2012) BIO Photography License Holder: Group, Biodiversity Institute of Ontario License Institution: Biodiversity Institute of Ontario Photographer: Adriana Radulovici Contact: ccdcol@uoqueph.ca



GEOGRAPHY

Country: Canada
 Province/State: Quebec
 Region/County: Charlevoix
 Sector: Baie des Rochers
 Exact Site:
 Lat/Lon: 47.957, -69.806



COLLECTION DETAILS

Collectors: Adriana Radulovici
 Collection Event ID:
 Date Collected: 16-Aug-2007

Sample ID: L90AR4-01
 Process ID: WW160-07
 Tax Names: Arthropoda, Malacostraca, Amphipoda, Uristidae, Anonyx, *Anonyx sarsi* species
 Rank Name: species
 Sampling Protocol: N/A
 BIN URI: BOLD:AAB9507
 BIN Name: BIN19507
 Kingdom: Animals

Marker Code	Sequence Length	GC	Ambiguous	Trace Count
COI-5P	658	34.7%	0%	2

COI-5P

Illustrative Barcode



Nucleotide Sequence

TACCTTTATTTTCTAGGTGCTTGAGCAAGTCTATTGGACATCTTAAATTAATTATC
 CGTCCGAACTTAGAATCTTAGTGTGTTAAATGGAGATGACCAAAATTCACAGACTAGTGA
 CAGCACACCCCTTATATATATTTTATAGTACAGACTATATATATGGGGTTTGGAAA
 TTAATTTGGCTTATATATAGTGTGCTGATATAGCTTCCACGATATATATATAGAG
 TCTGACTATACCCCTCTCTAACTCTTATATAGTAGAAGTCTATGAAAGAGAGTCTG
 GTACAGTGTAGAGTCTATCTCTTAGCTCTCTCTCCCTCATGGGGGAGACAGTAGA
 CCTAGCTATTTTCACTACATCTAGGAGGACTTTTCAAGCTAGGGGCTATTAATTTTATC
 TCACAGTAAATATAGAGAGCAGGTATACCTATAGACCAAAATACCATTTGTTGAT
 CTGTGTTACACAGCAATCTCTTTATATCTTTACCGTGTAGCAGGTGCAACCACTAT
 ACTCTTACTGACCGAAATATAGACTCTCTTTTGGACCTAGTGGAGGGGTGACCTATC
 TTATACCACTTTATTC

Sequence Metadata

Genbank Accession: FJ581511
 Translation Matrix: Invertebrate Mitochondrial
 Last Updated: 2013-11-27

Modify Sequence: [Clear Sequence](#) [Edit Sequence](#)

Amino Acid Sequence

TLVPLGMSRAGTSLSLIIRSELSTPSCLIIGDQYFNQVYAFIMFFMWPIMIGGFN
 NLVPLMLGSDPHYPRNHNHFWLPPSLTELLVSLVEGGVGTQVYVPLASRAGGSVD
 IATPSELGAGRSILGAINFISTVINRSPQPHQMLPLFMVVTATLELLSLPLAGATM
 LKTDNINISFFPSGGGPELTYHFLP

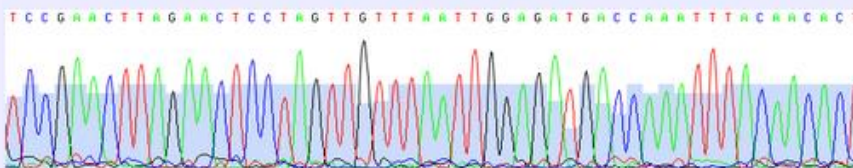
Identify Sequence:

[Full DB](#) [Species DB](#)
[Published DB](#) [Full Length DB](#)

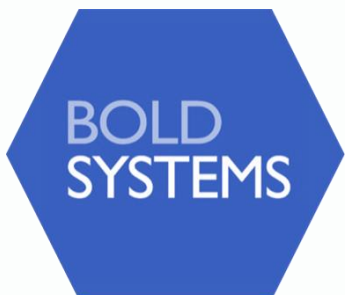
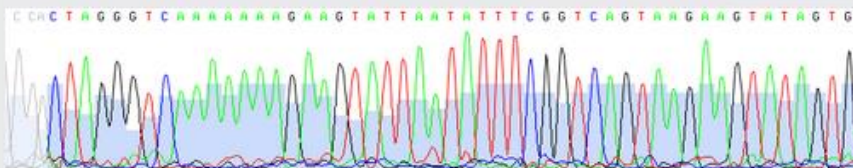
Trace Details

