


# The Macroalgal Herbarium Digitization Project

Research Goals and Specimen Demographics


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Macroalgae are sensitive indicators of environmental changes in marine, estuarine and freshwater ecosystems

## Research Goals

- *Bioinvasions: Use temporal and spatial distribution data to track the spread of invasive species.*
  - *Climate Change: Use temporal changes in species distribution, community structure, and seasonality to assess the effects of climate change on marine, estuarine and freshwater ecosystems.*
  - *Human Impact: Use changes in species distribution to help understanding the impact of human activity on ecosystems.*
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INTRODUCTION OF *GRACILARIA VERMICULOPHYLLA*  
(RHODOPHYTA, GRACILARIALES) TO NEW ENGLAND,  
USA: ESTIMATED ARRIVAL TIMES AND  
CURRENT DISTRIBUTION

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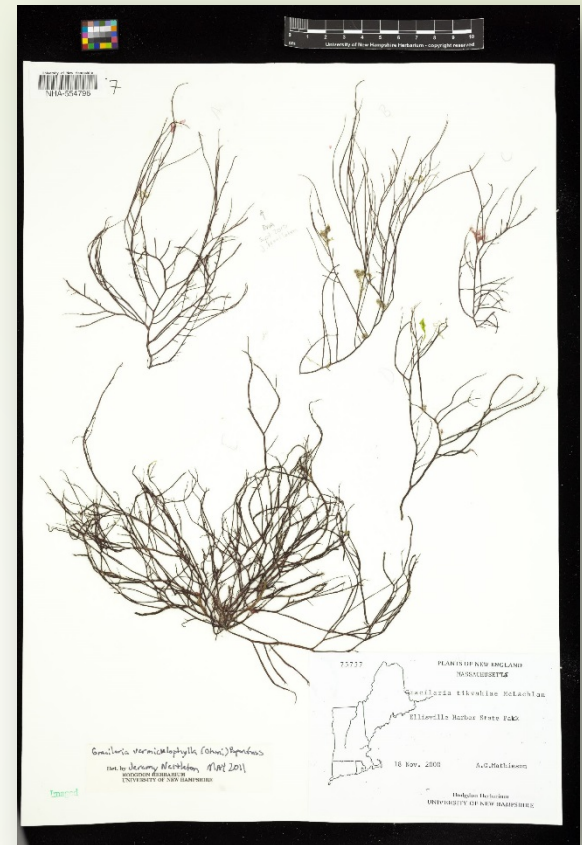
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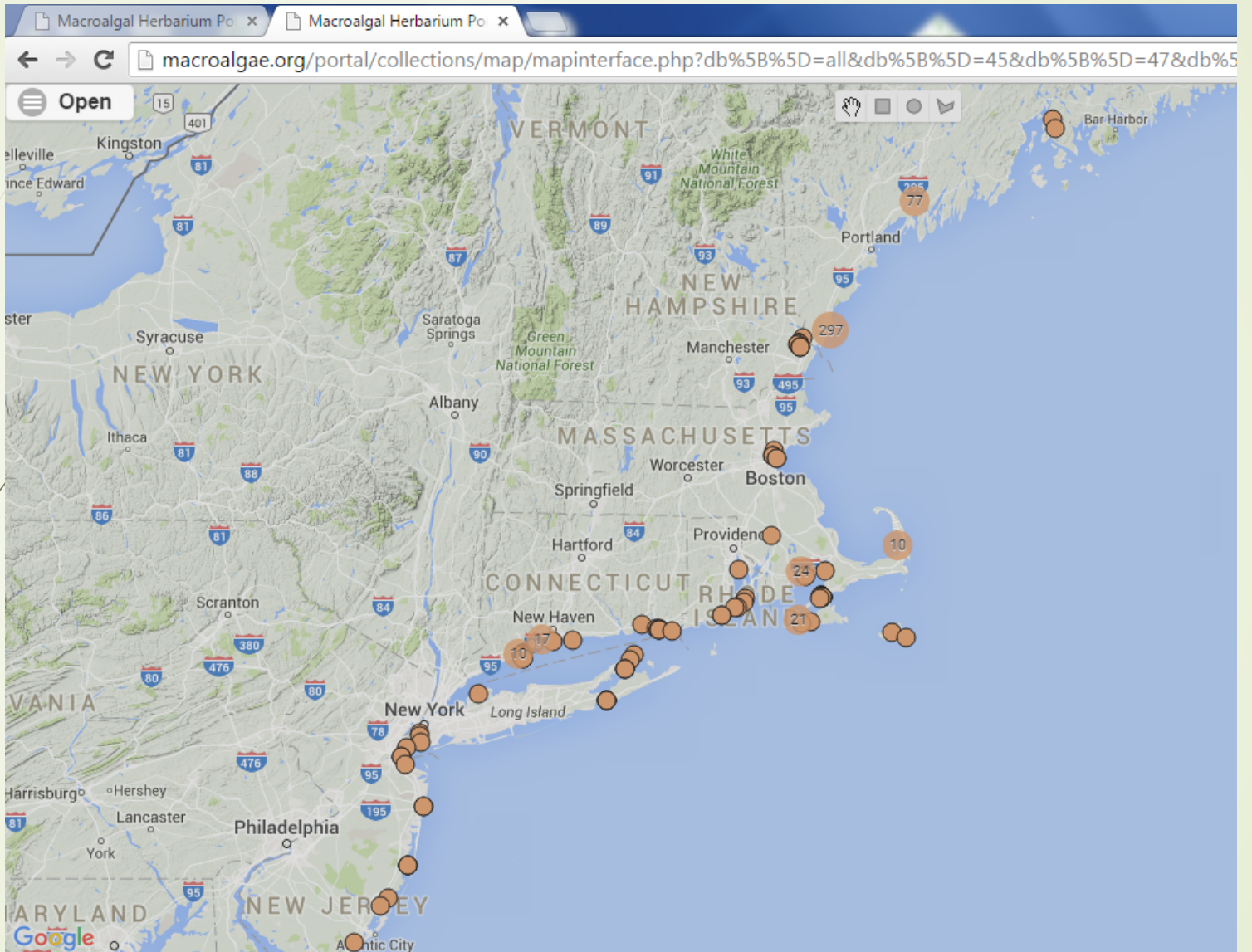
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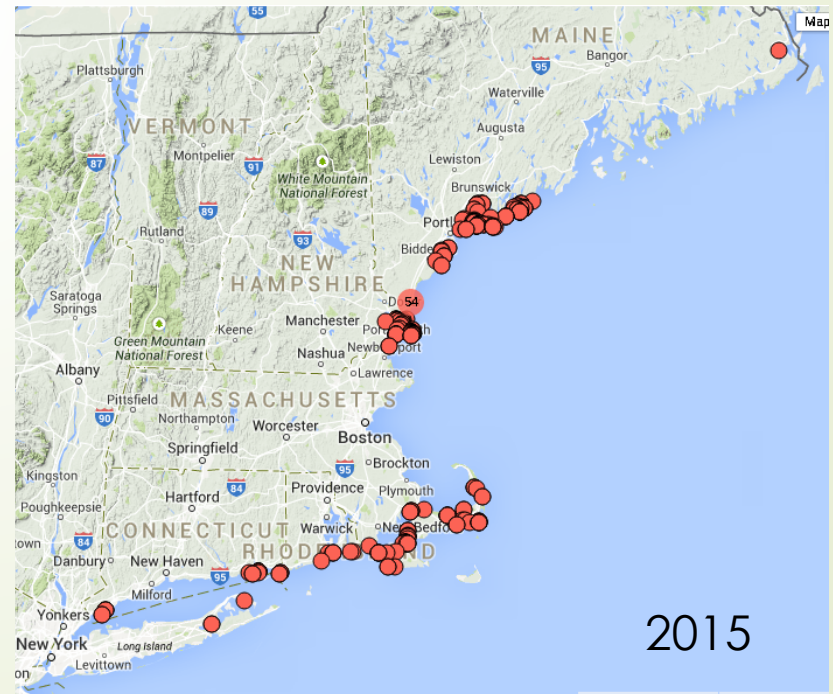
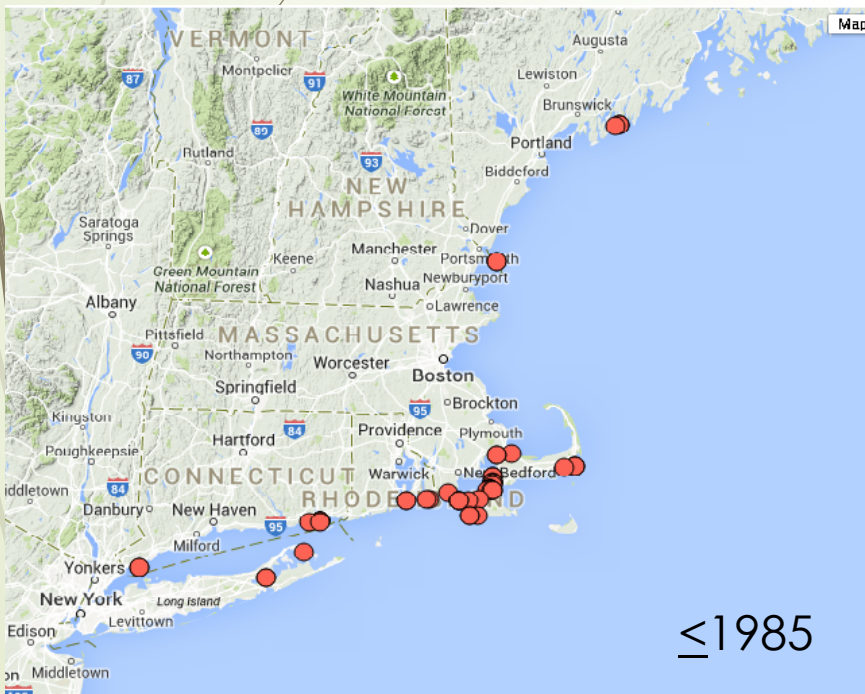
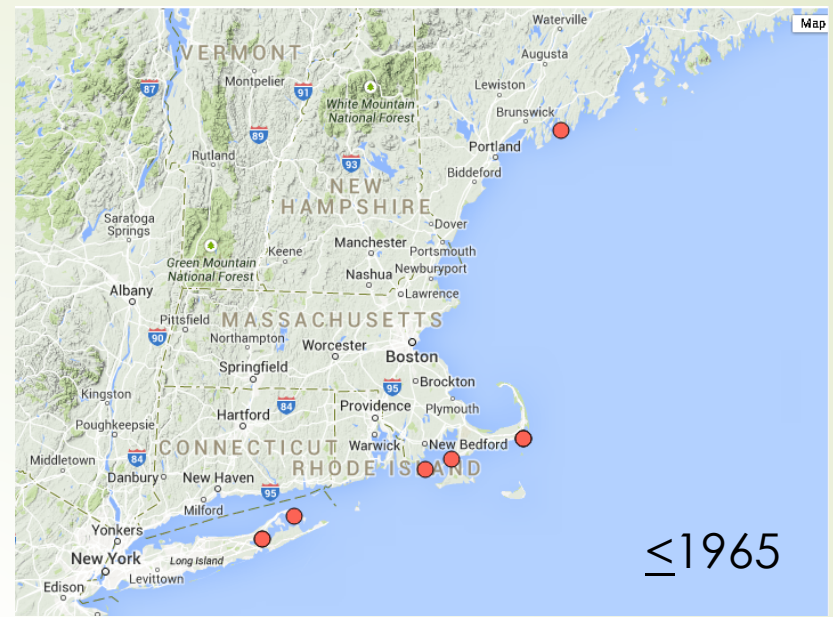
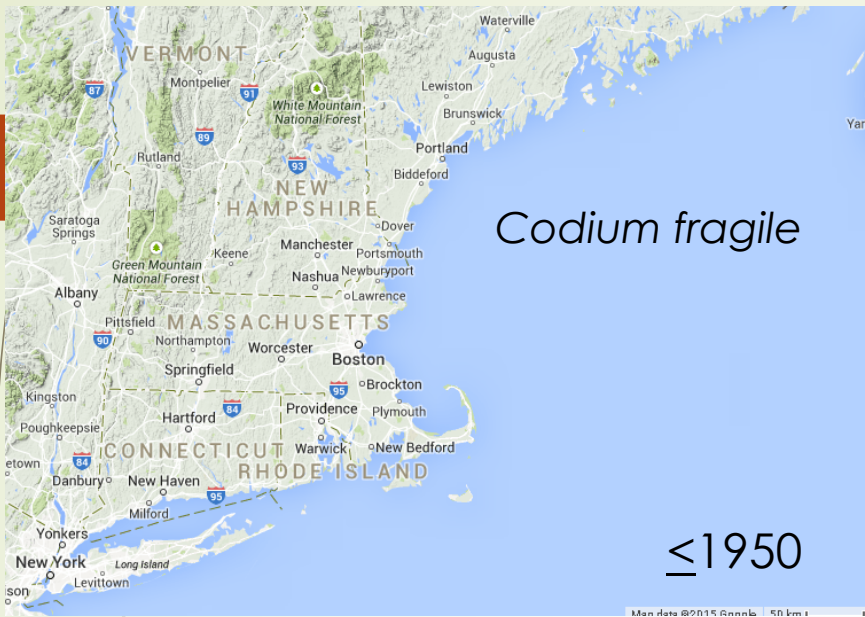
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**abstract.** The invasive Asian red alga *Gracilaria vermiculophylla* has recently spread rapidly around the globe. In the Northwest Atlantic, it was first collected in Virginia during 1998; in New England, it was first recorded from Narragansett Bay, Rhode Island in 2007. Until now, the specific dates of its introduction and current distribution in New England have been poorly understood. We employed a combination of field collections, evaluations of historical herbarium specimens, and molecular investigations (including mtCOI gene sequencing) to document its present distribution and approximate dates of introduction within New England. We found *G. vermiculophylla* at 18 of 24 Northwest Atlantic sites growing with native *G. tikvahiae* populations. Presently, it is recorded from Stamford, CT to Greenland, NH, with no populations known from five Maine sites where the native *G. tikvahiae* grows. Molecular screening of historical specimens revealed that *G. vermiculophylla* was collected from five sites in Massachusetts during 2000, whereas it was first documented in New Hampshire from the middle of the Great Bay Estuarine System (i.e., Dover Point) during 2001. In Rhode Island, initial specimens were documented during 2007, and those in Connecticut were first confirmed during







