

An underwater photograph of a coral reef. The foreground is dominated by large, green, brain-like coral structures. Several small, bright yellow fish are swimming around the coral. In the background, there are more diverse coral structures, including some branching corals, and several small blue fish. A metal chain is visible on the left side, attached to a vertical post. The water is clear and blue.

Puerto Rico Coral Reef Monitoring Program: Status and Trends 2018-2019 Surveys

NOAA-CRCP/DNER State and Territories Coral Reef Conservation Cooperative Agreement
NA17NOS4820037

Jorge R. Garcia-Sais, Stacey M. Williams, Jorge Sabater-Clavell, Milton Carlo

Reef Research, Inc.
P. O. Box 178
Boquerón, PR 00622

February, 2021

Contents

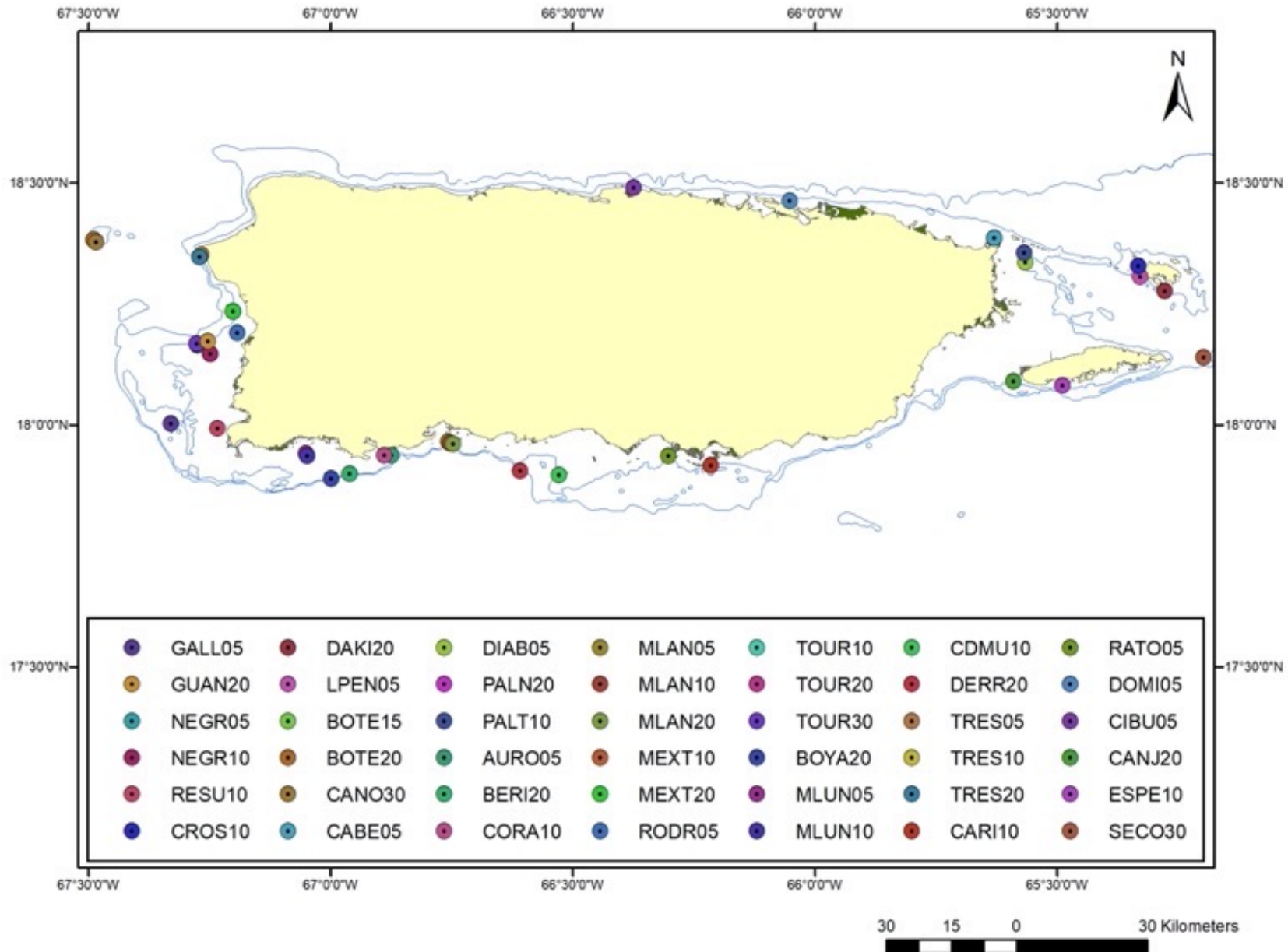
An underwater photograph of a coral reef. The scene is dominated by various types of coral, including large, flat, table corals in shades of white and light blue, and more delicate, branching corals in purple and blue. A prominent red and white striped fish is swimming in the center. Other smaller blue fish are visible in the background. The water is clear and blue, with sunlight filtering through from above.

- Sampling design and field methodology overview
- Oceanographic background to the 2018 and 2019 reef monitoring surveys
- Status of reef stations in terms of coral cover, species composition and patterns of benthic community structure
- Quantitative analyses of temporal variations in reef substrate cover by the main sessile-benthic categories
- Status of fish density, taxonomic composition/species richness and fish community structure
- Interactive discussion

Sampling Design/Methods

- 42 reef stations surveyed in 2-year monitoring cycles
- Location of reef stations provide for a depth, distance from shore, and geographically stratified sampling design
- Sessile-benthic characterizations based on 5 (replicate) 10m long permanent transects per reef station. Placement of transects in sections of optimal stony coral cover (non-random approach)
- Transects surveyed by continuous intercept technique using chains of 1.4cm link length. Mean: 964 data points per transect, 4,821 data points per reef station
- Quantitative fish/invertebrate characterizations based on 5 (replicate) 10 x 3m belt-transects, include determinations of density (Ind/30m²) and species richness (Spp/30m²) centered on benthic transects reference lines
- Belt-transects expanded to 20 x 3m for quantitative characterizations and size distributions of large commercially important fishes, large reef herbivores (Acanthuridae, Scaridae) and large invertebrates (lobsters, queen conch, Diadema); 300m²/reef station
- High-resolution digital photographic photo-albums per reef station
- Comparative (ANOVA/Permanova) and multi-variate (PRIMER) statistical approaches for data analyses

PRCRMP Reef Survey Stations: 2018 and 2019



An aerial photograph of a tropical coastline. A large, white, turbulent wave plume extends from the shore into the dark blue ocean. The coastline is visible with some green vegetation and buildings. The text is overlaid on the image in yellow.

Oceanographic background

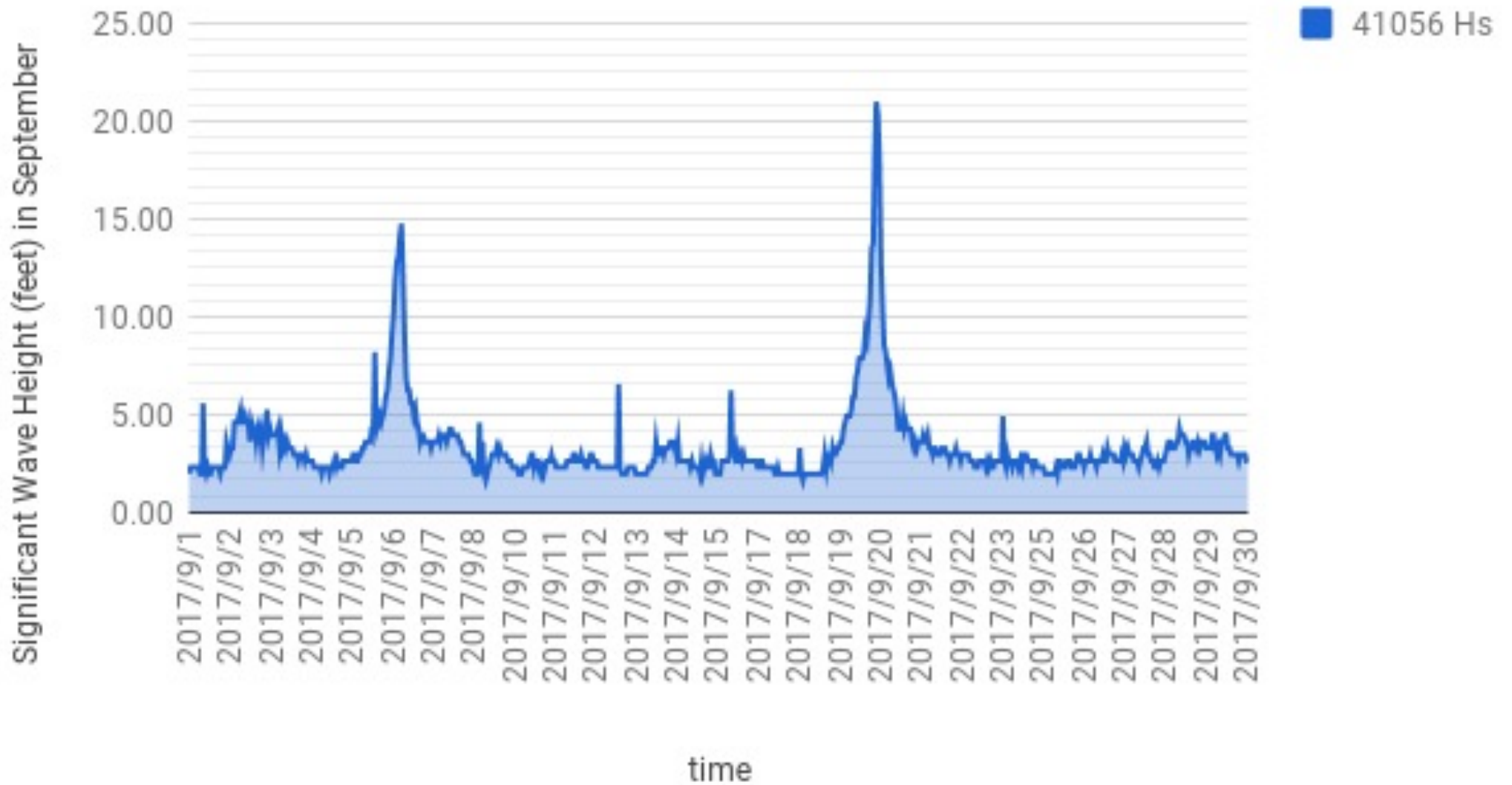
3 events of extreme wave action associated with the pass of Cat 4 Hurricanes Irma and Maria (September 2017) and winter storm Riley (March 2018)

- Mechanical impact to reef biota associated with sand abrasion, scouring, breakage, and displacement of reef biota, including corals
- Advective and turbulent conditions displace pelagic (fish, plankton) communities unable to swim away of impacted zones
- Nutrient enrichment associated with massive river loadings, sediment resuspension, and upwelling
- Increased water turbidity associated with total suspended sediments, localized salinity dilution and temperature reductions in amplified river plumes

Survey ended before the onset of the 2019 winter coral bleaching event (November 2019)

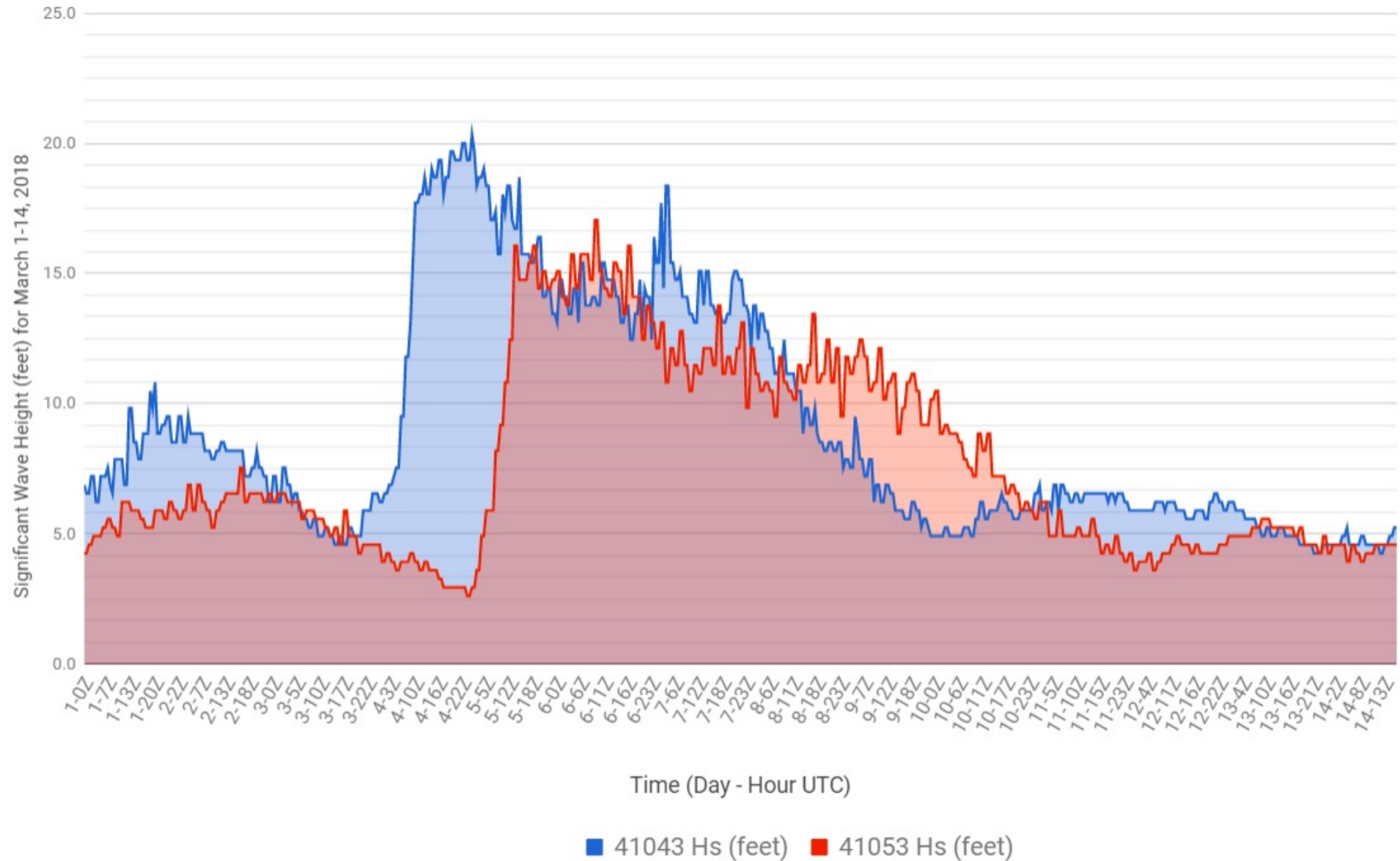
Hurricane Irma and Maria: September 2017