Download All Traces

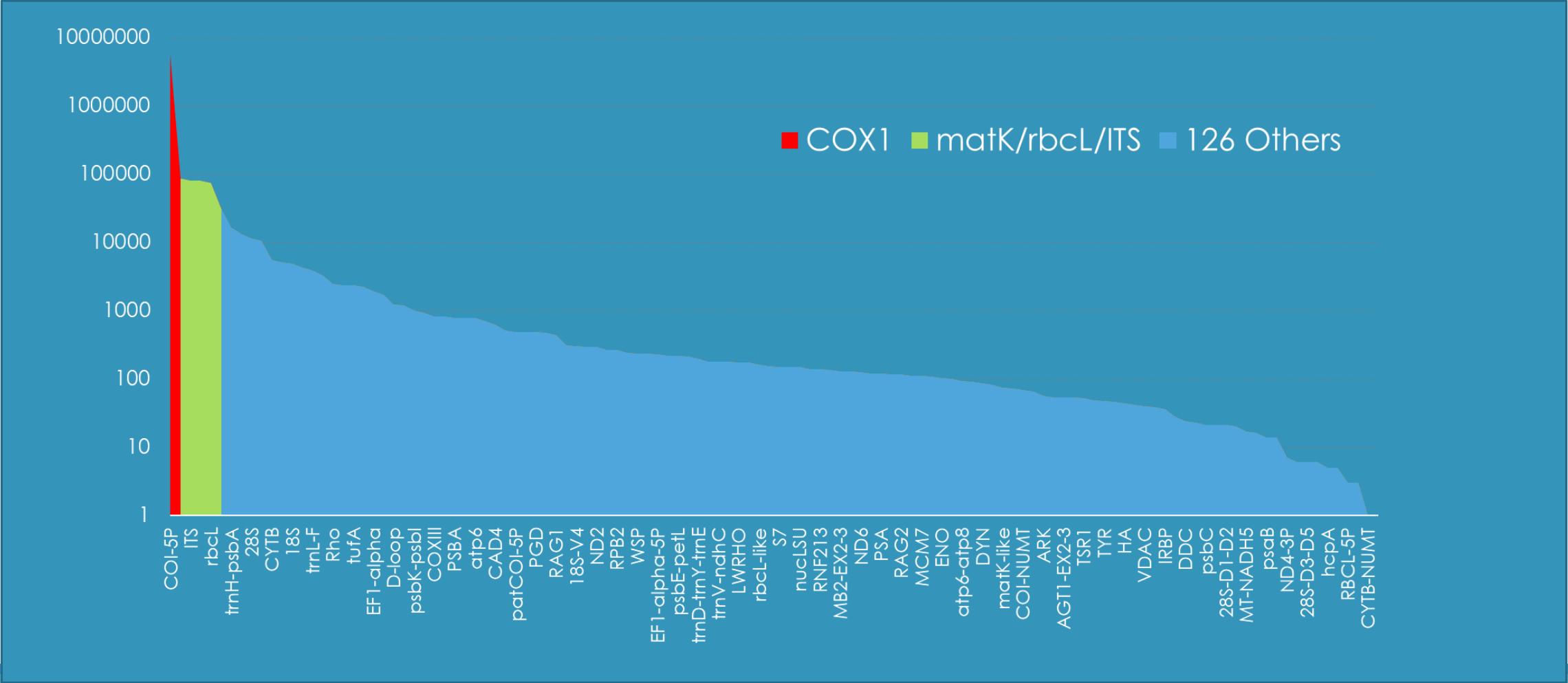
Sequencing Date: 2008-03-07 Trace Direction: F Forward Primer: LCO1490_11 Reverse Primer: HCO1490_11 [Download Trace](#)



Sequencing Date: 2008-03-07 Trace Direction: R Forward Primer: LCO1490_11 Reverse Primer: HCO1490_11 [Download Trace](#)



Molecular markers in BOLD



BOLD SYSTEMS

Project & Dataset Search Code Record Search

Project - BARG Birds of Argentina - Phase I

Activity Report

Specimens

1594 Specimens

GPS: 1553 / 1594

Country: 1592 / 1594

Images: 1148 / 1594

Barcode Compliant: 1579 / 1594

Sequences

1594 Sequences

COI-SP: 1594/1594

Descriptors

Codes: BARG

Markers: COI-SP

Title: Birds of Argentina - Phase I

Description: Sequences of the birds of Argentina, from specimens at the MACN, sequenced at BIO All Birds Barcoding Initiative

Campaign: N/A

Bounding Box Coordinates: This project has been released publicly.

Data Summary

BINS: 500

Countries (Top 5): Argentina (1591), Unspecified (2), Paraguay (1)

Taxonomy

Common class: Aves

- Passeriformes (order): 1006
- Anseriformes (order): 81
- Charadriiformes (order): 79
- Piciformes (order): 63

Issues

- Seqs lacking successful traces: 0
- Seqs with stop codons: 0
- Contaminated seqs: 0
- Problematic records flagged: 0

User Access

Manager

- Kevin Kerr (kevin.cr.kerr@gmail.com)

Users

- Dario A. Lijtmaer (dlijtmaer@macn.gov.ar)
- Cecilia Kopuchian (ckopuchian@gmail.com)
- Crystal Sobel (csobel@uoguelph.ca)
- Pablo Luis Tubaro (ptubaro@interlink.com.ar)
- Ana S. Barreira (asbarreira@gmail.com)
- Mark Stoeckle (stoeckm@mail.rockefeller.edu)

Record List

100 records per page

Select	Identification	Specimen Page	Sequence Page	Extra Info	BIN	Record Flags Legend					
						📍	📷	📄	📊	✖	🚫
<input type="checkbox"/>	Eacles imperialisDHJ02	09-SRNP-15406.02	MHMYH1919-10		BOLD:AAA1463	📍	20	2	📊		
<input type="checkbox"/>	Copiopteryx semiramis	11-SRNP-13945	MHMYO1372-12		BOLD:AAA2012	📍	12	2	📊		
<input type="checkbox"/>	Eacles imperialisDHJ01	05-SRNP-40127	MHATB411-06		BOLD:AAA3665	📍	11	2	📊		
<input type="checkbox"/>	Syssphinx jennyphillipsae	05-SRNP-35518	MHATB388-06	Paratype	BOLD:AAB8986	📍	6	2	📊		
<input type="checkbox"/>	Automeris rubescens	05-SRNP-70372	MHMXB895-06		BOLD:AAA4656	📍	6	2	📊		
<input type="checkbox"/>	Syssphinx quadrilineataDHJ01	10-SRNP-67944	MHMYK1206-11			📍	2	2	📊		🚫
<input type="checkbox"/>	Eacles imperialisDHJ01	09-SRNP-14259	MHMYD840-09		BOLD:AAA3665	📍	2	2	📊		
<input type="checkbox"/>	Eacles imperialisDHJ01	09-SRNP-14250	MHMYD839-09		BOLD:AAA3665	📍	2	2	📊		
<input type="checkbox"/>	Eacles imperialisDHJ01	09-SRNP-14251	MHMYD817-09		BOLD:AAA3665	📍	2	2	📊		
<input type="checkbox"/>	Eacles imperialisDHJ02	09-SRNP-14308	MHMYD764-09		BOLD:AAA1463	📍	2	2	📊		

