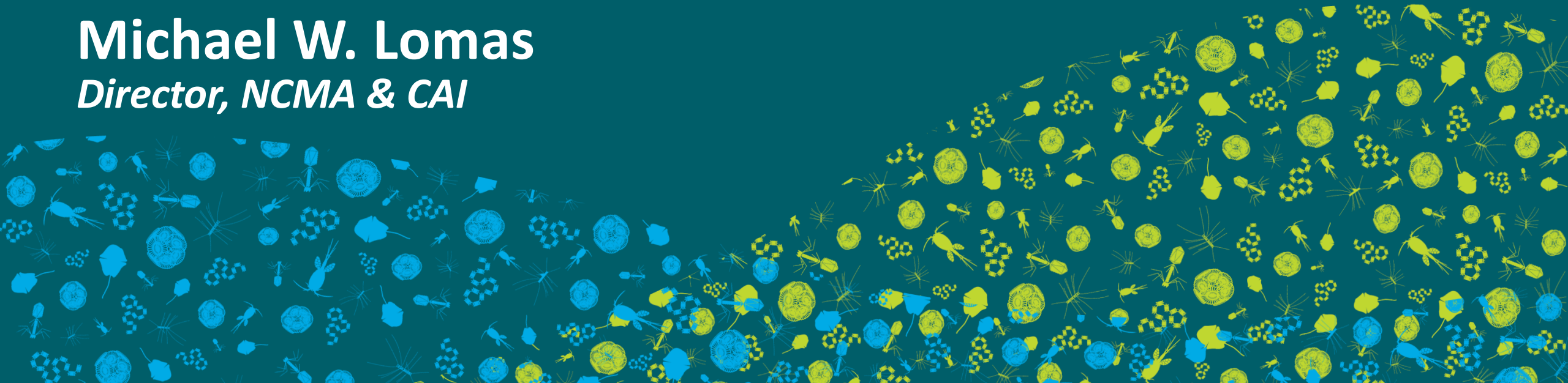
Bigelow | Laboratory for Ocean Sciences

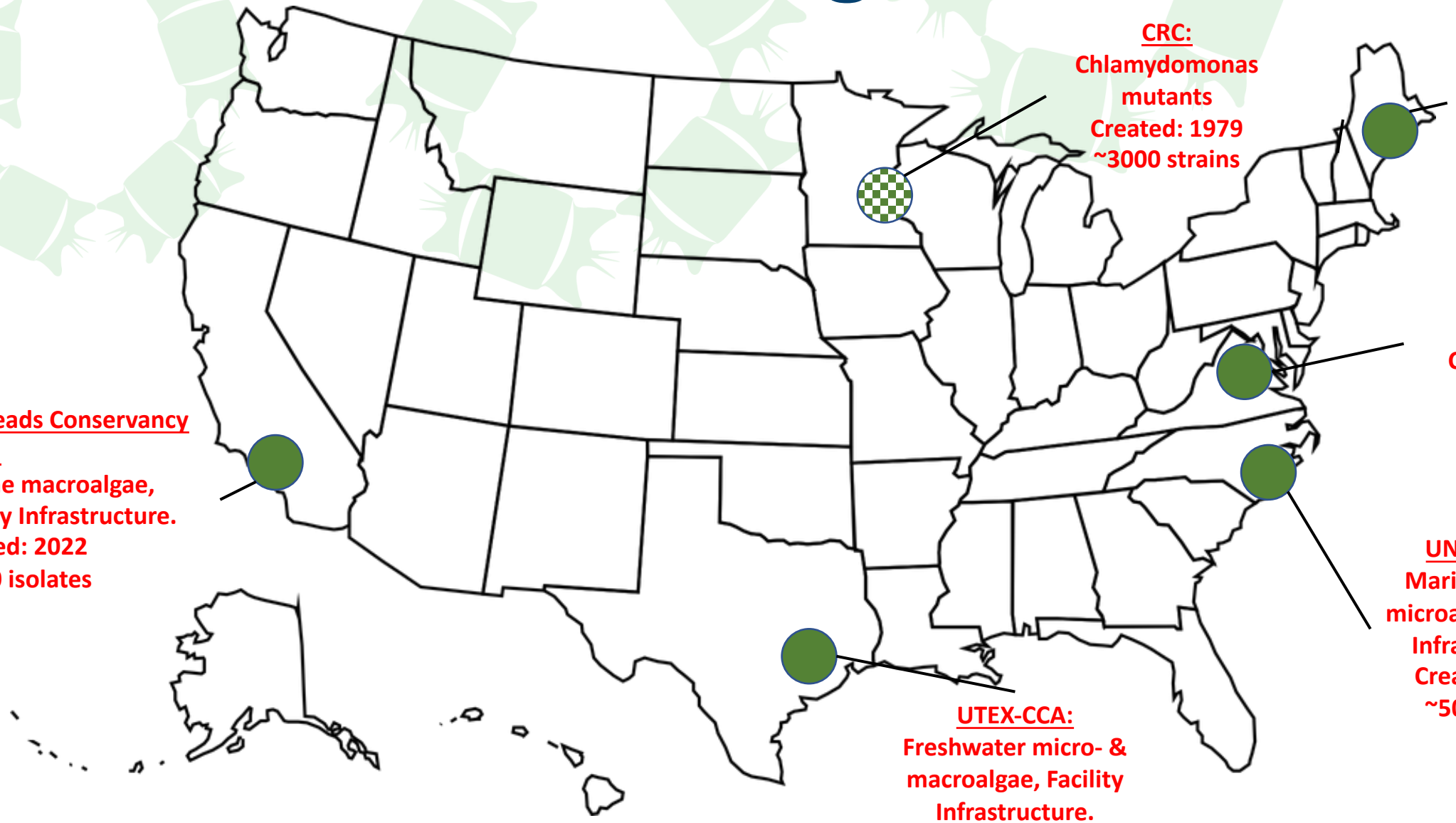
National Center for Marine Algae and Microbiota (NCMA)