## AN HISTORICAL COMPARISON OF SEAWEED POPULATIONS FROM CASCO BAY, MAINE

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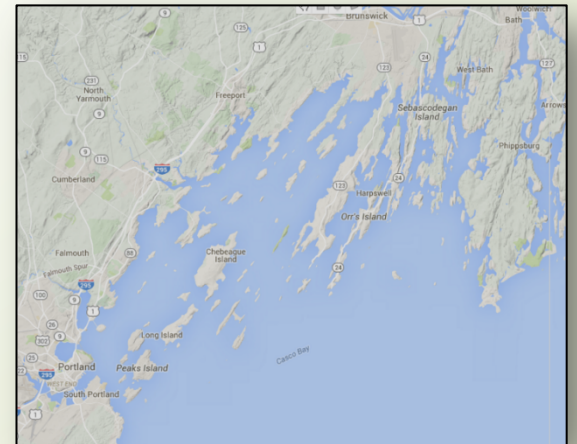
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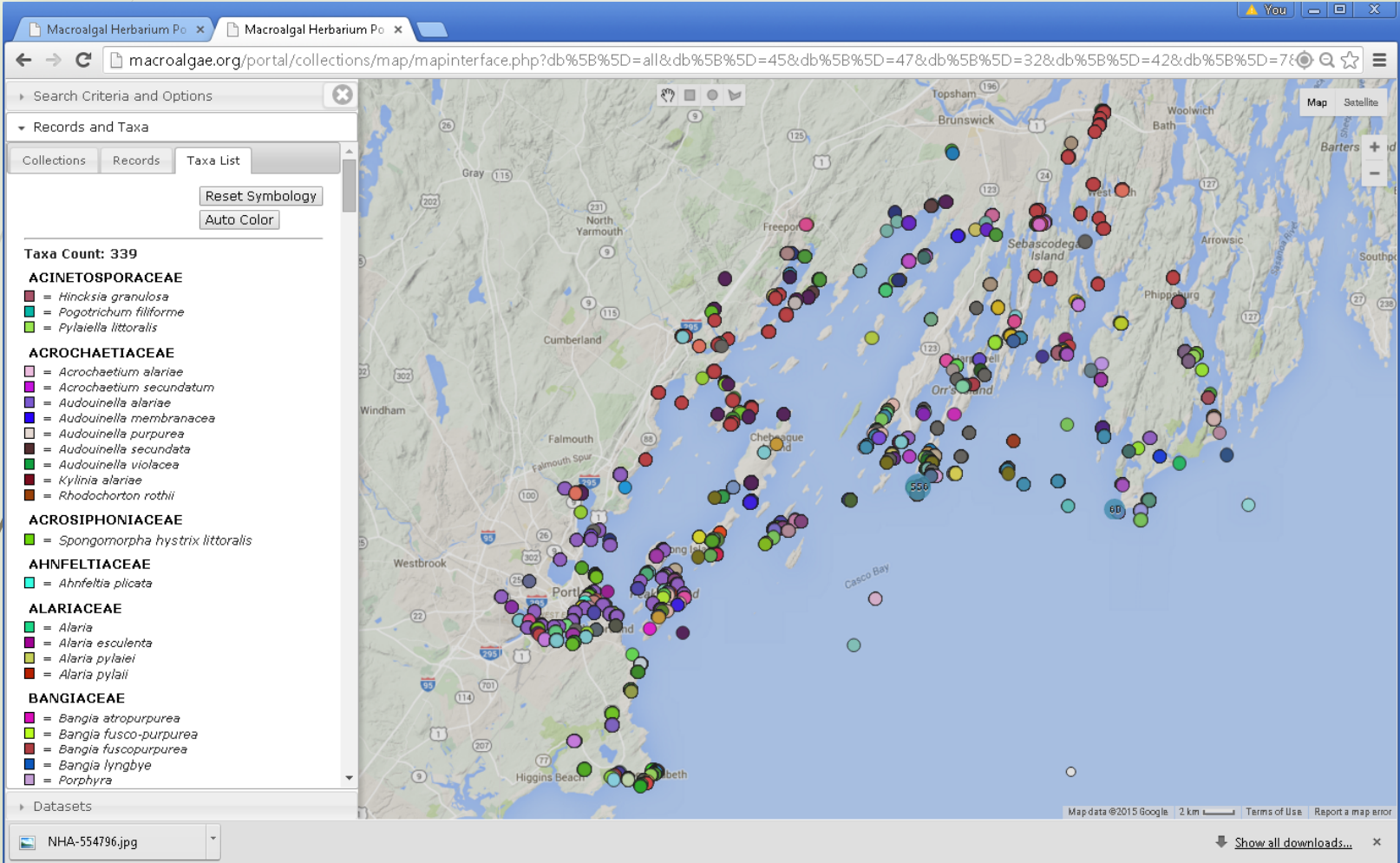
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**abstract.** Based on recent and historical collections dating back to the early 1900s, the seaweed flora in Casco Bay, Maine consists of 206 taxa: 55 Chlorophyta, 70 Phaeophyta, and 81 Rhodophyta. In 1911, Frank Shipley Collins recorded 173 taxa from Casco Bay, while 164 taxa were found during recent sampling since 1994. A comparison of the two time periods shows a 77.7% similarity; some plants have apparently disappeared (or are very rare) and others are newly recorded. Eight newly collected seaweeds represent species that are most common in estuarine and shallow embayments and have southern warm-water affinities (e.g., *Harveya ornata*, *Sargassum arbuscula*, *Callithrixion corallosum*, *Ceramium ciliolatum*, *Chondria hallypura*, *Polysiphonia densitata*, *P. elongata*, and *Spyridia filamentosa*); six others represent introduced taxa, including *Codium fragile* subsp. *tomentosoides*, *Diloma rhomboides*, *Bonnemaisonia lanifera* and its “*Trailliaella irritans*” stage, plus *Dumortiera costata*, *Lomentaria clavellata*, and *Porphyrymenestrif. yessoensis*. The Asian red alga *Neosiphonia harveyi*, which represents another introduced taxon (i.e., 7th), was reported by Collins during the early 1900s. Comparisons of historical and present-day floras at two sites in Harpswell, Maine showed that the percent similarity values were lower and ranged from 41.5% at Basin Cove to 48.9% at Potts Point. At Basin Cove enhanced water motion and the loss of a tidal dam caused increased and altered species composition, while anthropogenic impacts due to a lobster pond diminished the flora at Potts Point. Historical floristic comparisons of seven other areas (Helgoland, Germany; the North Atlantic Sea; Denmark; Mount Desert Island, Maine; Penikese Island, Massachusetts; southern California; and the Florida Keys) are used to evaluate the stability of Casco Bay’s flora and the impact of oil pollution. A comparison of Casco Bay’s “composite” flora of 206 taxa with several other Northwest Atlantic sites shows that its species richness is approximately the same as that found within the Great Bay Estuarine System of New Hampshire and Maine (215 taxa), while it exceeds Penobscot Bay in mid-coastal Maine (178 taxa), Passamaquoddy Bay in New Brunswick (158 taxa), and several Northwest Atlantic islands (51–145