Checklists

Code	Title	Details	Last Updated	Terminal Nodes	Updates	Reports
CL-CCPES	Can Crop Pests In Progress	Geography:Canada	2017-08-09	511	Updates	Reports
CL-CITES	CITES Appendix 1, 2015	Theme:Illegal Trade Cite:UNEP-WCMC (Comps.) 2015. The Checklist of CITES Species Website. CITES Secretariat, Geneva, Switzerland. Compiled by UNEP-WCMC, Cambridge, UK. Accessed 30/07/2015	2015-07-30	993	Updates	Reports
CL-PLONR	Plants at Risk, Ontario	Geography:Ontario Theme:At Risk Species	2015-11-09	79	Updates	Reports
CL-R14CR	IUCN RedList - CR Critically Endangered 2014	Theme:Critically Endangered Cite:IUCN 2014. The IUCN Red List of Threatened Species. Version 2015.1 Downloaded on 11 Nov 2014	2015-07-30	9148	Updates	Reports
CL-R14EN	IUCN RedList - EN Endangered 2014	Theme:Endangered Cite:IUCN 2014. The IUCN Red List of Threatened Species. Version 2015.1 Downloaded on 11 Nov 2014	2015-07-30	6830	Updates	Reports
CL-R14EW	IUCN RedList - EW Extinct in the Wild 2014	Theme:Extinct in the Wild Cite:IUCN 2014. The IUCN Red List of Threatened Species. Version 2015.1 Downloaded on 11 Nov 2014	2015-07-30	69	Updates	Reports

