

The Macroalgal Herbarium Consortium

ACCESSING 150 YEARS OF
SPECIMEN DATA TO
UNDERSTAND CHANGES IN THE
MARINE/AQUATIC
ENVIRONMENT



What are Macroalgae?

Rhodophyta (Red Algae) - 6,300 species in 10 orders

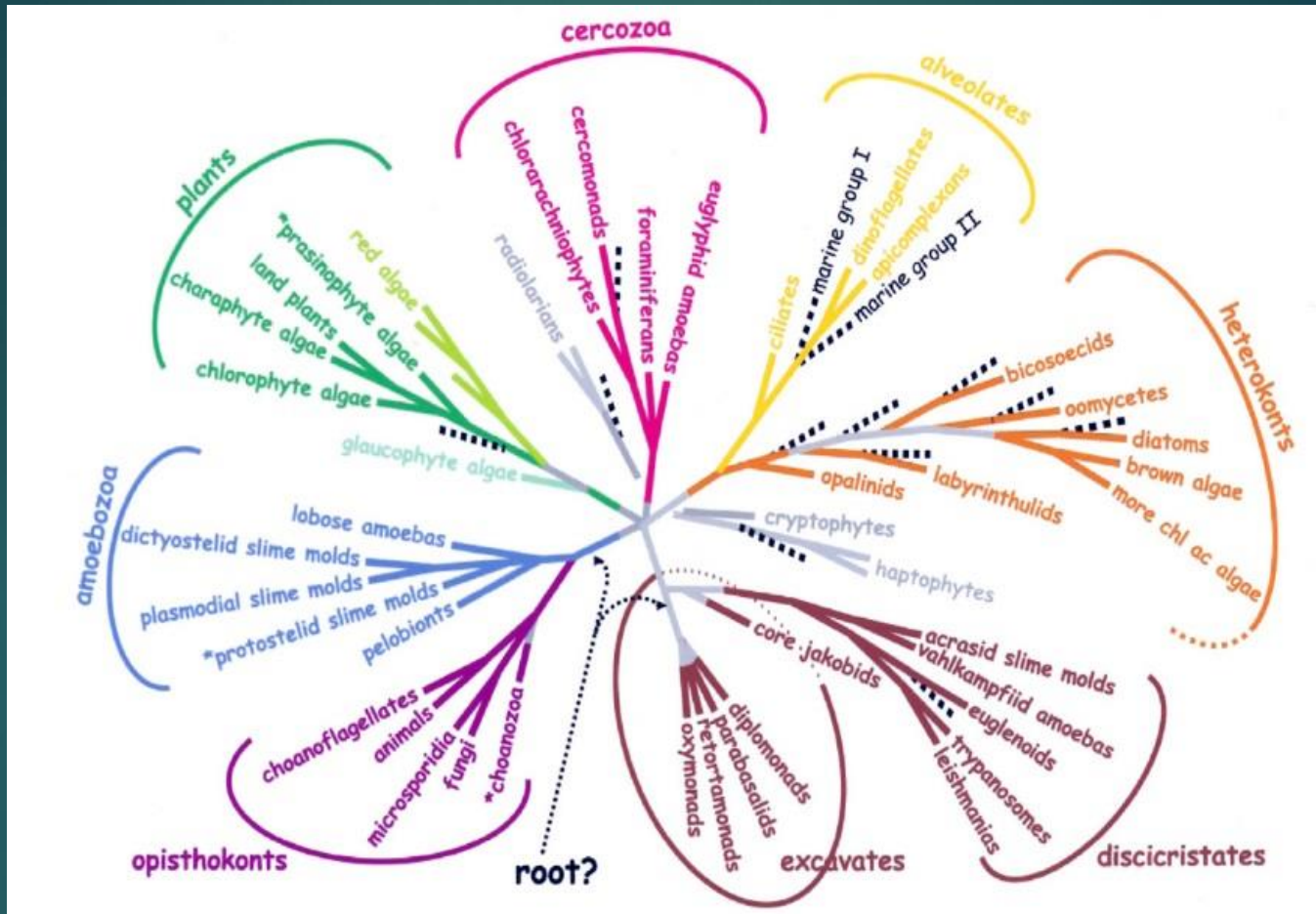
Chlorophyta (Green Algae) - 4,300 species in 15 orders

Charophyta - 3,500 species in 8 orders

Phaeophyta (Brown Algae) - 2,000 species in 18 orders



What are Macroalgae?