Buoy 41056 (East of Fajardo) - Significant Wave Height



Winter Storm Riley: March 2018

Significant Wave Height (feet) for Buoys 41043 (170 NM Northeast Puerto Rico) and 41053 (San Juan)

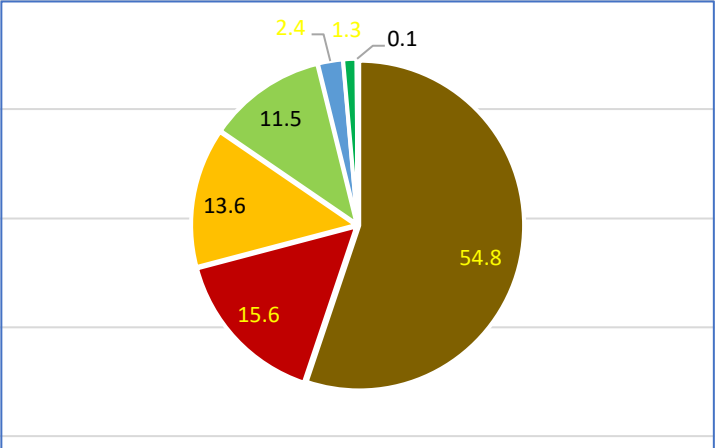
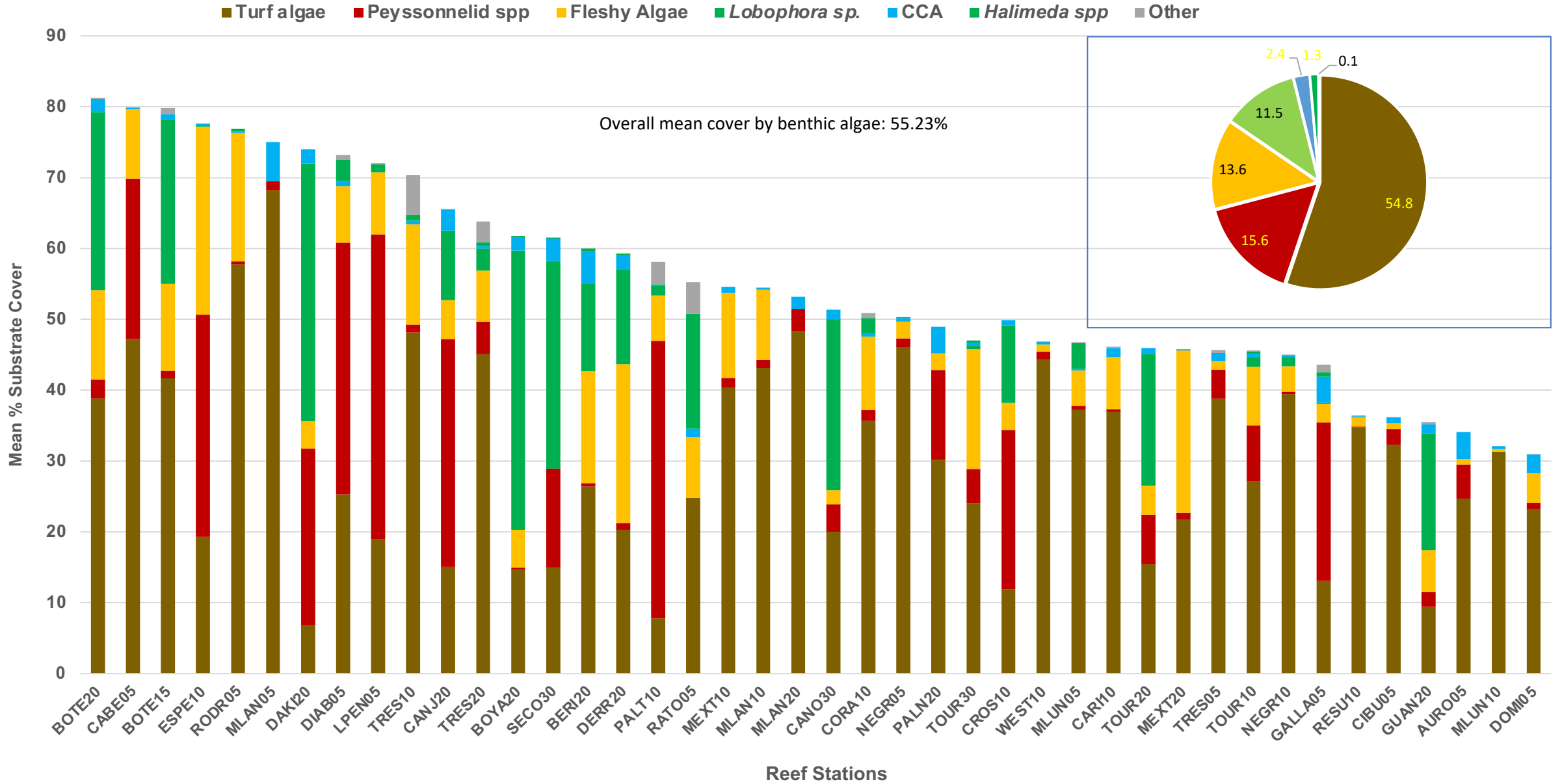


PRCRMP 2018 and 2019: Sessile-benthic Community Structure





Mean substrate cover by benthic algae : PRCRMP 2018 and 2019 surveys

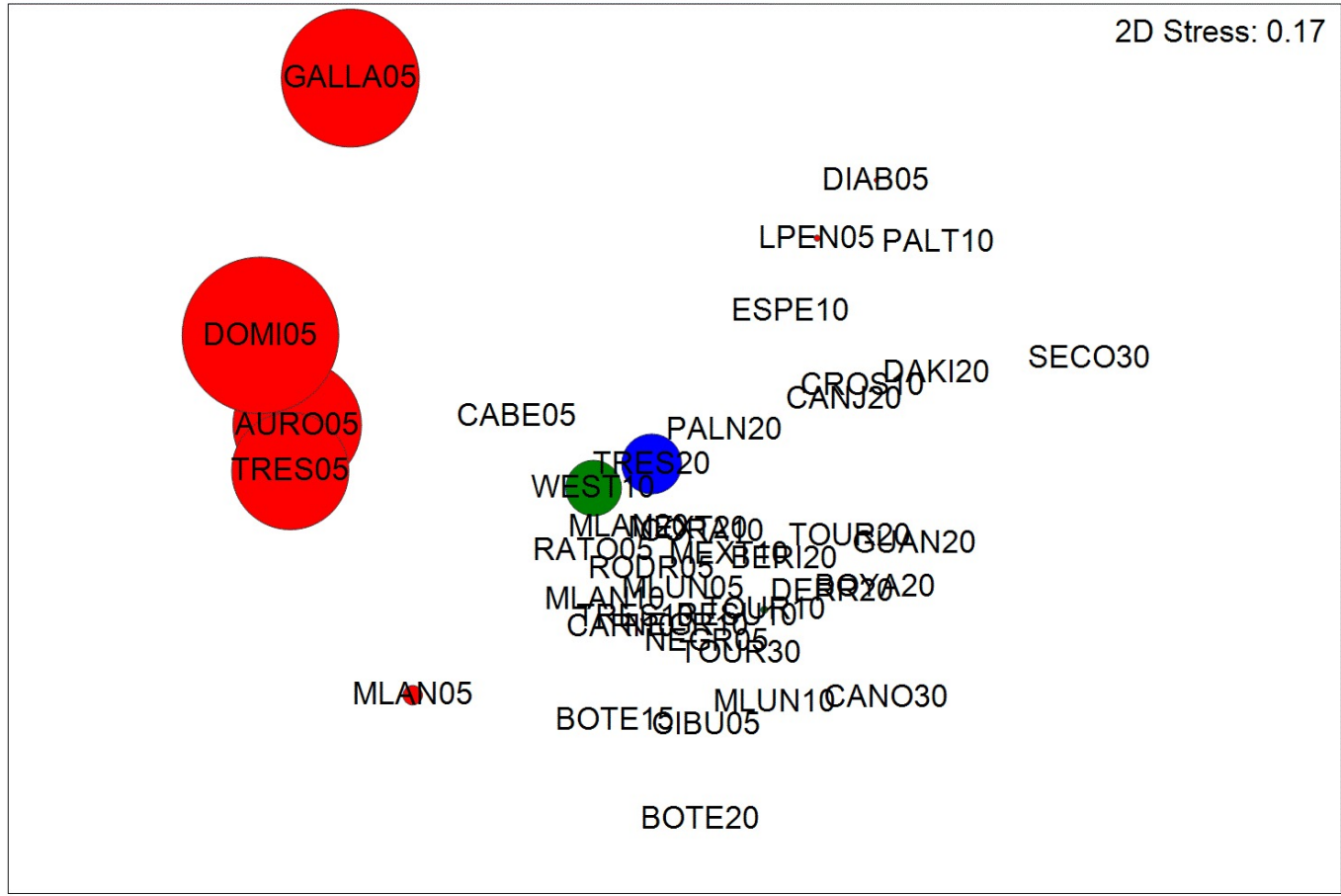
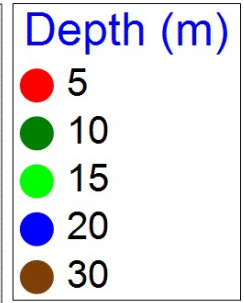
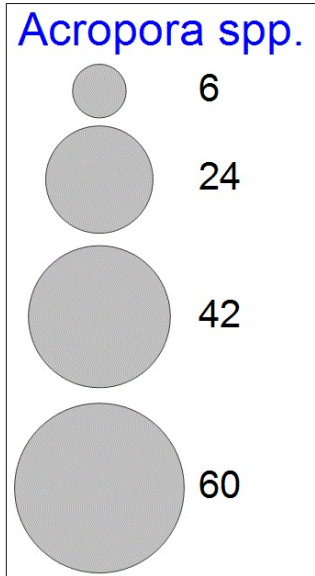


	Mean Cover (%)
	All Reef Stations
Benthic Categories	2018-2019 Surveys
Turf Algae	31.40
Peyssonnelid Algae	9.54
<i>Orbicella spp</i>	8.32
Fleshy Algae	5.91
<i>Lobophora spp.</i>	4.84
<i>Acropora spp.</i>	4.12
Sponges	3.87
Sand/rubble	3.47
<i>Porites spp.</i>	2.90
Cyanobacteria	2.58
<i>Agaricia spp</i>	1.86
Crustose coralline Algae (CCA)	1.71
<i>Siderastraea spp.</i>	1.30
<i>Montastraea spp</i>	1.14
<i>Diploria/Pseudodiploria spp.</i>	1.05
	Mean Density
Erect Soft Corals	10.97

Benthic Categories - PRCRMP 2018-2019 Surveys

Non-metric MDS

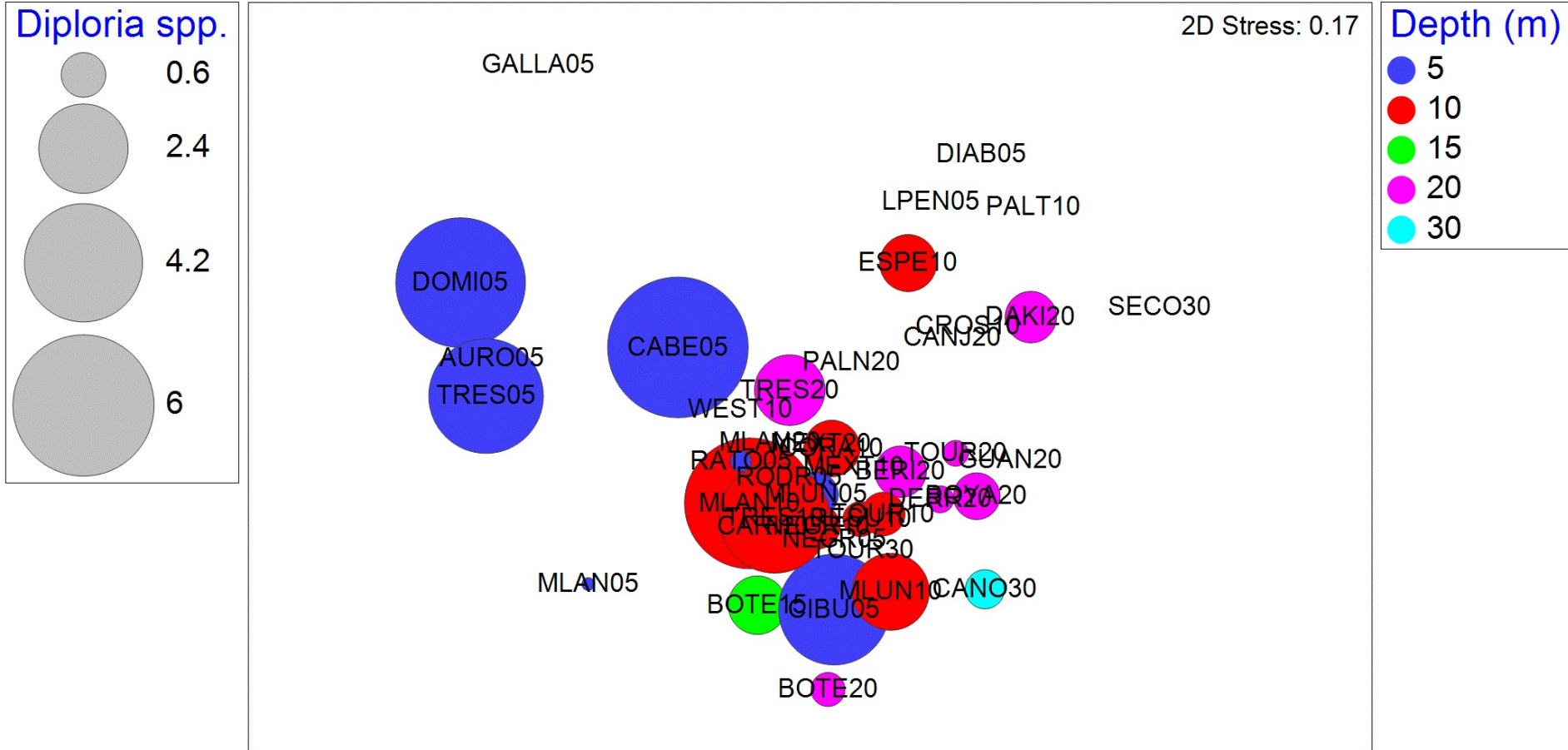
Transform: Square root
 Resemblance: S17 Bray-Curtis similarity



