Using Citizen Science to Monitor HABs
To educate the public on harmful algal blooms (HABs) while expanding the knowledge of phytoplankton that exist in coastal waters through research based monitoring.

- PMN started in 2001 as part of Marine Biotoxins Program in Charleston, SC
- Over 100 active sites in 15 coastal states
To educate the public on harmful algal blooms (HABs) while expanding the knowledge of phytoplankton that exist in coastal waters through research based monitoring.

**Train citizen scientists to:**

- Collect samples on weekly or bi-weekly basis
- Identify potential harmful algal species

**NOAA scientists can then:**

- Analyze water samples for HAB toxins
- Together can identify temporal and geographic HAB trends
• CyanoHAB monitoring started in 2015 as part of an EPA Office of Water grant
• 25 active sites in 13 states
• EPA Regions 4, 5, 7, & 8 currently represented
Why the PMN?

**Problem:** Very few government or private institutions have the capacity or capability to monitor coastlines and thousands of lakes (and reservoirs) annually impacted by HABs.

**Solution:** Engage local citizens in environmental monitoring of potentially harmful cyanobacteria and algae to aid NOAA scientists and others in their research.
Monitoring Benefits

• **Allows for an ‘early warning system’**
  - e.g. Can close shellfish beds/recreational waters and help prevent or reduce exposure and potential illness

• Monitor and maintain an extended survey area along coastal & fresh water bodies throughout the year

• Create a comprehensive list of harmful algal/cyano species inhabiting marine and fresh waters (establish baseline)

• Identify general trends where HABs are more likely to occur

• Promote an increased awareness and education to the public on HABs

• Create a working relationship between volunteers and researchers
Volunteer Equipment (marine)

Volunteers are loaned all sampling equipment *except* light microscopes for monitoring!

- Refractometer
- 20 um mesh plankton net
- Thermometer
- 5 gridded slides
- Cover slips
- 250 mL bottles
- 1L bottles
- 15mL of Lugol’s solution for preservation
- All shipping materials

*Region specific volunteer manual

*The PMN Manual has data sheets, phytoplankton ID sheets, and HAB information specific to your local coastal waters.

Photo credit: Elizabeth Zerai
Volunteer Equipment
Volunteers are loaned all sampling equipment

- Thermometer
- 5 gridded slides
- Cover slips
- 1L & 125 mL bottles
- 30 mL of Lugol’s solution for sample preservation
- Pre-paid overnight shipping label and shipping envelopes

*Identification sheets for target species
Volunteer Equipment (freshwater)

SWIFT M10 T digital microscope

- Provided to Pilot Program participants
- Volunteers take digital pictures of suspected target species and send to PMN
- Allows for rapid confirmation of tentative ID
- Build virtual archive of organisms observed
- WiFi capable- Great for public demonstrations
Training

- Usually done remotely
- Background of algae/cyanos
- What puts the H in HAB?
- Sampling protocols
- How to ID Target species
Training

• Volunteers must do practice sampling

• IDs are confirmed by PMN staff via photos and/or mailed in samples
Phyto app version 2 - coming soon!

- Will include freshwater species!
- More pictures!
- More pronunciations!
- Can enter data from phone or ipad!

Developed by PMN volunteer Shawn Gano to assist with and improve volunteer’s identification skills of marine algae & cyanos

http://youtu.be/ltzxoB06De0
Phytoplankton Monitoring Network

Volunteer Requirements:

1) Collect sample at least once every two weeks during the sampling season
2) Analyze sample identifying target algae/cyanos
3) Take digital pictures to send into the PMN
4) Input data into the PMN database
5) Ship sample to PMN as required
DATA ENTRY

• Data entered online for each sample
  – Whether target spp. found or not

• No counting of cells
  
  **No** = zip, zilch, zero
  **Yes** = 0-65% slide coverage
  **Elevated** = >65% with discoloration

• Final data entered into NCEI BEDI database
When a bloom is reported

Managers
Stakeholders
Phytoplankton Monitoring Network

**Bloom Events from 2001 – 2014**

Volunteer Reported Blooms > 200

- Non-harmful species > 150
- Potentially toxic species = 37
- Confirmed toxic events = 12
  - 9 Domoic Acid
    - Texas = 3
    - Mississippi = 2
    - North Carolina = 2
    - Alaska = 2
  - 1 Okadaic Acid
    - Texas
  - 2 Saxitoxin
    - Alaska

Maps created by NOAA Coastal Data Development Center (NCDDC)
Phytoplankton Monitoring Network

Freshwater Bloom Events 2016

Volunteer Reported Blooms = 7
Potentially toxic species = 4

Confirmed toxic events = 4
- Microcystis (MI/OH, MN)
- Aphanizomenon (ND)
- Dolichospermum (CO)

Non-Toxic blooms
- Anabaena/Dolichospermum
  - MN = 1
  - NC = 1
  - Kansas = 1
  - Utah = 1
- Aphanizomenon
  - MN, NC
- Planktothrix/Oscillatoria
  - KS, MN
- Microcystis
  - MN, NC
Target Freshwater Algae

- **Microcystis** spp.
- **Aphanizomenon** spp.
- **Cylindrospermopsis** spp.
- **Dolichospermum** spp. aka **Anabaena** spp.
- **Planktothrix** spp. aka **Oscillatoria** spp.

Toxic Cyanobacteria in Water: A guide to their public health consequences, monitoring, and management, World Health Organization, 1999
Funding partners

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