Introduction to an Algal Genetic Repository

Michael W. Lomas
Director, NCMA & CAI



Current U.S. Public Algae Assets



CRC:
Chlamydomonas mutants
Created: 1979
~3000 strains

NCMA:
Marine micro- & macroalgae, Facility Infrastructure.
Created: 1979
~4000 strains

ATCC:
Microalgae
Created: 1925
~70 strains

AltaSeads Conservancy (ASC):
Marine macroalgae, Facility Infrastructure.
Created: 2022
~1000 isolates

UNCW-ARC:
Marine harmful microalgae, Facility Infrastructure.
Created: 2016
~500 strains

UTEX-CCA:
Freshwater micro- & macroalgae, Facility Infrastructure.
Created: 1953
~3000 strains

NCMA Origins and Timeline

WOODS HOLE OCEANOGRAPHIC INSTITUTION
WOODS HOLE, MASSACHUSETTS 02543

Phone (617) 548-1400
TWX 710-346-6601

January 29, 1979

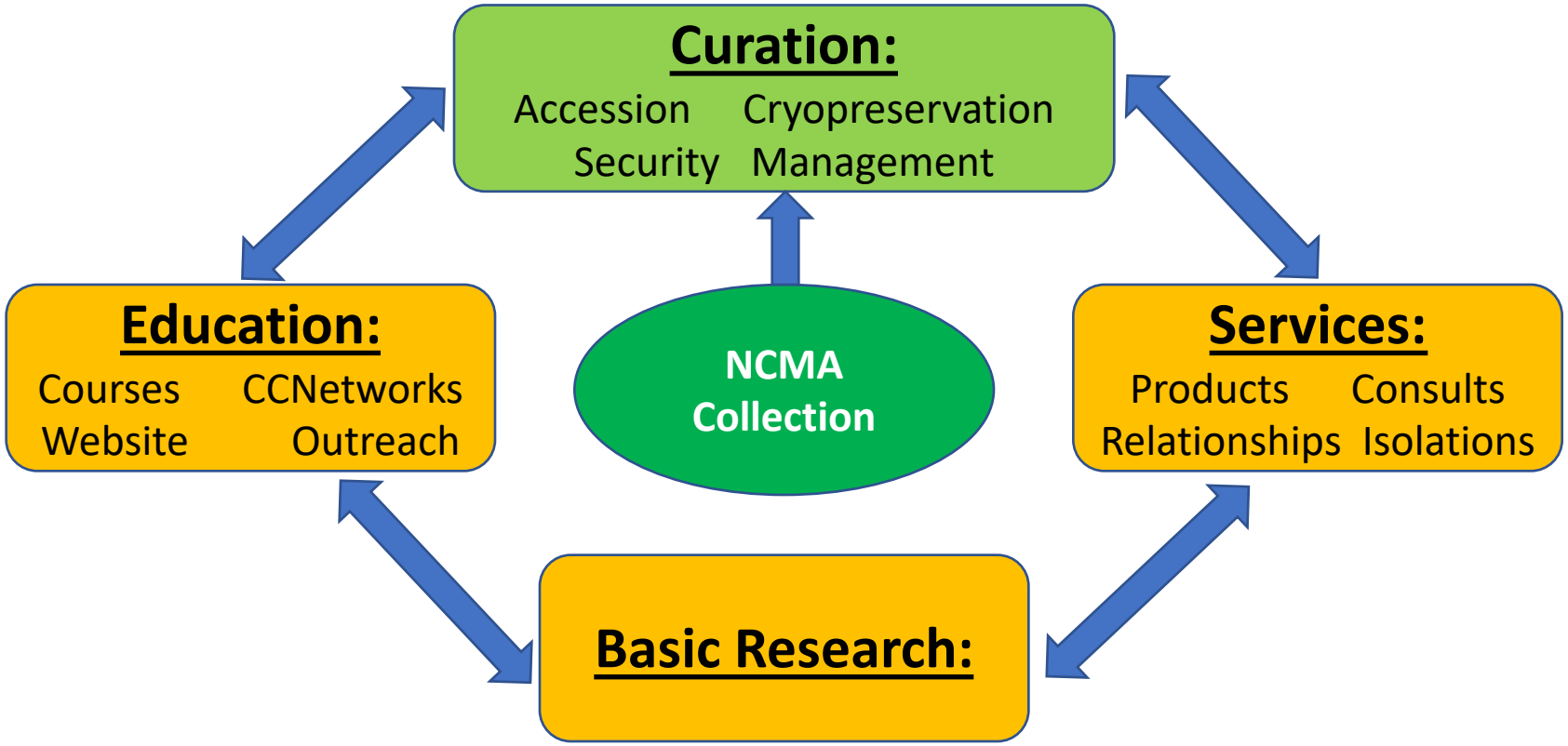
Users of Phytoplankton Cultures
World-wide

Dear Colleagues:

Reduced support for research makes it impossible for me to continue supplying phytoplankton cultures to other workers, at least in the numbers requested lately - over 300 cultures per year. Salary support for Mrs. H. I. Stanley, who has cared for the cultures for over 15 years, is no longer available. In order that I may continue to supply cultures where they are critically needed I suggest the following:

NCMA's PUBLIC Mandate

To **CURATE**, **MAINTAIN** and **DISTRIBUTE** known algae strains nationally and globally in support of algal research.