Eukaryota Tree of Life (Bauldauf 2003)

Why Are They Important

- ▶ Foundation of aquatic ecosystems – provide food, shelter and substrate for other organisms
- ▶ Maintain nutrient balance in aquatic ecosystem and produce oxygen
- ▶ \$7.4 billion industry as human food, phycocolloids, pharmaceuticals
- ▶ Sensitive indicator of environmental changes in aquatic ecosystems



How Many Specimens Are There in US Herbaria?



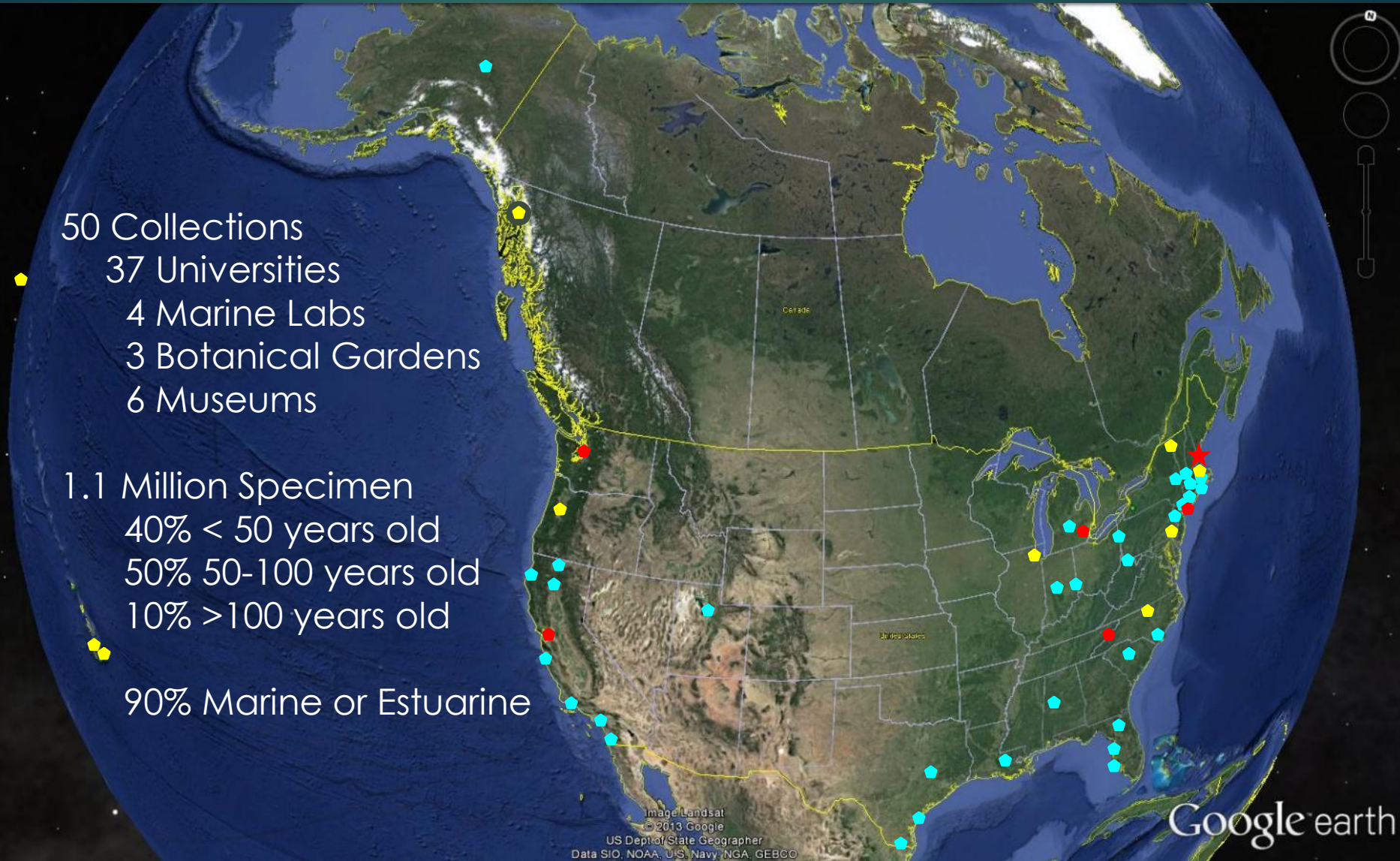
- ▶ 1.1 Million herbarium specimens in collections ranging from 100 specimens to 200,000

