The Biggest Algae Bloom on Earth: Development of the Great Atlantic *Sargassum* Belt

B.E.Lapointe, R. Brewton, M. Wang, C. Hu, D. McGillicuddy,

S. Lindell

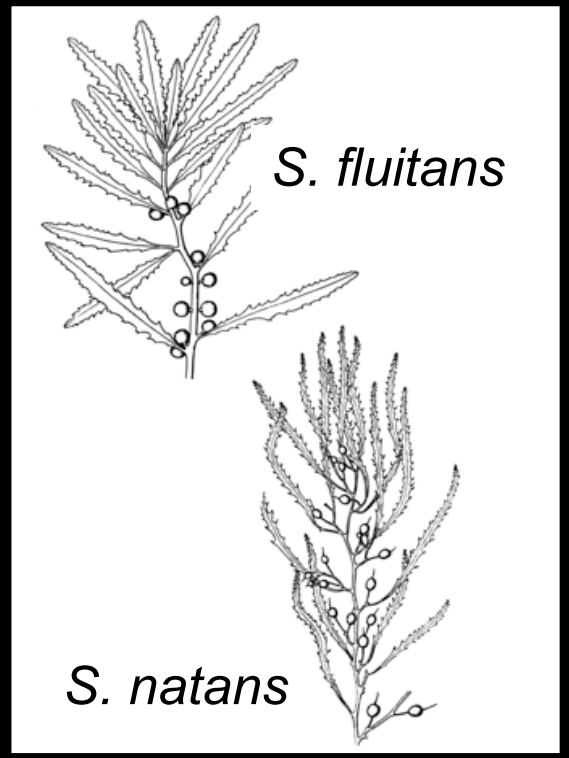
10Th US Symposium on Harmful Algae, Orange Beach, AL

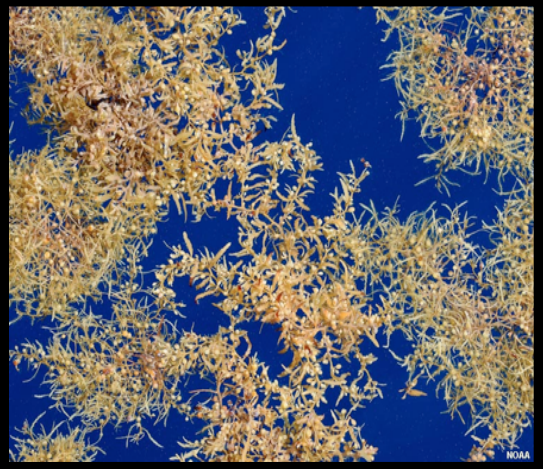
USF UNIVERSITY OF SOUTH FLORIDA COLLEGE OF MARINE SCIENCE

HARBOR BRANCH FLORIDA ATLANTIC UNIVERSITY

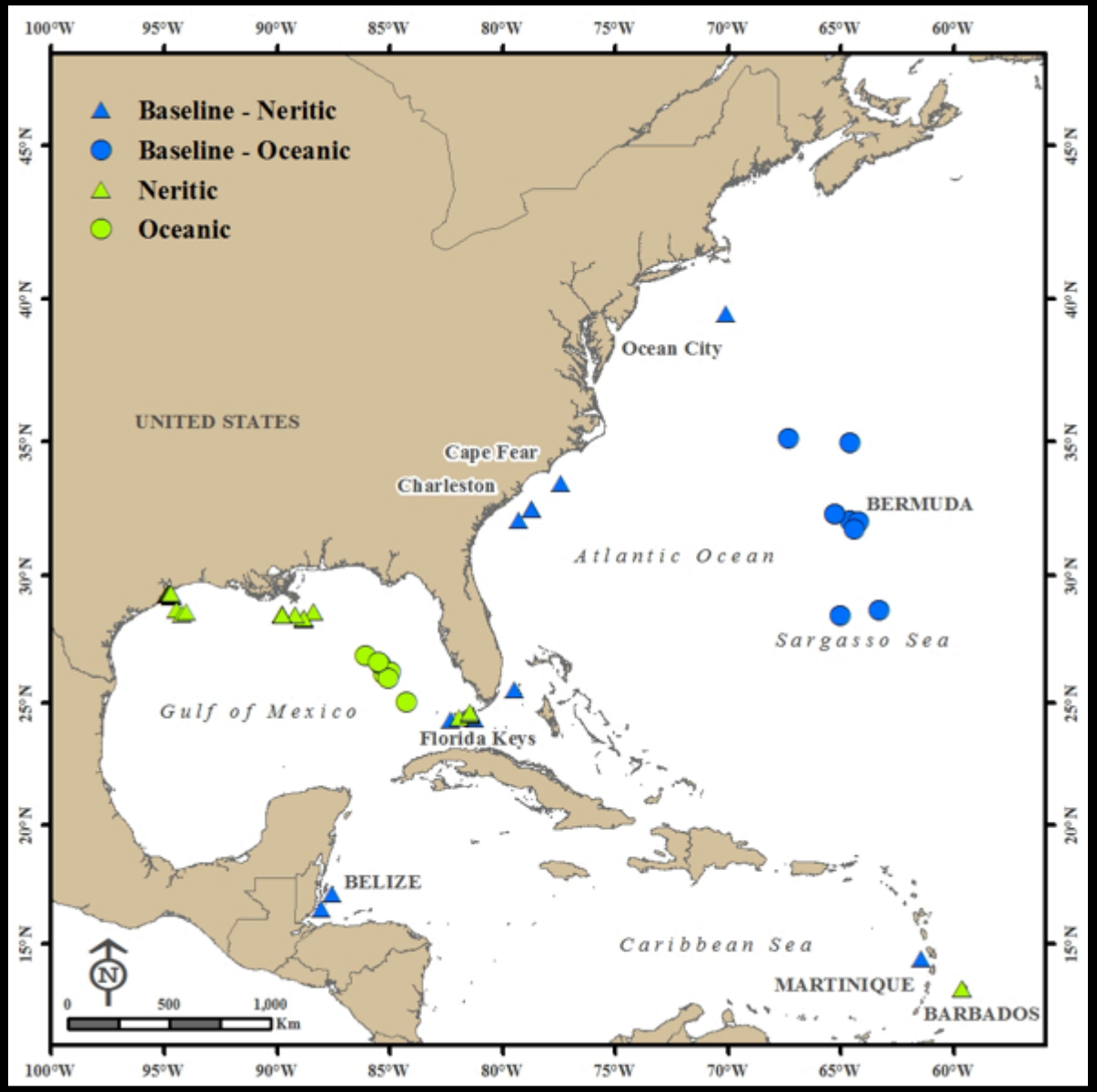
Woods Hole Oceanographic INSTITUTION

Two Species of Pelagic *Sargassum*: *S. fluitans* and *S. natans*





NSF Baseline (1986-1989) vs. GOM Sampling (2010-2018)