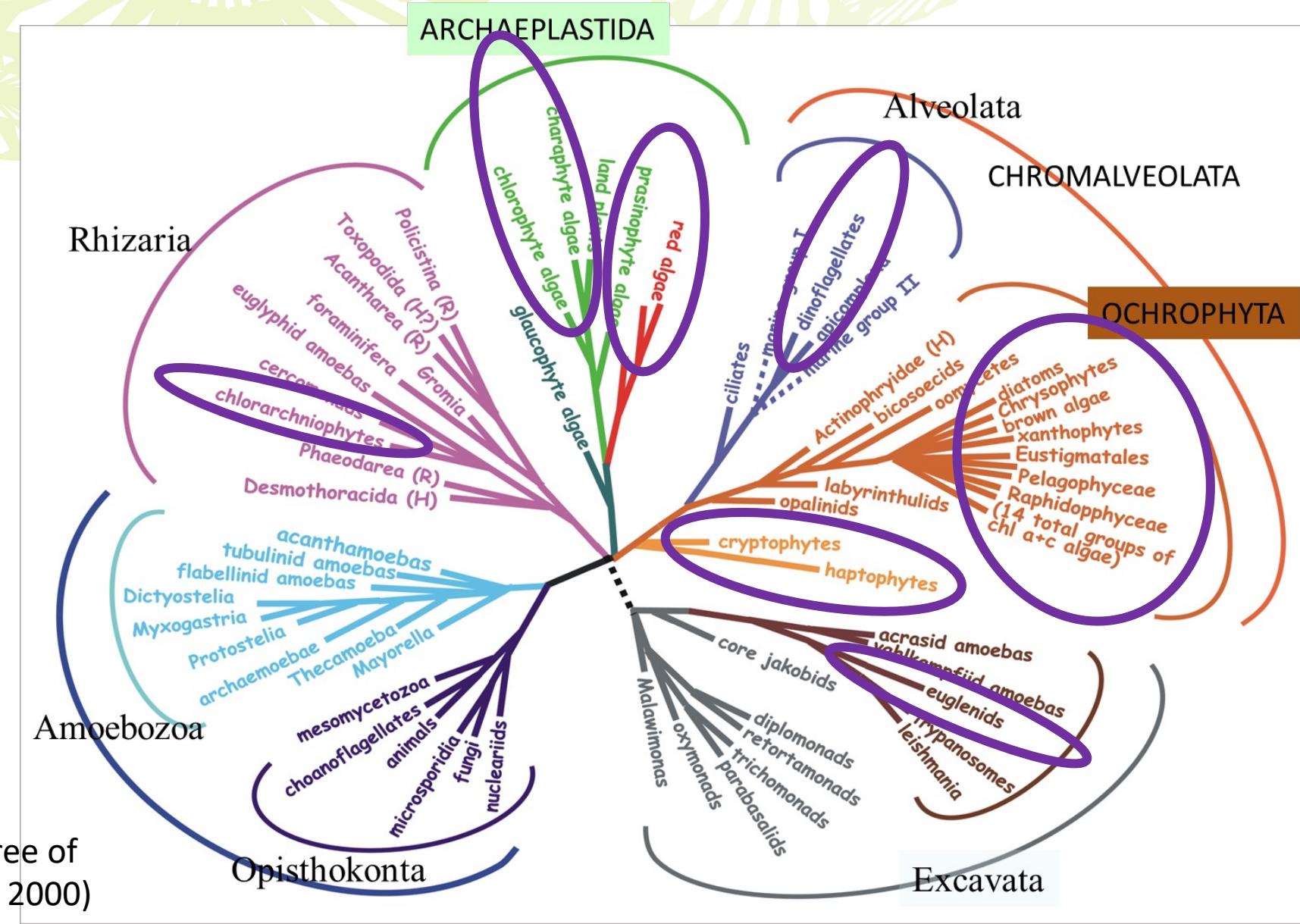


NCMA Collection Holdings (1)

- Holds ~3,800 strains of marine, brackish, hypersaline and freshwater algae; including cyanobacteria and macroalgae.
- 359 genera and 723 species, polar to tropical. Focus is on capturing as much geographic diversity as possible.
- Fifty +/- random new strains added to Collection/year on average. HOWEVER, pending proposals alone would contribute ~160 strains from Western Arctic, and 15,000 mutants from an important open ocean strain.

NCMA Collection Holdings (2)