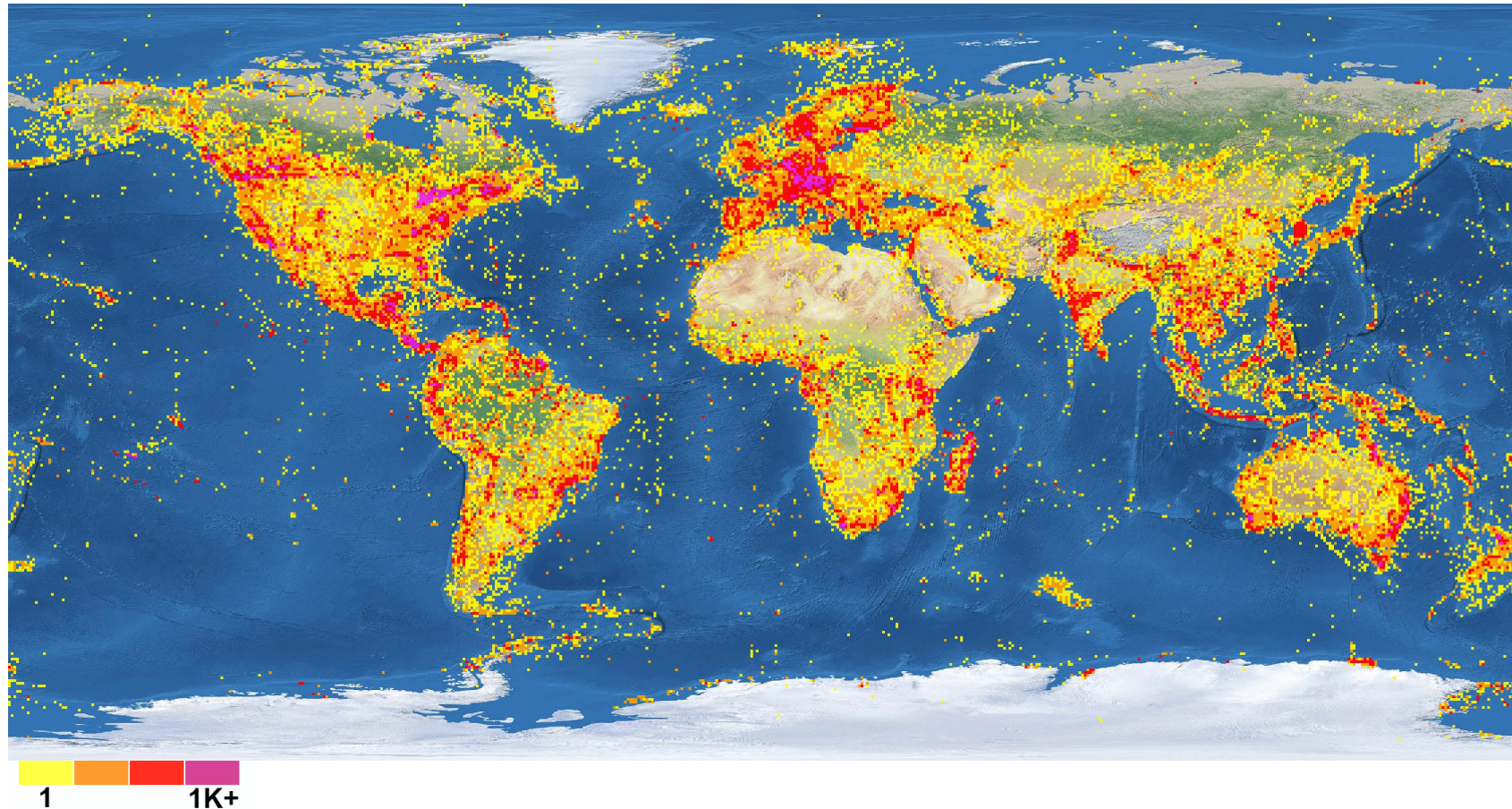
✓ Reports

Hit List

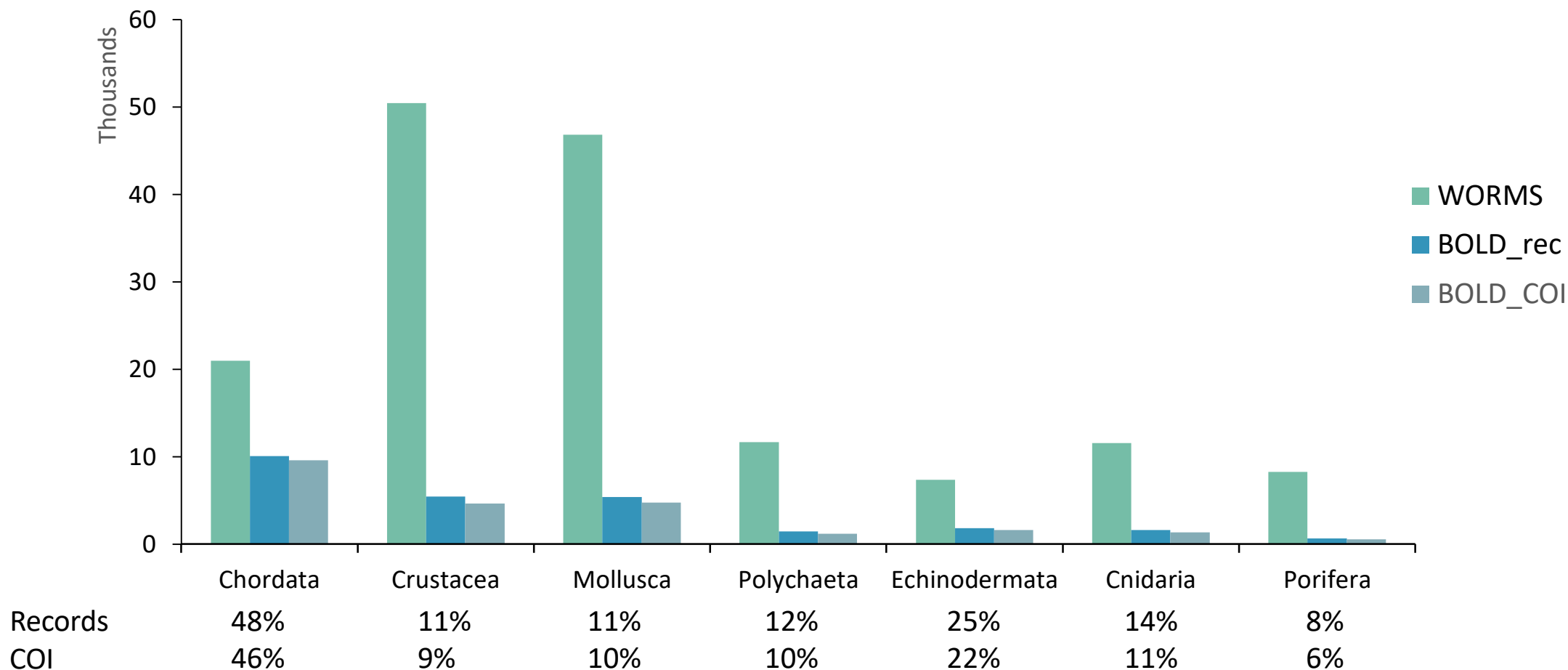
Progress

Disagreement

DNA Barcoding map



Barcoded animal species: 25K (13%)



Barcode Index Number (BIN)

BOLD:AAB9507

OPEN ACCESS Freely available online



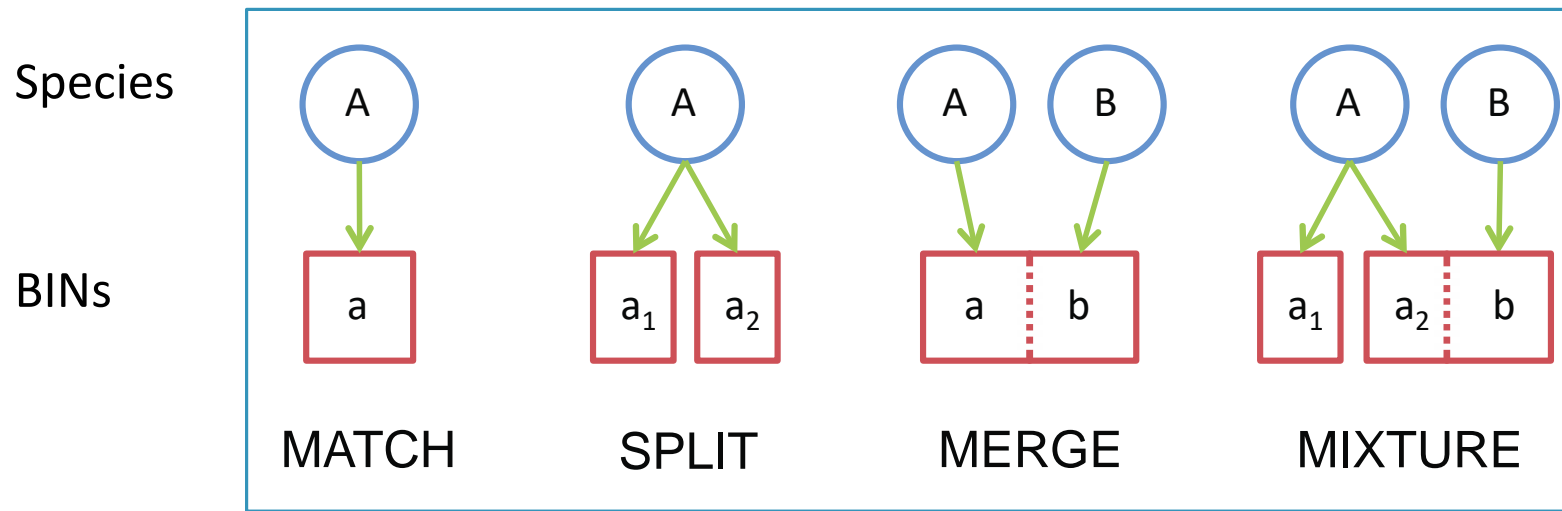
A DNA-Based Registry for All Animal Species: The Barcode Index Number (BIN) System

Sujeewan Ratnasingham^{1*}, Paul D. N. Hebert^{1,2}

¹ Biodiversity Institute of Ontario, University of Guelph, Guelph, Ontario, Canada, ² Department of Integrative Biology, University of Guelph, Guelph, Ontario, Canada

- Sequence based OTU designation by clustering all COI sequences in BOLD (once a month)
- Automatic, standardized, persistent

Species vs. BINs



- Lab issues: mis-labeling, cross-contamination
- Taxonomic issues: misidentification, synonymy
- Biology: cryptic species, young species, introgression, hybridization

Go to public records in this BIN

BIN DETAILS:

BIN UFI:	BOLD:AAB9507	Average Distance:	0.4% (p-dist)
DCI:	http://dx.doi.org/10.5883/BOLD:AAB9507	Maximum Distance:	1.08% (p-dist)
Member Count:	21 [19 Public]	Distance to Nearest Neighbor:	3.05% (p-dist)
Barcode Compliant Members:	21		
Founding Record:			

NEAREST NEIGHBOR (NN) DETAILS:

Nearest BIN UFI:	BOLD:AAA9153	Average Distance:	0.54% (p-dist)
Member Count:	17	Maximum Distance:	1.35% (p-dist)
Nearest Member:	CCMAL225-08	Distance Variance:	0.14% (p-dist)
Nearest Member Taxonomy:	Arthropoda, Malacostraca, Amphipoda, Ureididae, Anonyx, Anonyx sarsi		