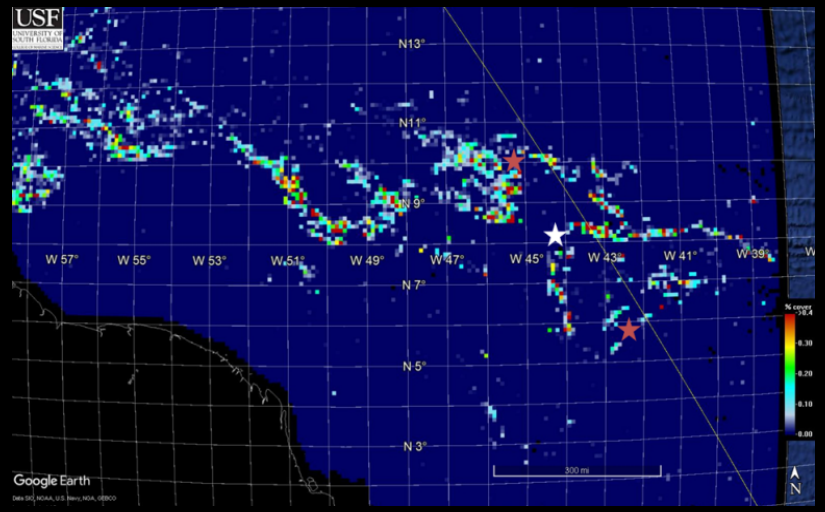
Baseline Productivity and Tissue C:N:P of *Sargassum*

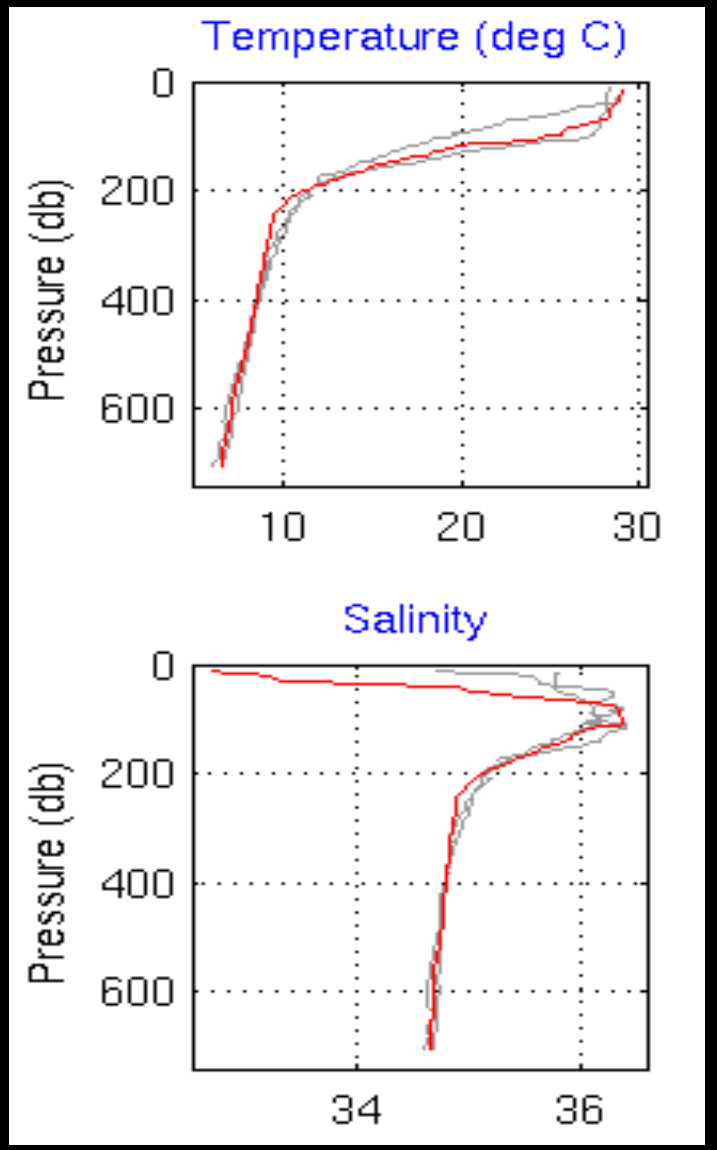
"Jar Fields"

Growth Chambers

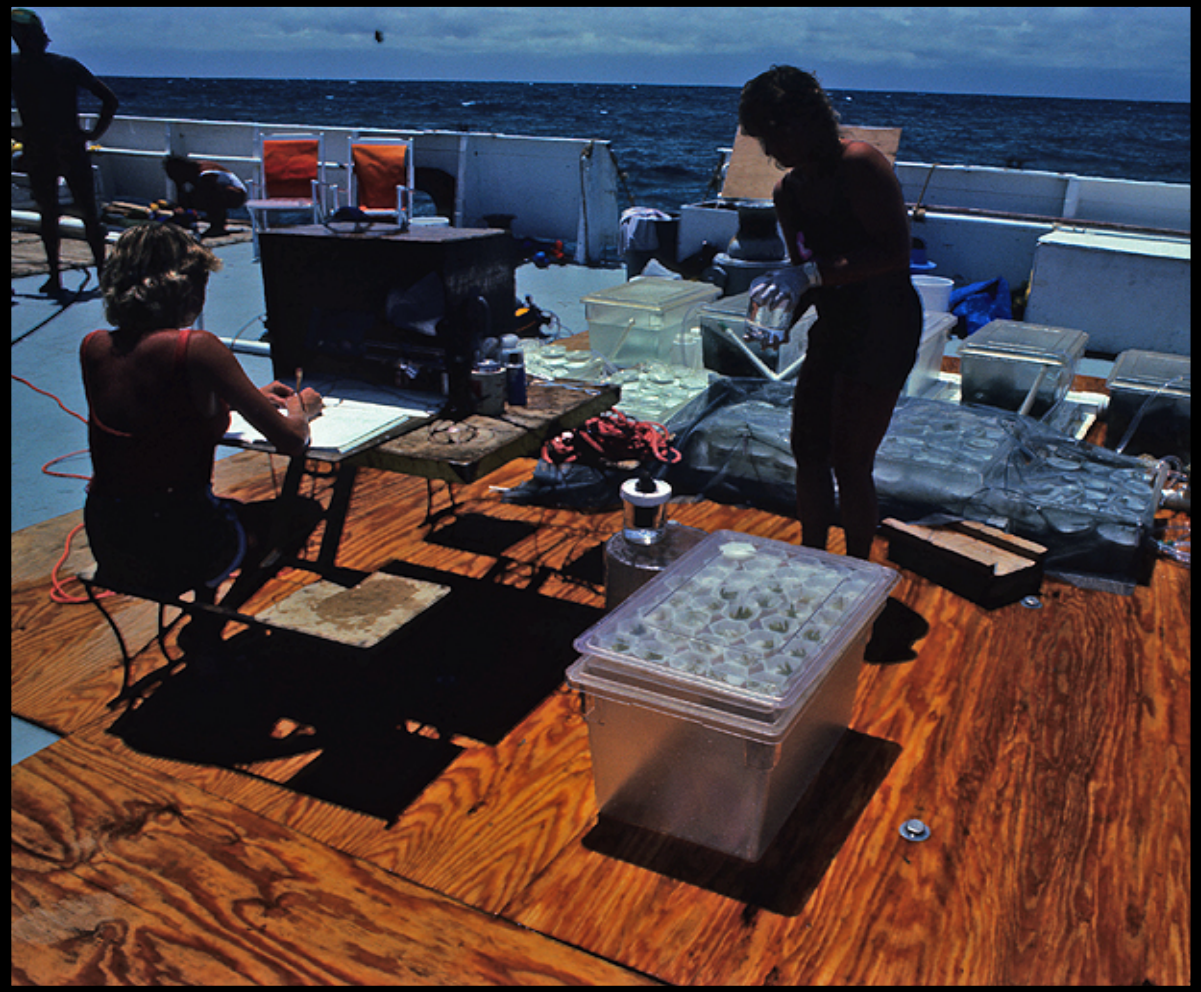
Tissue Analysis

Sampling *Sargassum* in the Amazon Plume
R/V *Thomas G. Thompson*: August 27-28, 2019