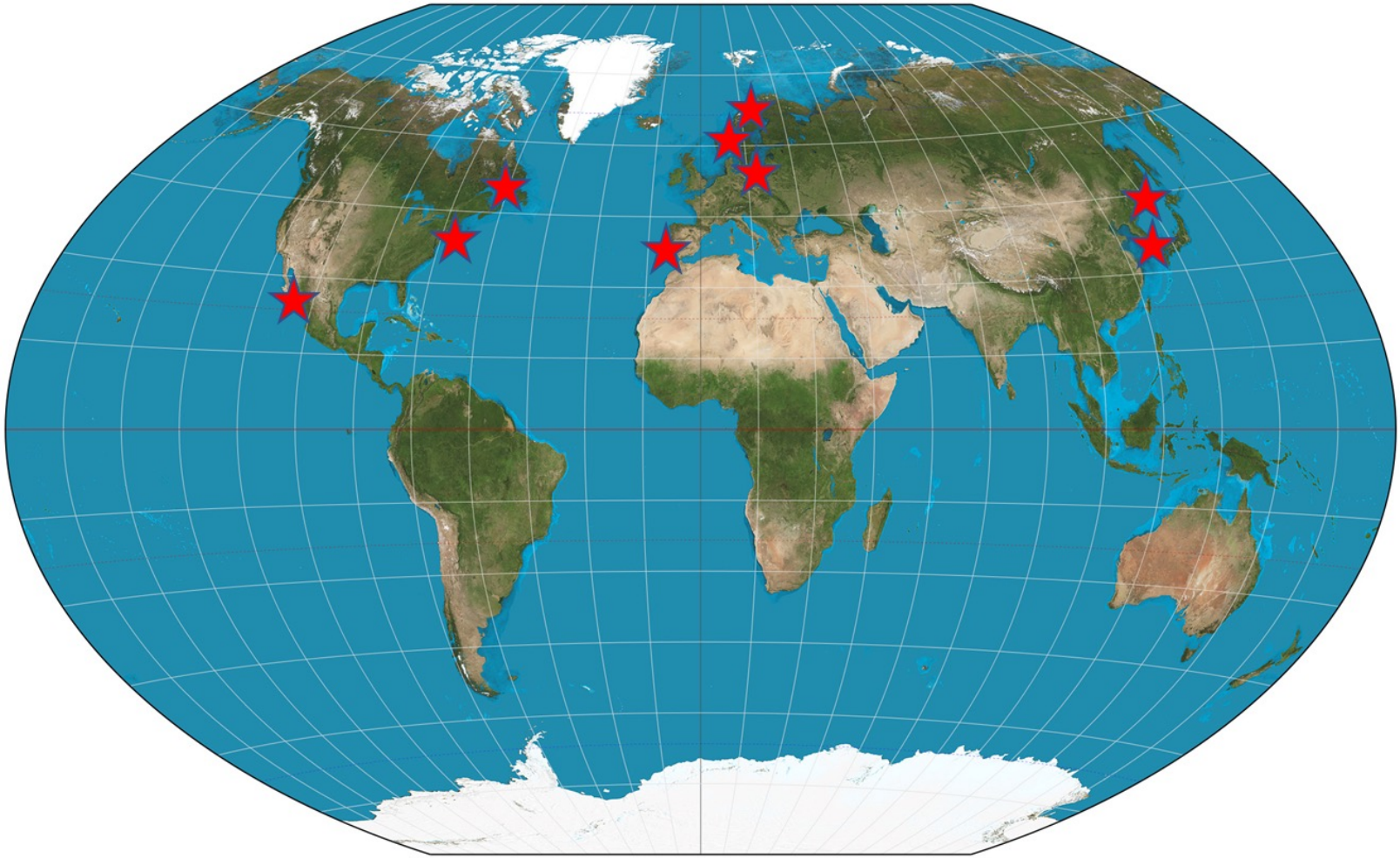
- These 359 genera and 723 species cover 52 classes of algae spread over 5 Kingdoms of the Tree of Life.
- Focus is on capturing all taxonomic diversity within the marine microalgae, of which we have been largely successful.



Eukaryote tree of life (Baldauf 2000)

