



Principal Investigators - please use this form to submit your MPA Baseline Program project annual report, including an update on activities completed over the past year and those planned for the upcoming year. This information will be used by the MPA Baseline Program Management Team to track the progress of individual projects, and will be provided to all MPA Baseline Program PIs and co-PIs prior to the Annual PIs workshop to facilitate discussion of project integration. Please submit this form to California Sea Grant when complete (sgreport@ucsd.edu, Subject [Award Number, project number, PI, "Annual Report"].)

Project Information

Project Year: Year 2: 2/1/2015-1/31/2016 MLPA Region: North Coast

Project Title & Number: Baseline monitoring and characterization of nearshore rocky reefs and kelp forests of marine protected areas along the North Coast of California (Proposal ID: Craig_7686) – R/MPA-32A

PI name: Dr. Sean F. Craig Co-PI name: Ryan Jenkinson, PhD candidate @ UC Davis

PI Contact Info Co- PI Contact Info (please list additional PIs and contact info in the "Project Personnel" section if necessary)

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Project Goals & Objectives

The overall goal of this project is to provide a summary description, assessment, and understanding of ecological conditions within nearshore rocky reef and kelp forest habitats both inside and outside of marine protected areas (MPAs) throughout the North Coast Study Region (NCSR).

We plan to meet the overall goals of the Project by:

- (1) Producing a quantitative baseline characterization and comparison of the structure of nearshore rocky reef and kelp forest ecosystems in MPAs and comparable reference areas of the NCSR. To achieve this goal SCUBA surveys at 4 MPA and 4 reference sites will collect data on fishes, invertebrates, and macroalgae as well as characterize substrate and reef rugosity.
- (2) Documenting initial ecological changes to rocky reefs and kelp forests within and outside of MPAs. This will be accomplished by comparing any notable trajectories of species densities, sizes and community composition between MPA and reference sites during the two year study period, and comparing data collected during this study to historical subtidal data from the area that has been collected by CDFW and HSU.
- (3) Providing a thorough baseline characterization of socioeconomically and ecologically important species found along North Coast rocky reefs, specifically describing current densities and sizes of two high priority species, red abalone (*Haliotis rufescens*) and red sea urchin (*Strongylocentrotus franciscanus*), that are likely to be part of metrics for assessing ecosystem health and change.

Summary of Project Activities Completed to Date

The Project Year 2 dive team was established in April-May 2015. Our team of local, experienced, well trained SCUBA divers was again lead by Postdoc Ryan Jenkinson and 4 additional “core” (lead) divers: (1) Johnathan Centoni (grad student in Dr. Sean Craig’s lab), (2) Franklin Moitoza (grad student in Dr. Sean Craig’s lab), (3) Chris Teague (grad student in Dr. Brian Tissot’s lab) and (4) Doug Simpson (HSU graduate and local dive expert). All members of the core team collectively have many years of North Coast SCUBA diving experience or extensive experience in federal and state subtidal/SCUBA monitoring programs from the National Park Service to the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) at UC Santa Cruz. On occasions where conditions allowed there was an additional (2nd) research vessel utilized for field sampling, thus requiring additional divers. In Year 2 those divers included (1) Brett Stacey, (2) Maia Grodin, (3) William Ray, (4) Johnny Roche, and (6) Jeff Bernard. In the first year (2014) the entire HSU team gained extensive training in SCUBA safety & rescue techniques in the HSU pool, as well at a nearby site (Trinidad harbor) in the field. These activities were lead by CO-PI Ryan Jenkinson (Postdoc) along with HSU Dive Safety Officer Richard Alvarez and HSU Boating Safety Officer Steve Monk. In addition, a full 1-week boating safety course, lead by Steve Monk along with 2 other instructors (James Fitzgerald-UC Davis Boating Safety Officer, and Marti Martinez—U.S. Coast Guard) was taken by our entire dive group, including PI Sean Craig. This boating safety course included everything from knot tying and vessel anchoring to vessel maneuvering in tight quarters, using both the 19’ and 22’ HSU vessels in Humboldt Bay to do things such as rescue a disabled diver in the water. In Project Year 2 a short 2-day refresher course was offered to all divers on the team to brush up on these skills. This was possible because most divers on the project had previously worked on the project in year 1. New divers added for Year 2 had only data collection responsibilities.

