BASELINE MONITORING OF ROCKY REEF AND KELP FOREST HABITATS OF THE NORTH COAST STUDY REGION

Dr. Ryan Jenkinson (Postdoc) & Dr. Sean Craig (HSU, Faculty)

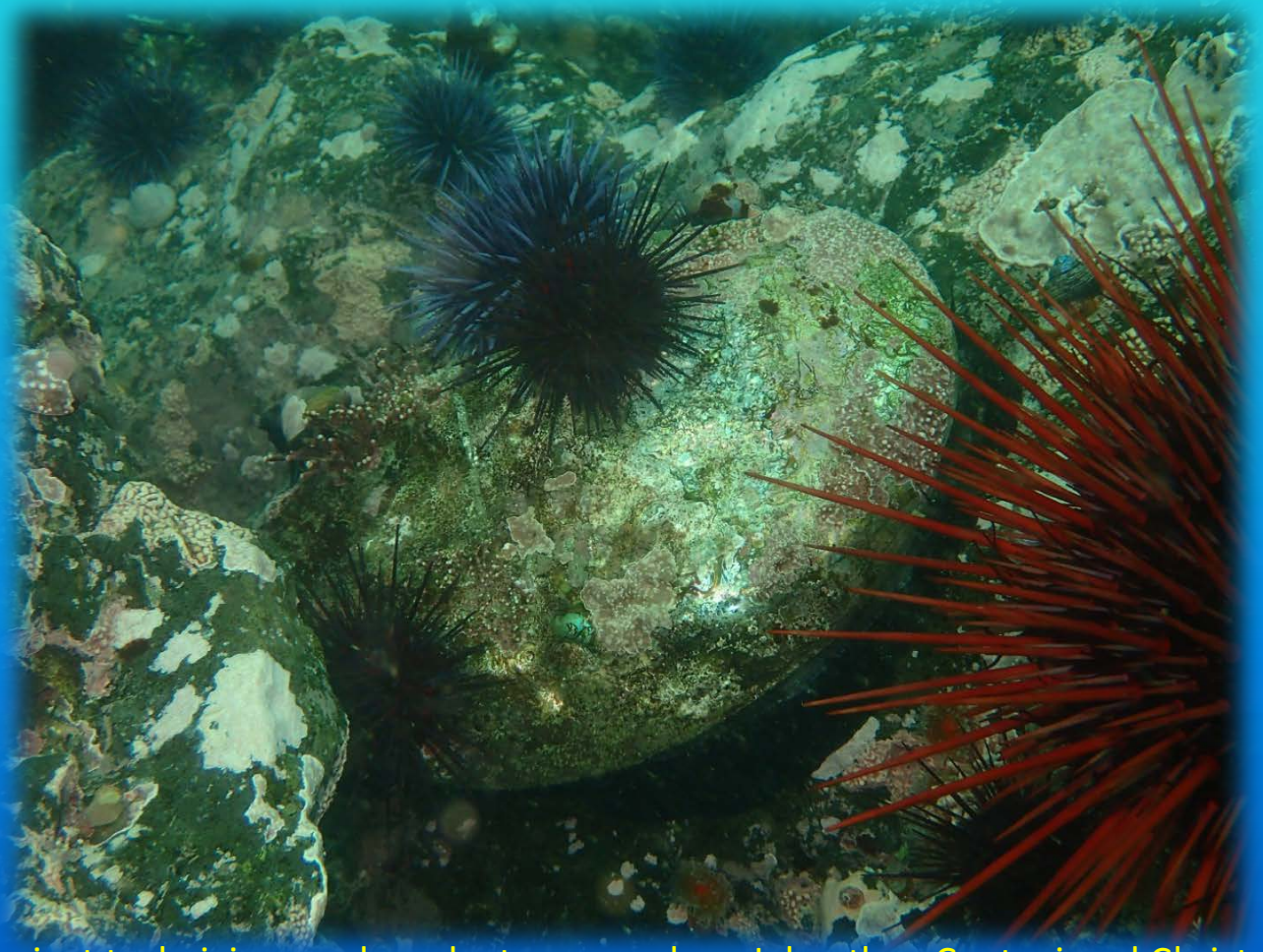


Photo credits: Project technicians and graduate researchers Johnathan Centoni and Christopher Teague

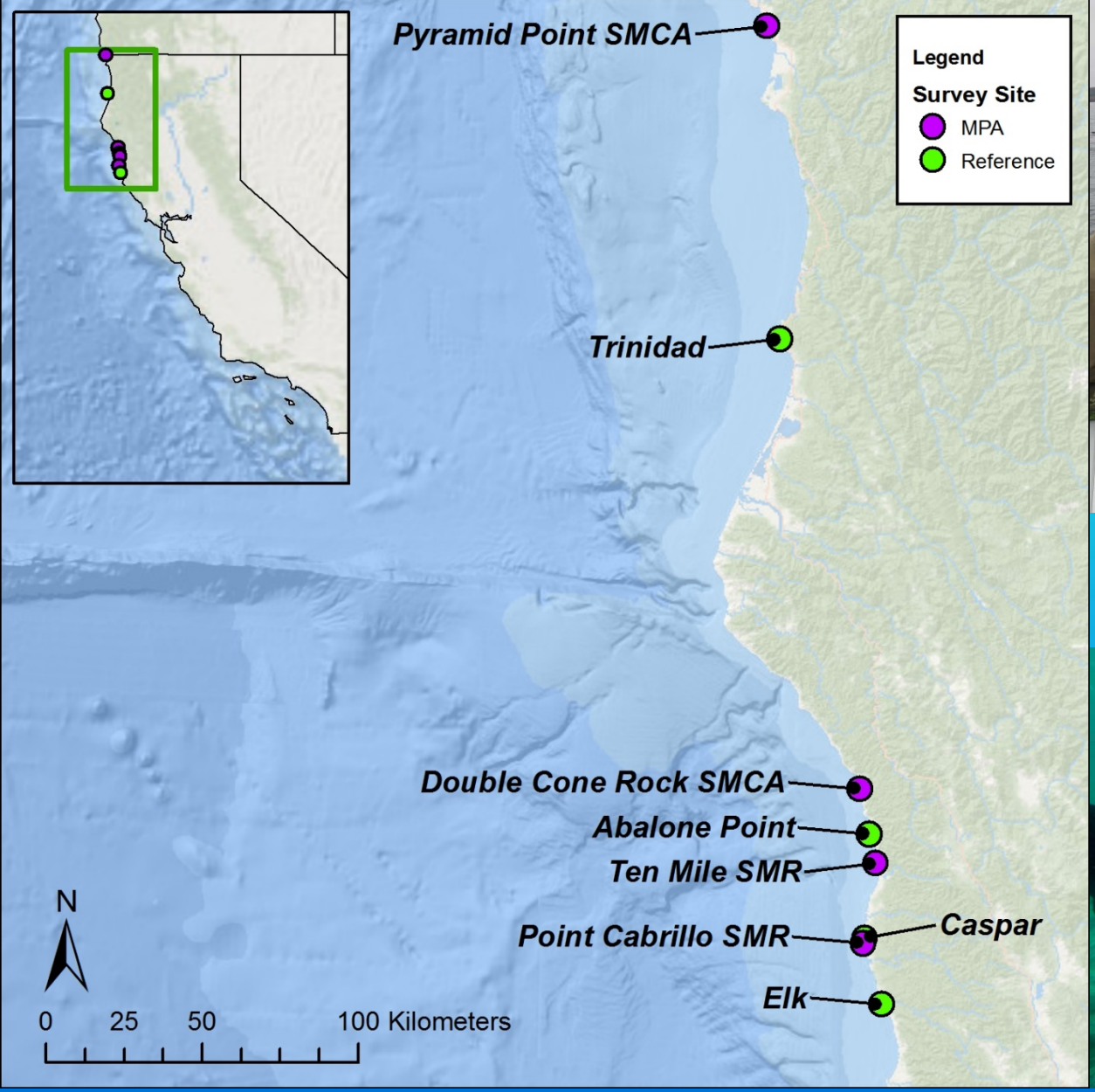
Acknowledgements:

SCUBA Divers- LEAD Dive Team:

- Ryan Jenkinson (Postdoc)
- Johnathan Centoni (Grad student-Craig Lab)
- Franklin Moitoza (Grad student-Craig Lab)
- Chris Teague (Grad student- Tissot Lab)

Additional SCUBA Divers:

- Doug Simpson
- Brett Stacey
- Maia Grodin
- Allison Lui
- Tim Moxon
- Jolene Evans
- Johnny Roche
- Leah Stamper
- William ray
- Olivia Barry
- Jeff Bernard
- Kyle weiss



HSU SCUBA divers in action

Figure 1. Locations of subtidal rocky reef baseline monitoring survey sites along the North Coast of California

Methods (2014-2015):

I. Sampled w/SCUBA & 19’ & 22’ HSU vessels

II. Each site divided into 3 “Cells” (PISCO Methods)

III. At each site-Surveys done in each cell at several depths:

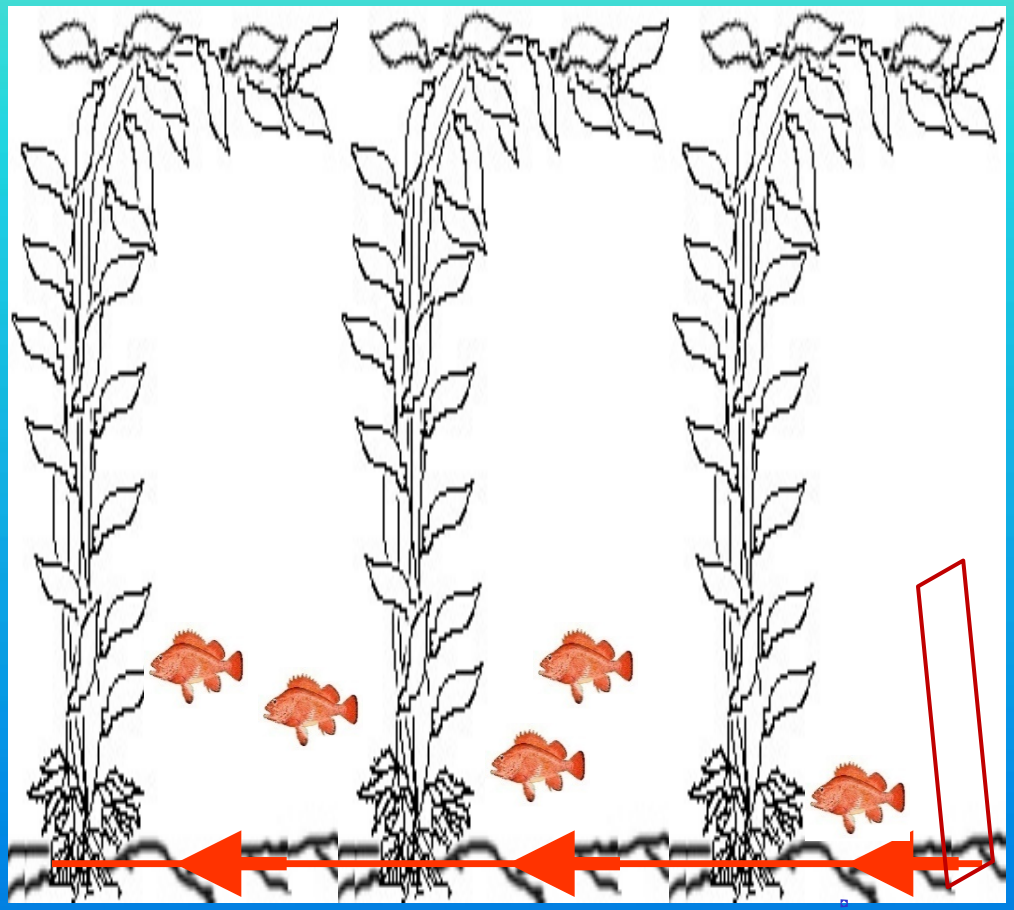
a) Uniform point contact (UPC)-percent cover of benthic species, habitat type & Reef rugosity