Baseline Studies: Low Productivity of *Sargassum* in the Sargasso Sea Compared to Neritic Areas



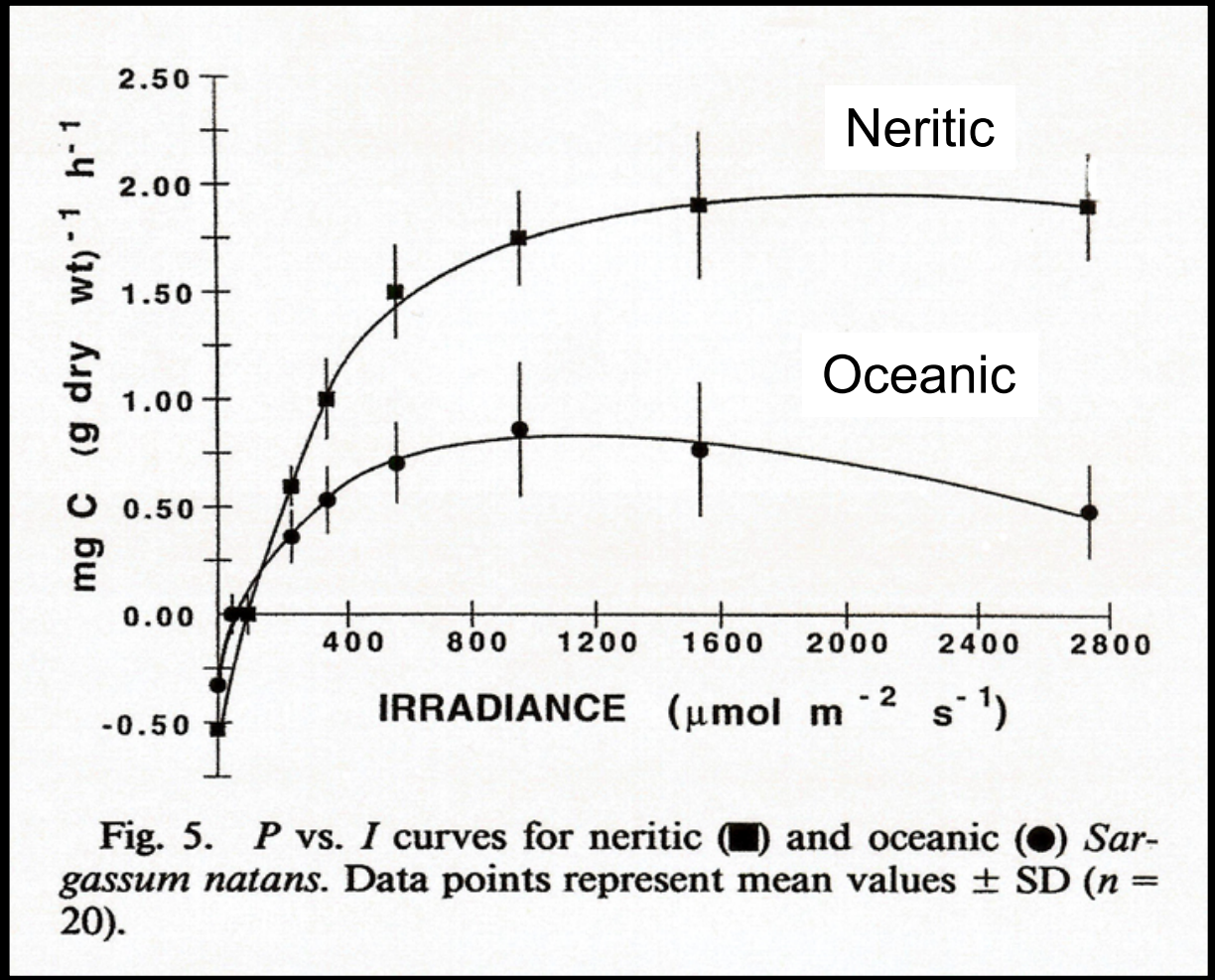
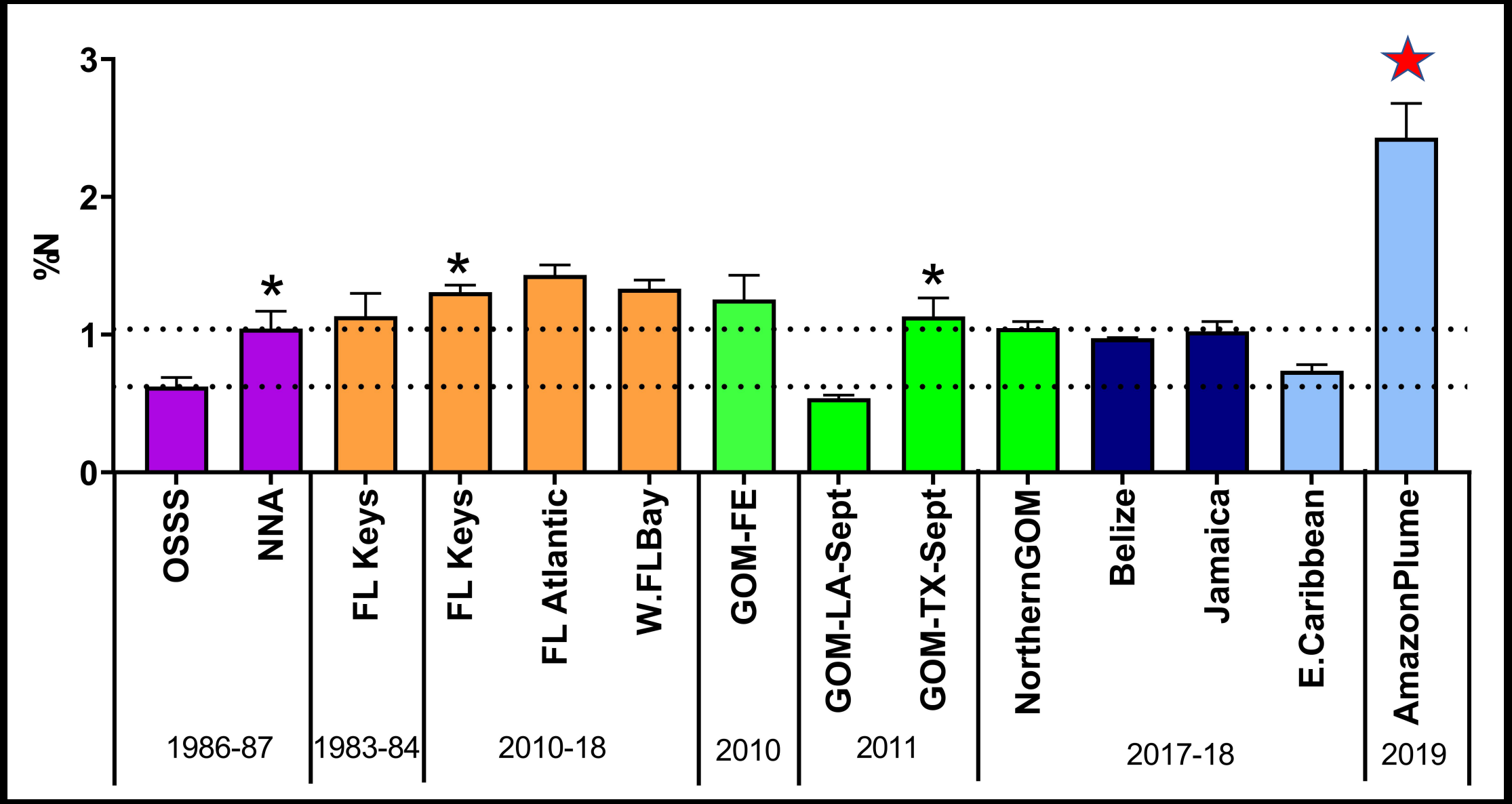