Benthic Categories - PRCRMP 2018-2019 Surveys

Non-metric MDS

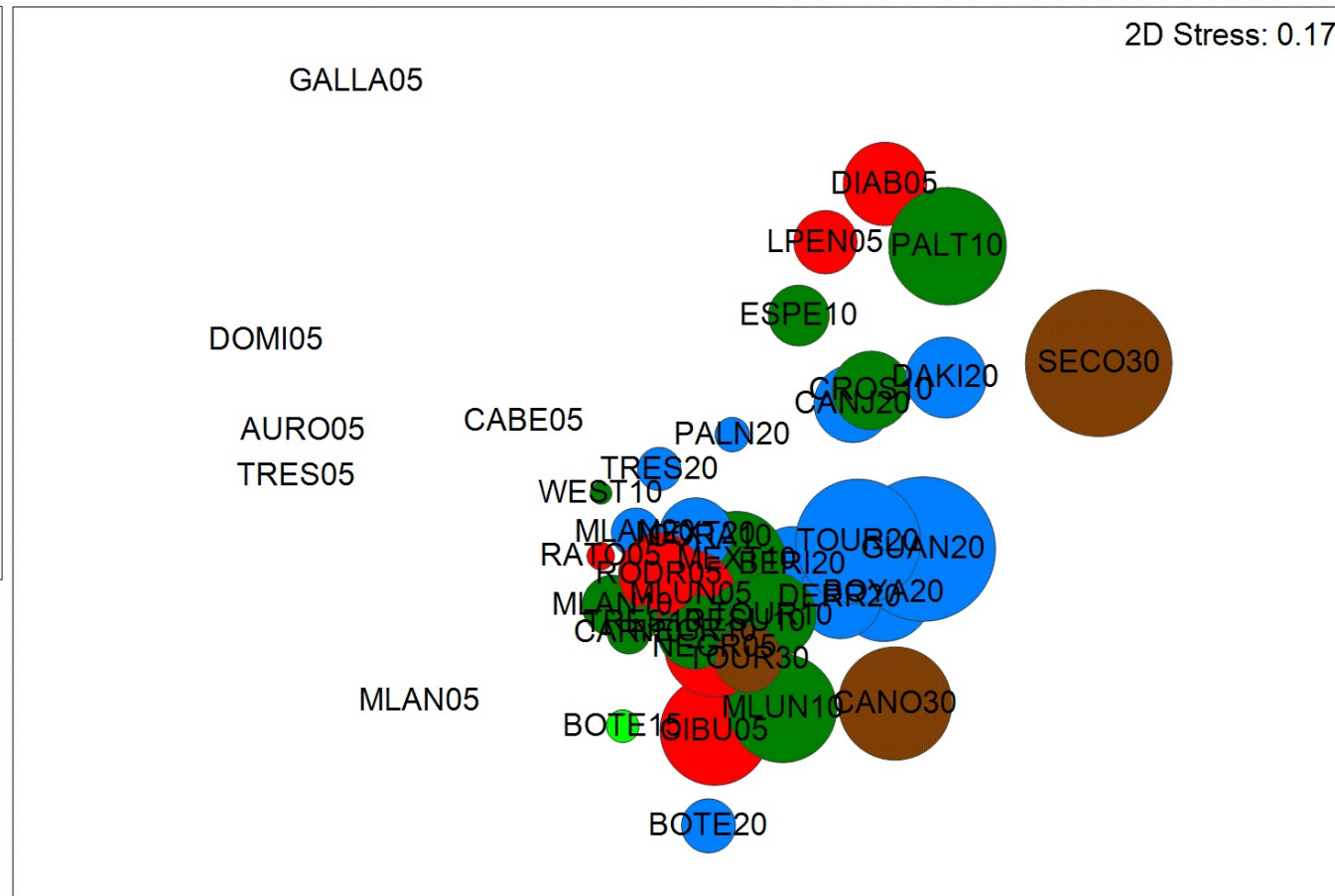
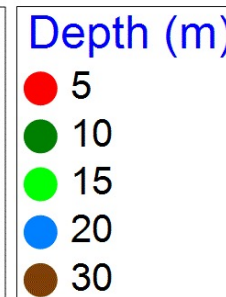
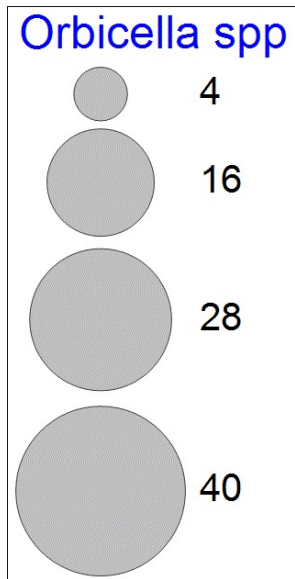
Transform: Square root
 Resemblance: S17 Bray-Curtis similarity



Benthic Categories - PRCRMP 2018-2019 Surveys

Non-metric MDS

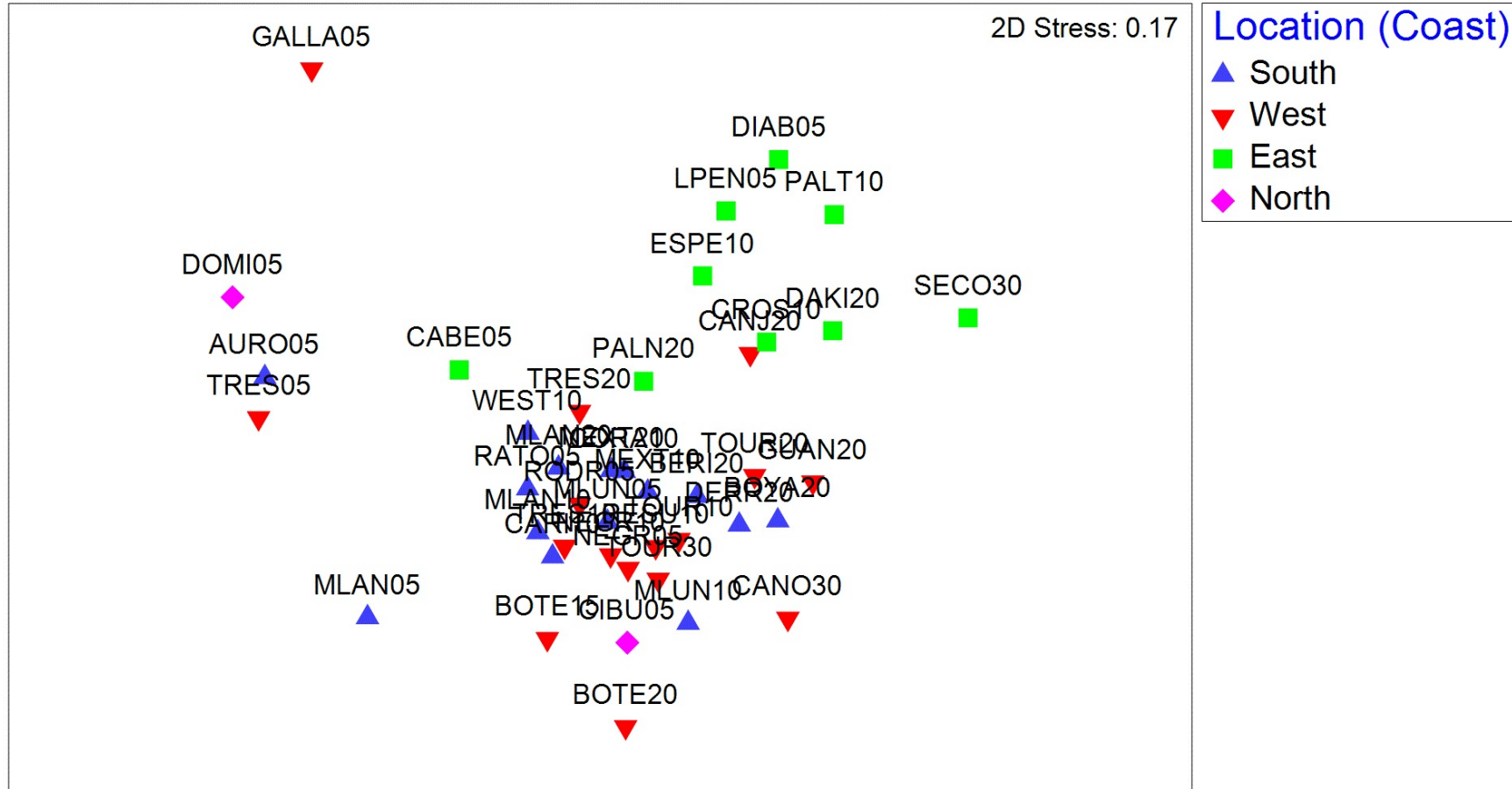
Transform: Square root
Resemblance: S17 Bray-Curtis similarity



Benthic Categories - PRCRMP 2018-2019 Surveys

Non-metric MDS

Transform: Square root
Resemblance: S17 Bray-Curtis similarity

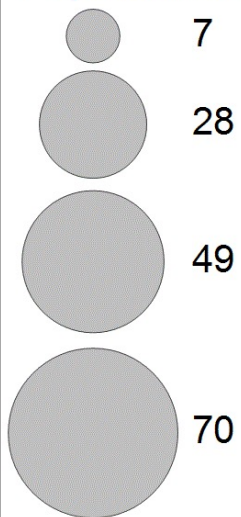


Benthic Categories - PRCRMP 2018-2019 Surveys

Non-metric MDS

Transform: Square root
 Resemblance: S17 Bray-Curtis similarity

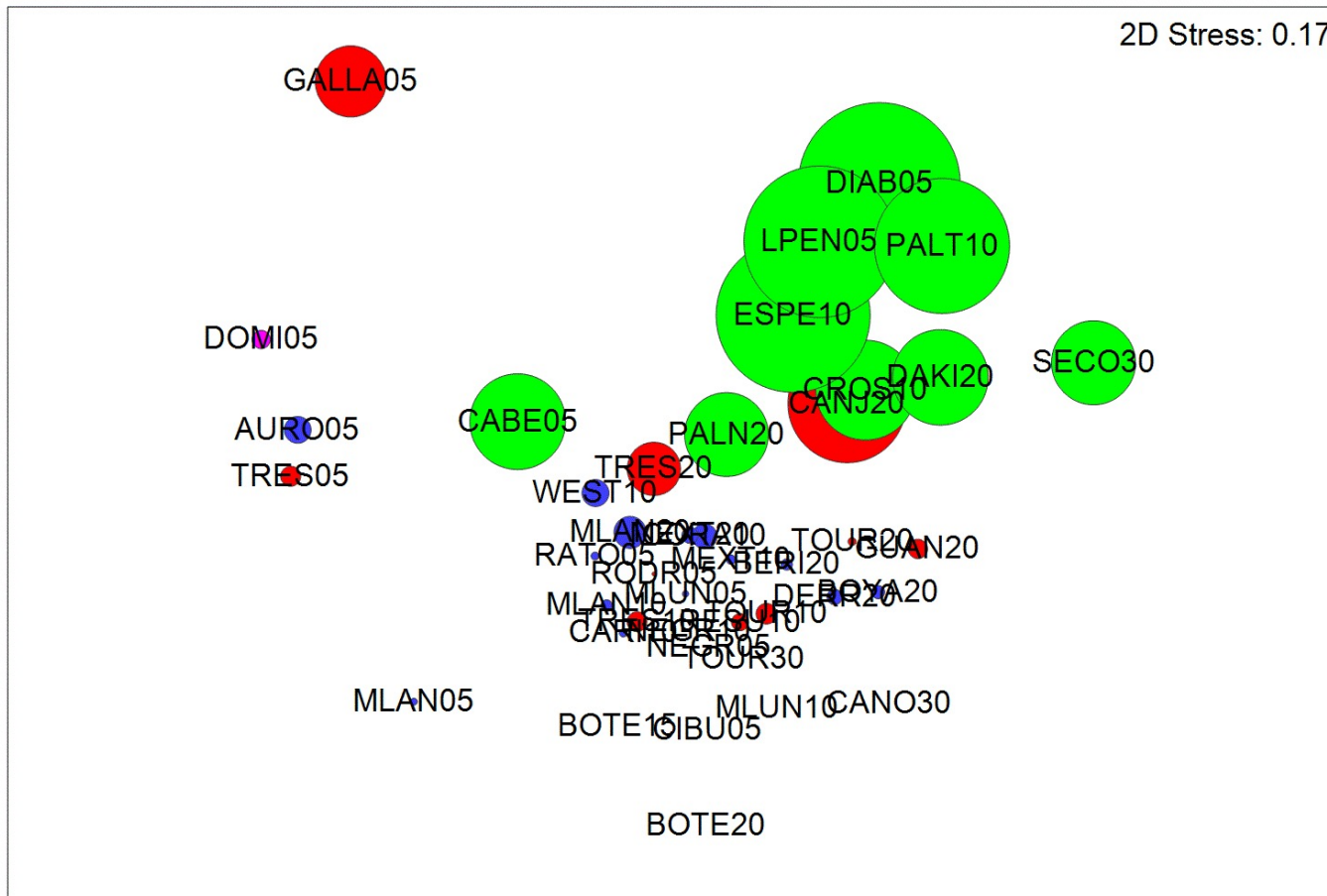
Peyssonnelid



2D Stress: 0.17

Location (Coast)