Where Are The Herbaria?

50 Collections
37 Universities
4 Marine Labs
3 Botanical Gardens
6 Museums

1.1 Million Specimen
40% < 50 years old
50% 50-100 years old
10% >100 years old

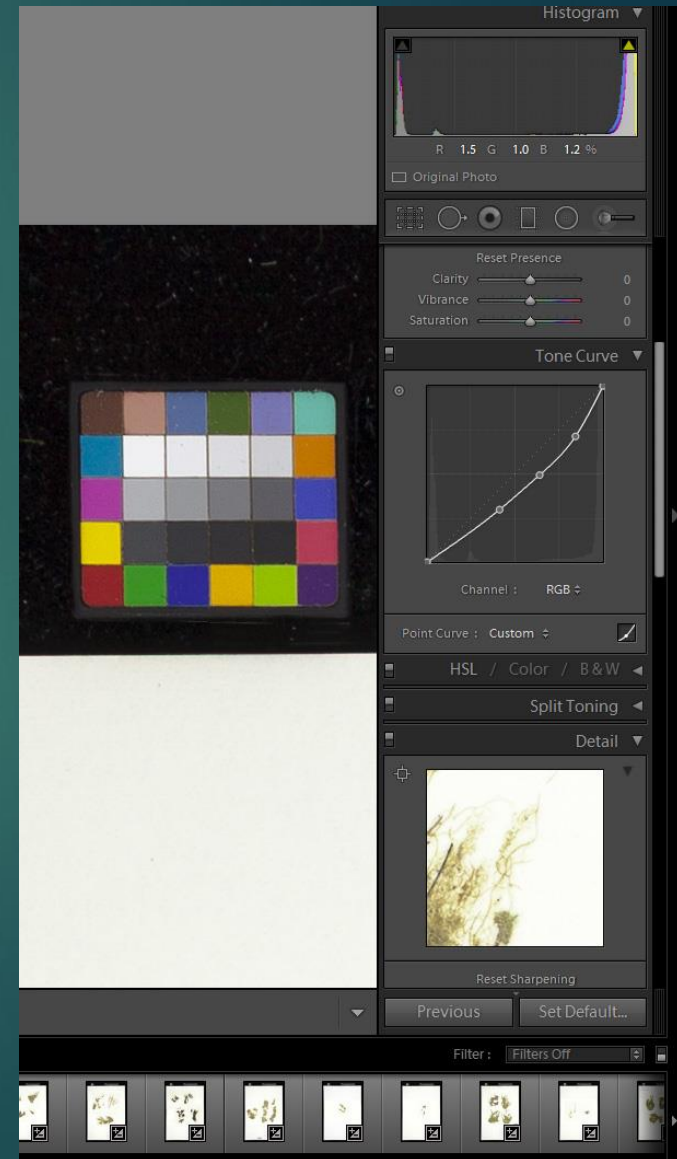
90% Marine or Estuarine



How Are They Being Digitized?