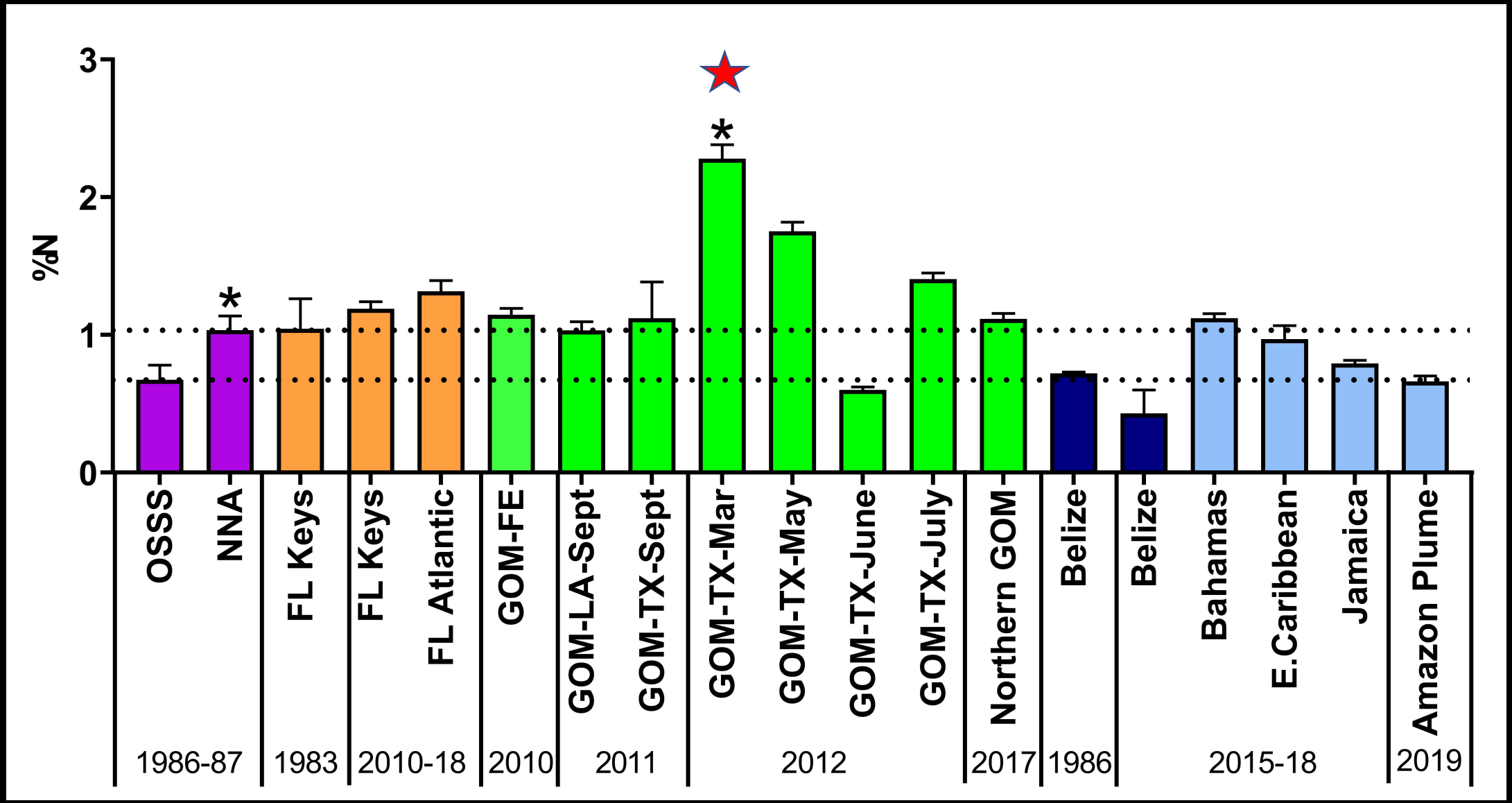
Fig. 5. *P* vs. *I* curves for neritic (■) and oceanic (●) *Sargassum natans*. Data points represent mean values ± SD (n = 20).

Lapointe, B. E. 1995. Limnol. Ocean. 40:625-633.