b) Swath surveys- size/abundance of red abs & red urchins

c) Swath surveys-density of macroinverts & algae

d)Swath surveys-Sizes & density of all fishes

Moving Windows



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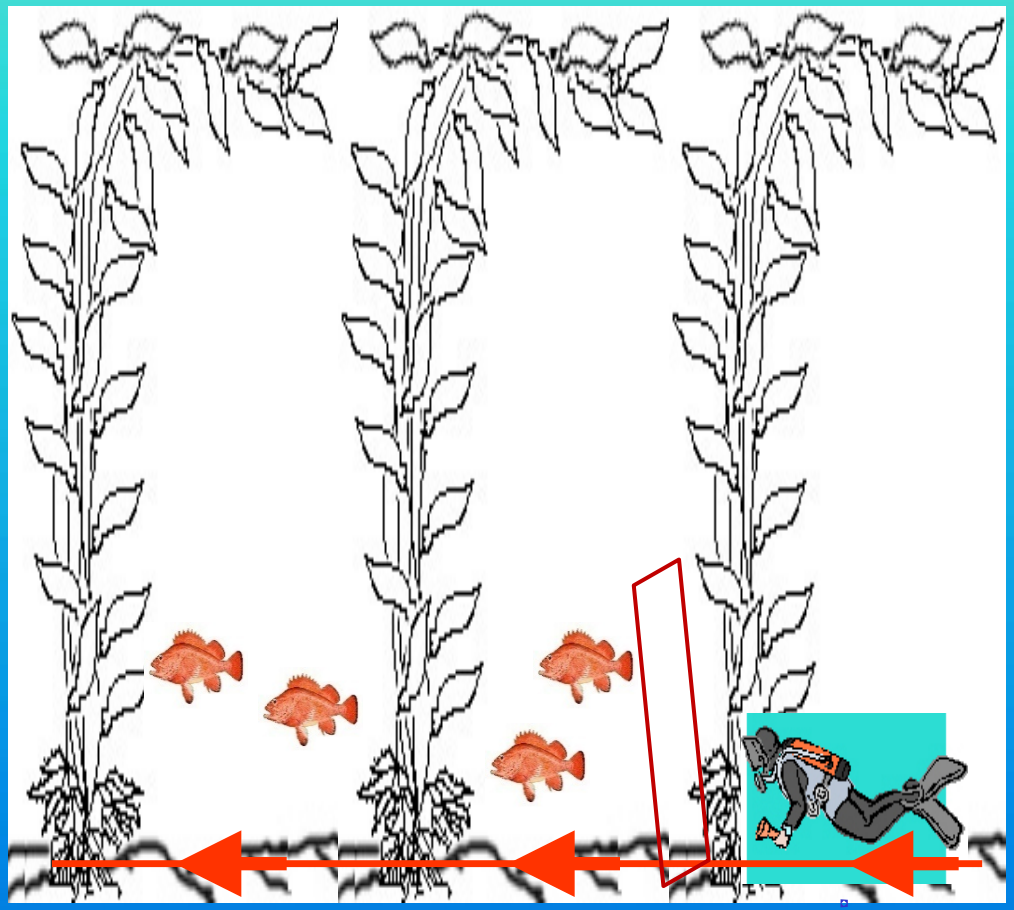

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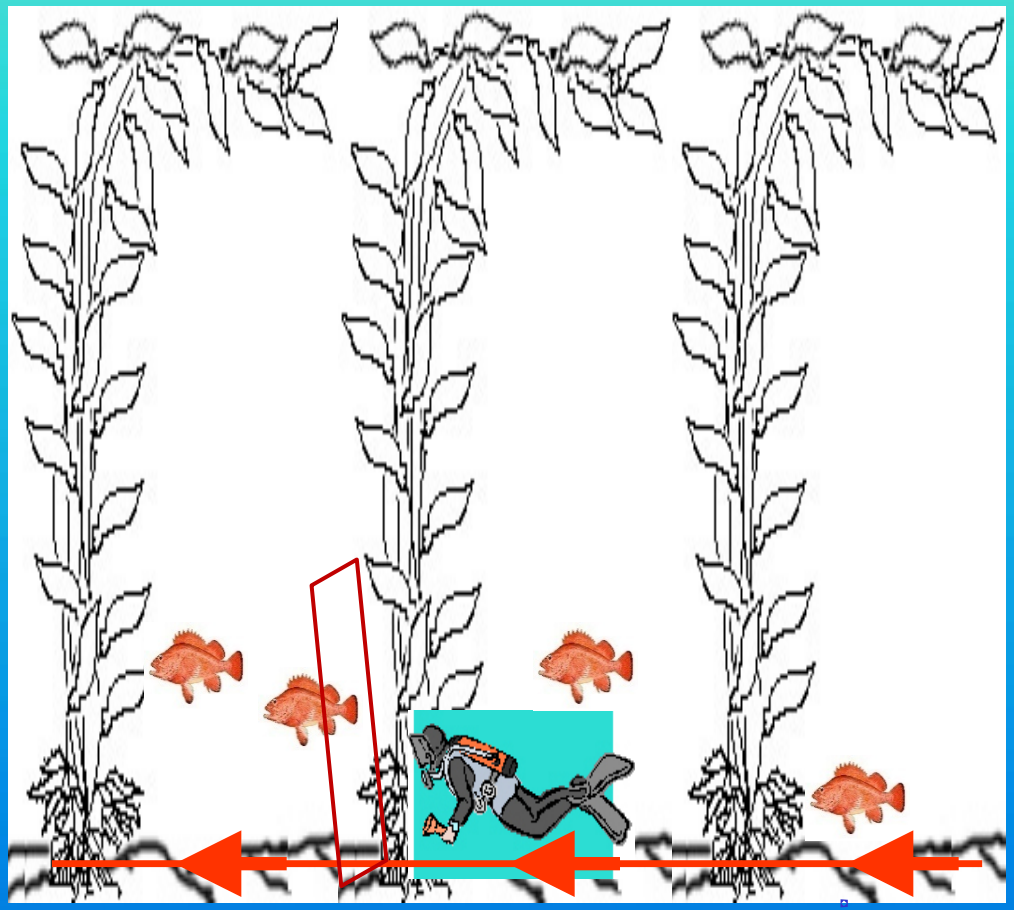

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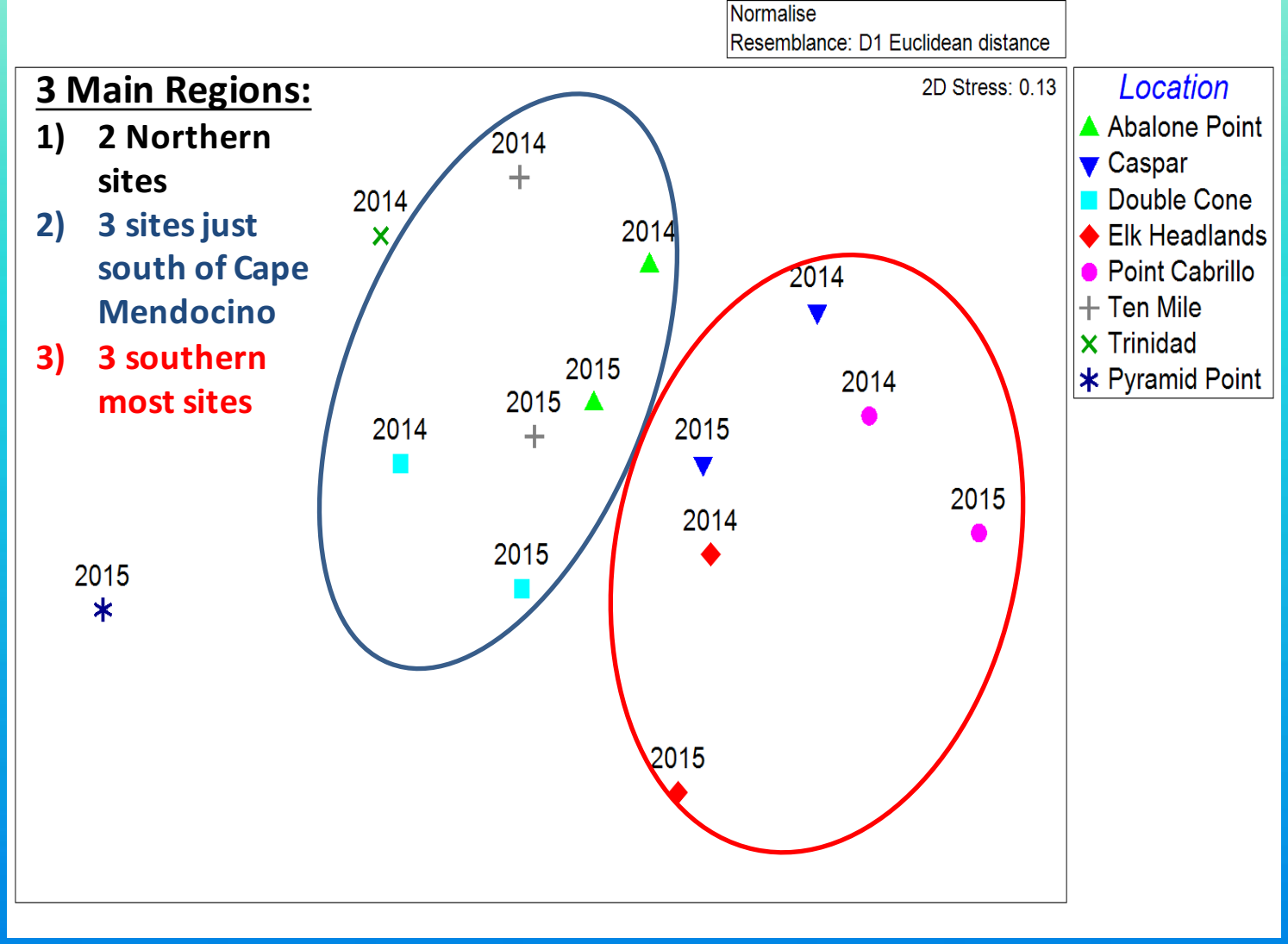

Figure 2. Multi-dimensional scaling plot (MDS) of community structure based on percentage of benthic cover, macroinvertebrates, macroalagae, and nearshore fish species combined. Each point represents the community sturcture at that site summed for each year. Points closer to eachother indicate closer similarity in community structure.

