PROJECT TITLE: Sandy Beach Ecosystems: Baseline Characterization and Evaluation of Monitoring Metrics for MPAs along the South Coast of California

Investigators: Jenifer E. Dugan, Henry M. Page, Karina J. Nielsen, and Julie M. Bursek

REVISED PLAN OF WORK

To address the overall objective and achieve our specific study goals, we will use a combination of biodiversity surveys and focal species/taxa sampling on intertidal macroinvertebrate communities of California's sandy beaches (Table 1). We have revised our plan of work to reflect the funding status of proposed related studies in UCSB's original multi-project integrative proposal and the reduction in funding. Our orignal plan of work appears in Appendix 1.

Table 1. Revised proposed Draft Metrics and Key Attributes for Ecosystem Assessment to be studied on sandy beaches in the South Coast Region. Changes in Draft Indicators/Focal species or Taxa in this table reflect proposed integrative activities that were not funded.

Draft Metrics and Key Attributes		**Draft Indicator/Focal Species or Taxa**
Trophic Structure	Predatory Birds	Marine Birds –species richness, abundance, activity, zone use Shorebirds, Seabirds, Gulls, Other birds, Terrestrial birds, including raptors and Belding's Savannah Sparrow
	Marine Predators	Pinnipeds- composition, abundance, activity, zone
	Suspension Feeders	Macroinvertebrates - abundance, biomass, size structure Sand crabs, Pismo clams, Bean clams
Productivity	Beach wrack	Macrophyte wrack composition, abundance, biomass Wrack invertebrate diversity, abundance, biomass
Diversity		Intertidal macroinvertebrate species richness
Non-consumptive Use		Human use - recreational activity, zone used Wildlife viewing
Consumptive Use		Fishing, Clamming

Monitoring Sites

We will conduct surveys to describe the ecological conditions, including draft indicator/focal species or taxa for key attributes and metrics of a range of beach types inside and outside of MPAs in the south coast region. Our primary study sites will be located in 9 MPAs that are spatially paired with 9 reference sites spanning the study region (Table 2). These primary beach sites were selected to represent beaches across the region that possess relatively intact intertidal and supralittoral zones and are not subject to mechanical grooming that removes wrack, extensive armoring or berm building. We will conduct additional specialized surveys and collections for Pismo clams on beaches at a minimum of 4 MPA sites and 4 reference sites where populations of this recreational fishery target species were found in the past (Table 2). To allow us to evaluate connectivity with other ecosystem features in the South Coast region including rocky intertidal, we will also conduct coordinated supplementary surveys of birds at a few additional sites (Table 2, To be determined in coordination with final rocky intertidal study site selection).

Data Collection

We will use the originally proposed methods and design to measure physical attributes/contextural information, biodiversity of intertidal invertebrates, data on long term indicators including birds, people, wrack, wrack-associated fauna (talitrid amphipods), sand crabs, and clams. We will sample proposed indicator groups of invertebrates 3 times (August/September/October 2011*, August/September 2012 and May/June 2013) during the project. The * data collection will be represented by the biodiversity sampling of MPA and reference sites.

Table 2. Proposed MPA and reference sites to be surveyed (subject to changes to enhance integration among ecosystem features). These sites were chosen to represent beach types across the region and to coordinate with study sites for other ecosystem features. Birds, wrack and people will be monitored monthly at sites with * and also at Arroyo Burro beach, Carpinteria State Beach, Carpinteria City Beach and East Beach as part of the SBC LTER program in Santa Barbara county. Pismo clams will be surveyed at sites with a [p].

Sites		Surveys	
MPA	**Reference**	**Monthly**	**Annual**
Point Conception SMR	Hollister Ranch Beach	X	
Kashtayit SMCA	Arroyo Quemado Beach*	X	
Naples SMCA	Haskell's Beach	X	
Campus Point SMCA*	East Campus Beach*	X	
Campus Point SMCA [p]	Santa Claus Lane Beach* [p]	X*	X
Point Dume SMCA [p]	Hermosa Beach [p] or Long Beach		X
Point Dume SMR	Leo Carrillo	X	
Abalone Cove SMCA	Portuguese Bend or Cabrillo Beach	X	
Crystal Cove SMCA	San Clemente State Beach	X	
Laguna SMR [p]	Huntington Beach [p]		X
San Diego/Scripps SMCA [p]	Coronado Beach [p]		X
Matlahuayl SMR	Black's Beach	X	
Tijuana River SMCA	Silver Strand State Beach	X	

Data analyses and synthesis

No major revisions anticipated.