Data collection commenced in May 2015. In Year 2 all field sites within the original proposal, found throughout the NCSR, were visited and surveyed: (1) Pyramid Pt. SMCA, (2) Trinidad, (3) Double Cone Rock SMCA, (4) Abalone Point, (5) Ten Mile SMR, (6) Caspar Headlands, (7) Cabrillo SMR, and (8) Elk Headlands. To our knowledge this was the first scientific subtidal survey of the Pyramid Pt. site. Our intensive sampling design involved surveys at three different locations (“cells”) at each site. Within each cell 4 separate depth contours were sampled, with multiple individual surveys for both benthic organisms and fishes at each depth contour. In addition, at most sites additional surveys to increase replication and coverage of sampling for red abalone and sea urchins were conducted.

As with all subtidal research on the North Coast, ocean conditions dictate the availability, timing, and opportunity to conduct boat-based monitoring. While we were unable to complete surveys within each cell at all sites, we are very pleased to have accessed and surveyed all proposed sites, completing all proposed work at the majority of locations.

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Highlights from project progress so far, such as successes achieved, new collaborations or partnerships, or interesting stories from the past year that may be suitable for a blog post or other media venue

The primary highlight from the 2015 season was accessing and surveying all proposed sites spread throughout the NCSR. Previous subtidal research (eg., CDFW) and the concurrent funded subtidal MPA Monitoring project have surveyed only a small portion of the NCSR, primarily within a few mile radius of the easily accessible Van Damme Beach. The scope, coverage, and replication of subtidal surveys across the entire NCSR- particularly in 2015- has not been previously attempted or completed, and we feel this is both a highlight for the MPA Monitoring Program and confirmation of the hard work, training, and dedication for the entire dive team and the logistical support provided by HSU's diving and boating programs.

Data collection efforts from this project led to the creation of 2 presentations (talk + poster) given at the Western Society of Naturalists (WSN) meeting in November of 2015. The poster presentation showed data from Pt. Cabrillo, a now long-established MPA site, where an increased number of sea urchins were counted, yet where a reduced number of abalone were observed. This negative correlation suggests competition between these species along the Northern California coast-and this hypothesis will be further examined by Johnathan Centoni (Grad student in Dr. Craig's lab) during his thesis research in the summer of 2016. We found the highest densities of red abalone outside of MPA sites, possibly in response to decreased red sea urchin abundances due to commercial harvest.

Description of any unforeseen events and substantial challenges, and resulting effects on project activities and progress. Please indicate any issues that may affect other PI's or require coordination with other Baseline partners (e.g., ME, DFG, Sea Grant).

All subtidal research within the NCSR, particularly that conducted from research vessels across large spatial scales, is presented by challenges in ocean conditions. While we certainly had the expected long waits for conditions to become workable, by being prepared, having a well-organized and trained dive team, and shore-based logistics accounted for at all times, we were able to complete sampling at all sites within the region.

However-Dr. Craig continued to struggle with health issues his daughter is facing (she has been diagnosed with Ehlers-Danlos syndrome) which landed her in the hospital 2 times during this year.

This project once again took the lead in organizing and maintaining overnight accommodations in the Fort Bragg area. The rental house was utilized by several HSU-MPA projects, including the (1) rocky intertidal MPA team [lead by Dr. Sean Craig], (2) Estuarine MPA team [lead by Dr. Frank Shaughnessy], (3) Sandy intertidal MPA team [lead by Dr. Sean Craig], and (4) Onshore hook-and-line fishing MPA team [lead by Dr. Tim Mulligan]). This shared house proved to be vital to the success of the HSU dive team associated with this project during the summer months of 2015, and greatly assisted other MPA projects as well.

Data status (i.e., paper/raw format or digitized; if digitized, what format?)

All data collected was reviewed and entered into an ACCESS database created specifically for this research project with the assistance of Dr. Brian Tissot (Director, HSU Telonicher Marine Lab). Data entry was performed by Co-PI Ryan Jenkinson and grad students Johnathan Centoni and Chris Teague. Beginning in mid- January (2016) preliminary data analysis began and a more detailed review of data is currently ongoing.

Activities Planned for following Project Year __ (if applicable) – Please describe remaining work and approximate timelines for completing that work, including any anticipated budget variances necessary to complete the project.

We are excited to be able to say that we have finished all SCUBA diving operations on this project, and all data have been entered by the Co-PI (Dr. Ryan Jenkinson) and graduate students (Chris Teague and Johnathan Centoni). Our research team presented 1 talk and 1 poster based on this work at the WSN meeting this past fall (November, 2015)- see abstracts below.