▶ Imaging

- ▶ Lightbox/copystand
- ▶ 21 to 36 megapixel camera
- ▶ Camera Control Software
- ▶ Adobe Lightroom (white balance, tone curve adjustment, jpg & dng export)



How Are They Being Digitized?

► Label Transcription in Symbiota Portal (Macroalgae.org)

The screenshot displays the 'occurrenceeditor.php' page for the University of New Hampshire (NHA). The interface is divided into several sections:

- Collector Info:** Includes fields for Catalog Number (NHA-575360), Other Numbers (56174), Collector (A. C. Mathieson), Number, and Date (1995-04-01). There are also checkboxes for 'Dupes?' and 'Auto search'.
- Latest Identification:** Shows the Scientific Name (Monostroma grevillei), Author, ID Qualifier, Family, and Date Identified.
- Locality:** Lists Country (United States), State/Province (Maine), County (Hancock), and Municipality. The full locality is 'Lamoine State Park, Eastern Bay, Lamoine, Maine'. It also includes a 'Locality Security' checkbox and fields for Latitude (44.453513), Longitude (-68.301485), Uncertainty (504), Datum, and Verbatim Coordinates.
- Georeferenced By:** Shows 'hmt' and 'georef batch tool 2013-'. It also includes fields for Georeference Sources, Georeference Remarks, Georeference Protocol, Georef Verification Status, and footprint (polygon).
- Misc:** A section for additional notes, currently containing 'reviewed - high confidence'.

On the right side, the 'Label Processing' section features a map of Maine with a red dot indicating the collection site. Below the map, the transcribed label text is shown:

56174
PLANTS OF NEW ENGLAND
(Maine)
Monostroma grevillei (Thuret) Wittrock
Lamoine State Park, Eastern Bay,
Lamoine, Maine

April 1, 1995 A. Mathieson

Hodgdon Herbarium
UNIVERSITY OF NEW HAMPSHIRE


Below the transcribed text, there are options for 'OCR Image' processing:

- OCR whole image
- OCR w/ analysis

The page is labeled 'Image 1 of 1' at the bottom right.

How Are They Being Digitized?

- ▶ Label Transcription in Symbiota Portal
 - ▶ Manual/semi-automated entry (barcode, filed-as name, country, state, county)
 - ▶ Voice recognition (collector(s), collection date, accession number, locality)
 - ▶ Optical character recognition (locality)

University of New Hampshire

NHA-669417

FLORA OF New Hampshire

Name Polysiphonia denudata (Dillwyn)Kutzing

Place end of Colony Cove Road , Durham Point area , Little Bay

♀ + ♂

Date June 29, 1976 A. Mathieson Collector

NEW YORK BOTANICAL GARDEN
NORTH AMERICAN MARINE ALGAE

COLLECTED AT GUÁNICA HARBOR, PORTO RICO,
BY MARSHALL A. HOWE,

Acetabulum crenulatum (Lamour.) Kentze
On stones at low-water mark forma

No. 2573

JUNE 25, 1903.

How Are They Being Digitized?

- ▶ Georeferencing (GeoLocate from Symbiota Portal)

GEOlocate Tool - Google Chrome

macroalgae.org/portal/collections/georef/geolocate.php?country=United%20States&state=Maine&county=Hancock&locality=Lamoine%20Stat