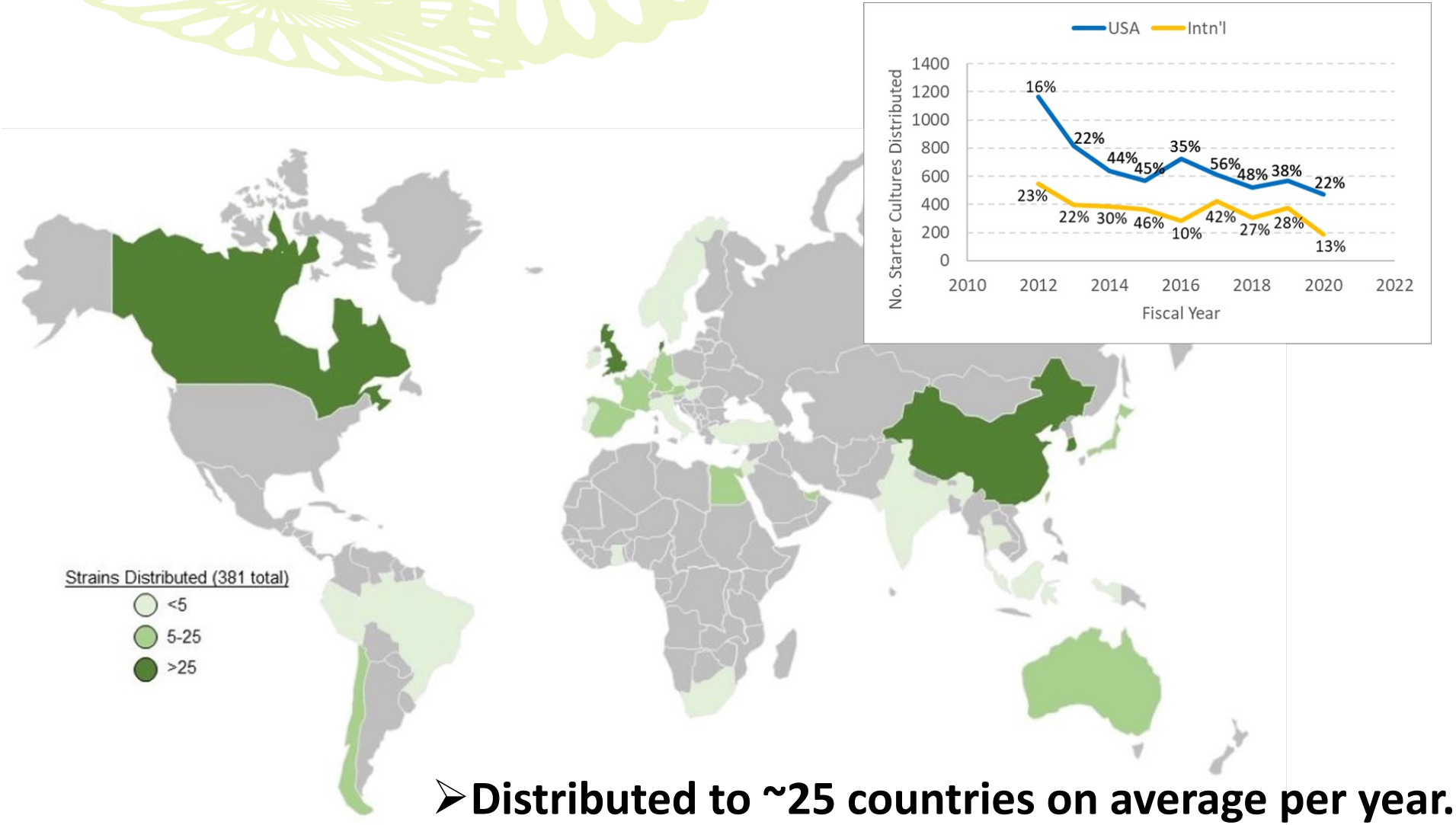
NCMA Collection Holdings (3)

- NCMA had ~150 macroalgae strains in 2020.
- NCMA accessioned a very large orphaned macroalgae collection (~1400 strains) in 2022.
- 9 genera and 23 species, subpolar to subtropical, collected from 9 countries – all genetic strains.