- South
- West
- East
- North



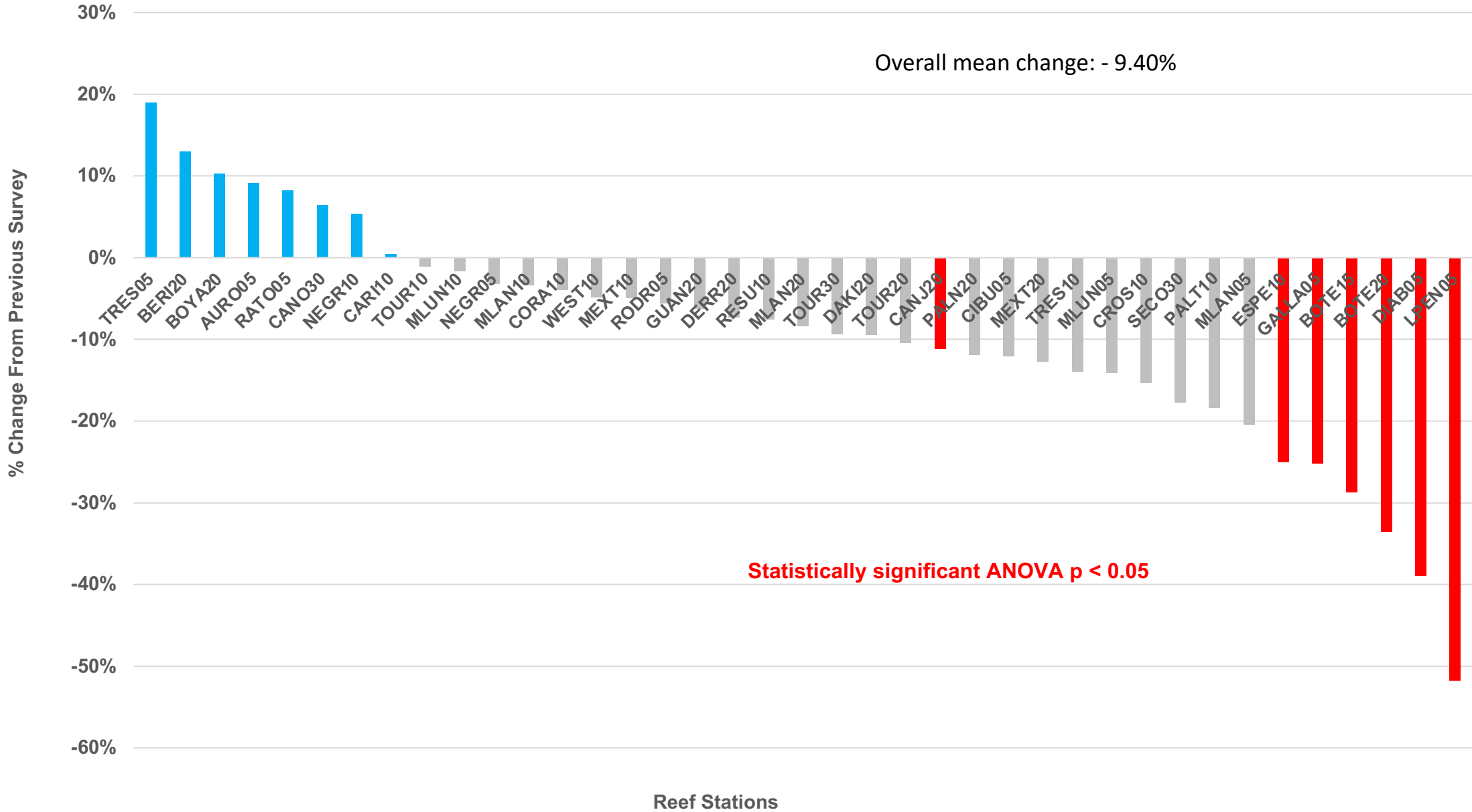


Ramicrusta sp

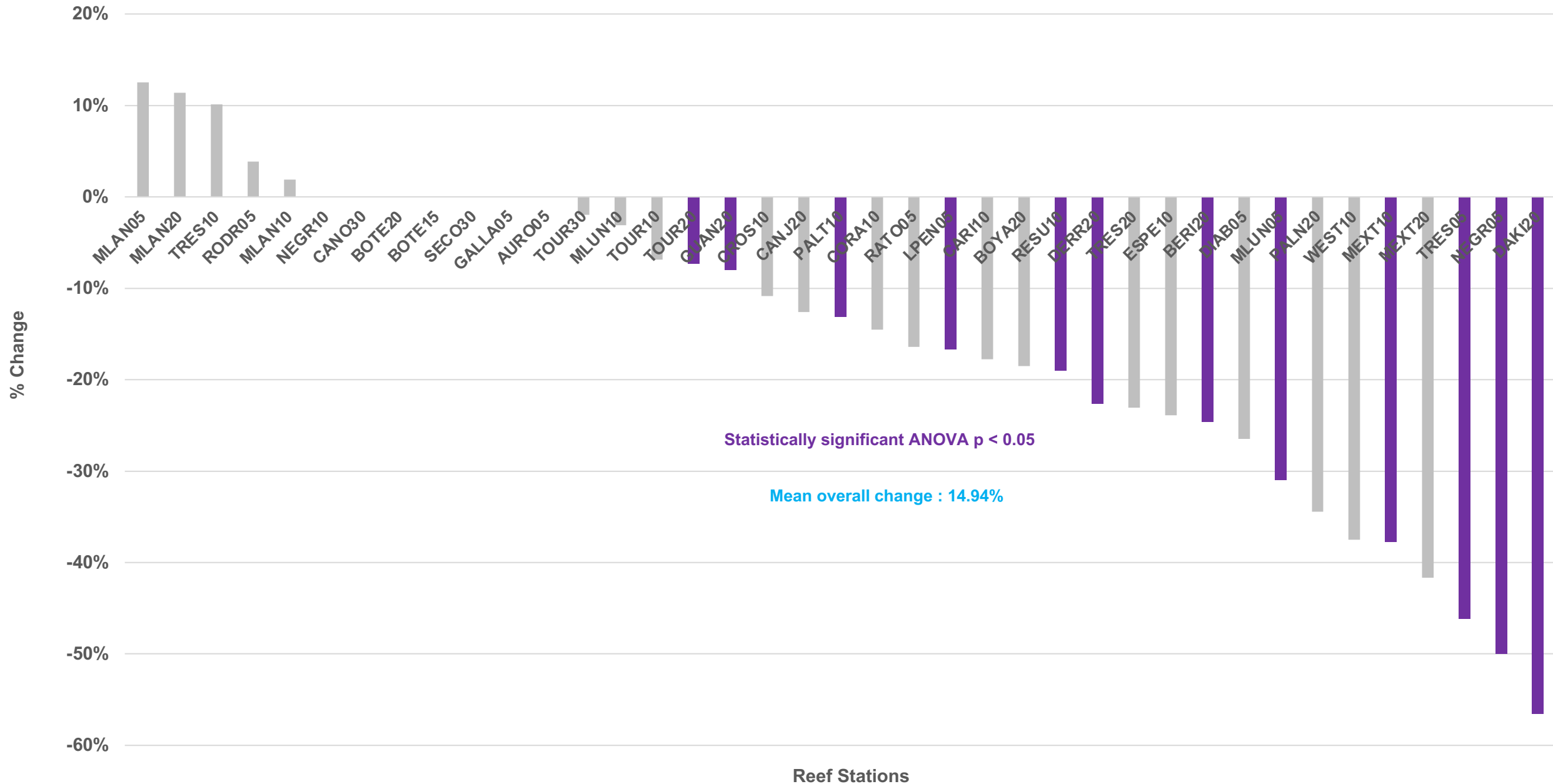
PRCRMP 2018 and 2019 - Sessile-benthic Communities: Monitoring Trends



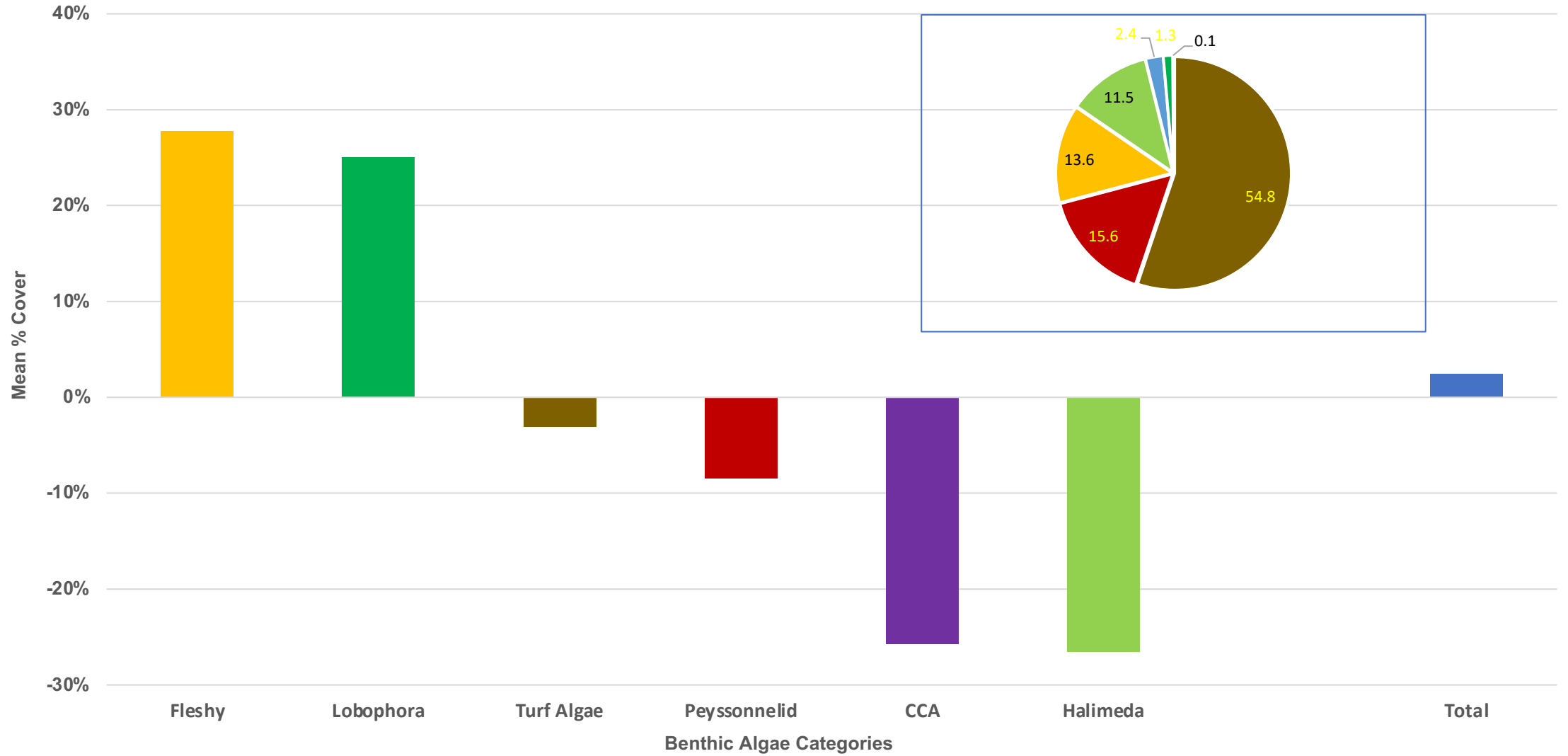
Stony Coral Percent Substrate Cover PRCRMP 2018 & 2019 : % change of from previous surveys (2016– 2017)



Erect Soft Coral Density PRCRMP 2018/2019 : % change from previous survey (2016 – 2017)



PRCRMP 2018 and 2019: mean percent change of benthic algae categories from previous surveys (2016-2017)



PRCRMP 2018 and 2019: Fish Community Structure







CONTACT US 1-800-334-3699 | HELP | SIGN IN

LiveAquaria
QUALITY AQUATIC LIFE DIRECT TO YOUR DOOR

Search site....