TAXONOMY:

- Phylum: Arthropoda [21]
- Class: Malacostraca [21]
- Order: Amphipoda [21]
- Family: Ureididae [21]
- Subfamily: Genus: Anonyx [21]
- Species: Anonyx sarsi [21]

Distance Distribution:

PUBLICATIONS:

Adriana E. Radulović, Bernard Sainte-Marie and France Dufréne DNA barcoding of marine crustaceans from the Estuary and Gulf of St. Lawrence: a regional-scale approach Molecular Ecology Resources 2008-04-01;36(1):181-187 (2007)

TREE RECONSTRUCTION OF BIN & NEAREST NEIGHBOR:

PDF tree (LAI) members and a member of the nearest BIN

HAPLOTYPE NETWORK:

Color & Label Scheme: Species Name Country Province/State

COLLECTION LOCATION:

Countries: Canada - [19] United States - [2]

BIN COMPLIANT WITH METADATA REQUIREMENTS

Specimen Images:

WW160-07 (Anonyx sarsi)
Creative Commons - Attribution Non-Commercial License
Share-Alike (CC BY-NC)
License Holder: BIO Photography Group, Biodiversity Institute of Ontario

Collection Sites:

Attribution:

Specimen Depositories:
*unvouchered - [2]
Biodiversity Institute of Ontario - [1]
Université du Québec à Rimouski - [18]

Sequencing Centers:
Biodiversity Institute of Ontario - [19]
Genetic Commercial Lab - [2]

Photography:
Adriana Radulović - [8]
BIO Photography Group - [1]
Jocelyn Gil - [4]

Collectors:
Adriana Radulović - [8]
Bernard Sainte-Marie - [8]
Christy Clair - [1]
Hélène Lantier - [1]
Jocelyn Gil - [1]
Michelle F. - [1]
Sandra MacCubbin - [1]
Tristan Brad - [2]

Specimen Identification:
Christina M. Clair - [1]
Jean-Marc Gagnon - [4]
Pierre Brunel - [3]
Student - [2]

Sequencing Support:
Canadian Barcode of Life Network - [19]
International Barcode of Life (IBOL) - [2]