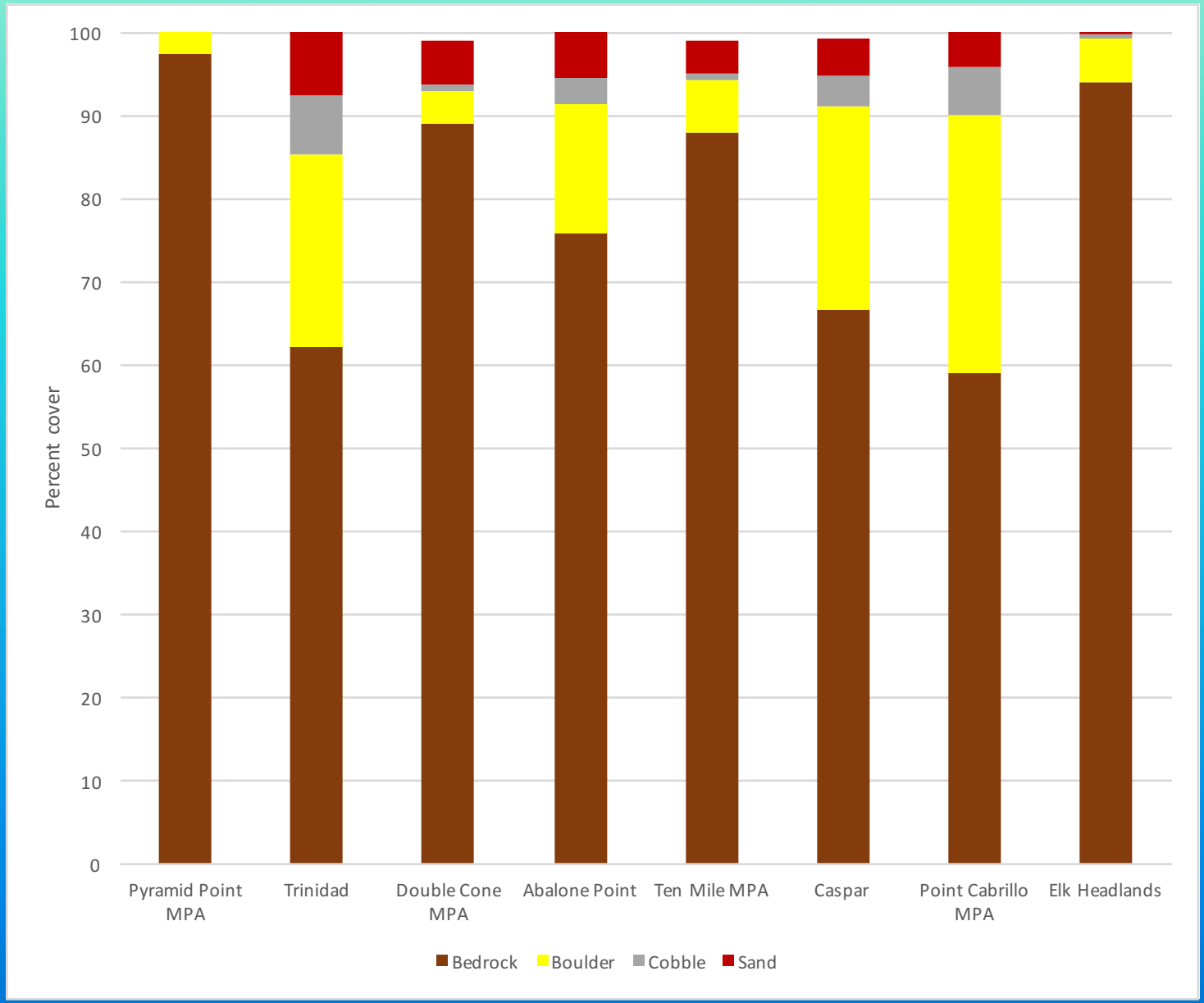

Figure 3. Mean percent cover of the four substrate types estimated during UPC diver surveys at all sites. Data represent means from all surveys within at cells at all depths at each site.

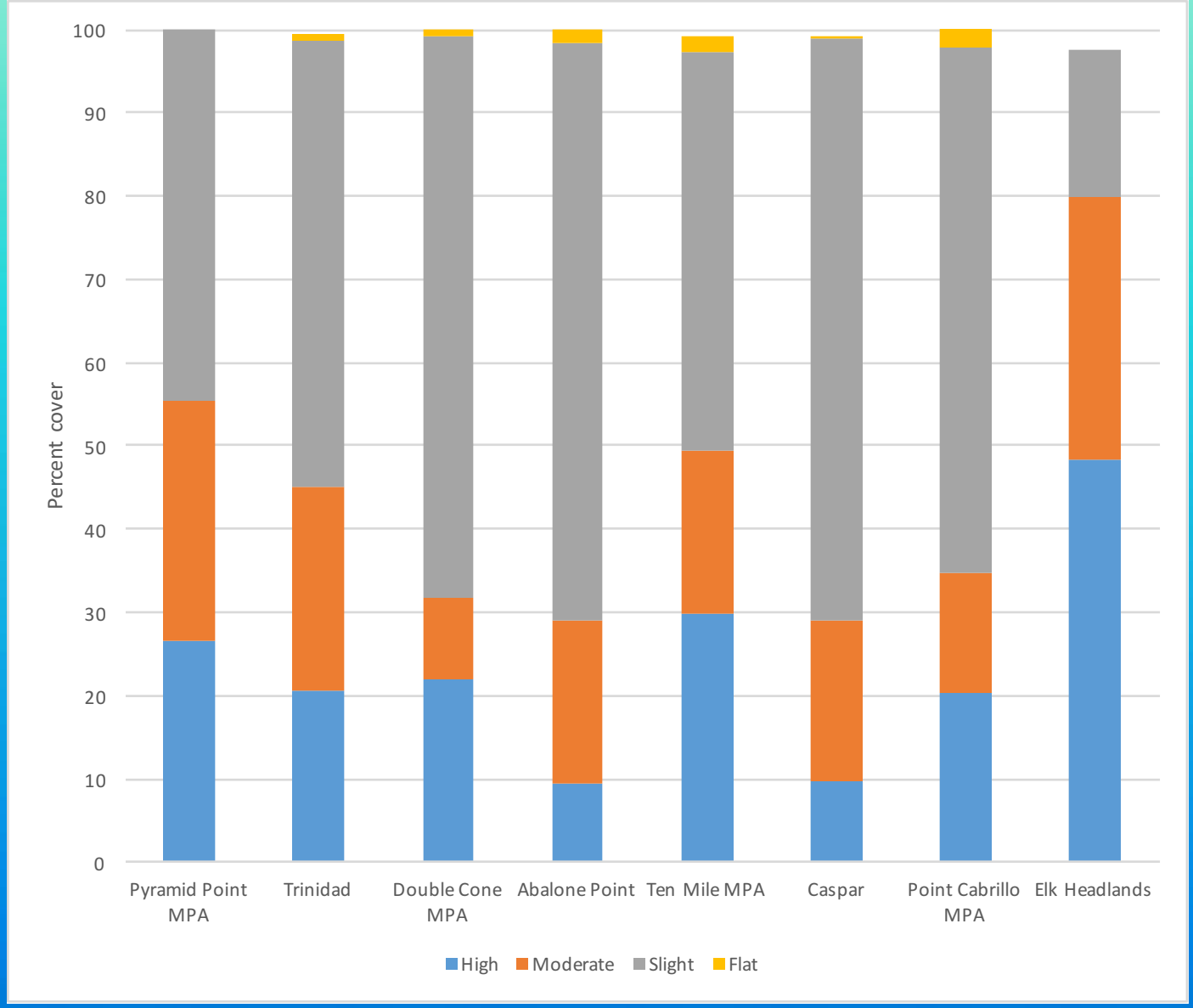

Figure 4. Mean percent of the four categories of vertical relief estimated during UPC diver surveys at all sites. Data represent means from all surveys within at cells at all depths at each site.

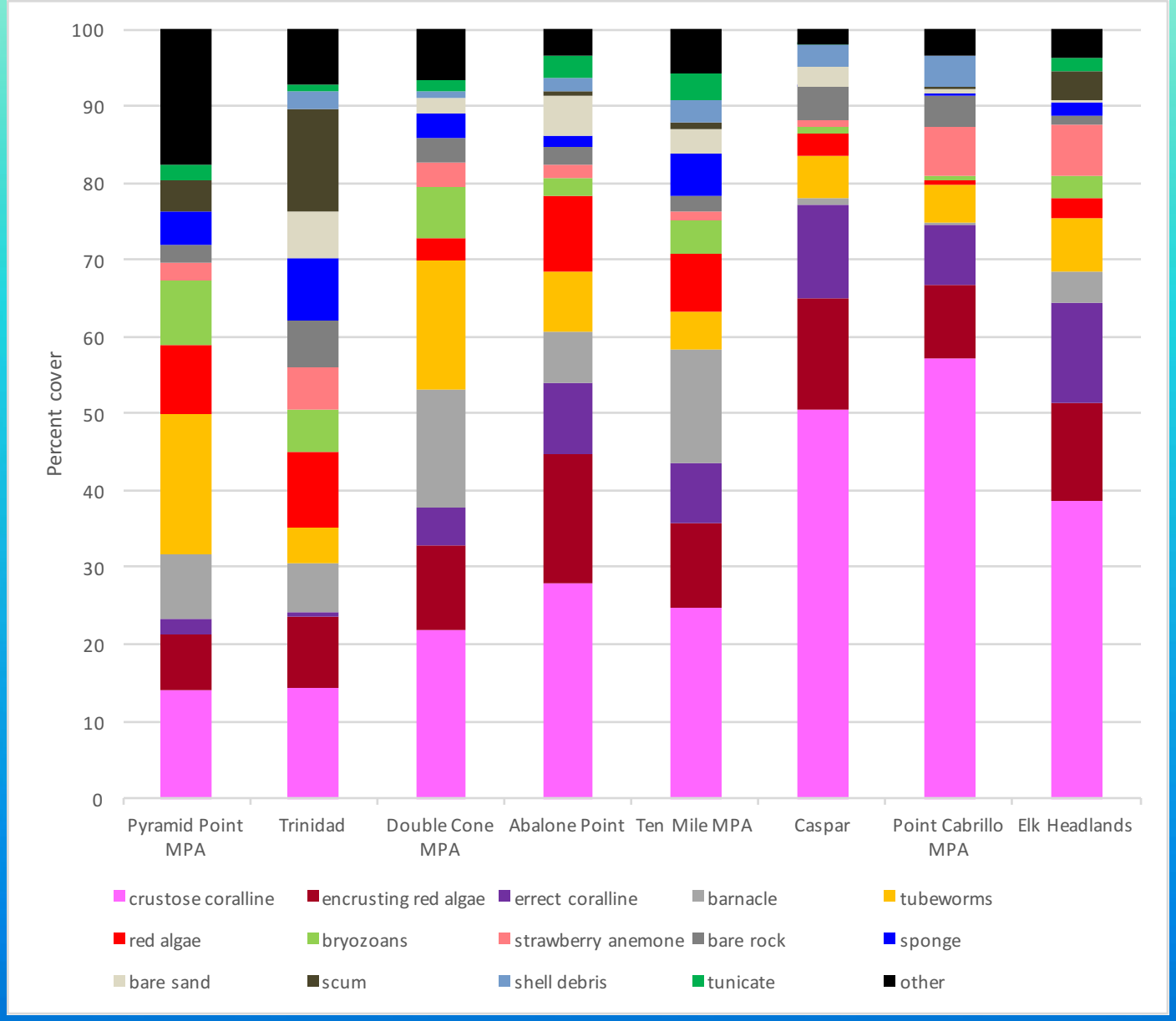

Figure 5. Mean percent cover of the 15 most abundant algal, sessile and colonial invertebrate, and non-living groups estimated during UPC diver surveys at all sites. Data represent means from all surveys within at cells at all depths at each site.