- Strategic balance of future value and standing mandate.



NCMA strain distribution:

- International Treaties/Protocols (e.g., Nagoya Protocol)



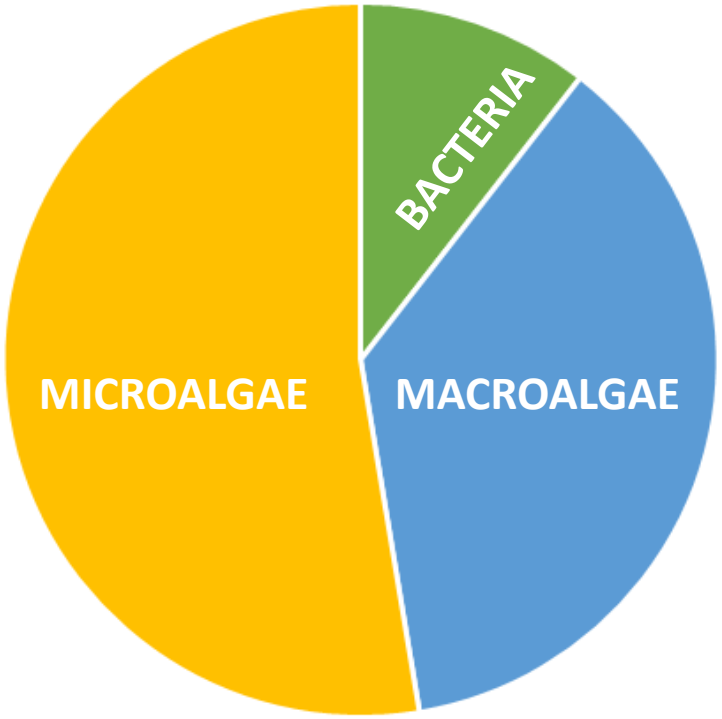
➢**Distributed to ~25 countries on average per year.**