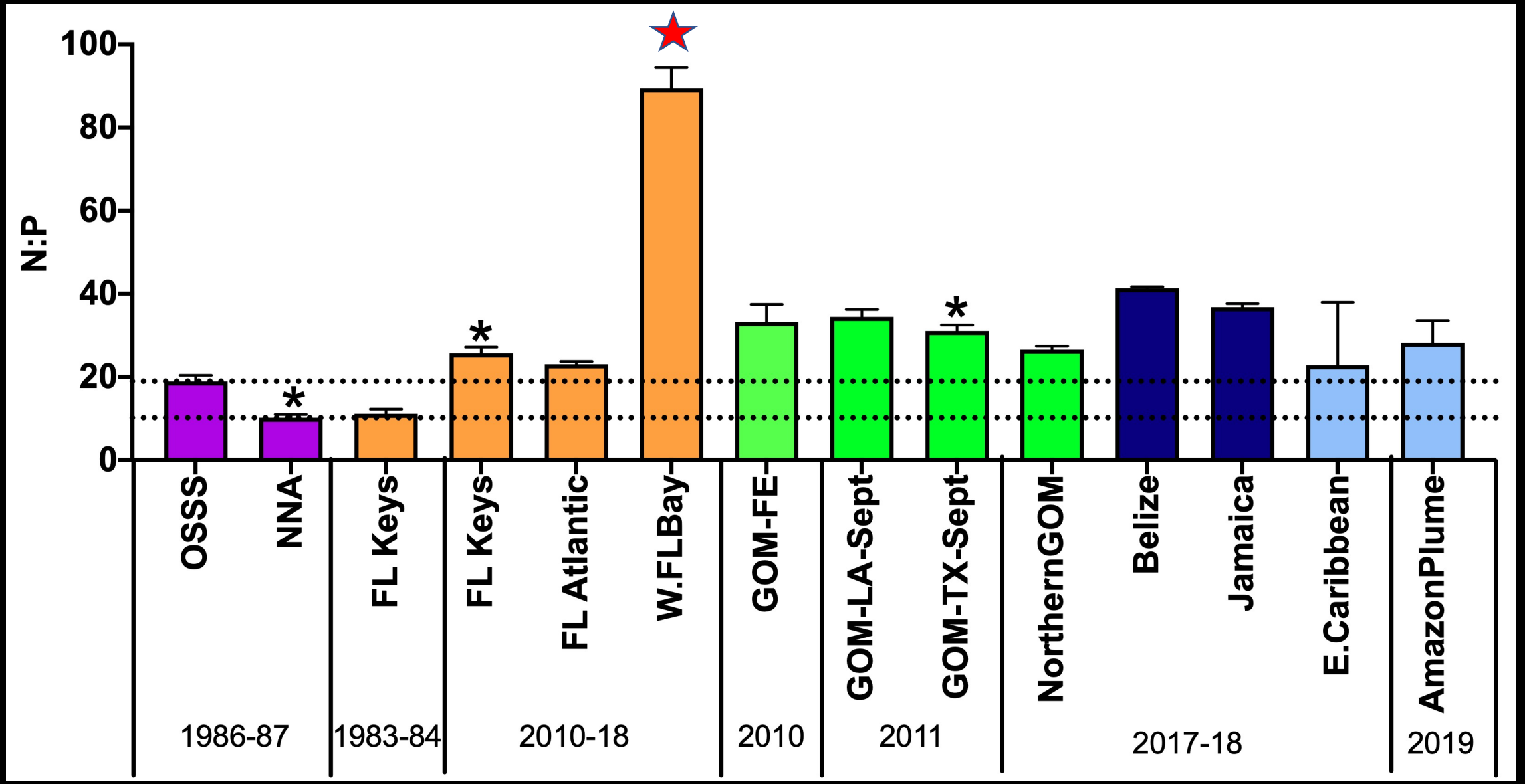
Higher Tissue Nitrogen of *S. natans* in Neritic Waters



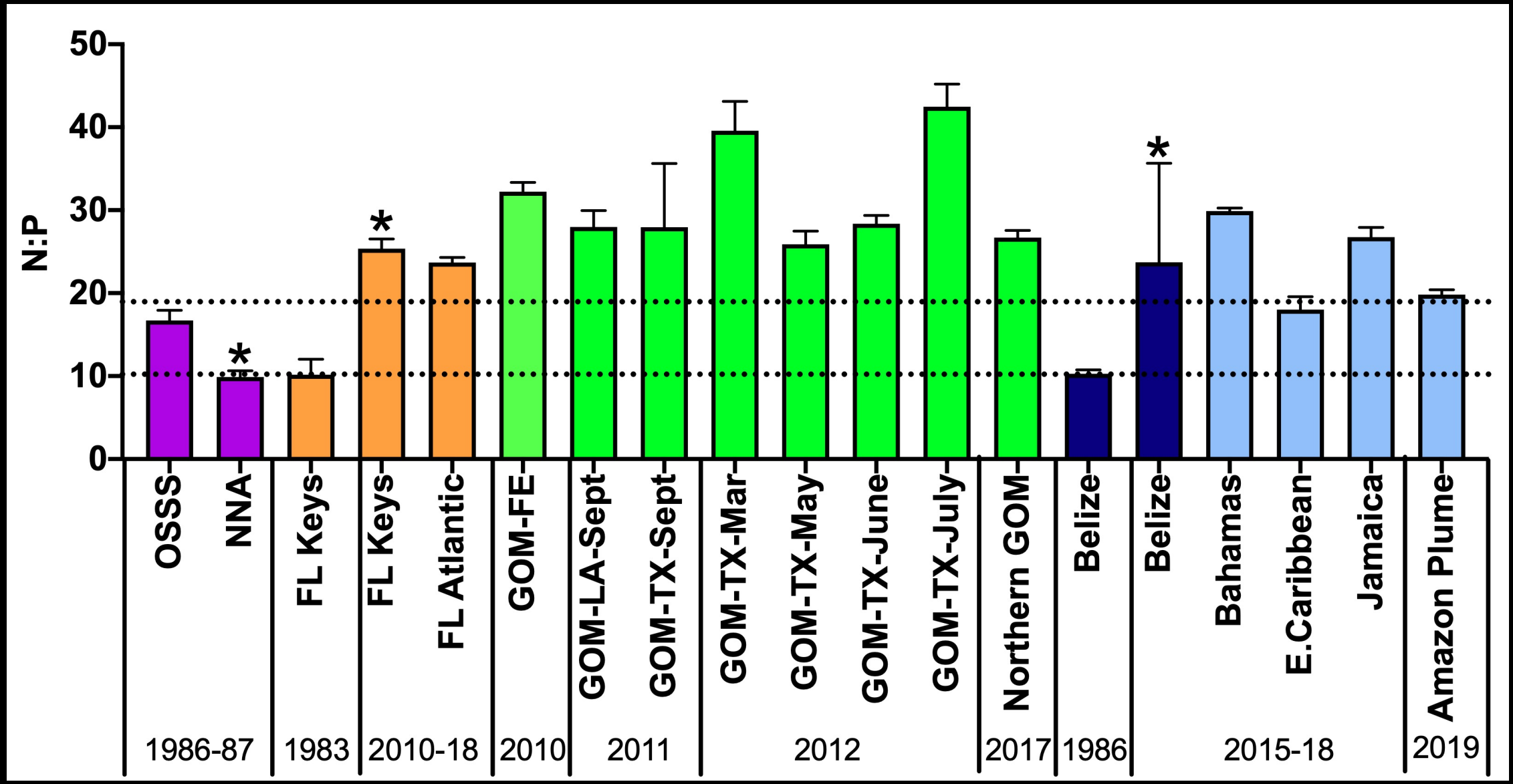
Higher Tissue Nitrogen of *S. fluitans* in Neritic Waters



Are N:P Ratios of *S. natans* Increasing in Neritic Waters?



Are N:P Ratios of *S. fluitans* Increasing in Neritic Waters?



Sargassum Blooms Develop in the Gulf of Mexico: 1980s

The Miami Herald

WEDNESDAY, AUGUST 14, 1991

SEAWEED BRINGS MIGHTY MACHINES TO HALT

PESKY HARVEST: Workers pull seaweed out of the water intakes at the Crystal River power plant, which had to shut down because the big pipes were clogged.