Computer Readable Format

BOLD:AAB9507

Anonyx sarsi

Max. distance: 1.08%

Nearest Neighbour: 3.05%

BOLD:AAA9153

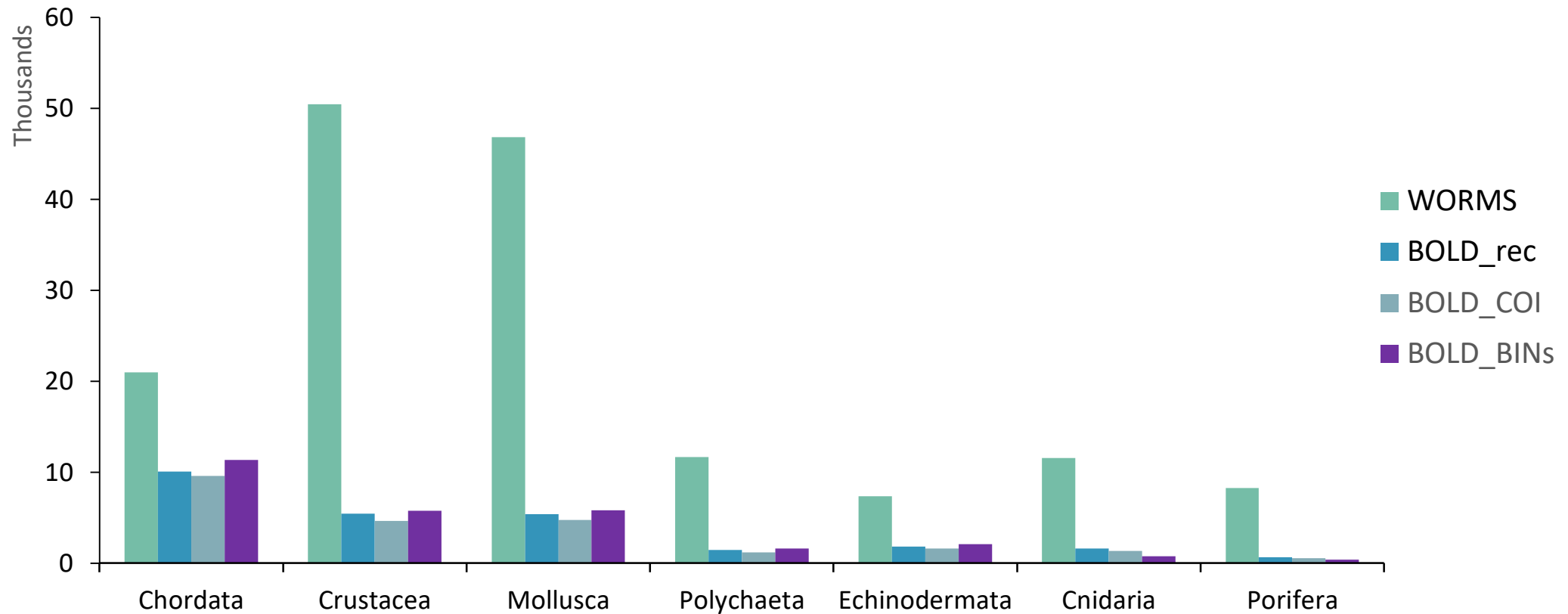


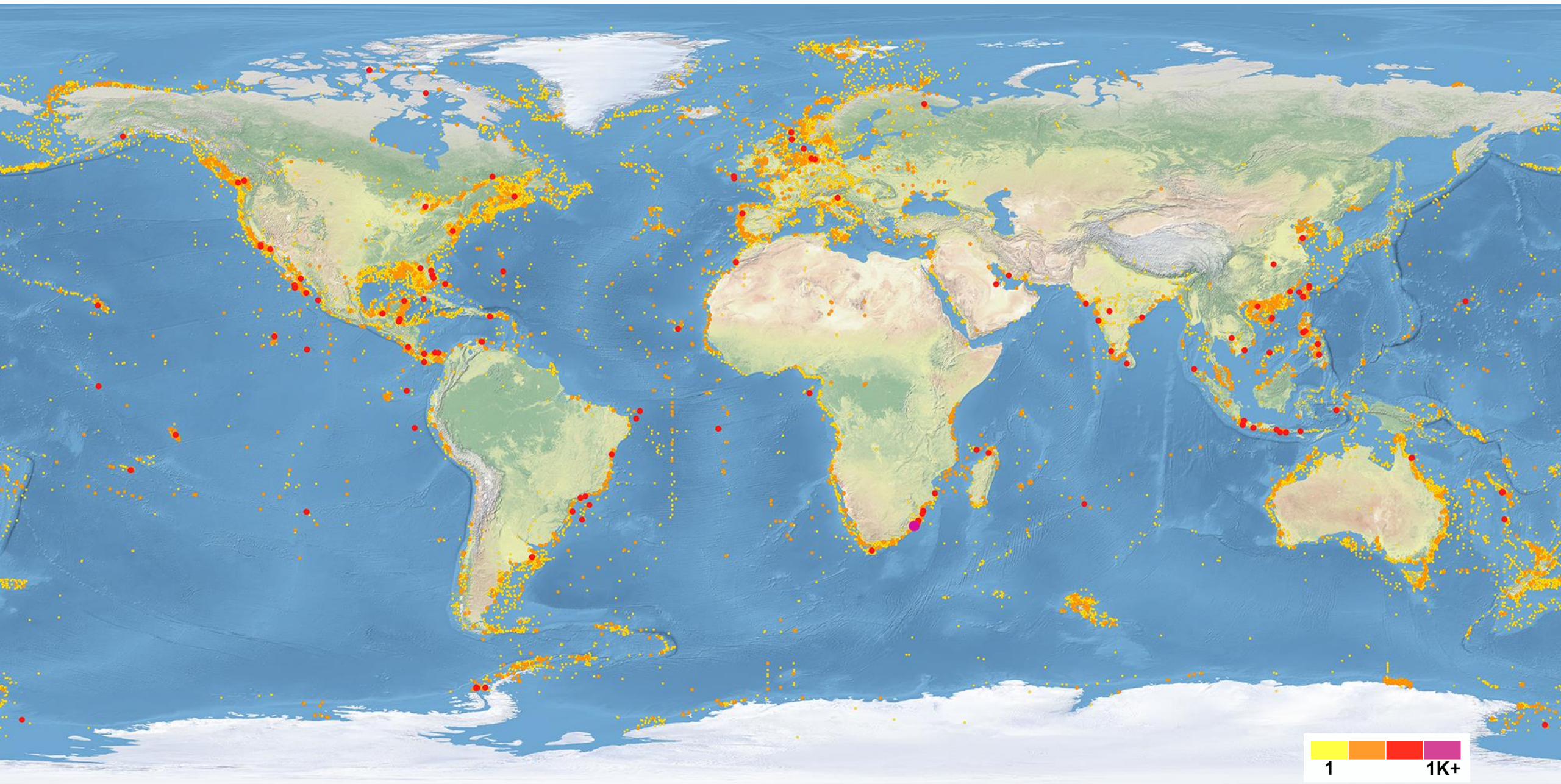
Platorchestia (Amphipopda: Talitridae): 9 species, 23 BINs

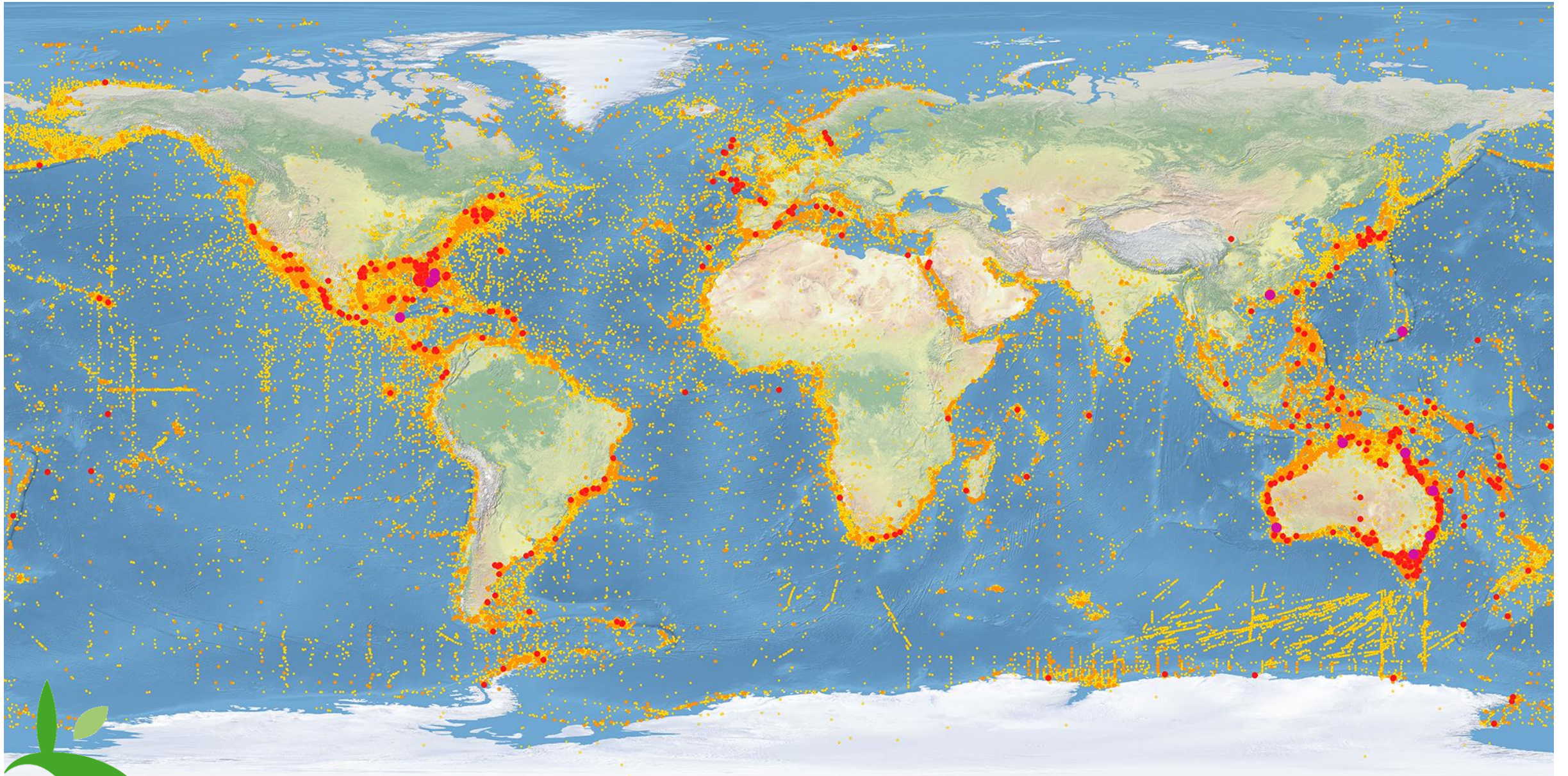
BIN	# Sequences	Species
BOLD:AAA2949	168	platensis
BOLD:AAB3402	62	platensis, monodi, pacifica
BOLD:AAD0041	30	pacifica, parapacifica, platensis
BOLD:ACH9802	3	pacifica
BOLD:ACI1345	1	pacifica
BOLD:ACQ1642	3	munmui
BOLD:ACB6373	21	monodi, munmui
BOLD:ACH9803	2	joi
BOLD:ACH9800	1	joi
BOLD:ACH2256	43	paludosus
BOLD:ACH9801	4	pachypus

