

## Introduction

- The Kellet's whelk, *Kelletia kelletii*, is a long-lived marine gastropod found from Baja California, Mexico to Monterey, California (6)
- Many populations can be found in California's Marine Protected Areas, established:
  - Southern CA (2012), Central CA (2007) N. Channel Islands (2003)
- The emerging whelk fishery take is now reported at 24 ports in California, mostly in Santa Barbara and San Diego (6)
- Total allowable commercial take - 100,00 lbs/year (3)
- As opposed to 2004 sampling sites, 2015 MPA sites have been free from fishing pressure for at least 3 years

### Question:

Do marine protected areas, and thus a relief from fishing pressure, affect Kellet's whelk population density?

### Hypothesis:

Kellet's whelk population density is affected by fishing pressure. MPAs mitigate the impact of the Kellet's whelk fishery, thus the whelk density is higher within MPAs where all take is prohibited.

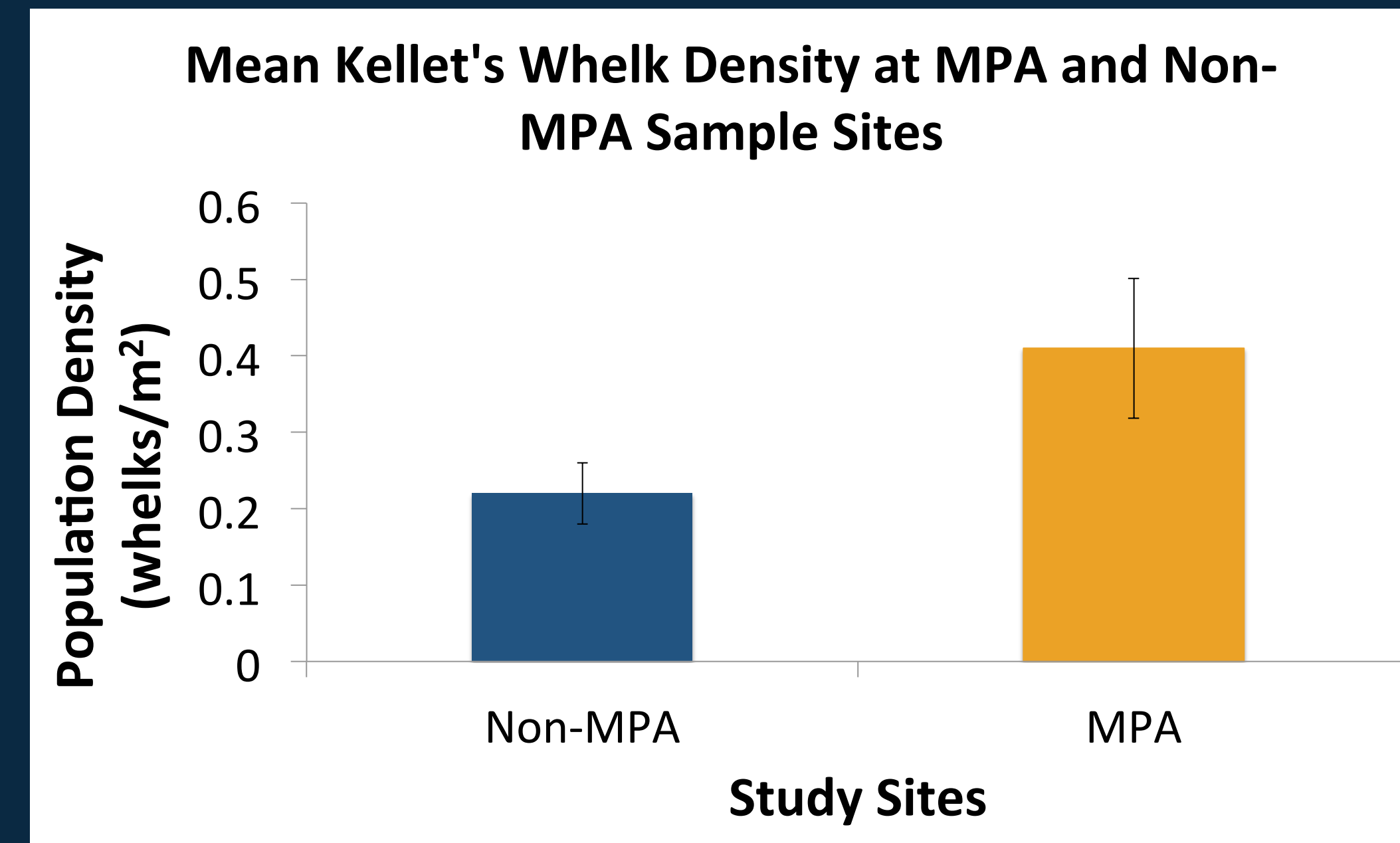


## Materials and Methods

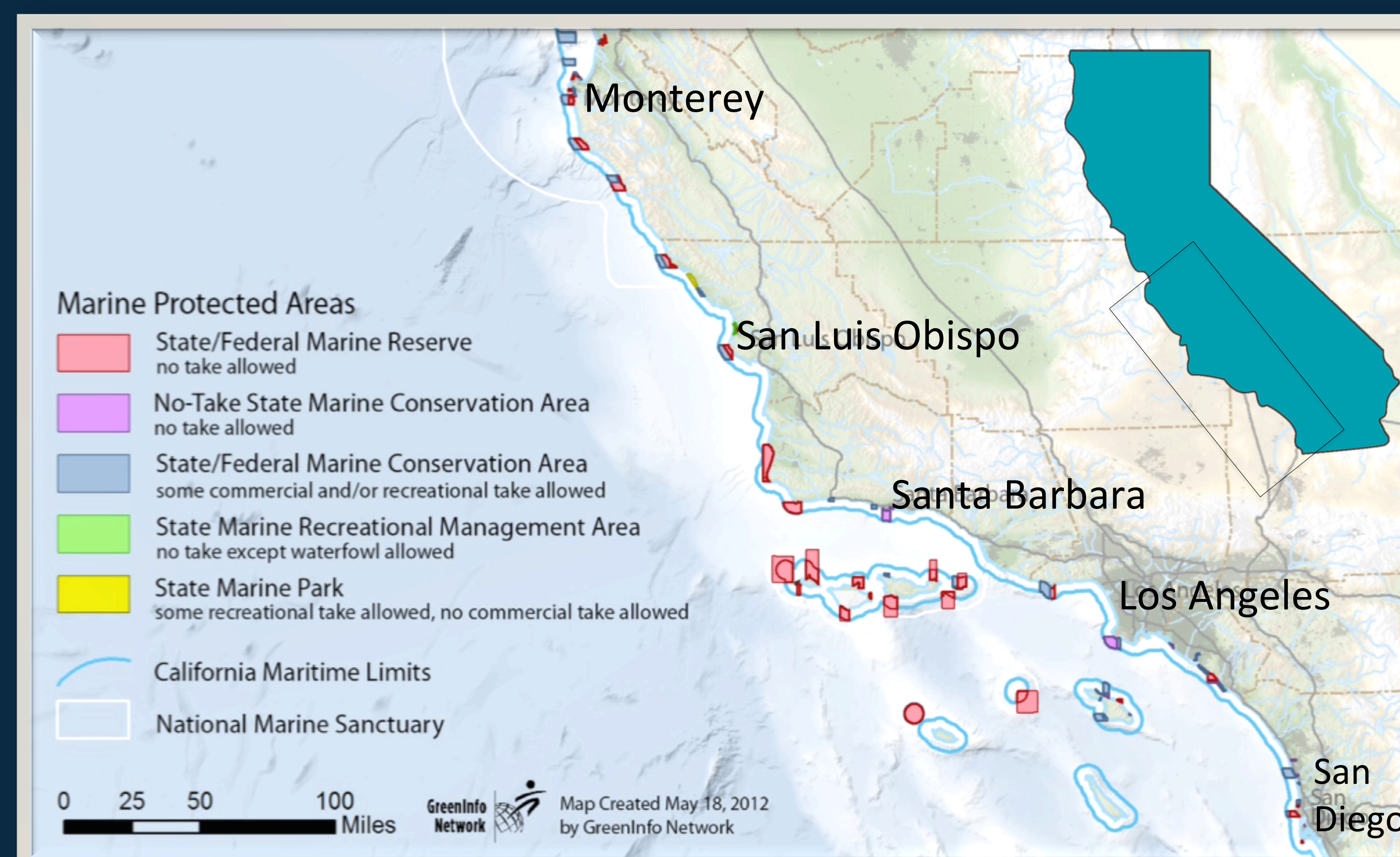
- Fixed-width transect surveys were completed on SCUBA along the kelp/sand interface at depths from 45 to 70 feet
- 6-7.5 transects were completed at each site, with each transect covering 60 m<sup>2</sup>
- 28 sites were surveyed in the San Diego, Channel Islands, Santa Barbara, San Luis Obispo, and Monterey regions
- Divers collected all whelks along the transects and brought them to the surface to be counted and measured
- Whelk density was determined for each site by dividing the total number of whelks found on the transects by the area surveyed (whelks/m<sup>2</sup>)