WEDNESDAY
AUGUST 14, 1991

St. Petersburg Times

Florida's Best Newspaper

Weather High, low 90s; 40% chance of rain. 2B | Wednesday | 25 cents

The sargassum cycle

Westerly currents carry rafts of sargassum from the Atlantic, through the Caribbean and into the Gulf of Mexico. Some researchers now believe that nutrient pollution in the Gulf sends sargassum production soaring. Borne by the Gulf's Loop Current, the sargassum is carried north toward Louisiana, then south along Florida's west coast. This summer, southwesterly winds, not typical this time of year, have blown rafts of the microalgae ashore. Normally, currents carry the sargassum into the Gulf Stream, which pushes it along the western edge of the Sargasso Sea.

Times photo — JIM DAMASKE

Sarah Millard, 5, of Marietta, Ga., wades to shore at Clearwater Beach Tuesday sporting her oceanic discovery: two handfuls of seaweed.

Pollution is behind invasion of seaweed

■ Nutrient pollutants in the Gulf fuel the profuse growth of giant mats of sargassum, the seaweed that has invaded beaches and shut down power plants.

By DAVID K. ROGERS
Times Staff Writer

The sargassum seaweed that forced the shutdown of two power plants this week and darkened miles of Gulf beaches this summer is largely the result of one frightening factor: pollution.

"We're polluting the whole Gulf of Mexico, and that's enhancing the production of this stuff," said Brian LaPointe, one of the

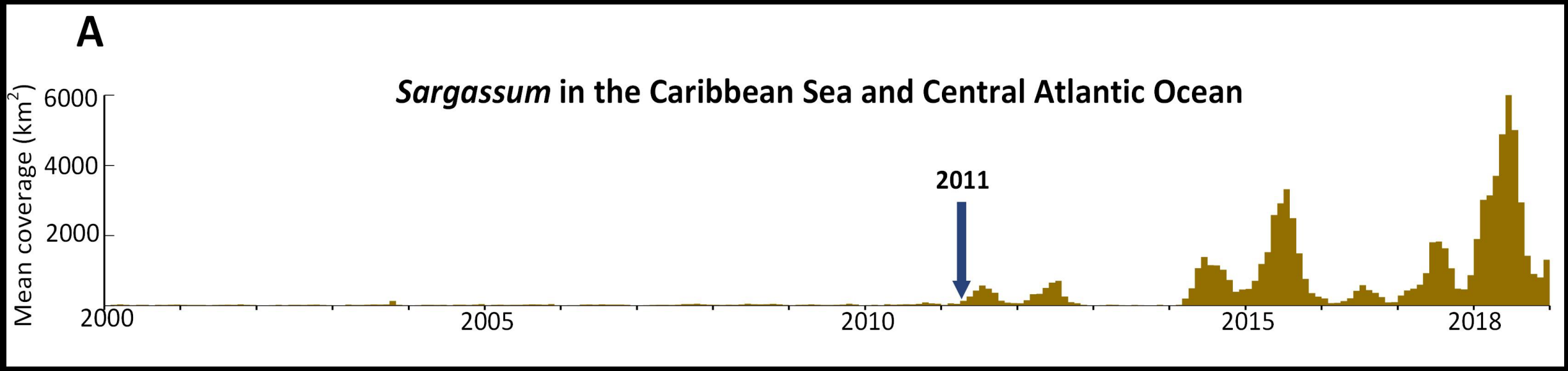
■ Imperiled by sea grass invasion, power plants remain idle. 1B

sargassum. "And this is not the first time we've had problems like this."

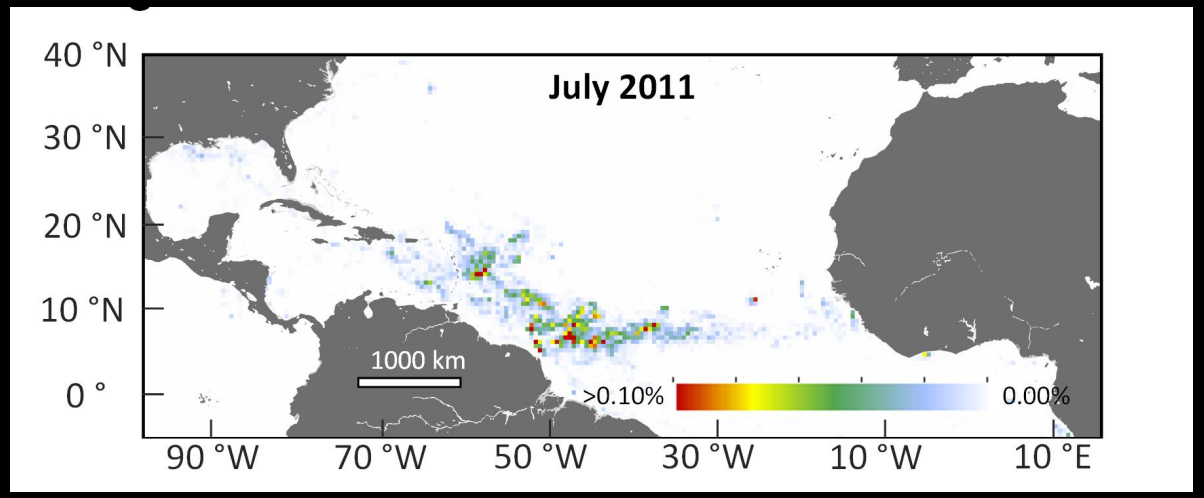
LaPointe said sargassum — which can double in size in less than 10 days — has grown so profusely in the Gulf of Mexico in recent years because of the abundance of nutrient pollutants washed into the Gulf from human sources, including agricultural and home fertilizers, sewage systems and industrial wastes.

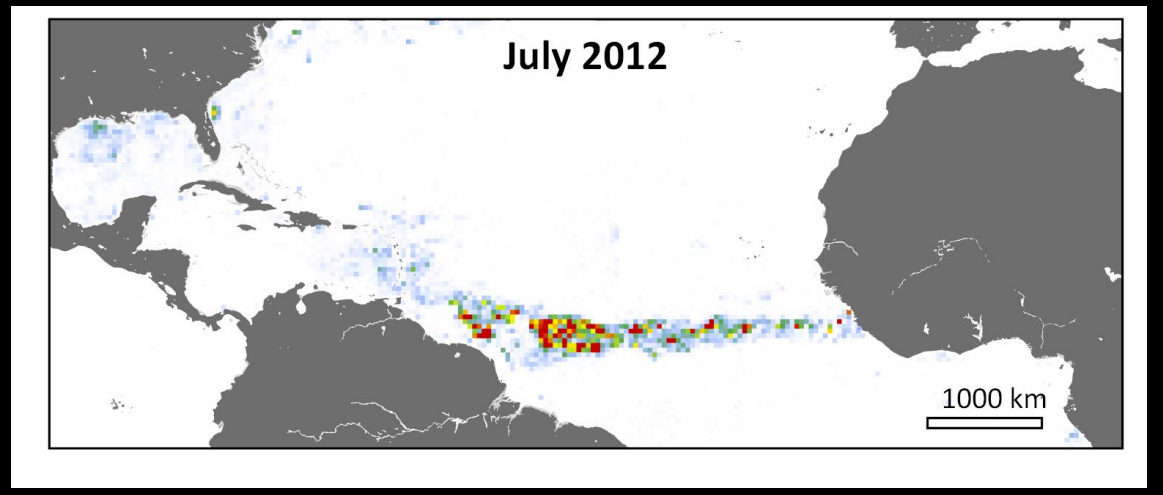
And the biggest pipe carrying pollutants to the Gulf is the Mississippi River, LaPointe said. For decades, cities, industries and farms along the Mississippi and its many tributaries assumed that the Gulf was