Physical Sample Access & Ownership

Clear and documented paper trails for sample access and ownership are essential as companies consider licensing algal strains held in public collections.

<u>For the collections held by NCMA:</u>

- MTAs are required for companies purchasing strains for research, but not for academics.
- MTAs have a stated timeline and do not transfer ownership
- Strain licensing is possible, but does not transfer ownership, and includes standardized revenue generation terms.

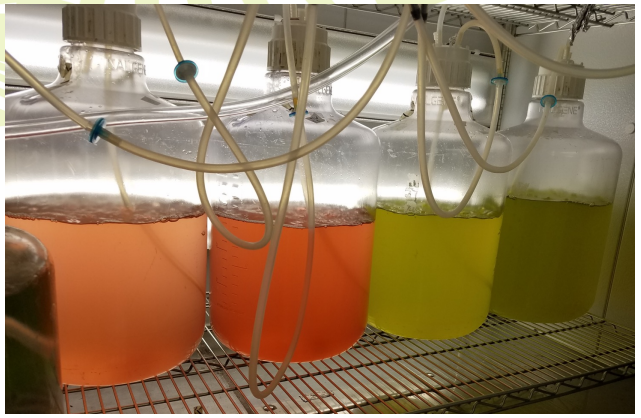


NCMA strain holdings that have been licensed by for-profit companies

NCMA Product Offerings

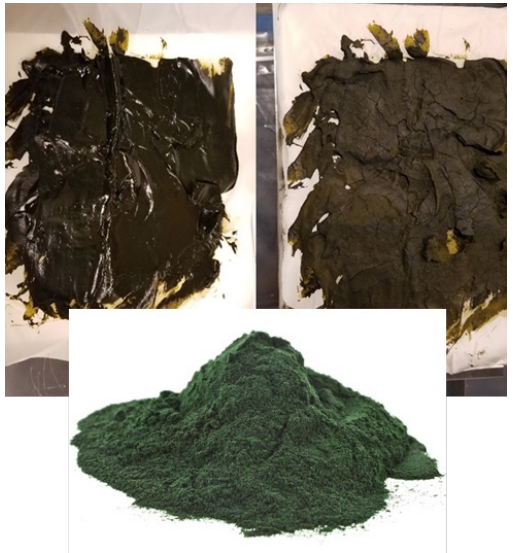
Starter Cultures

“Mass” Cultures

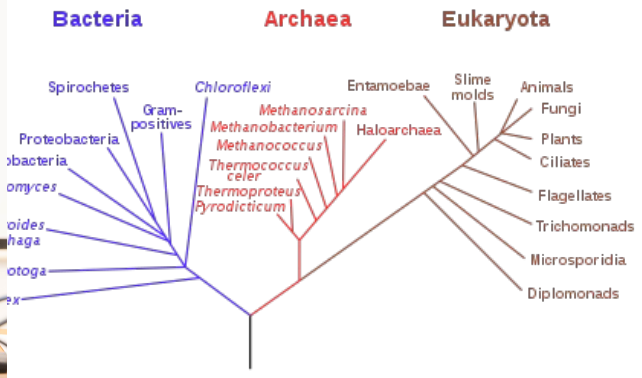


Nucleic Acid Preps

Harvested Biomass



Isolation/Identification



NCMA Strain Information

Current Information – meta data

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REQUEST A QU

about products services

Description | Culture Method | Cryopreservation | Documentation

Common Name	bangiophyceae
Collection Site	32.9°N -117.255°W Scripps Institute of Oceanography, pier, La Jolla, California USA
Ocean	North Pacific
Sea	California Bight
Nearest Continent	North America
Collected By	Gallup
Collection Date	
Isolated By	Dodson,A
Isolated Date	
Identified By	
Deposited By	Thomas,W
Deposit Date	05/12/1982
Strain Synonyms	WTP
Is The Strain Currently Axenic?	No