FREE SHIPPING
on aquatic life orders \$149 & up*

DIVER'S DEN | FRESHWATER FISH | FRESHWATER PLANTS | FRESHWATER INVERTS | POND | FOODS | AQUARIUM SUPPLIES

SALE CENTER | MARINE FISH | CORAL | REEF CLEANER PACKS | MARINE INVERT/PLANT | REEF ROCK | ORA FISH/CORAL/INV

Save up to 25% on featured clownfish and anemones. SHOP NOW >

Home > Marine Fish > Gobies > Masked Goby



Masked Goby
(*Coryphopterus personatus*) Item: CN-81395
\$ 25.99

Select Product

Small
Out of Stock

Additional locales and sizes may be available!

Email me when available >

7-Day Guarantee Learn more >

Ships from our **California Facility** Shipping Info >

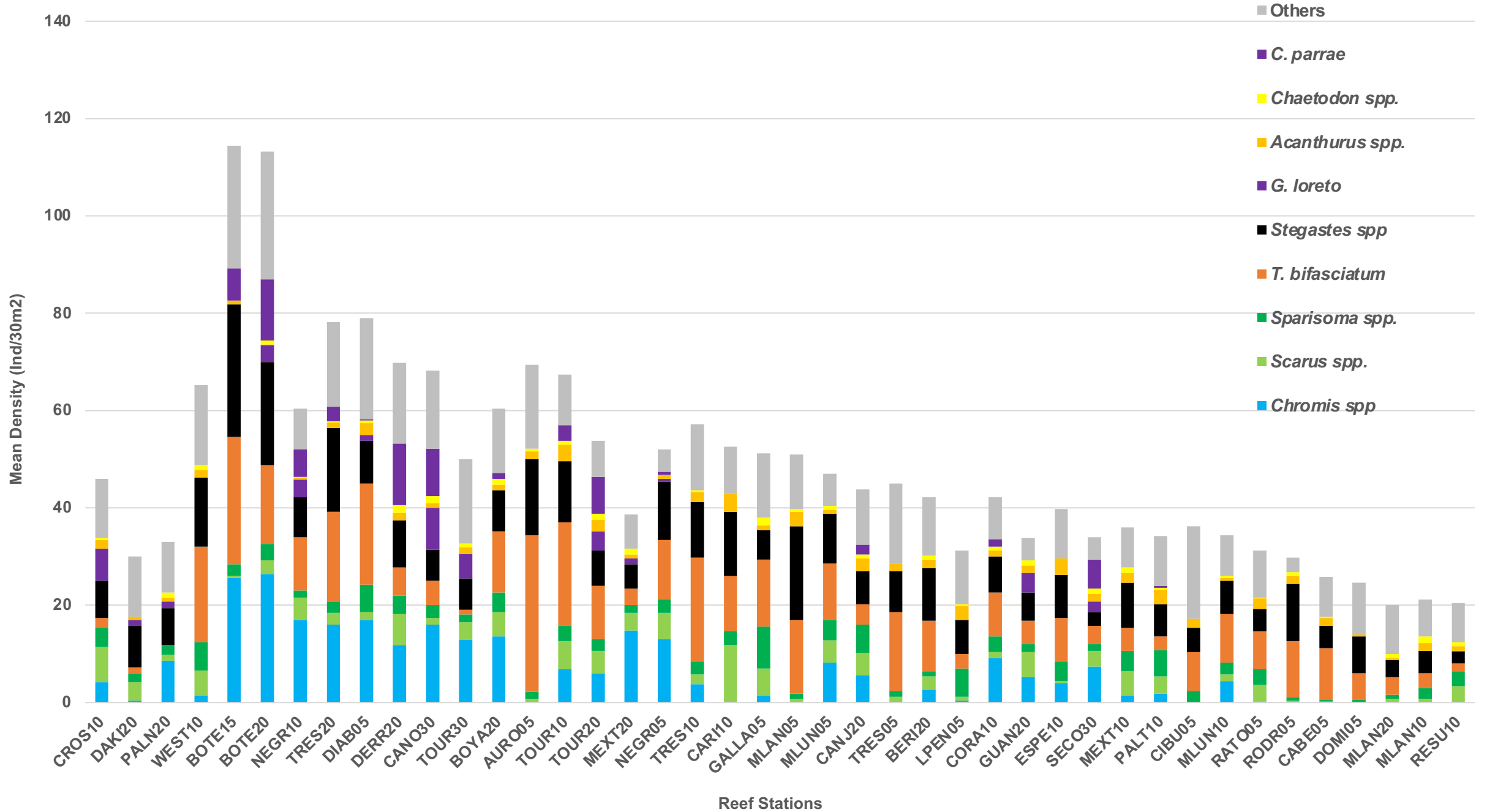
REWARDS PROGRAM
EARN 5% REWARDS! Learn more >

Please Note: Due to variations within species, your item may not look identical to the image provided. Approximate size range may also vary between individual specimen.

Quick Stats

Care Level Easy	Temperament Peaceful	Color Form Clear, Orange	Diet Carnivore	Reef Compatible Yes
Water Conditions sg 1.020-1.025, 72-78° F, dKH 8-12, pH 8.1-8.4	Max. Size 2"	Origin Caribbean	Family Caribbean	Minimum Tank Size 10 gallons

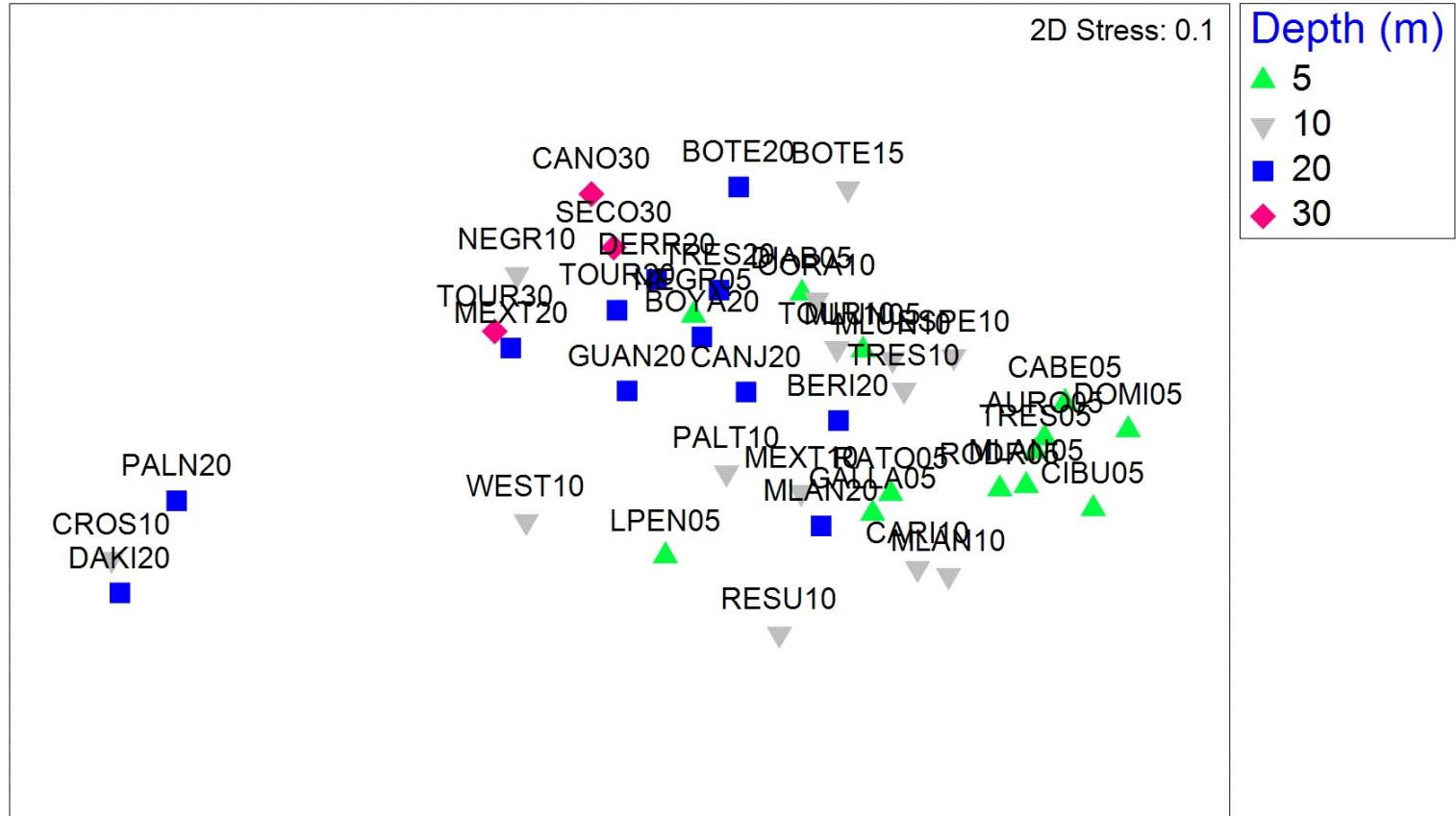
Mean Density of Fishes Surveyed in 10m x 3m belt-transects. PRCRMP 2018 and 2019 Surveys



Fish Community Structure - PRCRMP 2018-2019 Surveys

Non-metric MDS

Standardise Samples by Total
Transform: Square root
Resemblance: S17 Bray-Curtis similarity



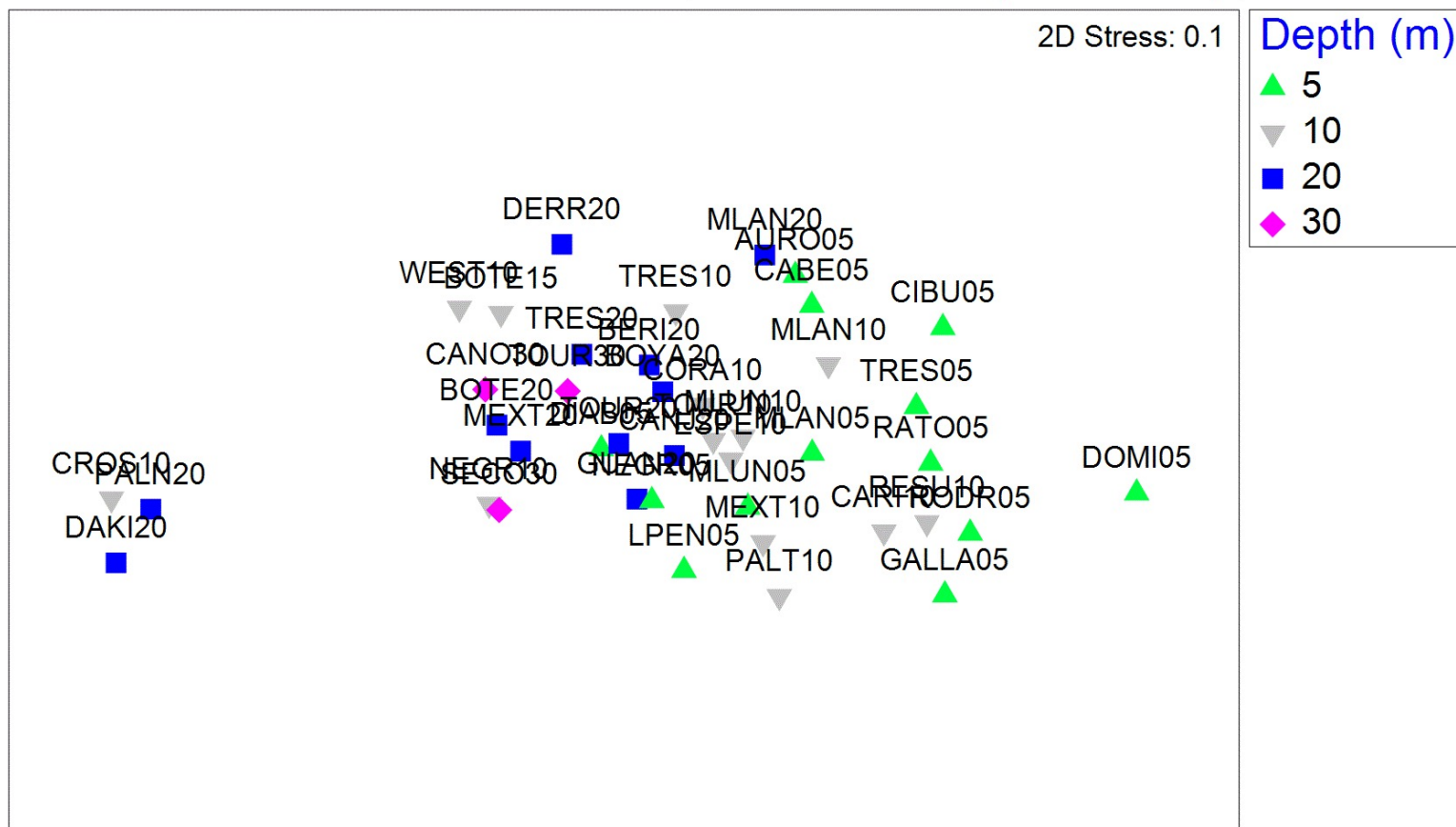
Distribution of main fish/invertebrate taxa into trophic groups

				Spongivores & Corallivores	Scavengers
Herbivores	Zooplanktivores	Small Carnivores	M/L Carnivores		
Parrotfishes	<i>C. personatus</i>	Wrasses	<i>Lutjanus spp.</i>	Angelfishes	Spiny lobster
Doctorfishes	<i>Chromis spp.</i>	Sea Basses	<i>Ocyurus chrysurus</i>	Butterflyfishes	
Farmer Damselfishes	<i>Clepticus parrae</i>	Gobies	<i>Epinephelus spp.</i>		
<i>Diadema antillarum</i>	<i>Decapterus spp.</i>	Grunts	<i>Mycteroperca spp.</i>		
	<i>Gramma loreto</i>	Puffers	<i>Gymnothorax funebris</i>		
		Squirrelfishes	Large Jacks		
		Drums and Croakers			
		Trumpetfish			
		small moray eels			
		Hawkfish			
		Small jacks			

