California Marine Life Protection Act Initiative
Methods Used to Evaluate Draft Marine Protected Area Proposals in the MLPA South Coast Study Region (Draft)
Section 6.0 – Habitat Replication

Draft revised January 21, 2009

6.0 HABITAT REPLICATION ANALYSES (GOALS 1, 2, 3, 4 AND 6)

Summary of Guidelines: Habitat Replication Analyses

The *California Marine Life Protection Act Master Plan for Marine Protected Areas* states that marine protected area (MPA) networks should include 'key' marine habitats and each of these habitats should be represented in multiple MPAs across biogeographical regions, upwelling cells, and environmental and geographical gradients. In addition the master plan states that 'key' marine habitats should be replicated in multiple MPAs with three to five MPAs containing each habitat type in each biogeographic region (Point Conception to Oregon).

Replication of habitats in MPAs address goals 1, 2, 3, 4 and 6 of the Marine Life Protection Act (MLPA) as well as other requirements and guidance in the act, including habitat replication within state marine reserves (SMRs). Evaluations of habitat replication include the number of replicates in SMRs, and also the replication of habitats in state marine conservation areas and state marine parks at the various levels of protection.

Guidance in the master plan requires that habitat be replicated in three to five MPAs in the biogeographic region. However, spacing guidelines (see Section 8.0) may require greater replication of habitats. Benefits of MPAs are largely dependent on the habitat contained in them. An MPA that does not contain appropriate habitat for a particular species (e.g., kelp forest) provides no benefit to that species.

In evaluating habitat replication, the MLPA Master Plan Science Advisory Team (SAT) considers:

- The overall size of each MPA or cluster of MPAs (contiguous MPAs with different allowed uses) at the three highest levels of protection
- The extent of each habitat contained within the MPA or MPA cluster

Only MPA clusters above the minimum size (nine square miles) were considered for habitat replication (with the exception of estuarine habitats). The SAT considered an MPA to include a specific habitat if the MPA encompassed a critical amount of the habitat. This critical amount was defined as an area sufficient to encompass 90% of the species known to use the habitat (see Table 1) in sufficient abundance to be ecological represented in the habitat.

To determine the estimated amount of habitat needed, the SAT examined biological survey data from a variety of habitat types present in the study region. Only datasets that had the following features were used: (1) sampling allowed for estimation of species richness, (2) sampling was spatially explicit (the location, depth and area was known), (3) sufficient replication to allow for robust resampling, (4) asymptotic like area by richness curves), (5) lack of meaningful design bias (e.g. only certain taxa were targeted). Using a re-sampling procedure and accumulation functions (including Michaelis-Menton) the SAT then estimated

the amount of habitat area needed to encompass 90% of the species likely to occur in each habitat (see figure Figure 1). Table 1 indicates the critical extent for six habitat types.

Figure 1. Estimated proportion of species per amount of habitat for rocky habitats