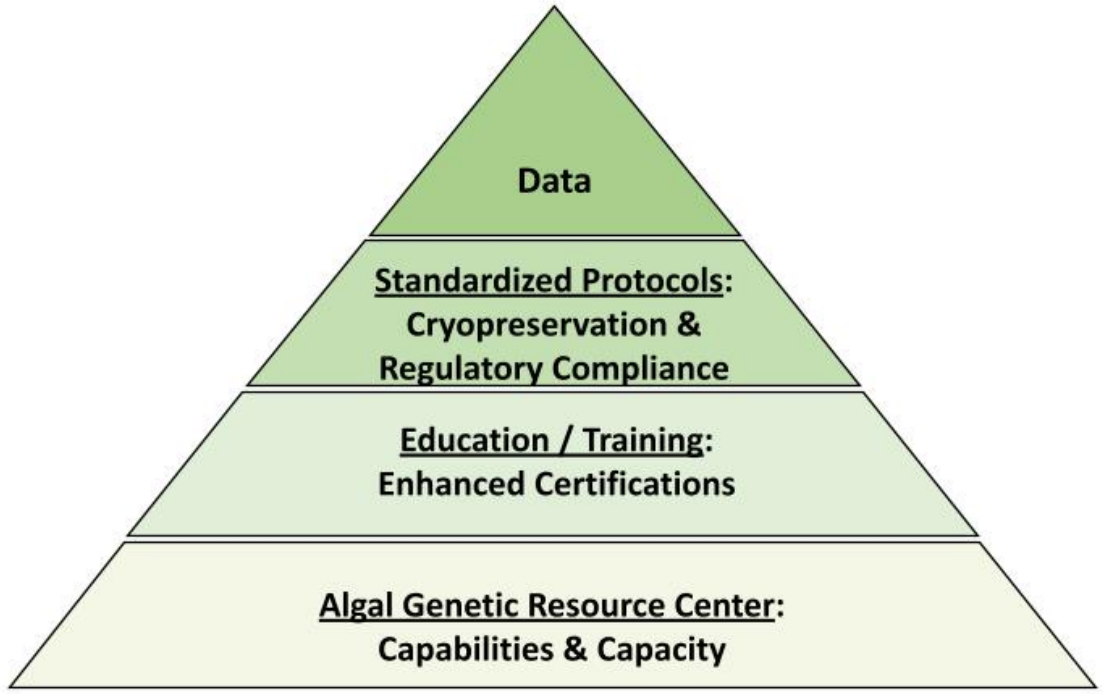
Expansion into Trait Data (trying to put the 'F' in FAIR Data

- ❑ Bulk & detailed biochemical composition
- ❑ Growth/Physiological Rates
- ❑ Metabolic Capabilities

ALGINet: Future U.S. Algal Germplasm Resource

- No harmonized plan to generate data for present and future holdings.
- Connect different data types in many different places.
- Currently few genetic model systems
  - PhycoCosm (Grigoriev et al. 2021) – 216 genomes (6/4/2024)
  - ~12 genetic model systems

Effective use of algal genetic resources is a BIG DATA challenge !



Modified from NSF:MSRI-2: Preproposal (Lomas et al. 2023)

Algal Genetic Resources: Agricultural Crops and Beyond (Lomas et al. 2022)

NAREEE-NGRAC: https://nareeeab.ree.usda.gov/committees/national-genetic-resources-advisory-council

Take home messages

- NCMA (CCMP) was founded on the premise of being a centralized microalgal collection, providing a home for orphaned collections, and supporting microalgae researchers.
- NCMA continues to serve as a national and global resource for algal research, through the offerings we provide.
- NCMA is leading an effort to build a more extensive U.S. national algal genetic resource network to <u>enable</u> a stable algal bioeconomy for the future.