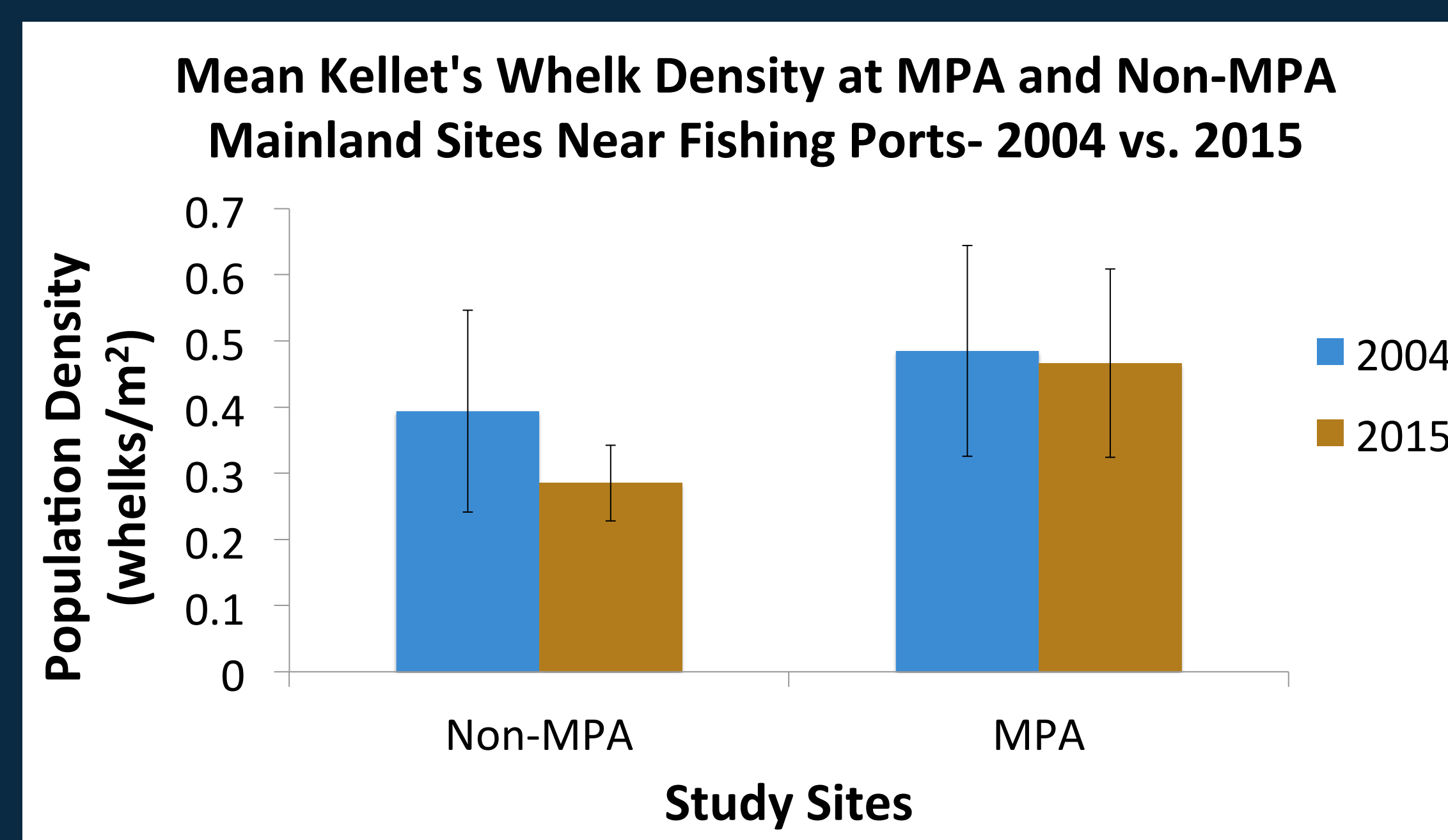
## Results



Whelk population density was significantly higher at MPA sites ( $p=0.0377$ ). The error bars represent the standard error about the mean density (SE: Non-MPA=0.04012, MPA=0.08301). The mean density of whelks at all sites within MPAs was 0.410 whelks/m<sup>2</sup>, and in non-MPA areas was 0.220 whelks/m<sup>2</sup>.