Fish Trophic Structure - PRCRMP 2018-2019 Surveys

Non-metric MDS

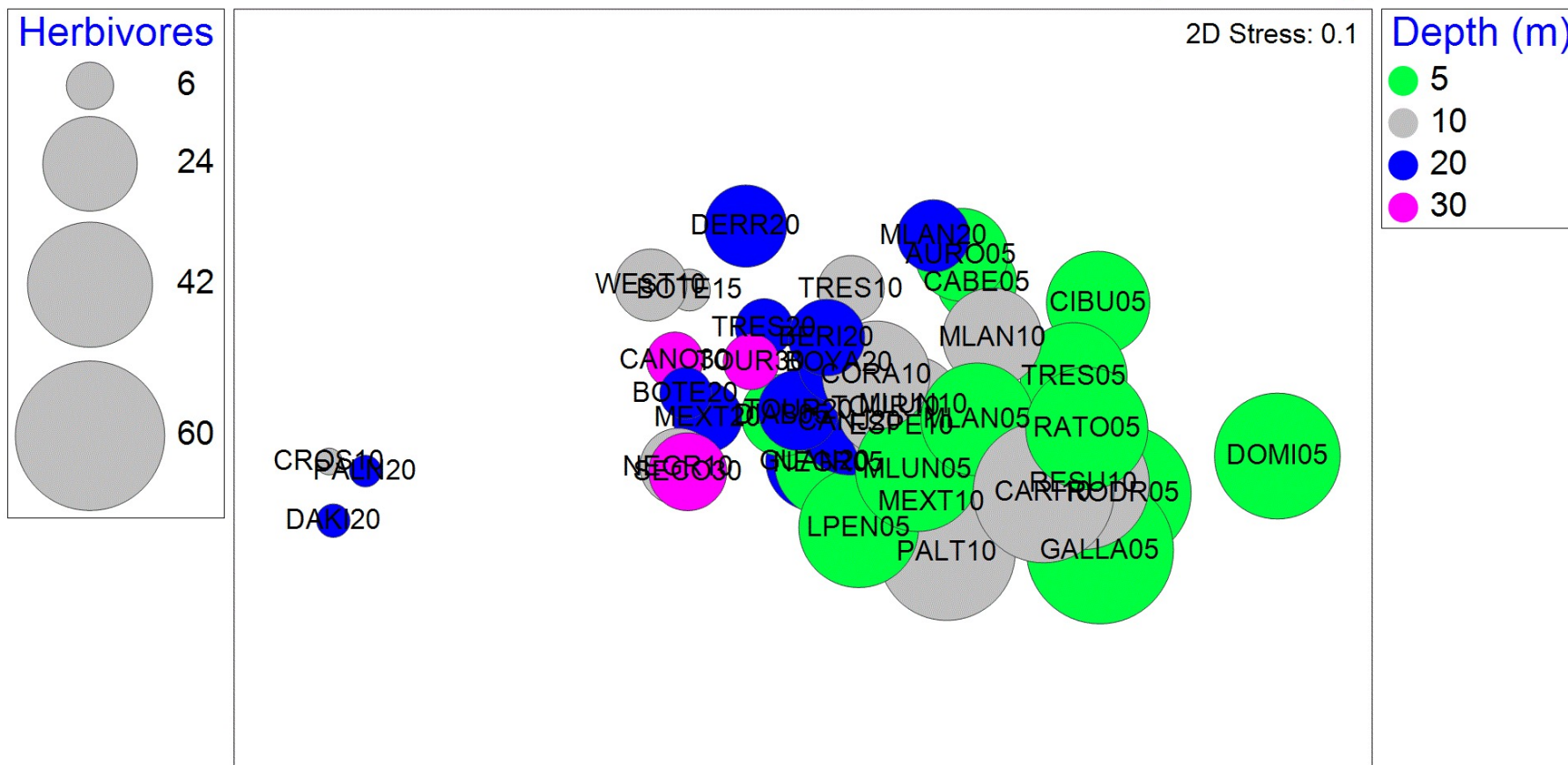
Standardise Samples by Total
Transform: Square root
Resemblance: S17 Bray-Curtis similarity



Fish Trophic Structure - PRCRMP 2018-2019 Surveys

Non-metric MDS

Standardise Samples by Total
Transform: Square root
Resemblance: S17 Bray-Curtis similarity

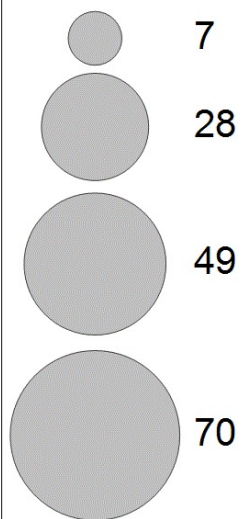


Fish Trophic Structure - PRCRMP 2018-2019 Surveys

Non-metric MDS

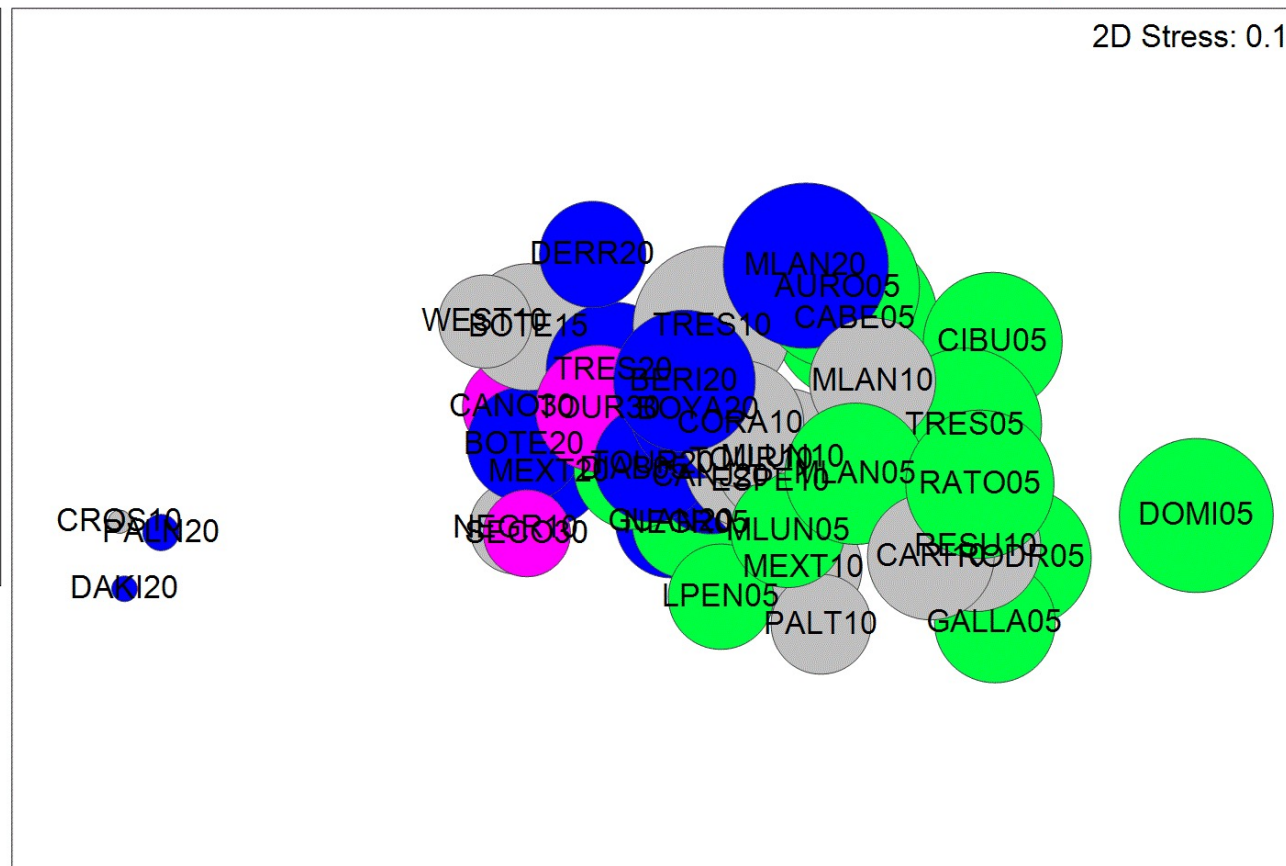
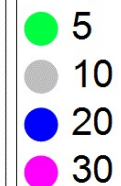
Standardise Samples by Total
Transform: Square root
Resemblance: S17 Bray-Curtis similarity

Small Carnivores



2D Stress: 0.1

Depth (m)

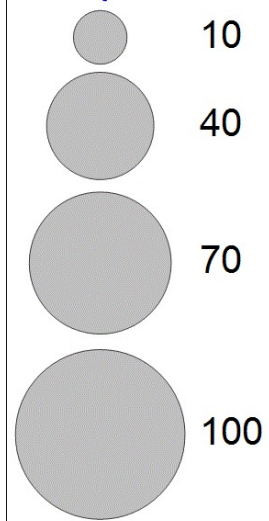


Fish Trophic Structure - PRCRMP 2018-2019 Surveys

Non-metric MDS

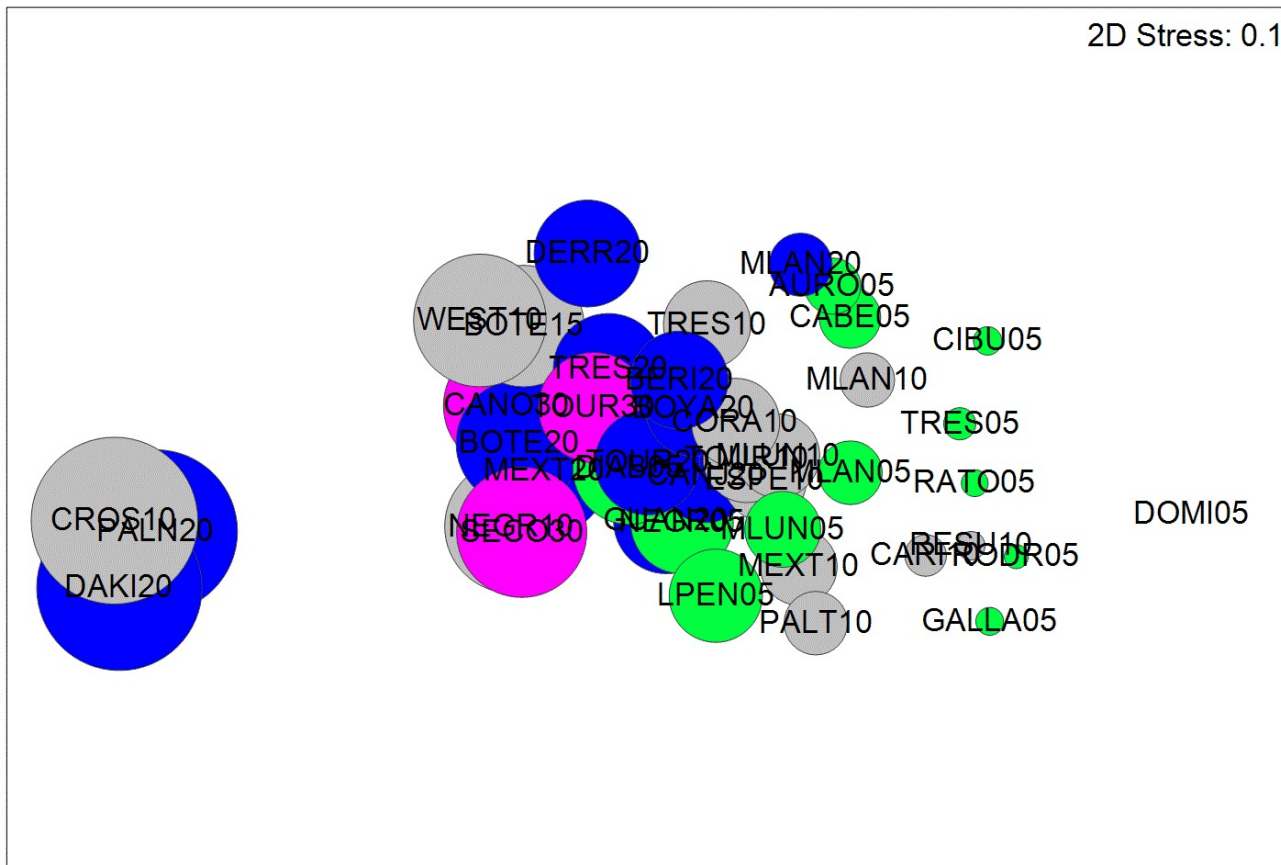
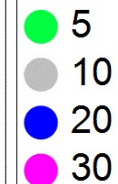
Standardise Samples by Total
Transform: Square root
Resemblance: S17 Bray-Curtis similarity

Zooplanktivores



2D Stress: 0.1

Depth (m)