Finally, Dr. Ryan Jenkinson has completed his PhD degree at UCD - SDSU and has already begun to collaborate with Dr. Craig and the North Coast Sea Urchin Fishermen to gain additional data (and experience) from them on a project originally sub-contracted out to HT Harvey and Associates. This project will gather data alongside these urchin harvesters, enabling us to gain a unique perspective on the subtidal benthic communities in areas of recent (and older) harvest activities. We are hopeful this work will shed further light on the trends seen in our WSN poster, which suggested competition between sea urchins and abalone in areas without harvest (at the Pt. Cabrillo Marine Reserve). Specifically, we hope to see the opposite trend: more abalone in areas where sea urchin harvest is ongoing (something the urchin harvesters claim is occurring). We hope to begin this work in May of 2016.

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Project Personnel – Please indicate additional project personnel involved in your MPA baseline project, including students and volunteers, or additional PI contact information if necessary, as well as the nature of their assistance in the project project.

	<i>Students Supported</i>	<i>Student Volunteers</i>	<i>Nature of Assistance</i>
<i>K-12</i>			
<i>Undergraduate</i>	<i>3 new SCUBA divers (2015)</i>	<i>3 SCUBA divers (2014-2015)</i>	
<i>Masters</i>	<i>3 (Centoni, Moitoza, Teague)</i>		
<i>PhD</i>	<i>1 completed (Dr. Jenkinson)</i>		

Number of other Volunteers not counted above and the nature of their assistance in the project:

None

Additional PI contact info not listed on first page:

None

Cooperating Organizations and Individuals - Please list organizations or individuals (e.g., federal or state agencies, fishermen, etc.) that provided financial, technical or other assistance to your project since its inception, including a description of the nature of their assistance.

Name of Organization or Individual	Sector (City, County, Fed, private, etc.)	Nature of cooperation (If financial, provide dollar amount.)
Tom Trumper	Private Sector	Owner, Pacific Rim Seafood Inc. (sea urchin divers)

Project Outputs and Materials: Please provide any other project-relevant information, such as descriptions of attached materials, media coverage your project has received, presentations, publications, images etc.

2 abstracts from talk (1st) and Poster (2nd) given at Western Society of Naturalists Meeting Nov 5-8, 2015 in Sacramento:
Teague, C.H.*, Jenkinson, R.S., Craig, S.F. INITIAL INSIGHTS INTO NORTHERN CALIFORNIA FISH COMMUNITY STRUCTURE FROM MPA BASELINE SURVEYS *Humboldt State University* In December 2012 a network of MPAs was implemented along the North Coast of California as a part of the Marine Life Protection Act. Over the past two years we have conducted SCUBA-based, visual surveys on nearshore rocky reefs at eight sites (4 MPA and 4 reference) between Point Arena and the California/Oregon border as a part of the North Coast MPA Baseline Program. Surveys focused on the abundance and distribution of fishes, invertebrates, and algae at depths ranging from 4-20 meters. Initial exploration of the fish community data revealed that the most abundant fishes were black rockfish (*Sebastes melanops*, 18.5 fishes·120m⁻³) and blue rockfish (*S. mystinus*, 14.7 fishes·120m⁻³) followed by olive and yellowtail rockfishes (*S. serranoides* and *S. flavidus*, respectively; 7.06 fishes·120m⁻³ combined). Interestingly, the ratio of young-of-the-year (YOY) fishes to adults varied between species. At our study sites, black and blue rockfishes had high abundances of all size classes whereas the size structure of olive and yellowtail rockfishes tended towards the smallest size classes. This discrepancy between adult and juvenile densities could be indicative of an ontogenetic shift wherein these fishes move to deeper water as they mature.

Centoni, J.J.*, Moitoza, F.D., Jenkinson, R.S., Craig, S.F. THE EFFECT OF MARINE PROTECTED AREAS ON HARVESTED SPECIES ABUNDANCE AND EPIBENTHIC RICHNESS ON SUBTIDAL ROCKY REEFS *Humboldt State University* Marine protected areas on nearshore subtidal reefs have been demonstrated to provide multiple benefits, including but not limited to conserving biodiversity and providing refuge from fishing pressures on targeted species. Here we provide a comparison of abundances of commercially targeted red urchins (*Mesocentrotus franciscanus*), recreationally targeted red abalone (*Haliotis rufescens*) and benthic diversity inside a previously established MPA and an adjacent reference site along the north coast of California. Surveys were conducted in 2014 and 2015 along multiple depth strata as part of the North Coast Study Region MPA Baseline Monitoring Program. We found increased densities of urchins inside the MPA site although this varied at different depths. Red abalone abundances were higher outside of the MPA site and also varied along depth strata. Overall benthic species diversity/richness was lower within the MPA boundaries. These trends may be caused by the lack of harvest of urchins inside of MPAs and provide insight into the expectations of newly established MPAs on subtidal rocky reefs along California's north coast.