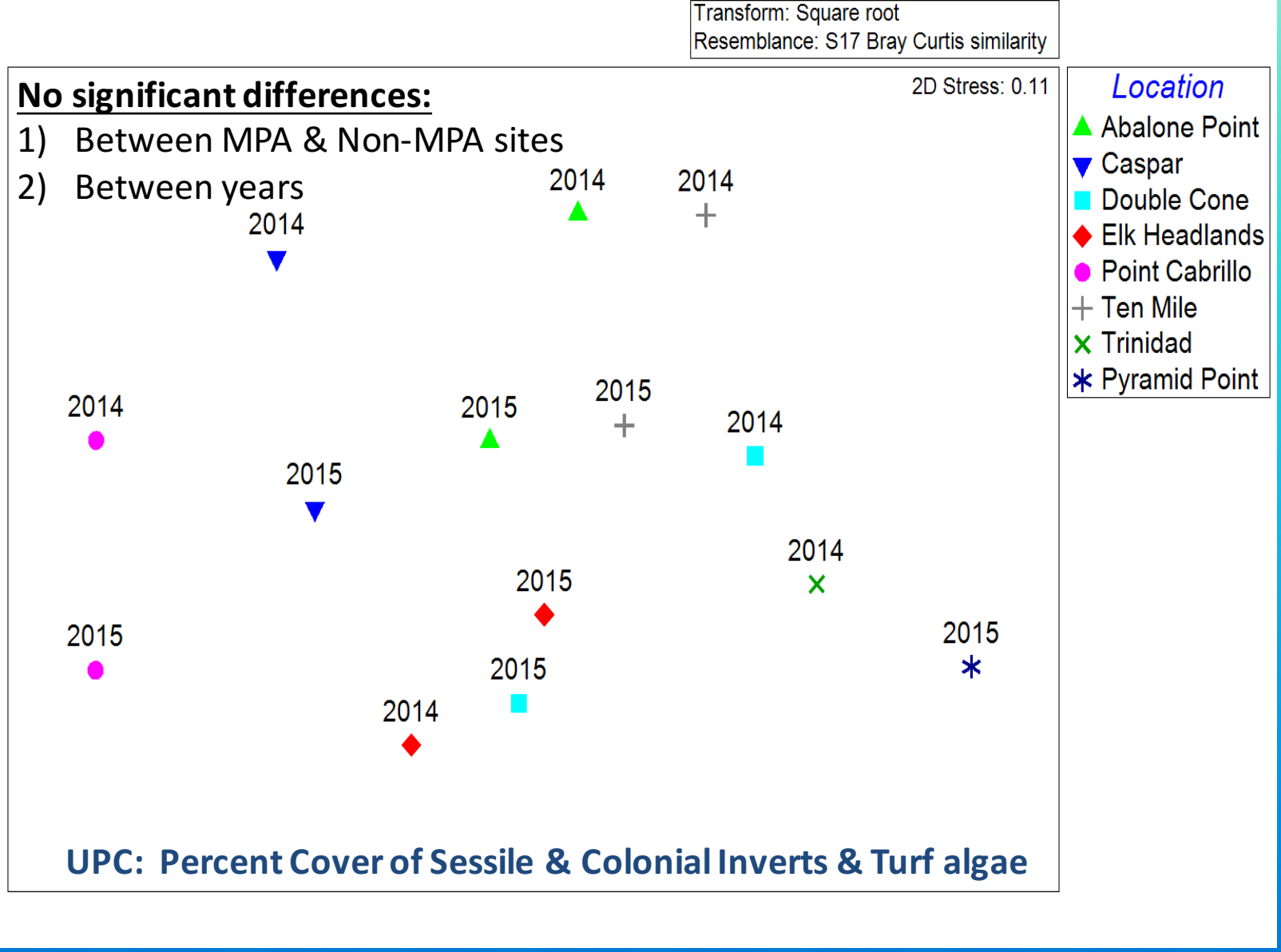

Figure 6. Multi-dimensional scaling plot (MDS) of community structure based on the percent cover of sessile and colonial invertebrates and turf algal species estimated on UPC surveys. Each point represents the community structure at that site summed for each year. Points closer to each other indicate closer similarity in community

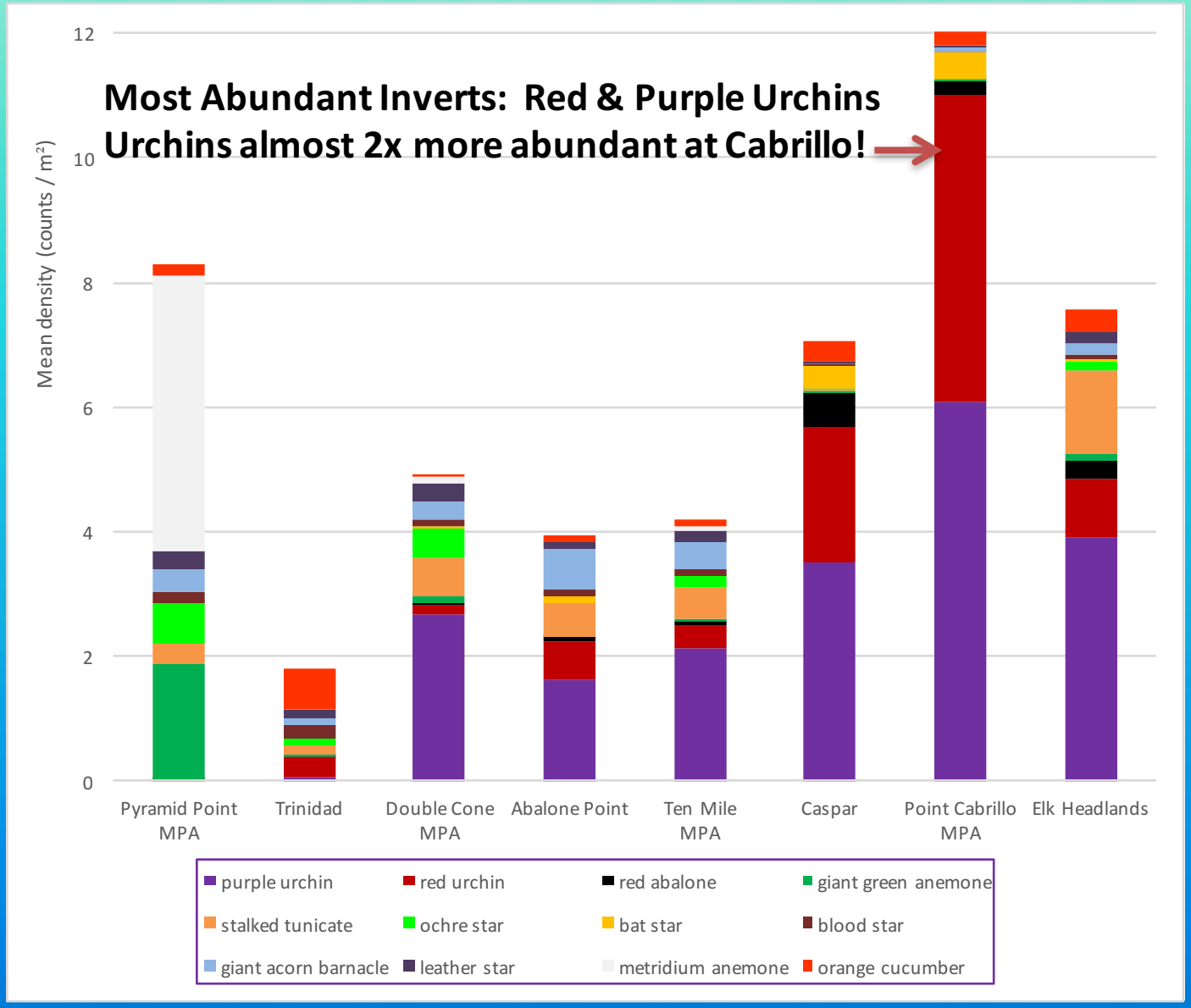

Figure 7. Mean densities of the 12 most abundant macroinvertebrate species enumerated during benthic swath surveys at all sites. Data represent means from all surveys within at cells at all depths at each site.

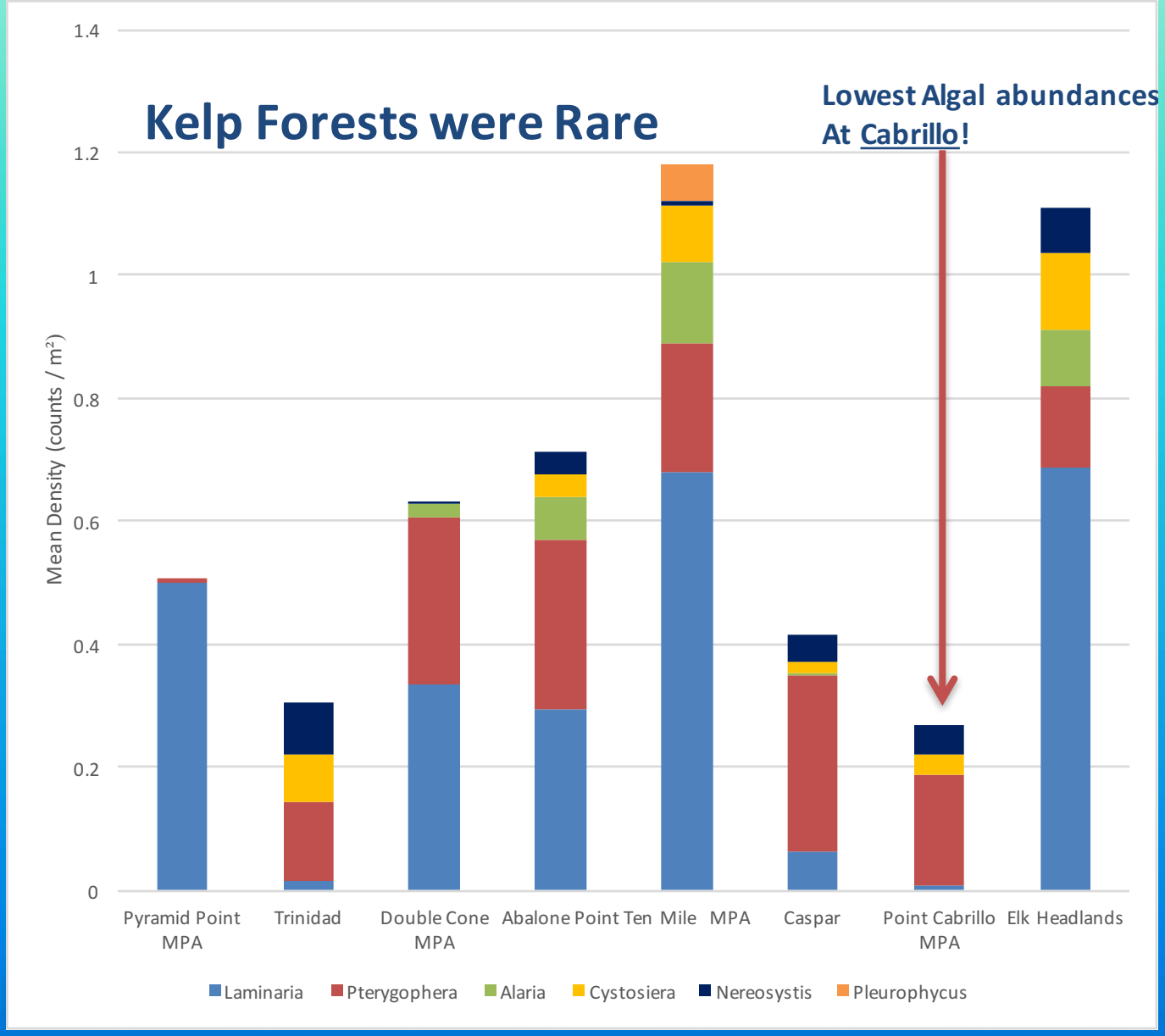

Figure 8. Mean densities of the six most abundant macroalgal species enumerated during benthic swath surveys at all sites. Data represent means from all surveys within at cells at all depths at each site.