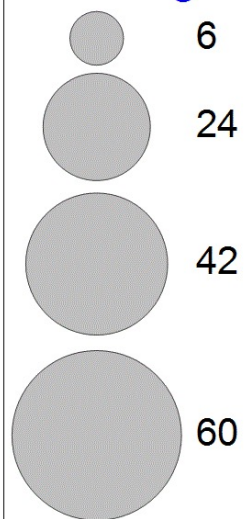


Fish Trophic Structure - PRCRMP 2018-2019 Surveys

Non-metric MDS

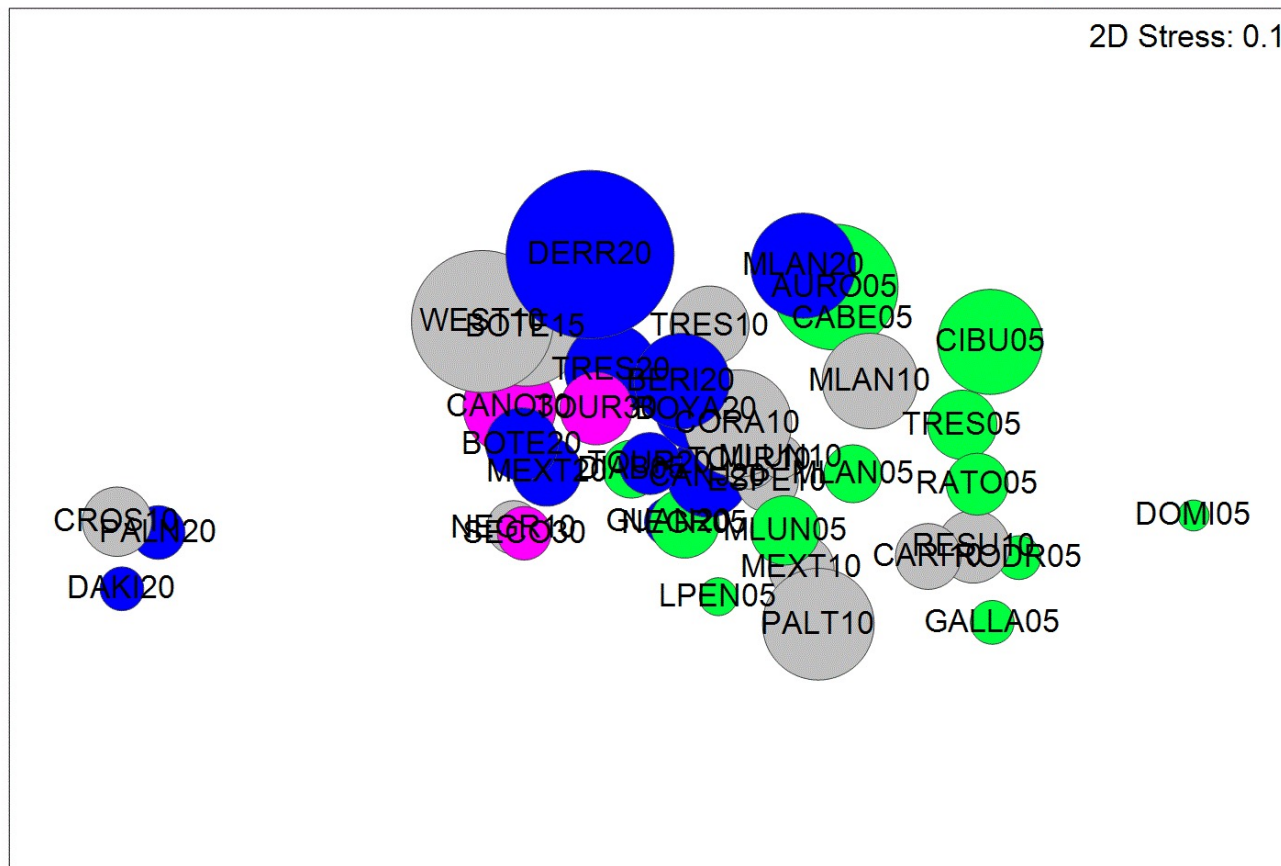
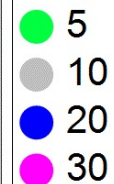
Standardise Samples by Total
Transform: Square root
Resemblance: S17 Bray-Curtis similarity

Mid/Large Carnivores



2D Stress: 0.1

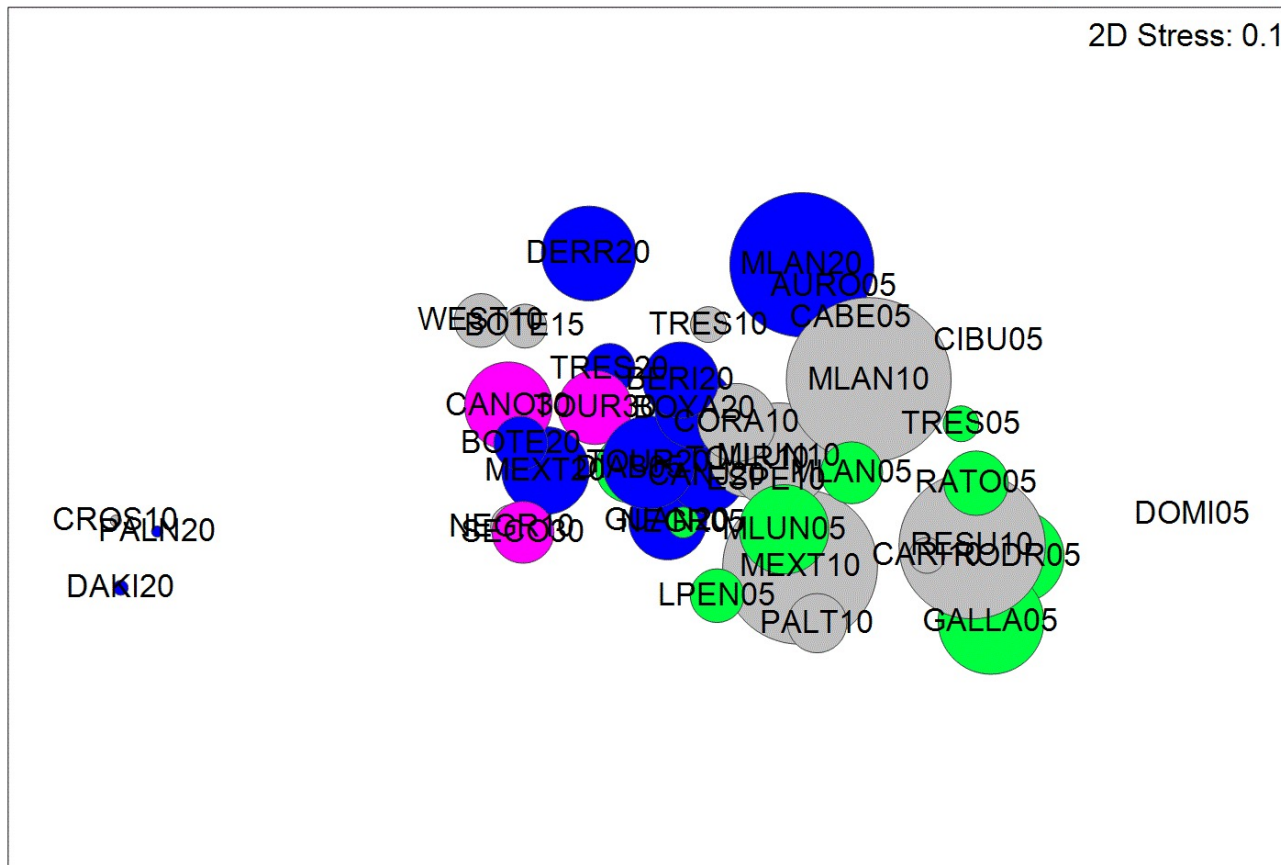
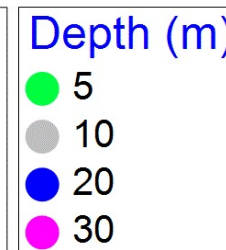
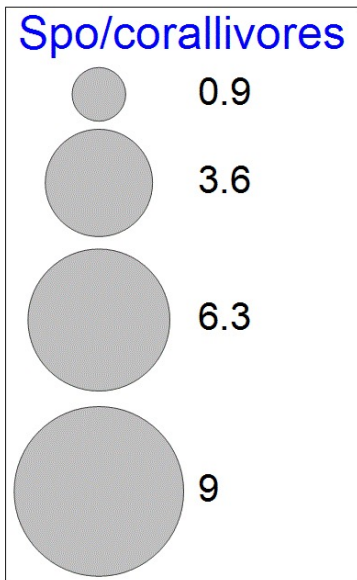
Depth (m)



Fish Trophic Structure - PRCRMP 2018-2019 Surveys

Non-metric MDS

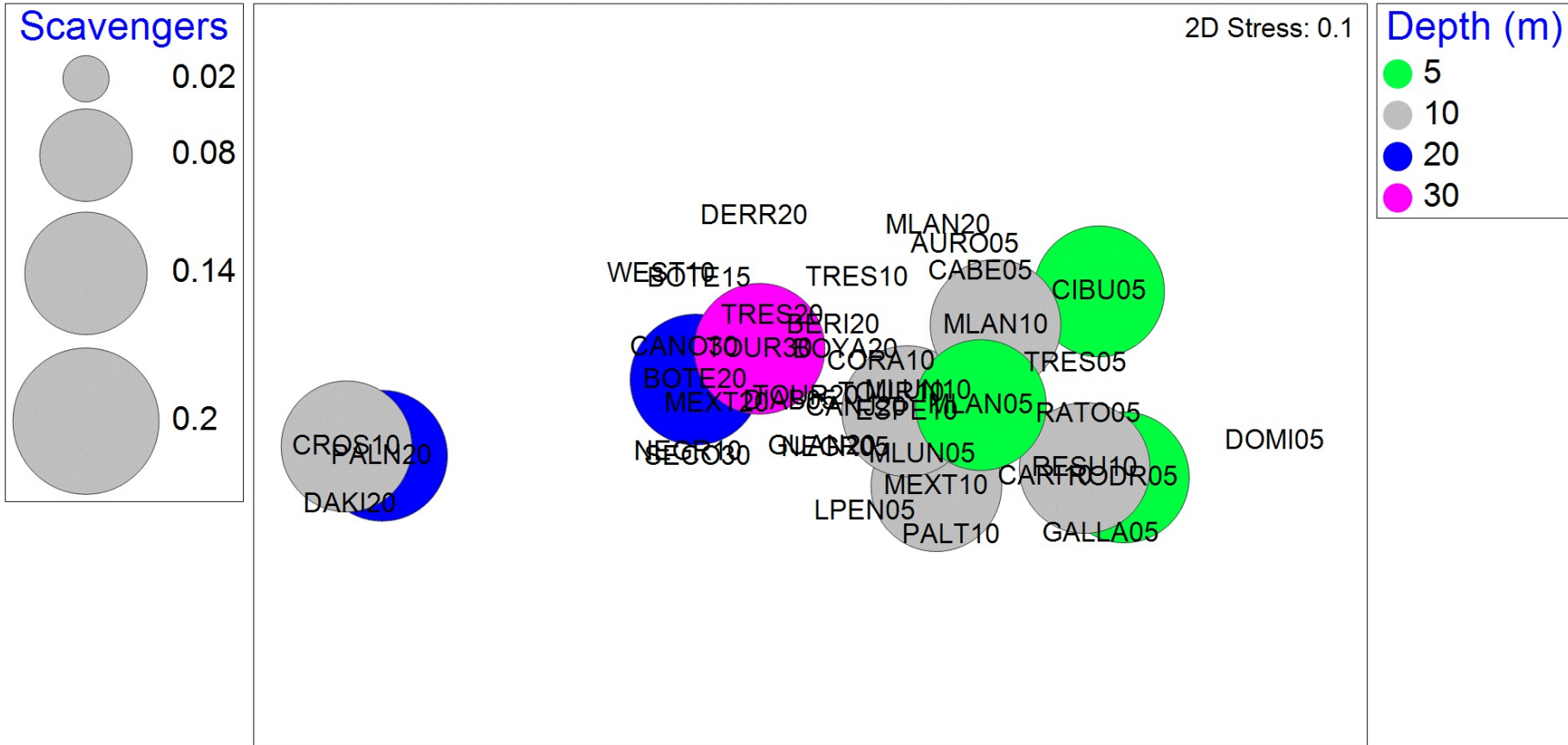
Standardise Samples by Total
Transform: Square root
Resemblance: S17 Bray-Curtis similarity