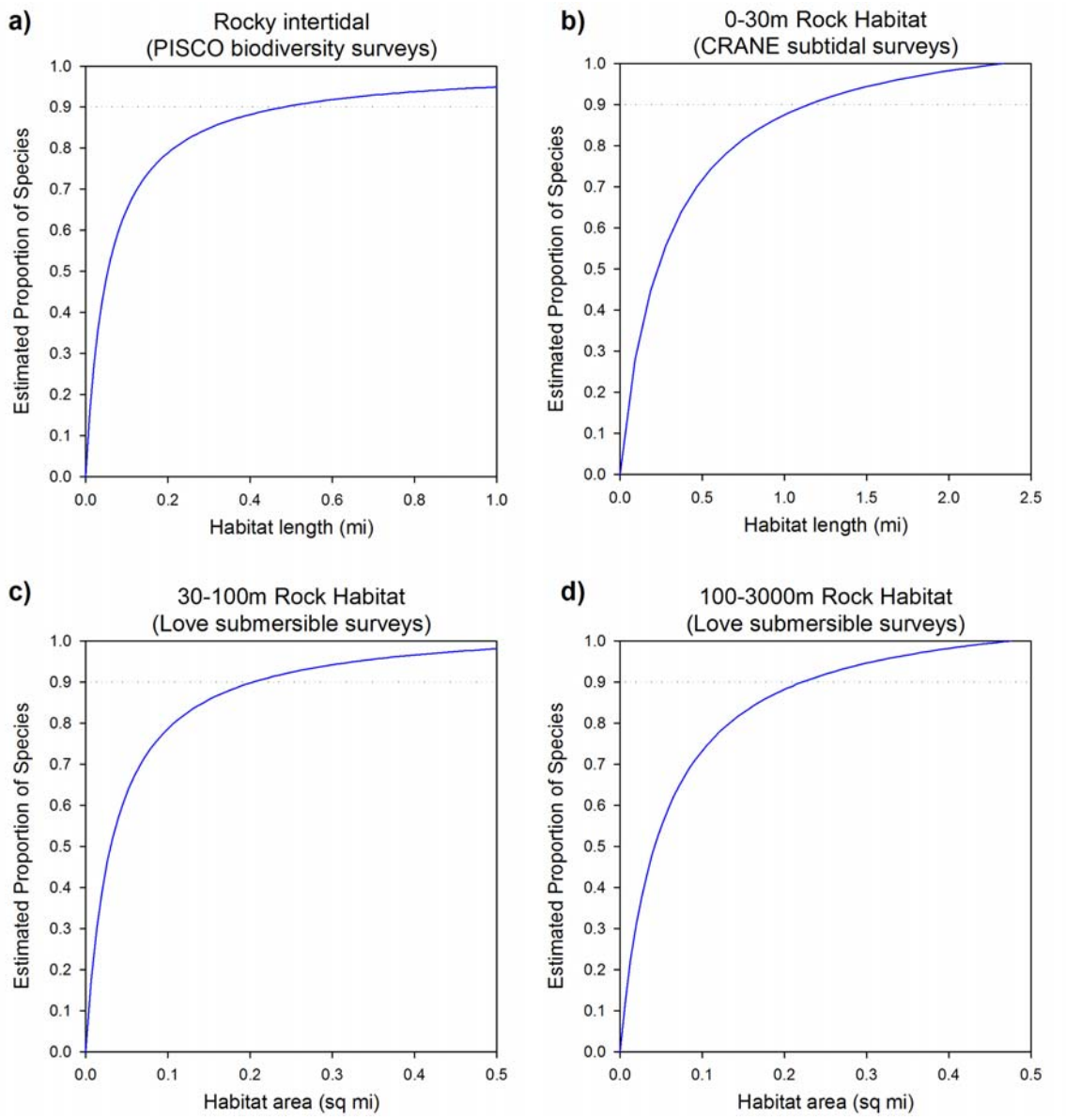

Table 1. Amount of habitat in an MPA necessary to encompass 90% of local biodiversity

Habitat	Representation needed to encompass 90% of biodiversity	Data Source
Rocky Intertidal	~0.48 linear miles	PISCO Biodiversity
Shallow Rocky Reefs/Kelp Forests (0-30 M)	~1.14 linear miles	Crane Subtidal Surveys
Deep Rocky Reefs (30-100 M)	~0.20 square miles	Love surveys
Deep Rocky Reefs (100-3000 M)	~0.22 square miles	Love Surveys
Sandy Beaches	~1.14 Linear miles	See below
Sandy Habitat (0-30 M)	~1.14 Linear miles	See below
Sandy Habitat (30-100 M)	~2.24 square miles	SCCWRP (BIGHT '98 & '03)
Sandy Habitat (100-200 M)	~1.10 square miles	SCCWRP (BIGHT '98 & '03)
Sandy Habitat (>200 M)	~0.46 square miles	SCCWRP (BIGHT '98 & '03)
All Sandy Habitat (>0 M)	***~8 square miles***	***Preferred option – see below***
Estuarine Habitats	0.12 square miles (77 acres)	SONGS sampling

For kelp, shallow sandy and shallow rocky habitats, protection of habitat must extend from shore to the 30 meter contour.

As noted above, estuaries are not included in the general rule that replication of habitat needs to be within an MPA cluster that is at least nine square miles. This is because estuarine habitats very often are not adjacent to coastal rocky habitats and a requirement for co-location could greatly restrict the location of MPA clusters.

The SAT recommends that wherever possible, a mixture of estuarine sub-habitats be protected in close proximity to one another to allow for the movement of species among sub-habitats. Additionally, protection of areas close to the mouth of an estuary is likely to have great benefit for species that use both estuarine and open-coast habitats. As for all other habitats shown above, the minimum area for estuarine reserves were based upon biological surveys and yielded the estimated amount of area needed to encompass 90% of the biodiversity in an estuarine system. The analysis showed that 77 acres is sufficient area to capture 90 % of the species across the three main estuarine sub-habitats: eelgrass, tidal flats,

and coastal marsh. In order for estuarine habitats to be considered present, a minimum of 77 acres of estuarine habitats must be included within an MPA. For the three sub-habitats to be considered present, a minimum of 25 acres of each must be included within an MPA.

There were several representative habitat types for which survey data was either unavailable or there was insufficient replication to use the methodology discussed above. The presence of these habitats in a given MPA was assessed as follows:

Soft bottom (0-30 meters) – The species that are unique to this habitat mainly inhabit the surf zone, therefore the linear extent of shallow soft bottom was used to assess the presence of this habitat. The distribution and movement patterns of species in the surf zone is likely similar to that of species on shallow rocky reefs, therefore the % of biodiversity was assessed using the area/biodiversity relationship derived from 0-30m rocky reefs (1.14 linear mile = 90% biodiversity). To be considered present this habitat must also extend to the 30 meter contour.

Sandy beaches – no data were available to make a scientific assessment of the relationship between beach length and biodiversity. Because sandy beaches are usually inshore from shallow soft bottom areas and to make area delineation logistically feasible the SAT linked the required linear extent of sandy beaches to Soft Bottom habitats (0-30 meter). Hence, the SAT considered sandy beach habitat present if there was at least 1.14 miles of sandy beach in a given MPA.

All sandy habitat (>0 meters) – we list a preferred value ~8 square miles that includes all subtidal sandy habitat. Here the value comes from examination of two sets of National Marine Fisheries Service (NMFS) trawl data that yield a value of ~8 square miles using the methodology discussed above. The NMFS samples come from areas just outside the region and are much larger than the Southern California Coastal Water Research Project (SCCWRP) samples (>10 times as large). Also the NMFS trawls were used for the MLPA North Central Coast Study Region evaluations which yielded a value of nine square miles of sandy habitat for that region. Hence to integrate both the SCCWRP data and the results of analysis using NMFS data we present a minimum and preferred size for sandy habitats. It is important to note the using the preferred size does not discard the values generated by the SCCWRP analysis; instead the two results should be used together. That is, the preferred size for sandy subtidal habitats is 8 square miles including a shore length of at least 1.14 linear miles (for the 0-30 meters depth), and 2.24, 1.1 and 0.46 square miles of habitat in the 30-100, 100-200 and >200 meter zones, respectively.