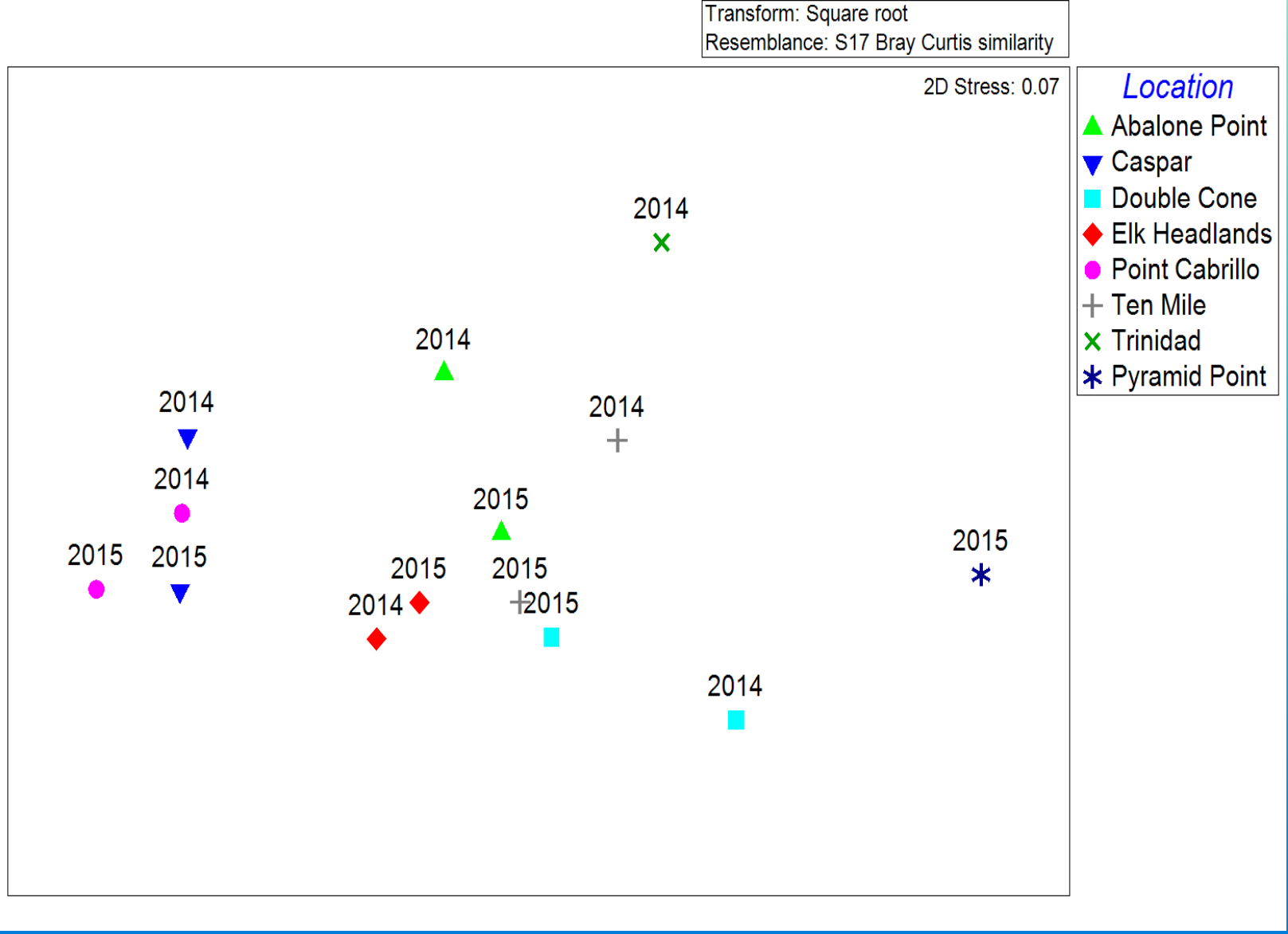

Figure 9. Multi-dimensional scaling plot (MDS) of community structure based on the abundance of macroinvertebrates and stipitate algal species recorded on benthic swath surveys. Each point represents the community structure at that site summed for each year. Points closer to each other indicate closer similarity in community structure.

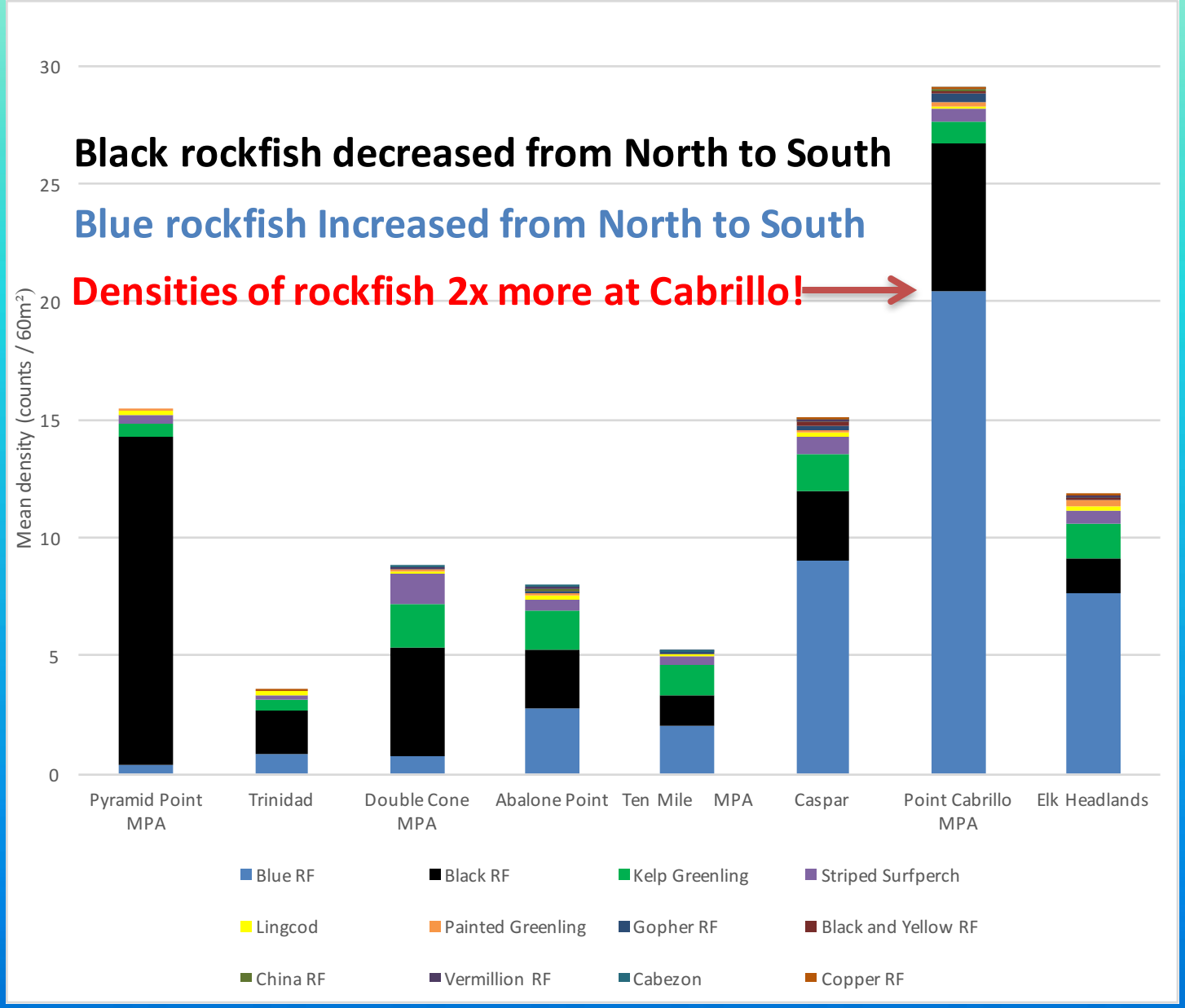

Figure 10. Mean densities of the 12 most abundant fish species enumerated during swath surveys at all sites. Data represent means from all surveys within at cells at all depths at each site. Young of the year rockfish are excluded from data presented here.

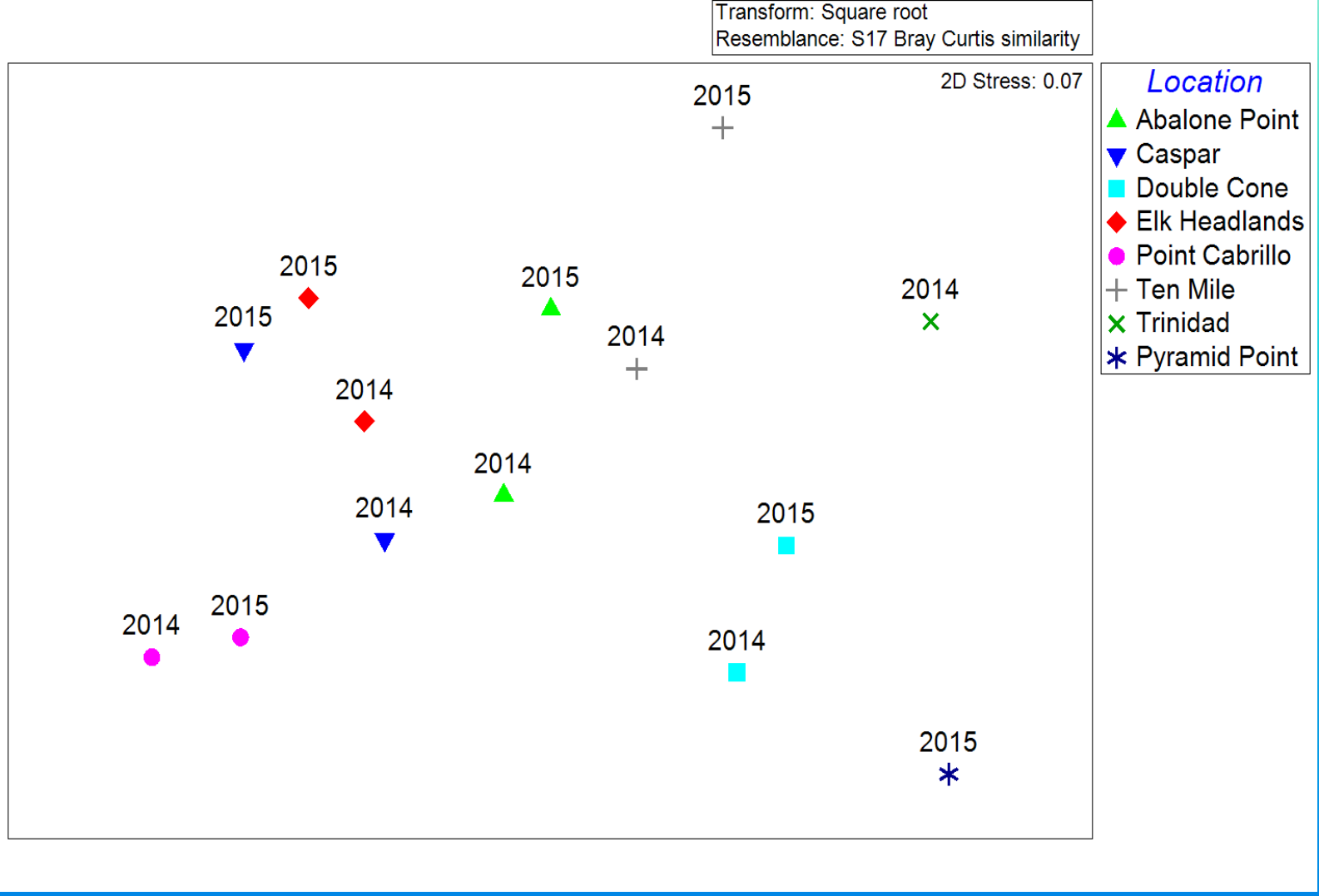

Figure 11. Multi-dimensional scaling plot (MDS) of community structure based on surveyed fish assembledges including only adult sized fish (excluding young of the year rockfish species). Each point represents the community sturcture at that site summed for each year. Points closer to each other indicate closer similarity in community structure.