2 possible locations found. powered by: GEOlocate

Workbench **2 possible locations found**

Georeference | Options | Draw polygon | Place marker | Measure

Locality String: Lamoine State Park, Eastern Bay, Lamoine, Maine

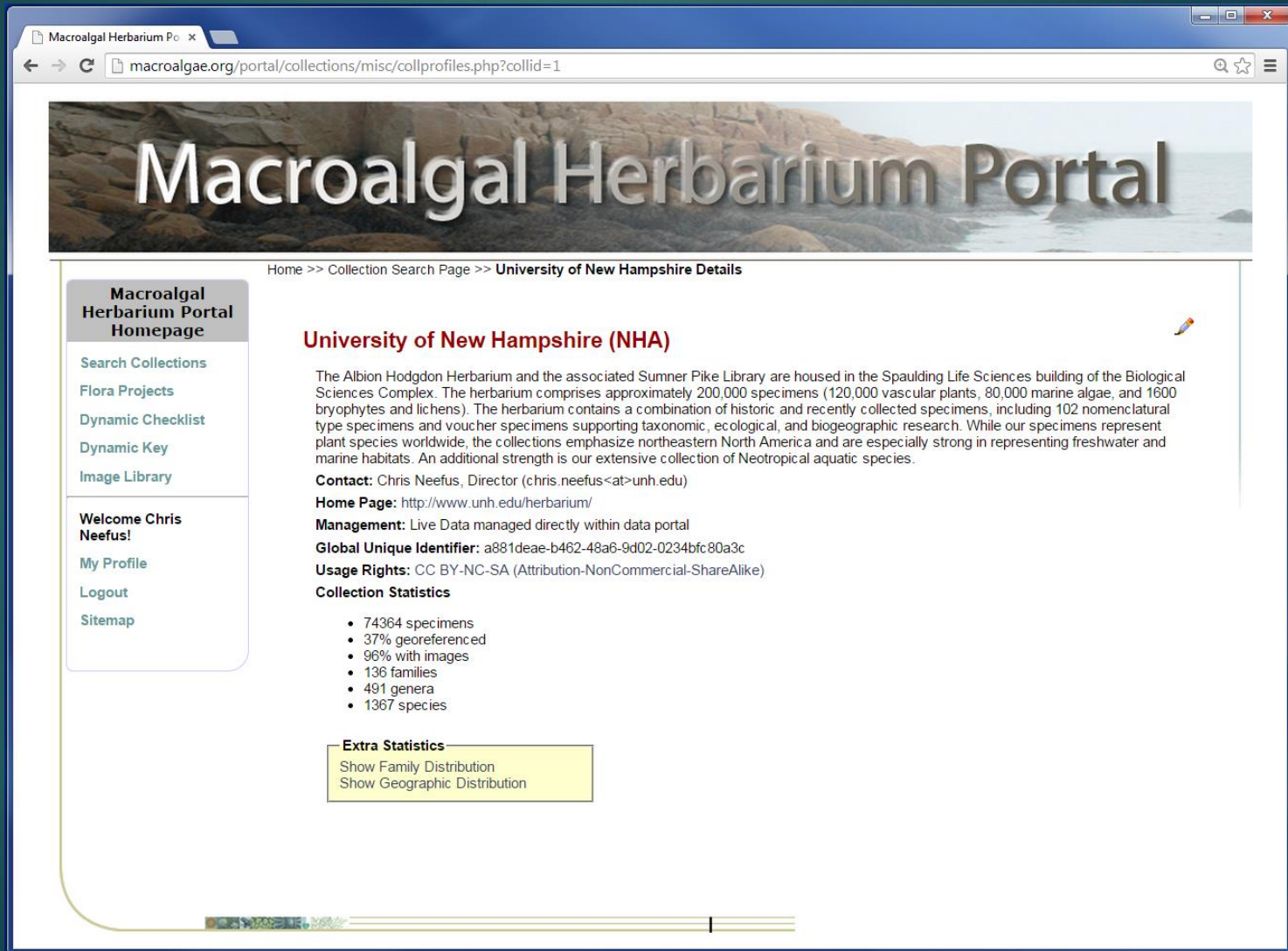
Country: UNITED STATES OF AMERICA latitude: 44.45722 longitude: -68.29861 uncertainty: 2289 m error polygon

State: 44.45722 -68.29861 2289 Unavailable

County:

How Is The Data Being Disseminated?

- ▶ Macroalgae.org specimen data portal (Symbiota)



The screenshot shows a web browser window with the URL macroalgae.org/portal/collections/misc/collprofiles.php?collid=1. The page title is "Macroalgal Herbarium Portal" and the breadcrumb trail is "Home >> Collection Search Page >> University of New Hampshire Details".