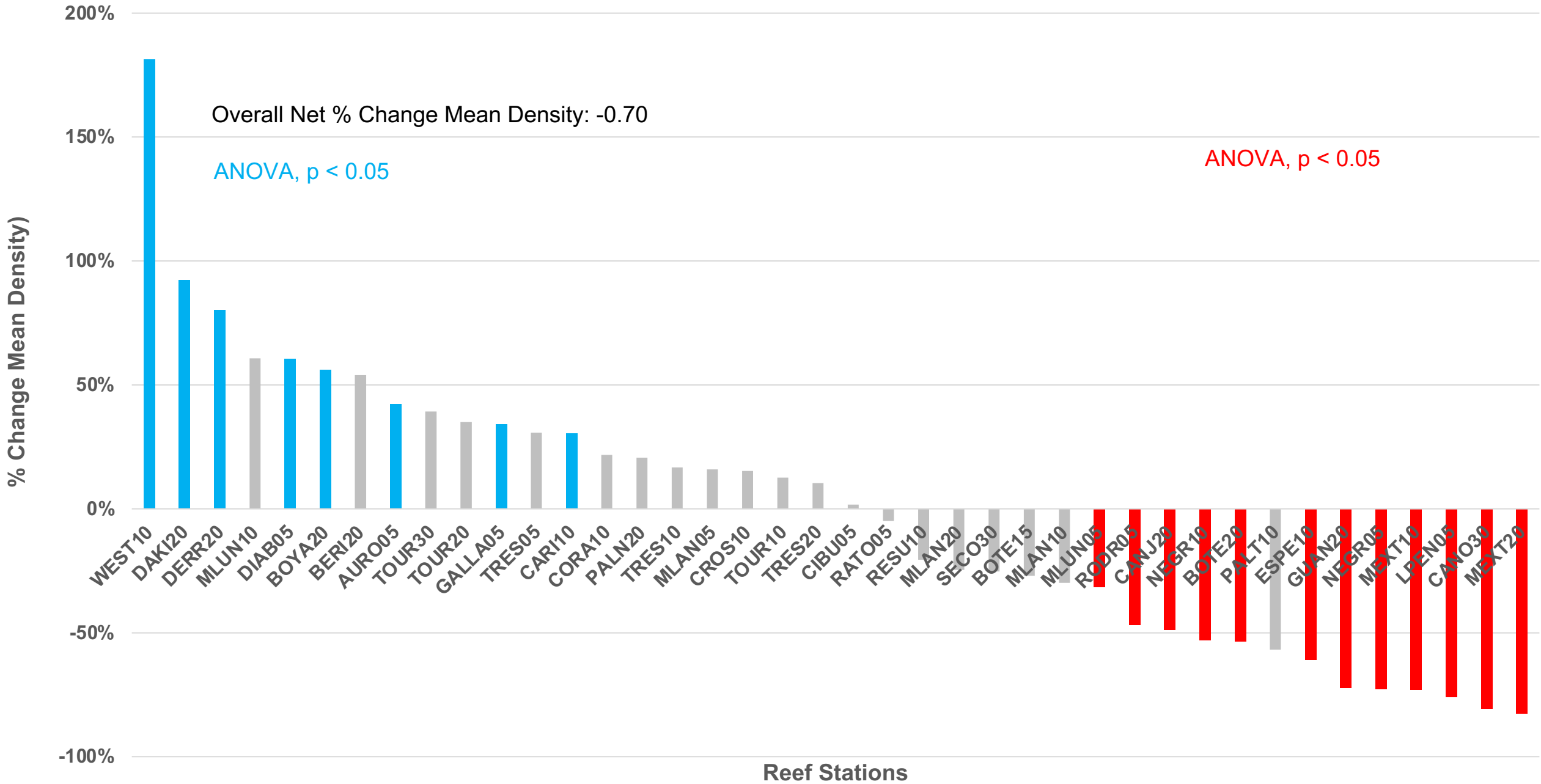
Fish Trophic Structure - PRCRMP 2018-2019 Surveys

Non-metric MDS

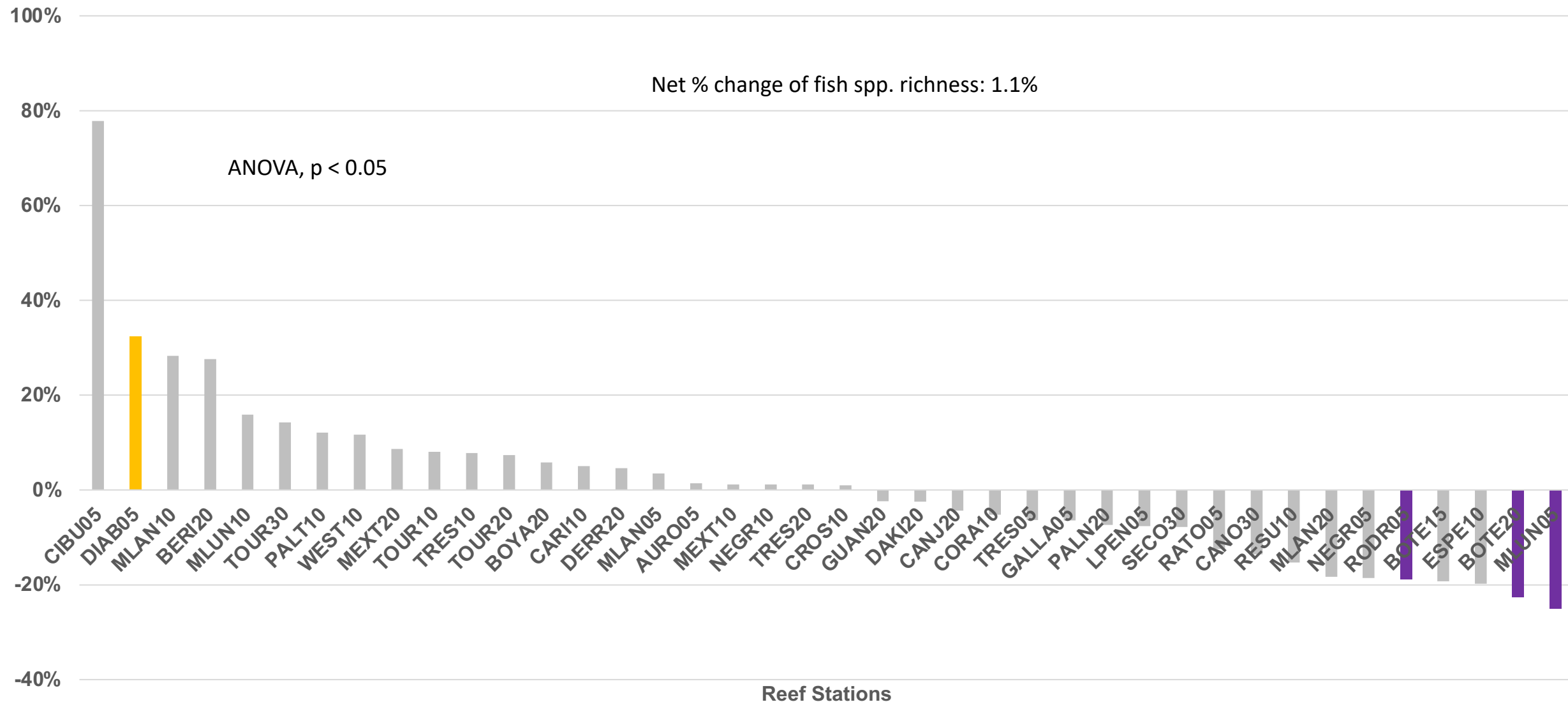
Standardise Samples by Total
Transform: Square root
Resemblance: S17 Bray-Curtis similarity



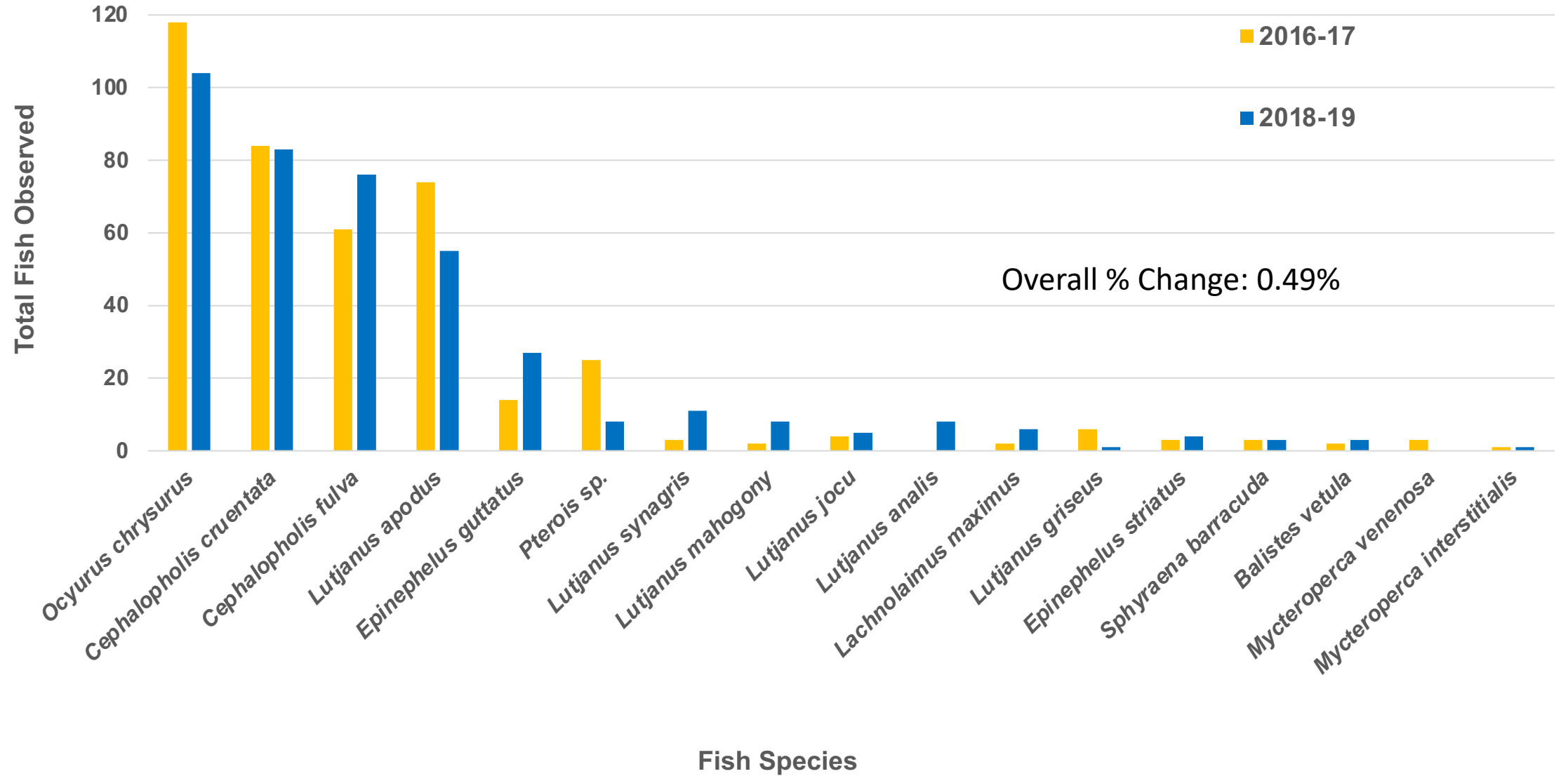
Percent change of mean fish density between 2018-2019 and previous surveys (2016-2017)



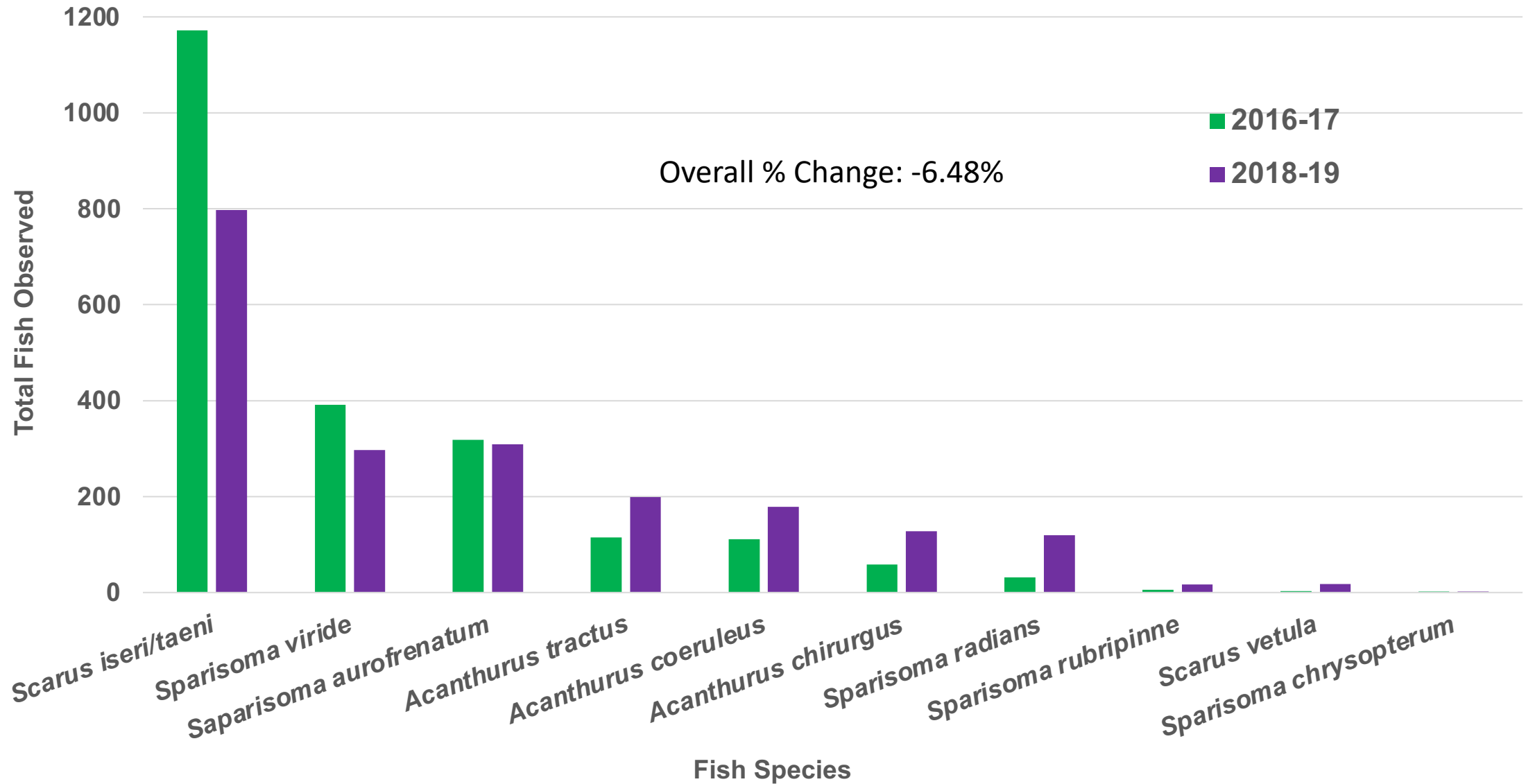
Percent change of fish species richness between the 2018-19 and previous surveys (2016-17)



Variation of Mid/Large Demersal Carnivorous Fish Abundance Between the 2018-20 and Previous Surveys (2016-17)



Variation of Mid/Large Herbivorous Fish Abundance Between the 2018-20 and Previous Surveys (2016-17)





Questions???