Frank Shipley Collins





# Specimen Demographics

Goal: Digitize All Macroalgal Herbarium Specimens in US Herbaria

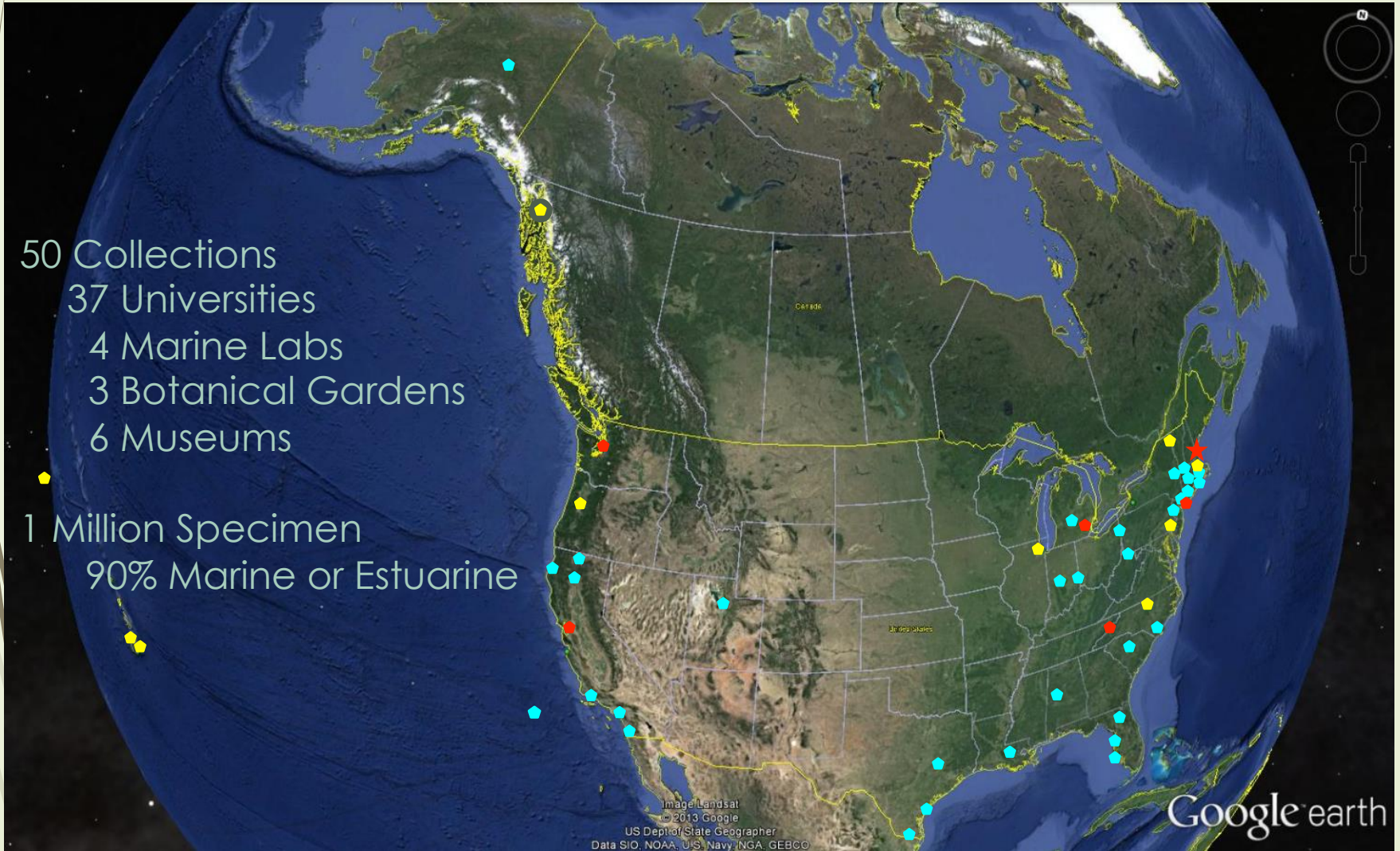
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- Transcribe
  - Barcode
  - Accession #
  - Taxon Name
  - Collector
  - Collection Date
  - Locality
- Georeference