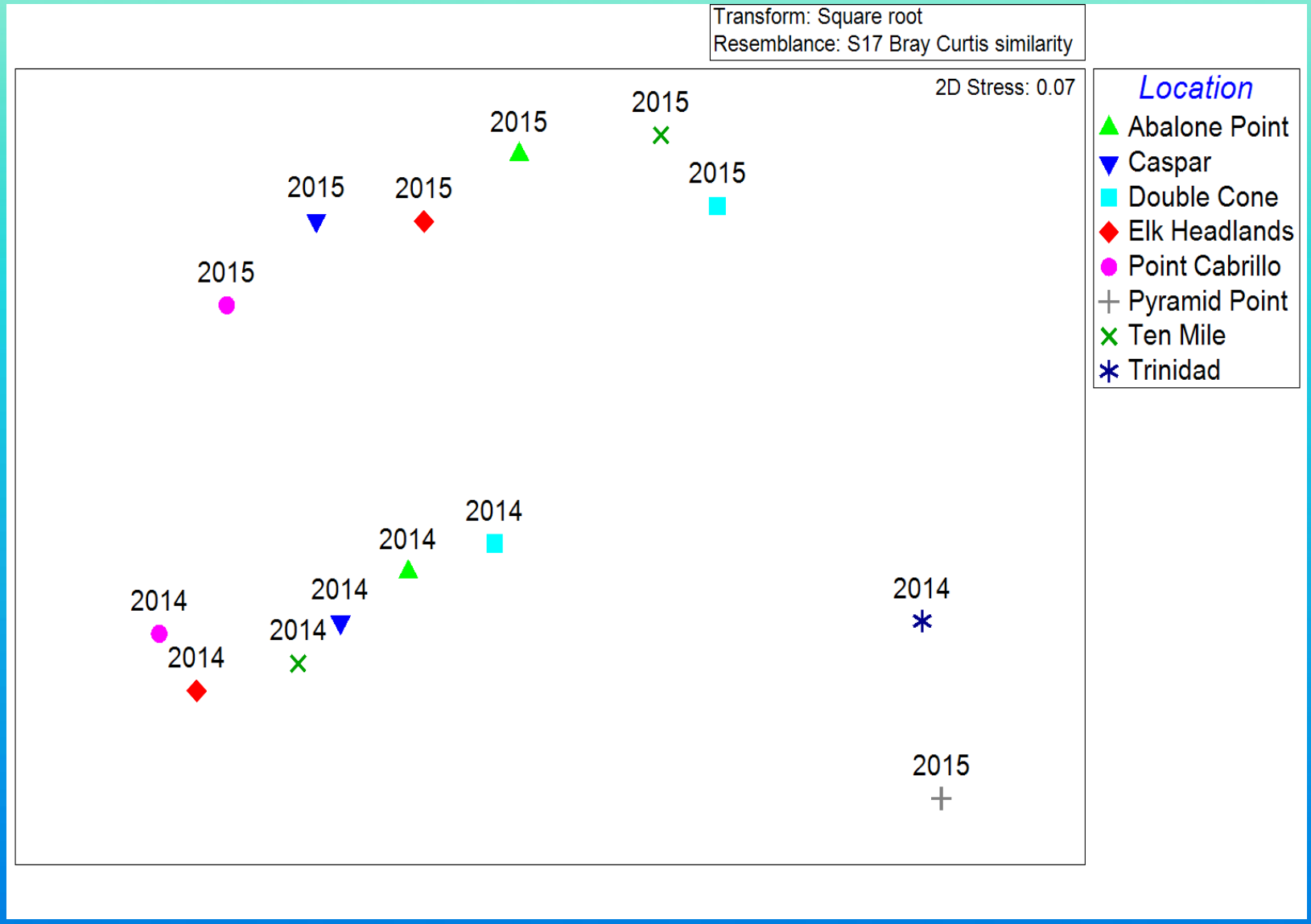

Figure 12. Multi-dimensional scaling plot (MDS) of community structure based on surveyed fish assemblages. Each point represents the community structure at that site summed for each year. Points closer to each other indicate closer similarity in community structure.

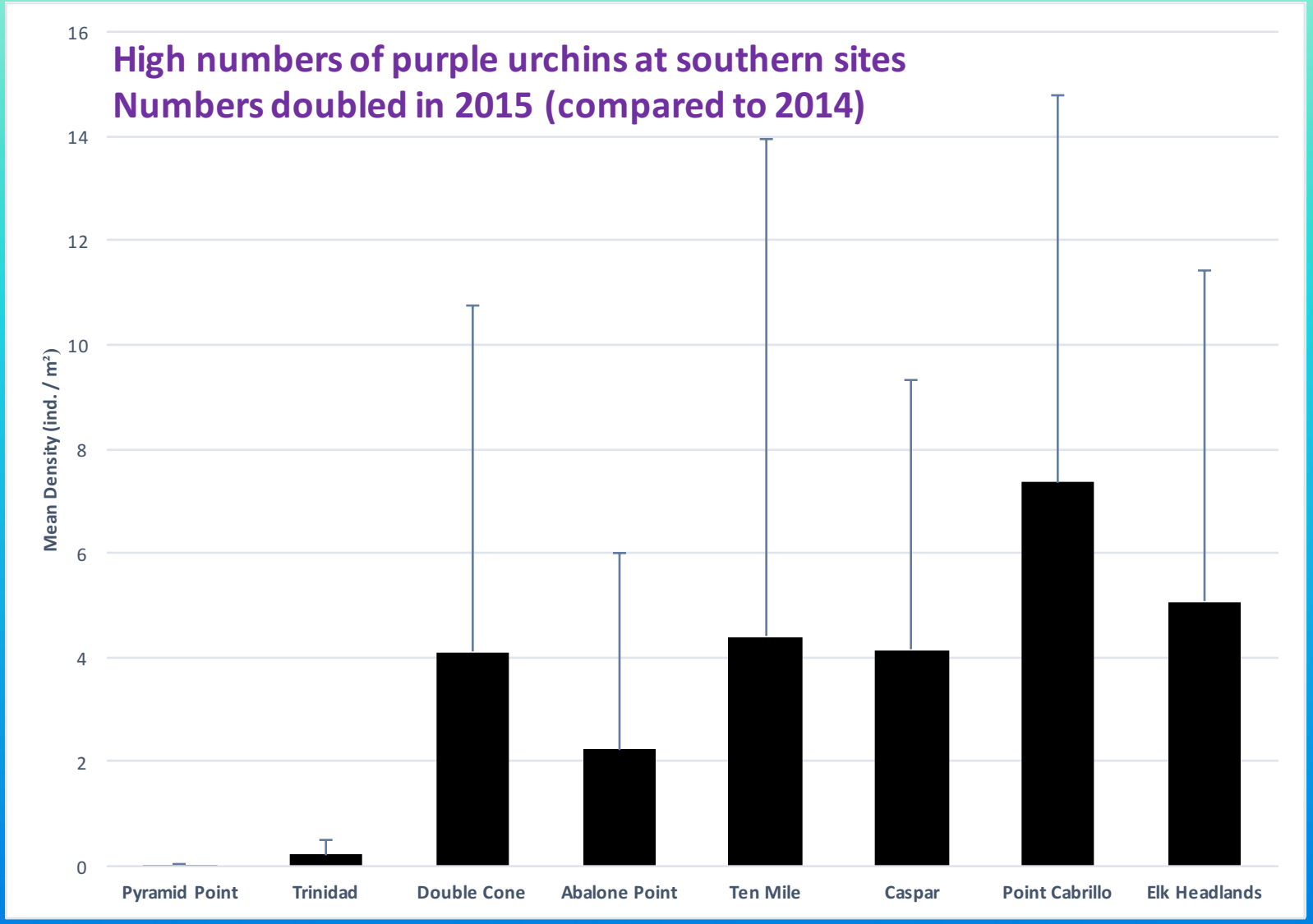

Figure 13. Mean density of purple sea urchins enumerated during both benthic swath and targeted urchin and abalone surveys. Densities represent means of all transects at all depths within each cell in 2014 and 2015. Error bars indicate a single standard deviation from the mean densities.