Macroalgal Herbarium Portal Homepage

- Search Collections
- Flora Projects
- Dynamic Checklist
- Dynamic Key
- Image Library

Welcome Chris Neefus!
My Profile
Logout
Sitemap

University of New Hampshire (NHA)

The Albion Hodgdon Herbarium and the associated Sumner Pike Library are housed in the Spaulding Life Sciences building of the Biological Sciences Complex. The herbarium comprises approximately 200,000 specimens (120,000 vascular plants, 80,000 marine algae, and 1600 bryophytes and lichens). The herbarium contains a combination of historic and recently collected specimens, including 102 nomenclatural type specimens and voucher specimens supporting taxonomic, ecological, and biogeographic research. While our specimens represent plant species worldwide, the collections emphasize northeastern North America and are especially strong in representing freshwater and marine habitats. An additional strength is our extensive collection of Neotropical aquatic species.

Contact: Chris Neefus, Director (chris.neefus@unh.edu)
Home Page: <http://www.unh.edu/herbarium/>
Management: Live Data managed directly within data portal
Global Unique Identifier: a881deae-b462-48a6-9d02-0234bfc80a3c
Usage Rights: CC BY-NC-SA (Attribution-NonCommercial-ShareAlike)

Collection Statistics

- 74364 specimens
- 37% georeferenced
- 96% with images
- 136 families
- 491 genera
- 1367 species

Extra Statistics

- Show Family Distribution
- Show Geographic Distribution

How Long Does It Take?

► Specimens per Hour and Cost per Specimen

Activity	Specimens per Hour	Cost per Specimen
Barcoding & preliminary record creation ^a	80	\$0.12
Specimen Imaging ^a	69	\$0.14
Label transcription ^a	63	\$0.15
Georeferencing ^b	195	\$0.08
Total		\$0.49

^aUndergrad Students \$9.50/h
^bGrad Students \$16/h

What is the Progress to Date?

Digitizing Institution	Start	Collections	Specimens	Records Created	On Portal	Imaged	Fully Transcribed	Geo-referenced
University of New Hampshire	Year 1	10	127,285					
New York Botanical Garden	Year 1	5	163,350					
University of North Carolina	Year 1	7	74,167					
University of Michigan	Year 1	5	78,683					
University of Washington	Year 1	3	37,154					
Duke University	Year 1	1	19,000					
University of Alaska	Year 1	1	8,300					
Bishop Museum	Year 1	1	78,795					
Field Museum	Year 1	1	37,494					
Oregon State University	Year 1	1	9,000					
University of Guam	Year 1	1	13,600					
University of California - Berkeley	Year 2	9	228,493					
University of Hawaii	Year 2	1	2,000					
Harvard University	Year 2	2	150,000					
Academy of Natural Sciences	Year 3	1	37,000					
University of Vermont	Year 3	1	3,500					
Totals		50	1,067,821					
				484,606	357,592	250,241	157,054	70,321

Acknowledgements

- ▶ **University of New Hampshire** – Janet Sullivan, Liz Hull, James Lydecker, Matt Lafond, Emily Tassinari, Olivia Fleszar, Natalie Feldsine , Tucker Smith, Xander Howard, Mike O'Malley, Hannah Traggis, Mike Mayo
- ▶ **New York Botanical Garden** – Ken Karol, Barbara Thiers, Stephen Gottschalk, Naveed Davoodian
- ▶ **Arizona State University** - Ed Gilbert
- ▶ **AlgaeBase** – Michael Guiry
- ▶ **Yale University** – Patrick Sweeney
- ▶ **iDigBio** – Gil Nelson, Deb Paul, Larry Page, Joanna McCaffrey, David Jennings, and everyone else.



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A copy of this presentation is available at

<http://macroalgae.unh.edu>

The project data portal is at <http://macroalgae.org>