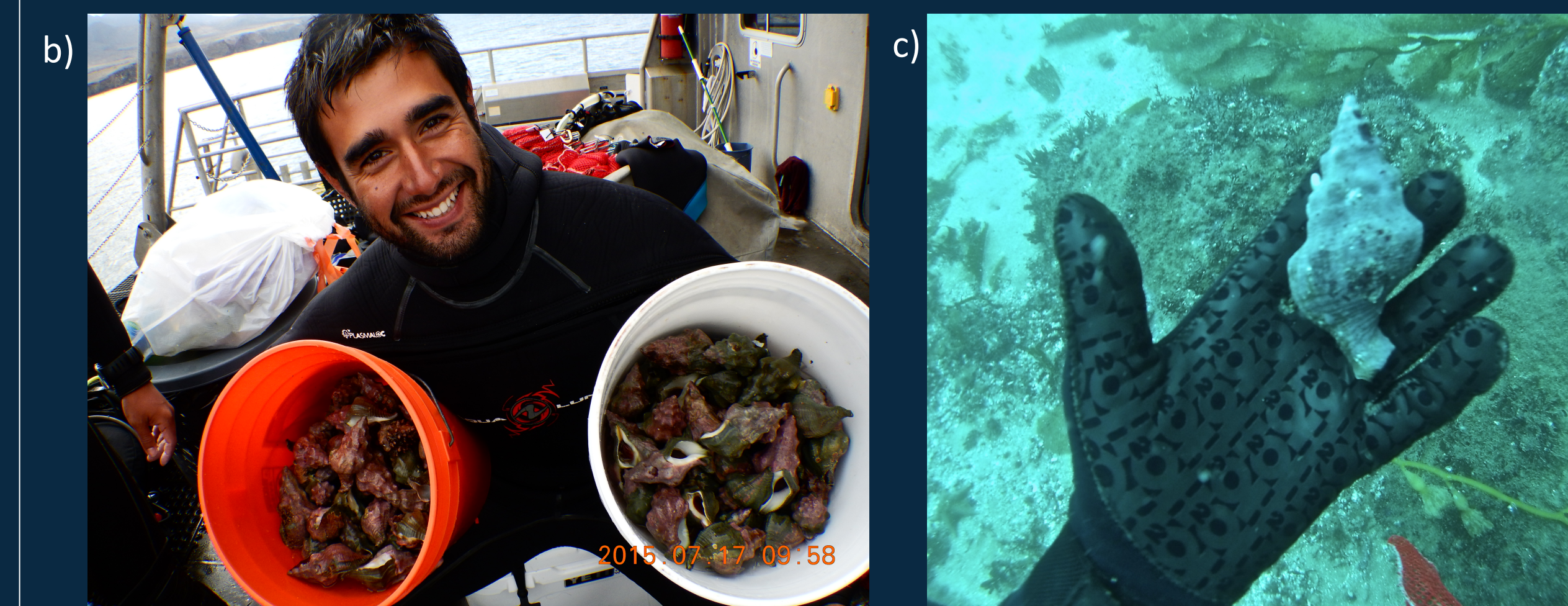
California's MPA network from Monterey to San Diego. Sites were sampled throughout the range. All sites within MPAs were either in reserves or conservation areas where no take of Kellet's whelk is allowed. Photo Reference: <http://www.californiampas.org/pages/regions.html>



Whelk mean density at mainland sample sites (San Diego and Santa Barbara regions) near fishing ports shows non-significant changes in mean density from 2004 to 2015 (Non-MPA  $p=0.7287$ , MPA  $p=0.5333$ ), yet noticeable trends of decreasing density in fished areas.

## Discussion

- The significantly higher density of whelks observed in protected sites suggests that there is an MPA effect of increasing population numbers
- The drastic increase in take since 2003 is concentrated in non-MPA areas (1)
- Current populations appear to be stable, but closures and limits in the future could protect the species from depletion beyond recovery (5)
- 2004 vs. 2015 Sampling Data
- Trends of decreasing density in fished areas near ports in Southern CA, with only three more years of fishing pressure than nearby MPAs
- MPAs appear to mitigate the effects of fishing pressure (2)
- Ecological Impacts:
- The predatory Kellet's whelk controls the abundance of kelp and algal grazers, thus their decline could shift kelp forest dynamics (4,7)
- Future Research:
- Yearly follow-up surveys to track the population density of whelks and effects of MPAs
- Habitat assessments to see if all sites are comparable and ideal
- Effects of top predators, like sea otters, on whelk density in MPAs (2)



a) Kellet's whelks of various sizes. b) Diver, Roberto C., showing off the high density of whelks found at a site. c) A whelk is collected along a transect in the sampling area.

## References

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