# Specimen Demographics

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

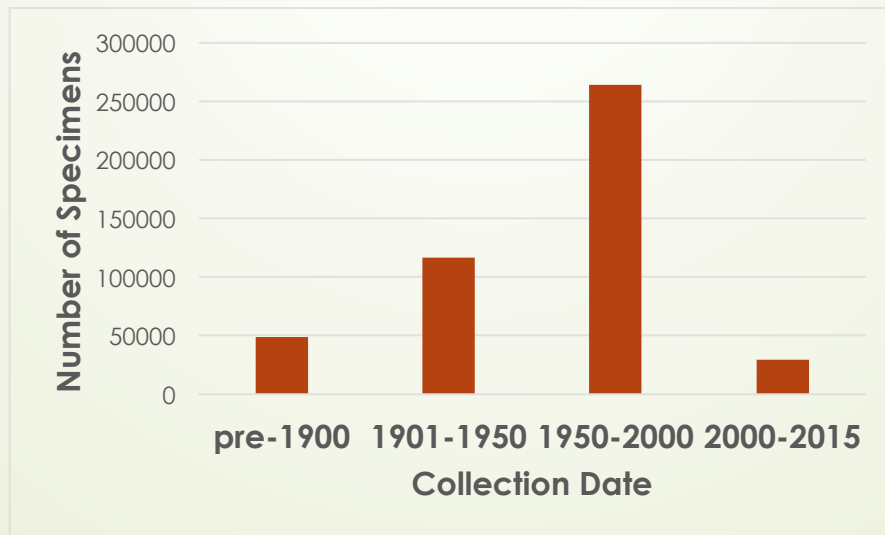
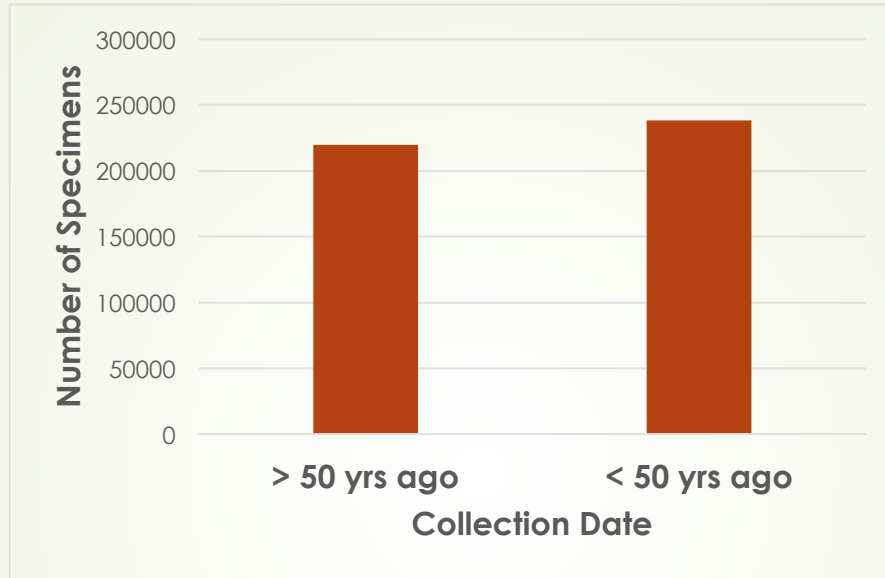
1 Million Specimen  
90% Marine or Estuarine