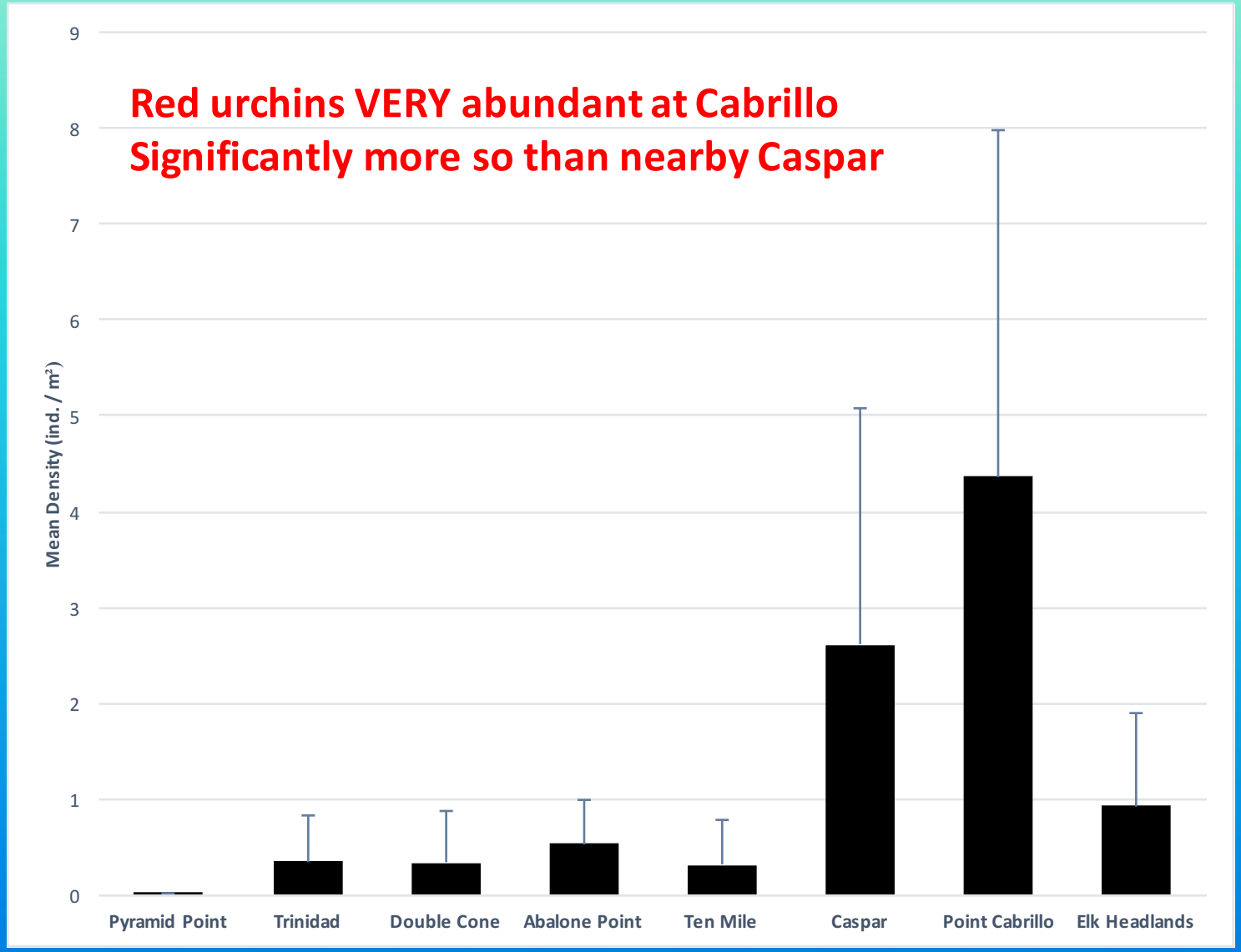

Figure 14. Mean density of red sea urchins enumerated during both benthic swath and targeted urchin and abalone surveys. Densities represent means of all transects at all depths within each cell in 2014 and 2015. Error bars indicate a single standard deviation from the mean densities.

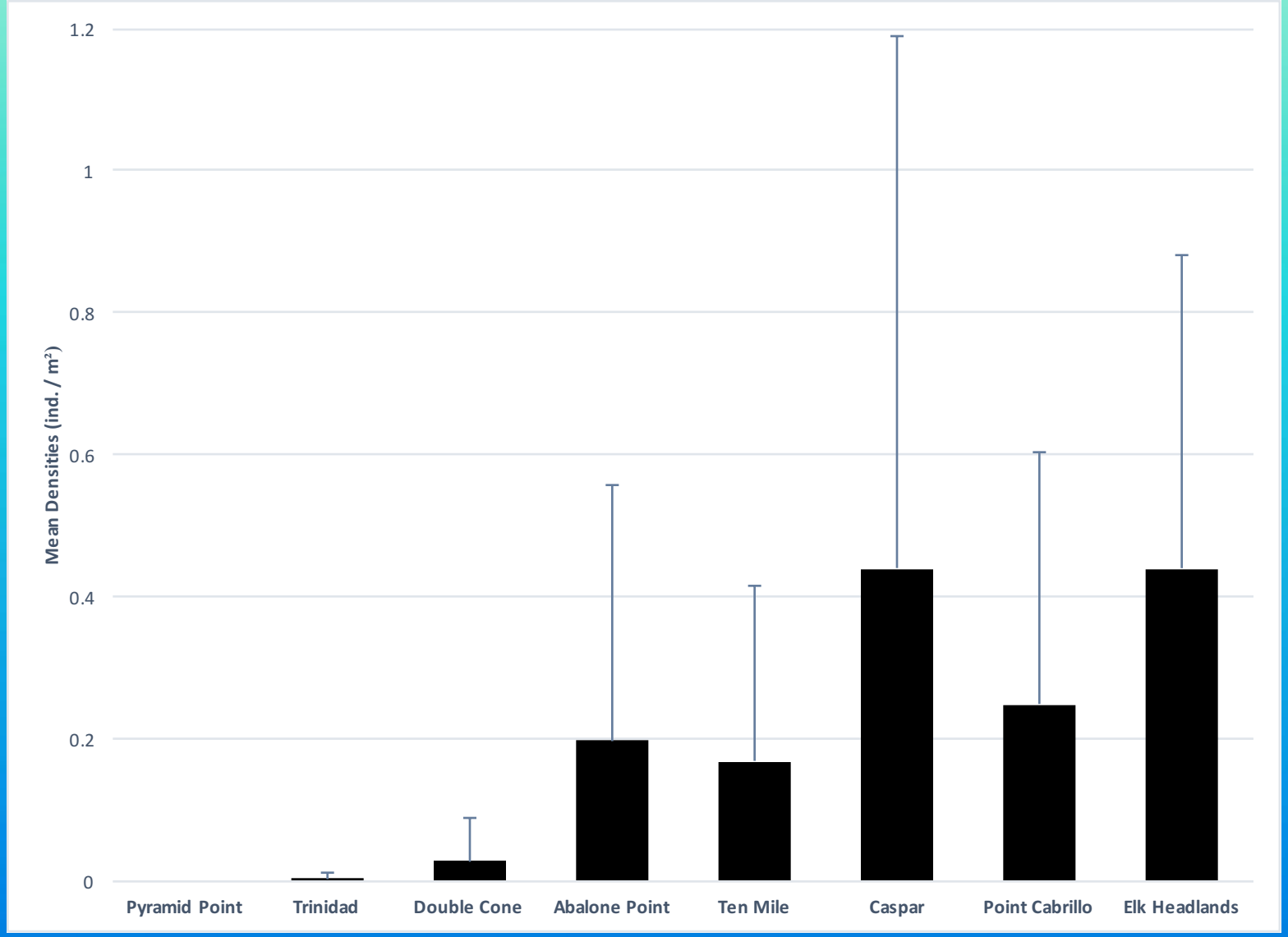

Figure 15. Mean density of red abalone enumerated during both benthic swath and targeted urchin and abalone surveys. Densities represent means of all transects at all depths within each cell in 2014 and 2015. Error bars indicate a single standard deviation from the mean densities.

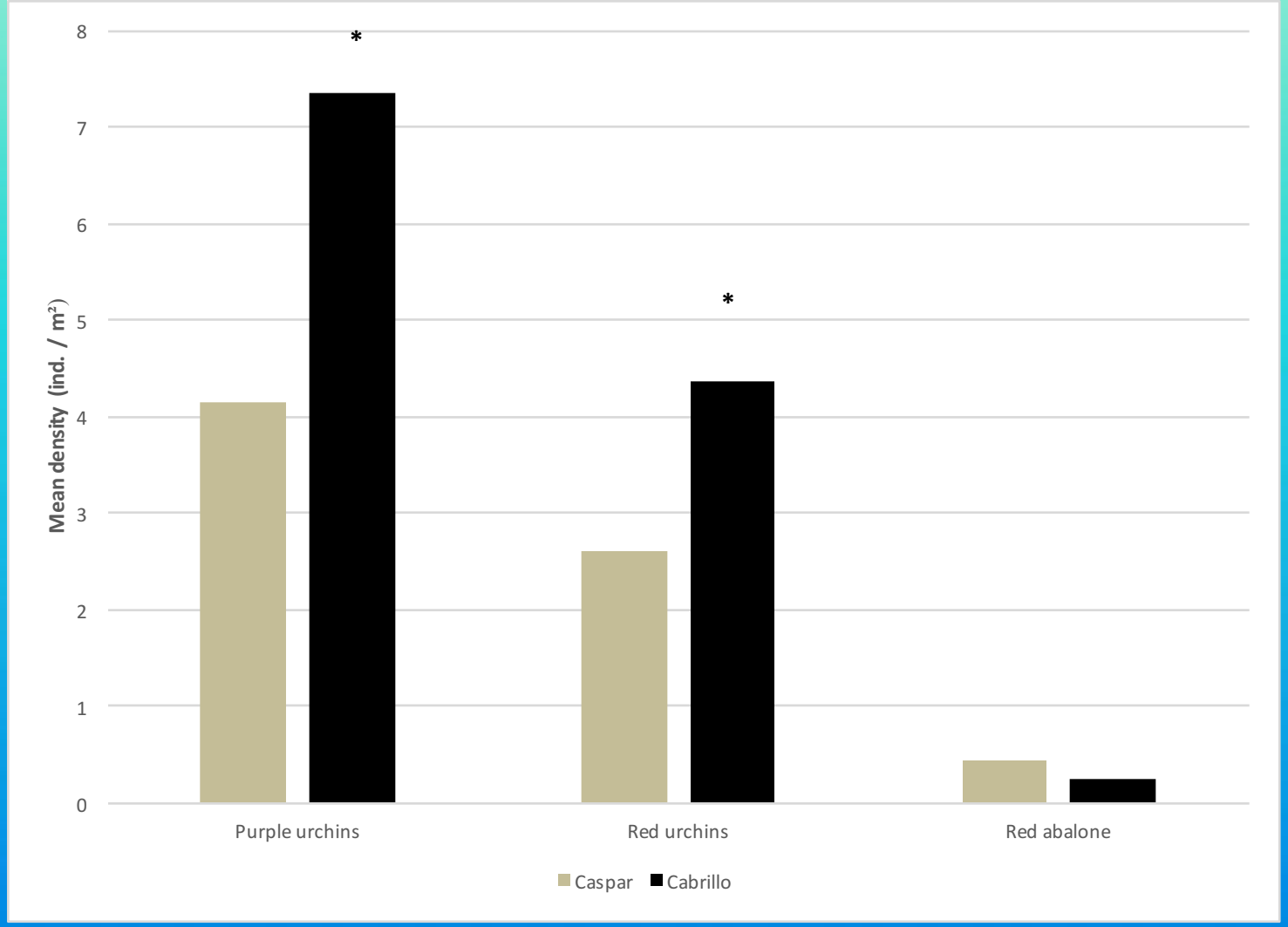

Figure 16. Comparison of purple sea urchins, red sea urchins, and red abalone densities at the adjacent Caspar reference site and the Point Cabrillo SMR site. Densities represent means of all transects at all depths within each cell in 2014 and 2015. See figures 13-15 for estimates of variance- SD bars removed from this figure so that mean differences were more apparent. * symbol denotes significant difference in density between the two survey types ($p < 0.05$).

Any Questions?