BIN	# Sequences	Species
BOLD:AAY4437	15	japonica
BOLD:ACI2547	4	japonica
BOLD:ACH7347	3	japonica
BOLD:ACH2809	2	japonica
BOLD:ACH9813	2	japonica
BOLD:ACI0930	2	japonica
BOLD:ACH2808	1	japonica
BOLD:ACH2810	1	japonica
BOLD:ACI2544	1	japonica
BOLD:ACI2545	1	japonica
BOLD:ACI2546	1	japonica
BOLD:ACI2549	1	japonica

Marine barcoding (25K species – 29K BINs)







GBIF

HITLIST



BOLD SYSTEMS DATABASES IDENTIFICATION TAXONOMY WORKBENCH RESOURCES LOGIN Q

BARCODE OF LIFE DATA SYSTEMS v4

beta

Advancing biodiversity science through DNA-based species identification.

[EXPLORE THE DATA](#)

DESIGNED TO SUPPORT THE GENERATION & APPLICATION OF DNA BARCODE DATA

BOLD is a cloud-based data storage and analysis platform developed at the Centre for Biodiversity Genomics in Canada. It consists of four main modules, a data portal, an educational portal, a registry of BINs (putative species), and a data collection and analysis workbench.

Please note that this version of BOLD is in beta and will contain bugs. Users can help address these bugs by testing the system and reporting issues to support@boldsystems.org. This version is very different from the prior one but has access to all the same data.



DATA PORTAL

A data retrieval interface that allows for searching over 1.7M public records in BOLD using multiple search criteria including, but not limited to, geography, taxonomy, and depository.



EDUCATION PORTAL

A custom platform for educators and students to explore barcode data and contribute novel barcodes to the BOLD database.




BIN DATABASE

A searchable database of Barcode Index Numbers (BINs), sequence clusters that closely approximate species.




WORKBENCH

A data collection and analysis environment that supports the assembly and validation of DNA barcodes and other sequences.



Multiplex Barcode Research And Visualization Environment

mBRAVE is a multi-user platform supporting the storage, validation, analysis, and publication of highly multiplexed projects based on high-throughput sequencing (HTS) instruments. This system builds on the [BOLD Platform](#) to support species identification and discovery for HTS data.



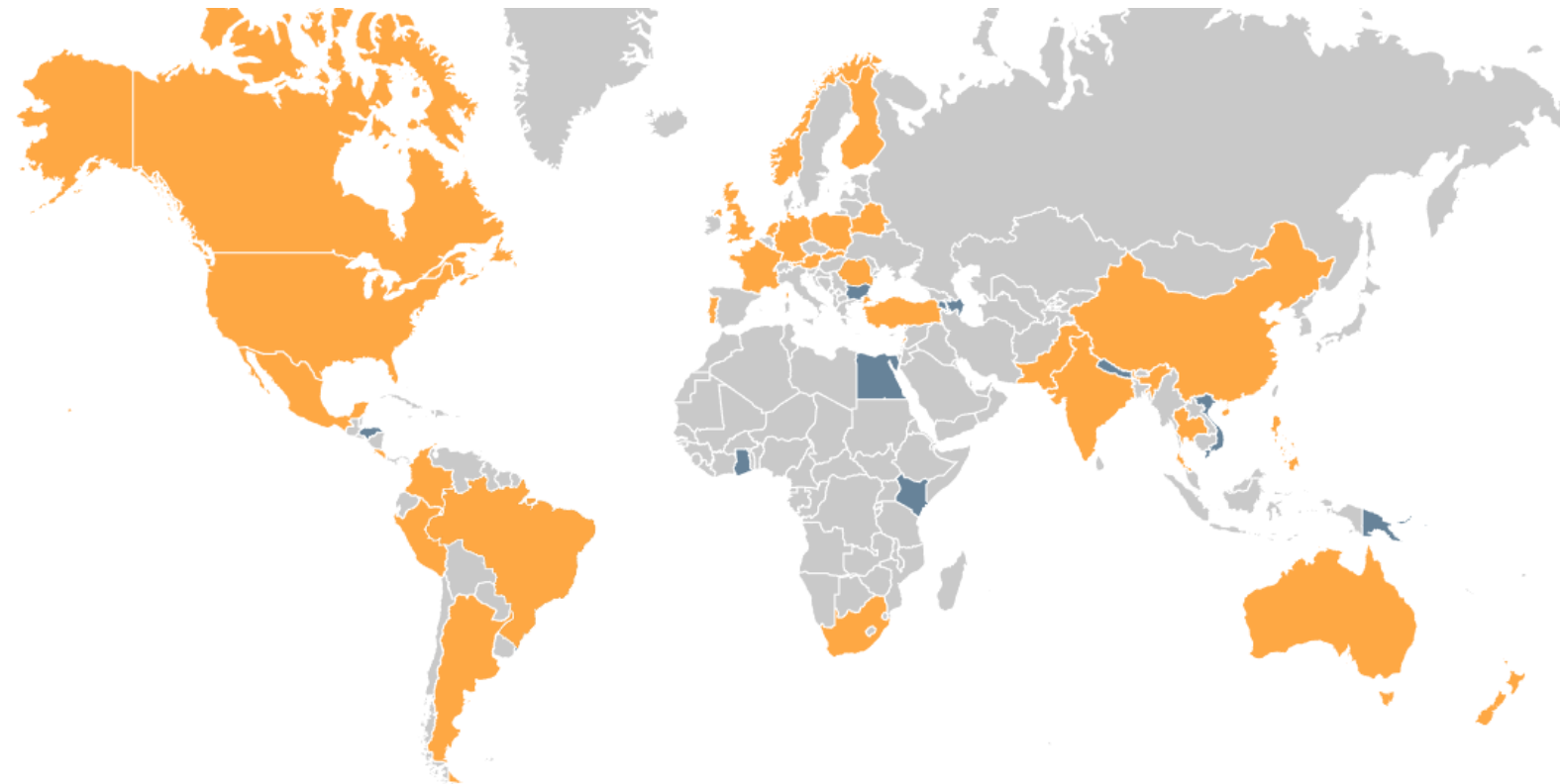
[Login](#)