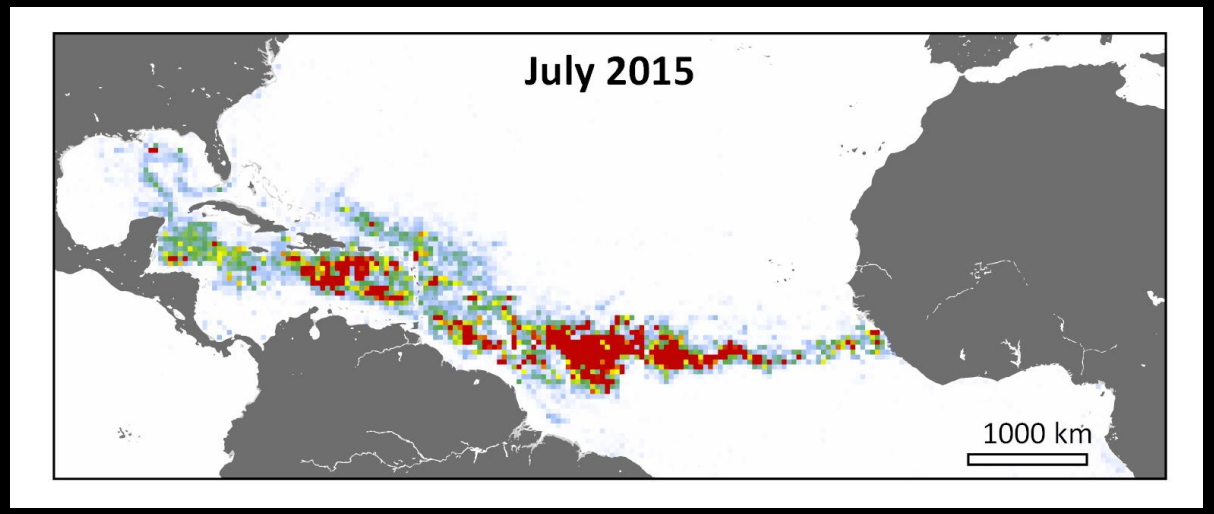
Wang et al. (2019): The Great Atlantic *Sargassum* Belt
Science 365: 83-87.

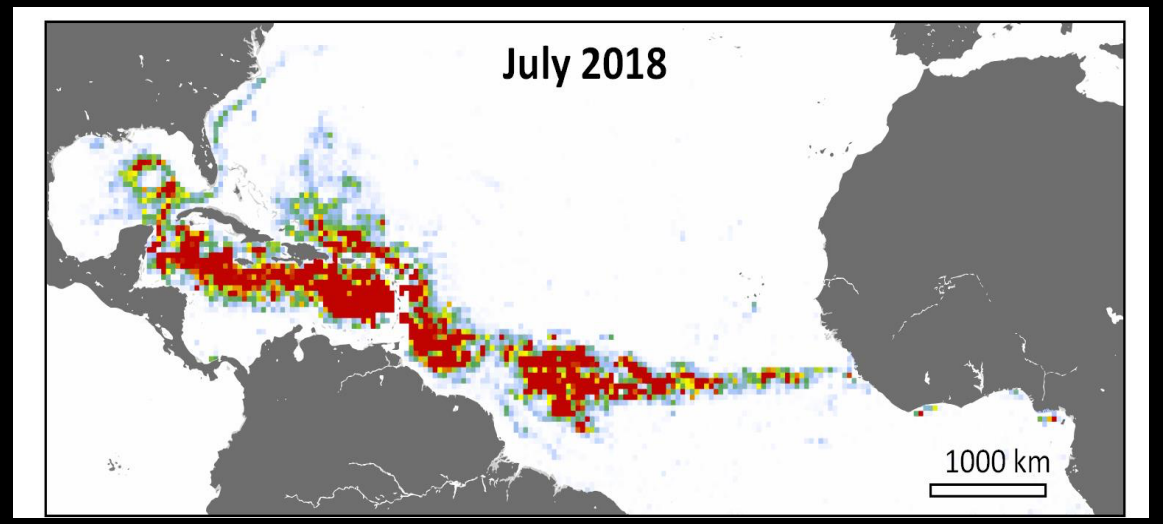


Sargassum Belt Develops in Spring, Peaks In Summer MODIS-Aqua and MODIS-Terra









Wang et al. (2019)

MARINE ECOLOGY

The great Atlantic *Sargassum* belt

Mengqiu Wang[1], Chuanmin Hu[1]*, Brian B. Barnes[1], Gary Mitchum[1], Brian Lapointe[2], Joseph P. Montoya[3]

Pelagic *Sargassum* is abundant in the Sargasso Sea, but a recurrent great Atlantic *Sargassum* belt (GASB) has been observed in satellite imagery since 2011, often extending from West Africa to the Gulf of Mexico. In June 2018, the 8850-kilometer GASB contained >20 million metric tons of *Sargassum* biomass. The spatial distribution of the GASB is mostly driven by ocean circulation. The bloom of 2011 might be a result of Amazon River discharge in previous years, but recent increases and interannual variability after 2011 appear to be driven by upwelling off West Africa during boreal winter and by Amazon River discharge during spring and summer, indicating a possible regime shift and raising the possibility that recurrent blooms in the tropical Atlantic and Caribbean Sea may become the new norm.