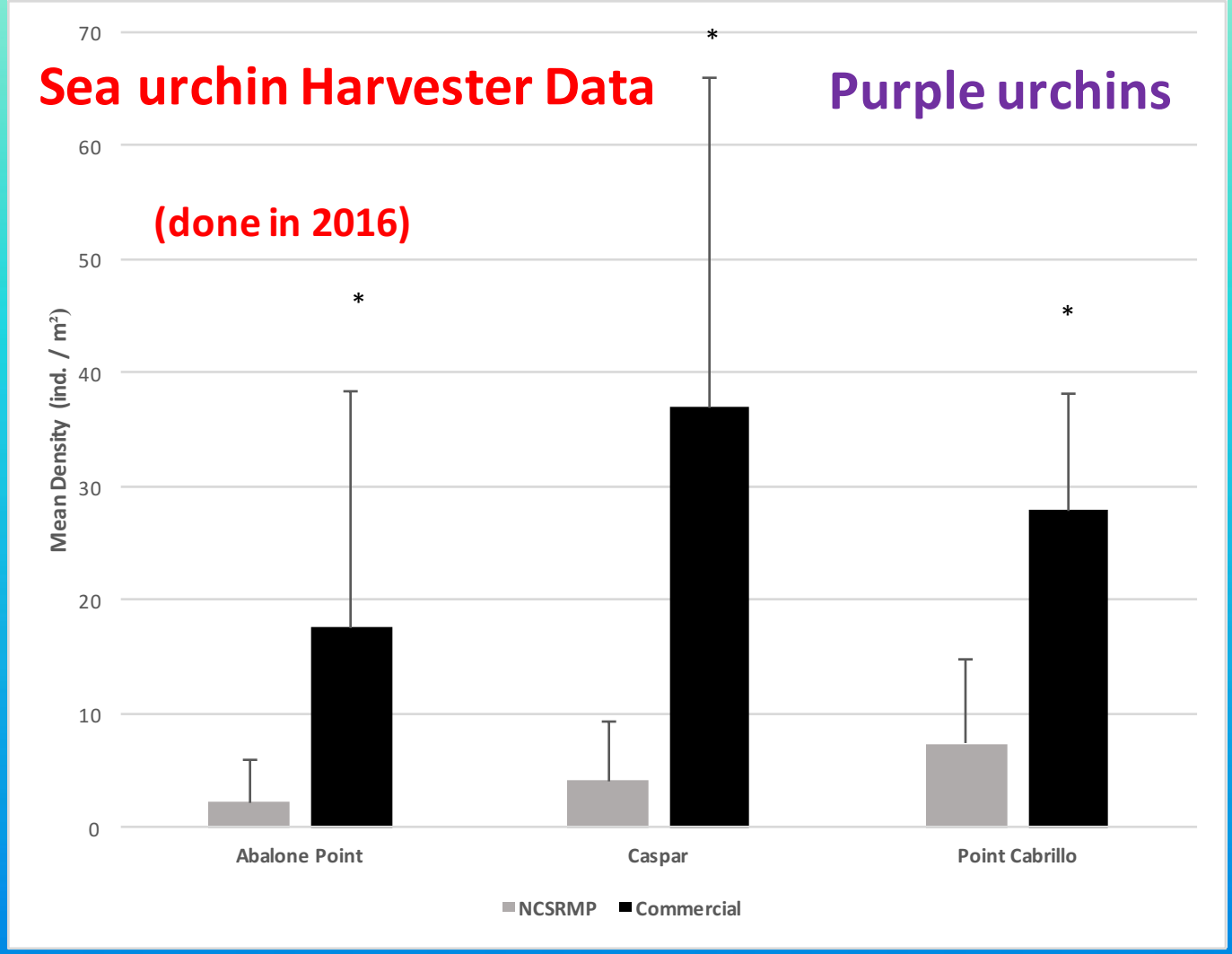

Figure 17. Comparison of mean purple sea urchin densities estimated at three sites by the North Coast Study Region Monitoring Program (NCSRMP) and commercial sea urchin divers. Sample size is not equal between survey groups. Error bars indicate a single standard deviation from the mean. * symbol denotes significant difference in density between the two survey types ($p < 0.05$).

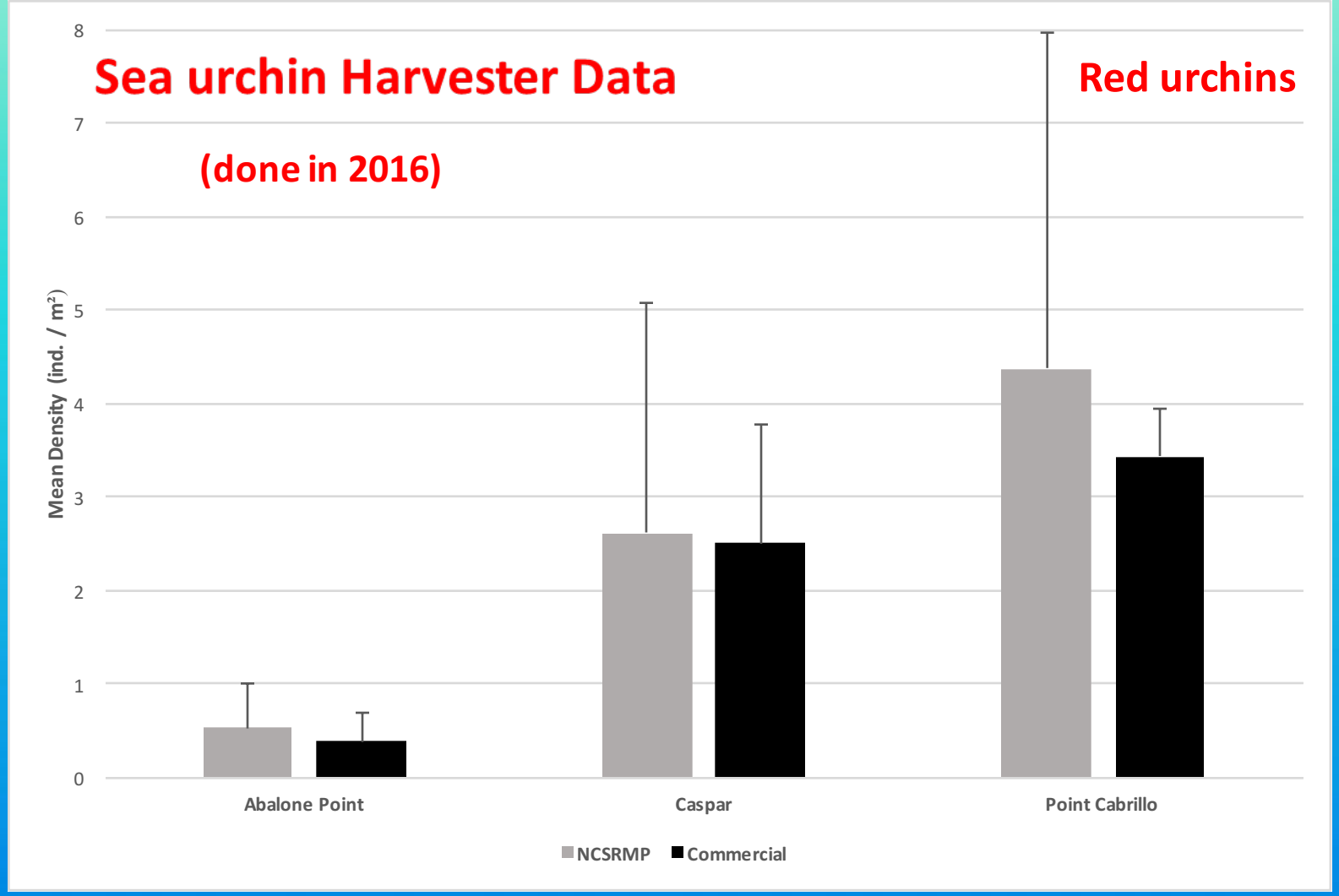

Figure 18. Comparison of mean red sea urchin densities estimated at three sites by the North Coast Study Region Monitoring Program (NCSRMP) and commercial sea urchin divers. Sample size is not equal between survey groups. Error bars indicate a single standard deviation from the mean. * symbol denotes significant difference in density between the two survey types ($p < 0.05$).

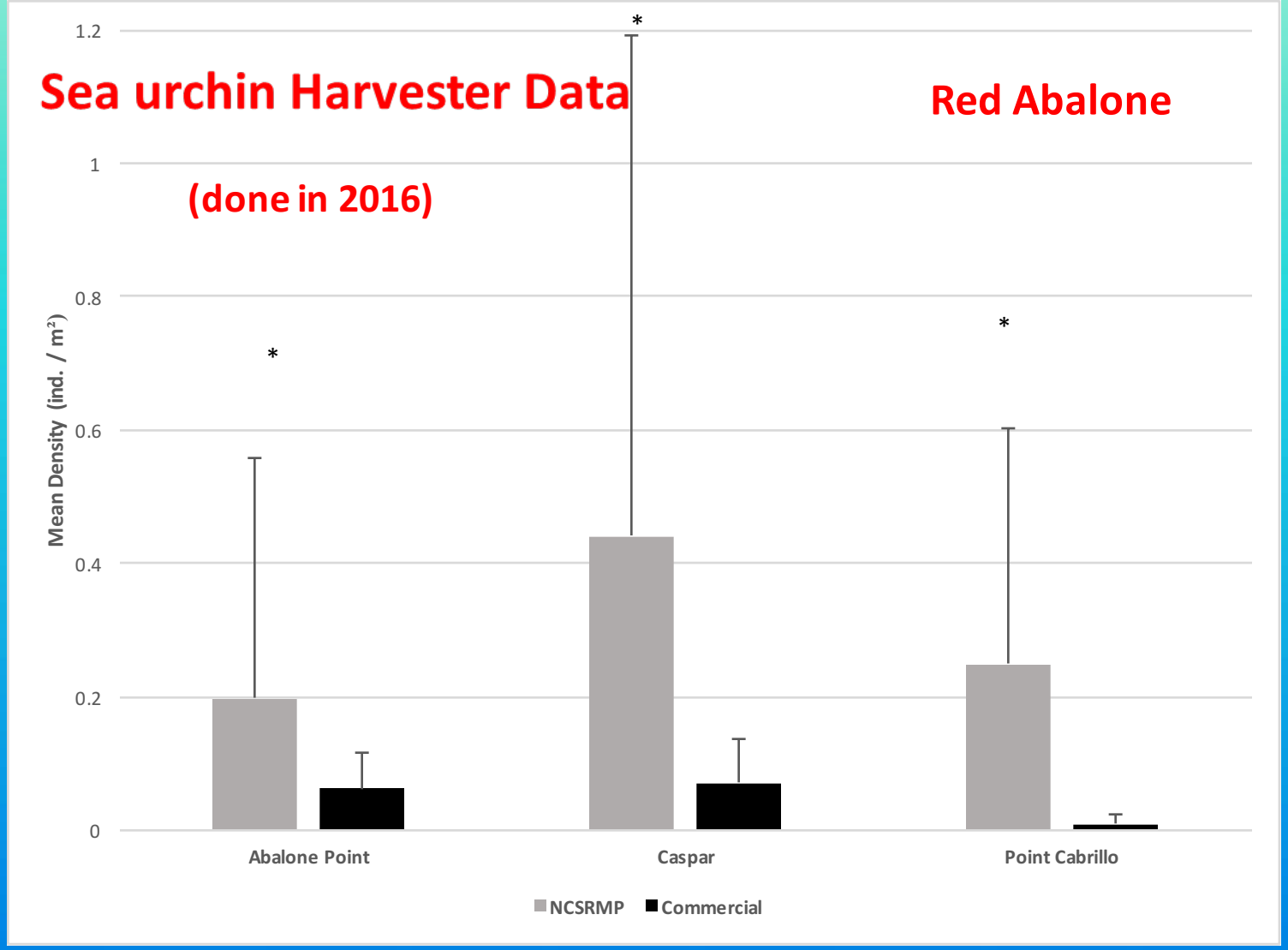

Figure 19. Comparison of mean red abalone densities estimated at three sites by the North Coast Study Region Monitoring Program (NCSRMP) and commercial sea urchin divers. Sample size is not equal between survey groups. Error bars indicate a single standard deviation from the mean. * symbol denotes significant difference in density between the two survey types ($p < 0.05$).