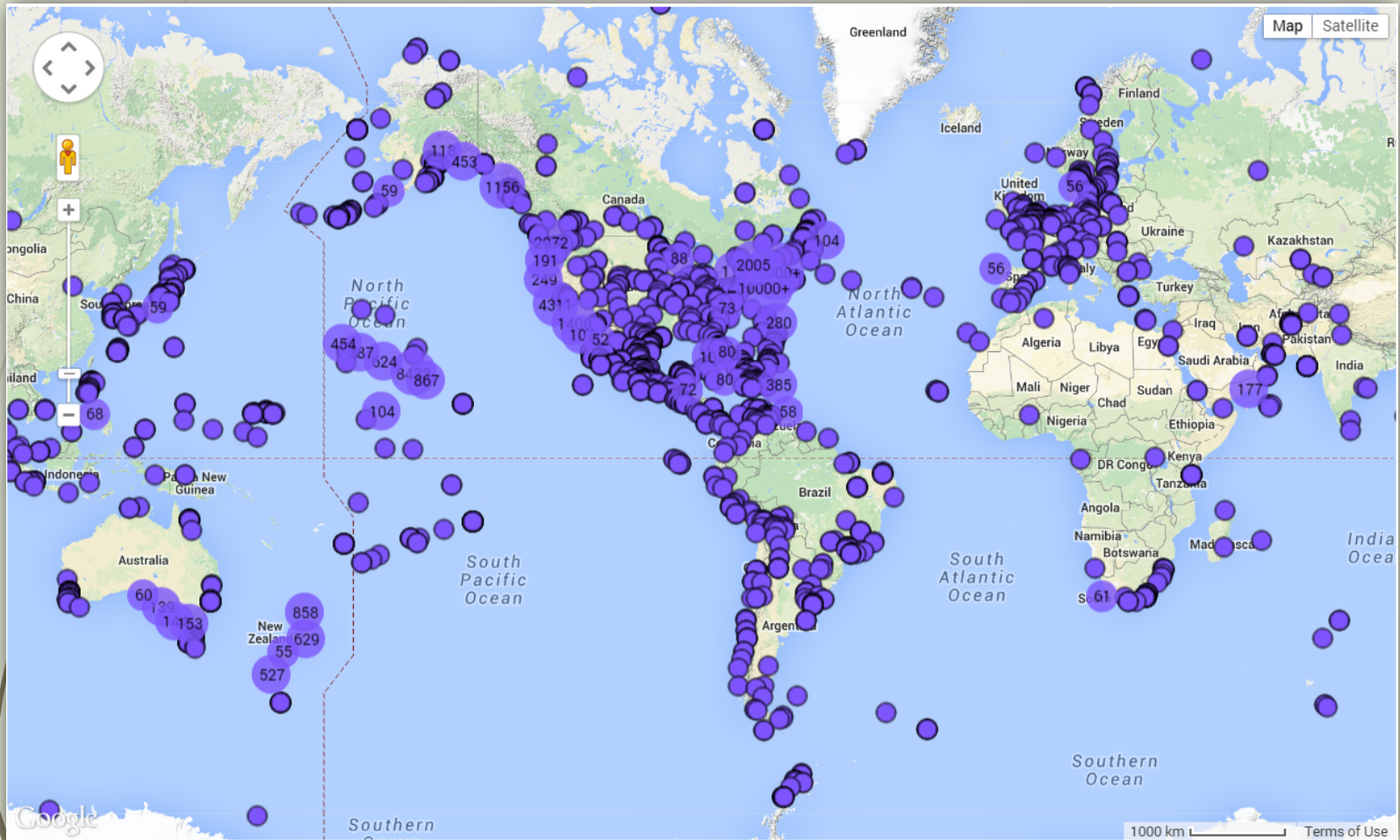
# Currently Digitized Specimens

Digitizing Institution	Start	Collections	Specimens	Percent Complete				
				Records Created	On Portal	Imaged	Transcribed	Geo-referenced
University of New Hampshire	Year 1	10	131,677	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
New York Botanical Garden	Year 1	5	169,150	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
University of North Carolina	Year 1	7	49,736	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
University of Michigan	Year 1	5	95,892	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
University of Washington	Year 1	3	36,102	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
Duke University	Year 1	1	21,837	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
University of Alaska SE	Year 1	1	9,889	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
Bishop Museum	Year 1	1	65,000	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
Field Museum	Year 1	1	47,791	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
Oregon State University	Year 1	1	12,109	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
University of Guam	Year 1	1	13,600	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
University of California - Berkeley	Year 2	9	228,862	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
University of Hawaii	Year 2	1	2,401	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
Harvard University	Year 2	1	150,000	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
Academy of Natural Sciences	Year 3	1	37,000	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
University of Vermont	Year 3	1	3,500	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
<b>Totals</b>		<b>49</b>	<b>1,074,546</b>	<b>693,059</b>	<b>644,737</b>	<b>506,584</b>	<b>422,270</b>	<b>260,775</b>

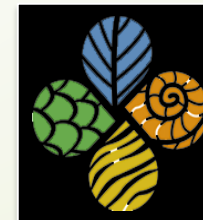
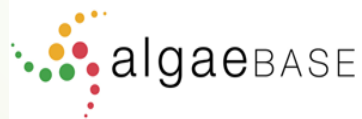
# Temporal Distribution



# Broad Geographic Coverage



# Acknowledgments



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