[Register](#)

mBRAVE is now accepting all new registrants.

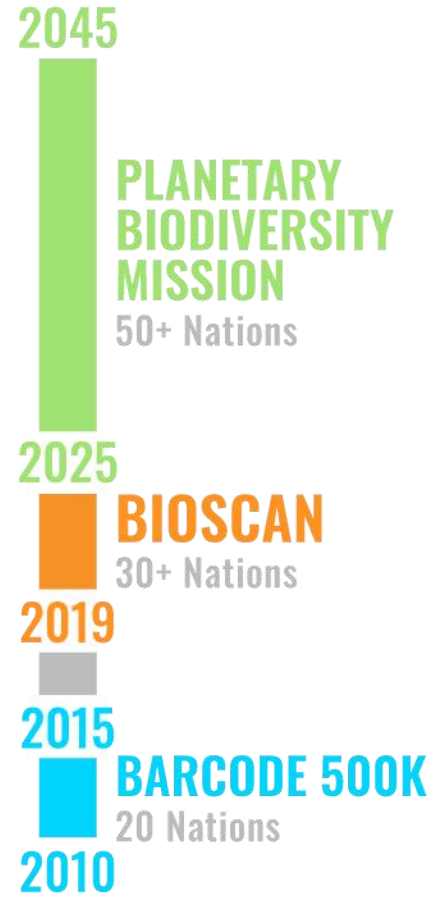


iBOL Consortium

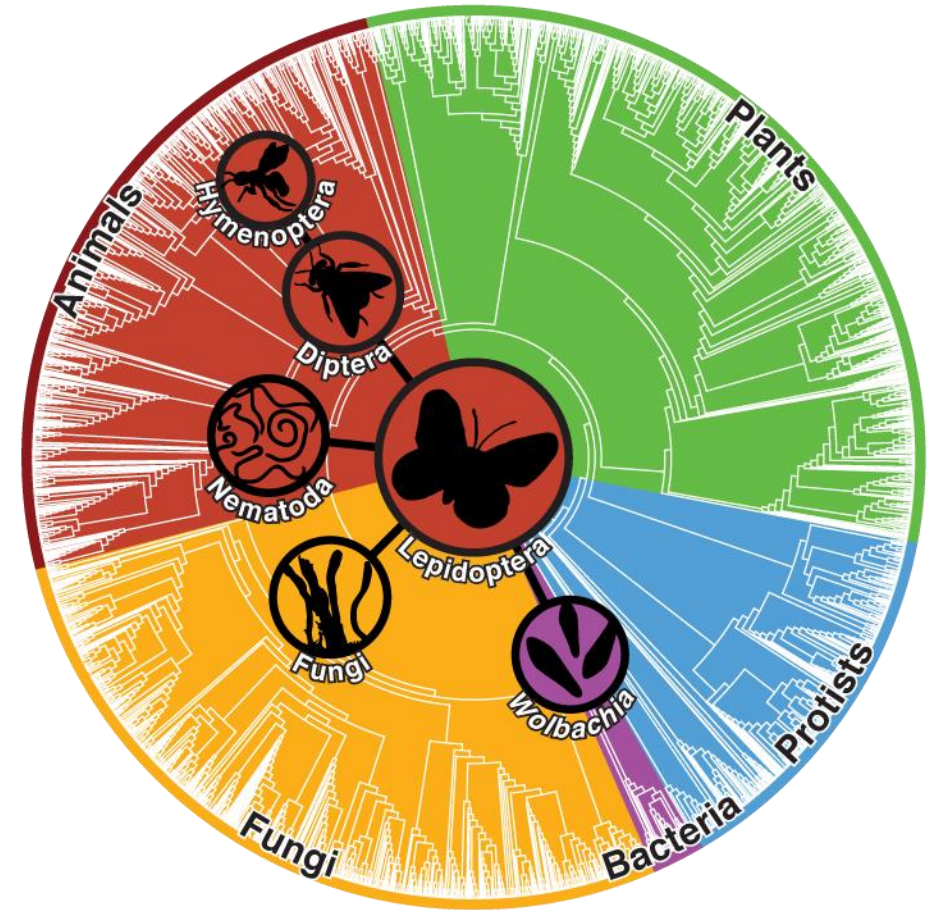




TRACKING ECOSYSTEMS



TIMELINE



REVEALING SYMBIOMES

BIOSCAN has four main objectives:



**SCAN SPECIES COMMUNITIES
AT 2,500 SITES**



**CODIFY SPECIES INTERACTIONS
AT 2,500 SITES**



**EXPAND THE REFERENCE LIBRARY
TO 2.5 MILLION SPECIES**



**SPEED THE UPTAKE OF DNA
BARCODING
TO PROTECT LIFE**

Thank you