SCIENCE ADVANCES | RESEARCH ARTICLE

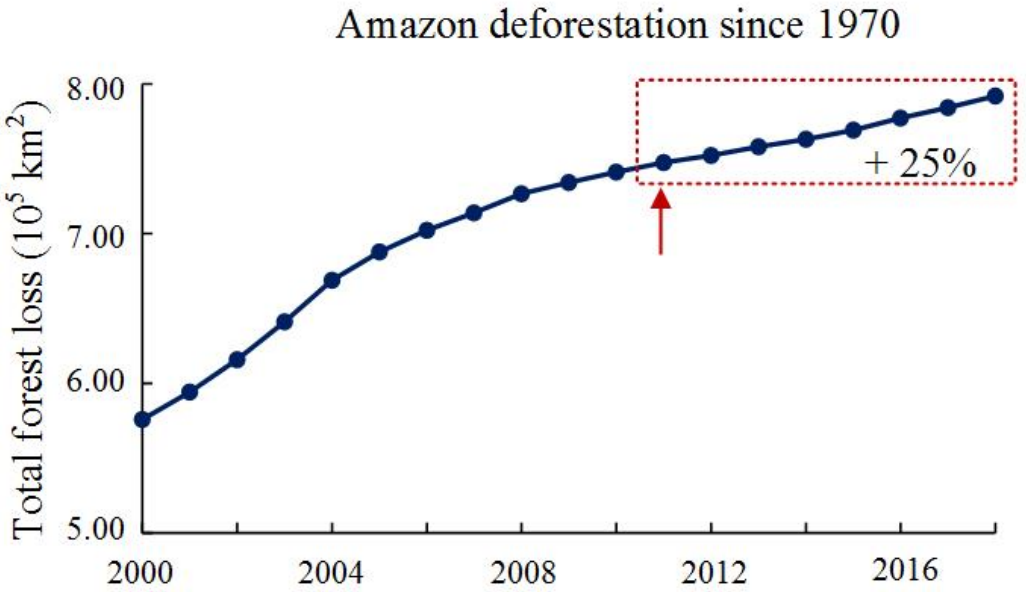
EARTH SCIENCE

Recent intensification of Amazon flooding extremes driven by strengthened Walker circulation

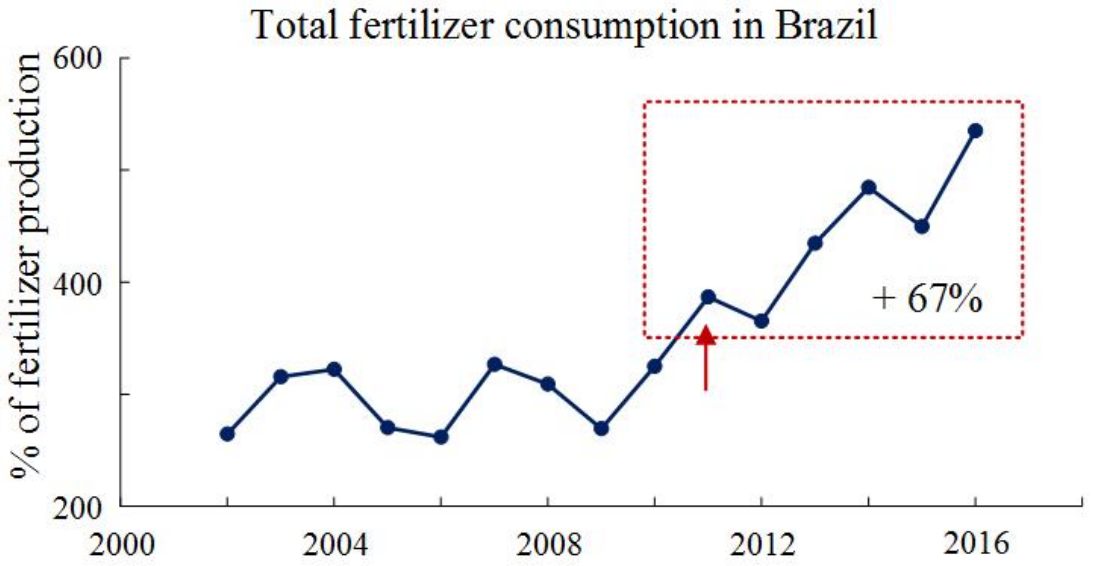
Jonathan Barichivich[1,2]*, Emanuel Gloor[3], Philippe Peylin[4], Roel J. W. Brienen[3], Jochen Schöngart[5], Jhan Carlo Espinoza[6], Kanhu C. Pattnayak[3]

The Amazon basin is the largest watershed on Earth. Although the variability of the Amazon hydrological cycle has been increasing since the late 1990s, its underlying causes have remained elusive. We use water levels in the Amazon River to quantify changes in extreme events and then analyze their cause. Despite continuing research emphasis on droughts, the largest change over recent decades is a marked increase in very severe floods. Increased flooding is linked to a strengthening of the Walker circulation, resulting from strong tropical Atlantic warming and tropical Pacific cooling. Atlantic warming due to combined anthropogenic and natural factors has contributed to enhance the change in atmospheric circulation. Whether this anomalous increase in flooding will last depends on the evolution of the tropical inter-ocean temperature difference.

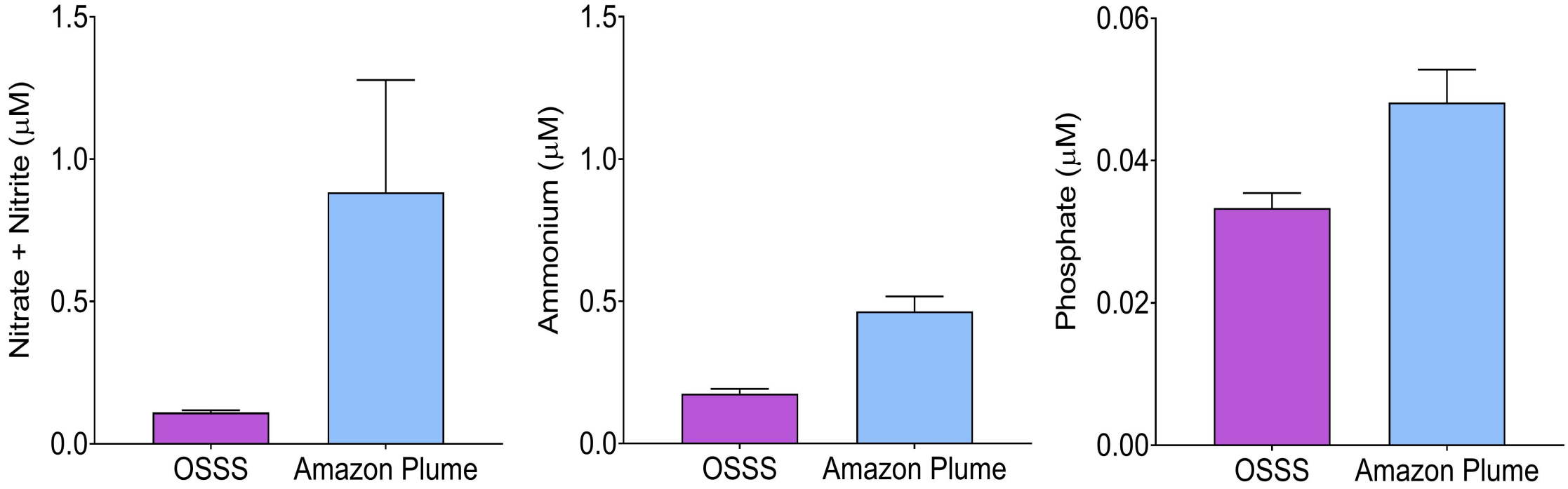
A Wang et al. 2019



B



Sargassum Enriched by Micromolar Increases in DIN and SRP in Amazon Plume



Amazon Plume DIN:SRP = 28:1

Special Thanks To:

Granted through the
Harbor Branch Oceanographic Institute Foundation

Jennifer Nomura
Emily Cheung
Sonia Brugger
Tanju Mishara
Kama Cannon


Fighting Caribbean *Sargassum*: $120 million in 2018
Thank You!