Citizen-Scientist Volunteer Monitoring Research

This component will proceed as originally proposed.

Integration with other Ecosystem Features

We designed our study and will finalize study sites in coordination with studies of other ecosystem features to take advantage of a number of productive analyses we have identified that can be used to examine hypotheses concerning connectivity among ecosystem features and ecological processes in the South Coast region. These analyses will be enhanced by our participation in a multi-project integrative proposal (Caselle, Blanchette). A revised list of anticipated integrative analyses follows (note, this should not be considered an exclusive list).

1. Comparisons of macrophyte inputs to sandy beaches (wrack type, cover and biomass and counts of stranded plants and holdfasts for key species) with condition and macroalgal biomass for nearshore kelp forests and reefs (Pondella and Caselle, Svejkovsky) will allow estimates of connectivity and potential MPA effects on adjoining ecosystems.

2. Coordinated comparisons of the abundance, species richness and composition of shorebirds, seabirds and other avian predators on beaches with that observed in adjacent rocky intertidal habitats (Blanchette, et al. and Robinette, Jahnke) will increase understanding of the response of upper trophic levels to ecosystem condition and MPA designation. These comparisons could potentially extend to piscivorous birds foraging in subtidal habitats and roosting on sandy, and rocky shores (Robinette, Jahnke). .
3. Our collaborative pilot studies including data analyses, protocol development and training for intertidal monitoring of sandy beaches and rocky shores (Blanchette et al.) by LiMPETS and community volunteers will inform the development and framework for sustainable citizen science monitoring programs for the MPA network.
4. Our results from regular surveys of human use and activities (consumptive and non-consumptive) on beaches in MPAs and reference sites will contribute data for socioeconomic analyses of MPA implementation (Scholtz et al.).

Outcomes and Deliverables

The anticipated outcomes and deliverables of our study have not changed substantively from our original proposal. Our study outcomes will provide:

1) new baseline data for species richness of macrofauna, abundance and size structure of key species, abundance of shore birds, wrack and surf zone fishes in the SC region that will be suitable for comparisons with historic and existing data and fully integrated into a shared database including EML metadata;

2) an efficient working model for long-term monitoring of the most critical indicators for sandy shores involving citizen scientist volunteers that will be fully integrated with monitoring of other ecosystem features; and

3) a comprehensive, integrated ecosystem assessment report that clearly indicates how sandy shores contribute to the ecological functioning of the region.

Our study's deliverables include:

1) a description of sandy beaches inside and outside MPAs that is explicitly linked to adjacent ecosystem features through mechanistic processes;

2) comprehensive baseline data of the condition of sandy beaches at the time of MPA implementation and a subset of metrics appropriate for cost-effective and time-efficient long-term tracking of condition and trends (with metadata reporting using the Ecological Metadata Language standard);

3) specific recommendations on how to mount and run a citizen scientist volunteer monitoring program using these metrics;

4) descriptions of initial changes (if any) in recreational uses including fishing, non-consumptive activities and ecological components on sandy beaches over the first 2 years of MPA implementation; and

5) integration and interpretation of data from sandy beach surveys via a synthetic ecosystem assessment in collaboration with other components of this effort including kelp forests and reefs, seabirds, rocky intertidals shores, and consumptive and non-consumptive uses.

Milestones

MILESTONES CHART REVISED

TASKS AND MILESTONES	2011-2012 S O N D J F M A M J J A	2012-2013 S O N D J F M A M J J A	2013-2014 S O N D J F M A M J J A
1. Visit and set up sites and finalize sampling logistics, coordinate with other studies			
2. Monthly surveys of birds, wrack, pinnipeds and people			
3. Biodiversity surveys of intertidal macroinvertebrates			
4. Surveys of populations of draft indicator/focal species or taxa			
5. Surveys of Pismo clam populations			
6. Sample processing and data entry			
7. Data analyses			
8. Citizen science protocol development and testing			
9.. Citizen science protocol workshop			
10. Synthesis and integration, collaborative products			