Marine Life Protection Act Initiative

Science Guidelines for Marine Protected Area Design

North Coast Educational Workshop 1

September 29, 2009 - Crescent City, Eureka and Fort Bragg, CA

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Summary of MLPA Goals

1. To protect the natural diversity and function of marine ecosystems.

2. To help sustain and restore marine life populations.

3. To improve recreational, educational, and study opportunities in areas with minimal human disturbance.

4. To protect representative and unique marine habitats.

5. Clear objectives, effective management, adequate enforcement, and sound science.

6. To ensure that MPAs are designed and managed as a network.

Scientific Guidance in the Master Plan

- From the ***California MLPA Master Plan for Marine Protected Areas***
  - Flexibility
  - Biogeographical regions (Goals 1, 2, and 4)
  - Species likely to benefit (Goals 1 and 2)
  - Levels of protection (Goals 1, 2, 4 and 6)
  - Habitat representation (Goals 1 and 4)
  - Habitat replication (Goals 1, 2, 3, 4 and 6)
  - MPA Size (Goals 2 and 6)
  - MPA Spacing (Goals 2 and 6)
  - Monitoring (Goals 3 and 5)

Flexibility in MPA Design

*The diversity of species and habitats to be protected, and the diversity of human uses of marine environments, **prevents a single optimum network design** in all environments.

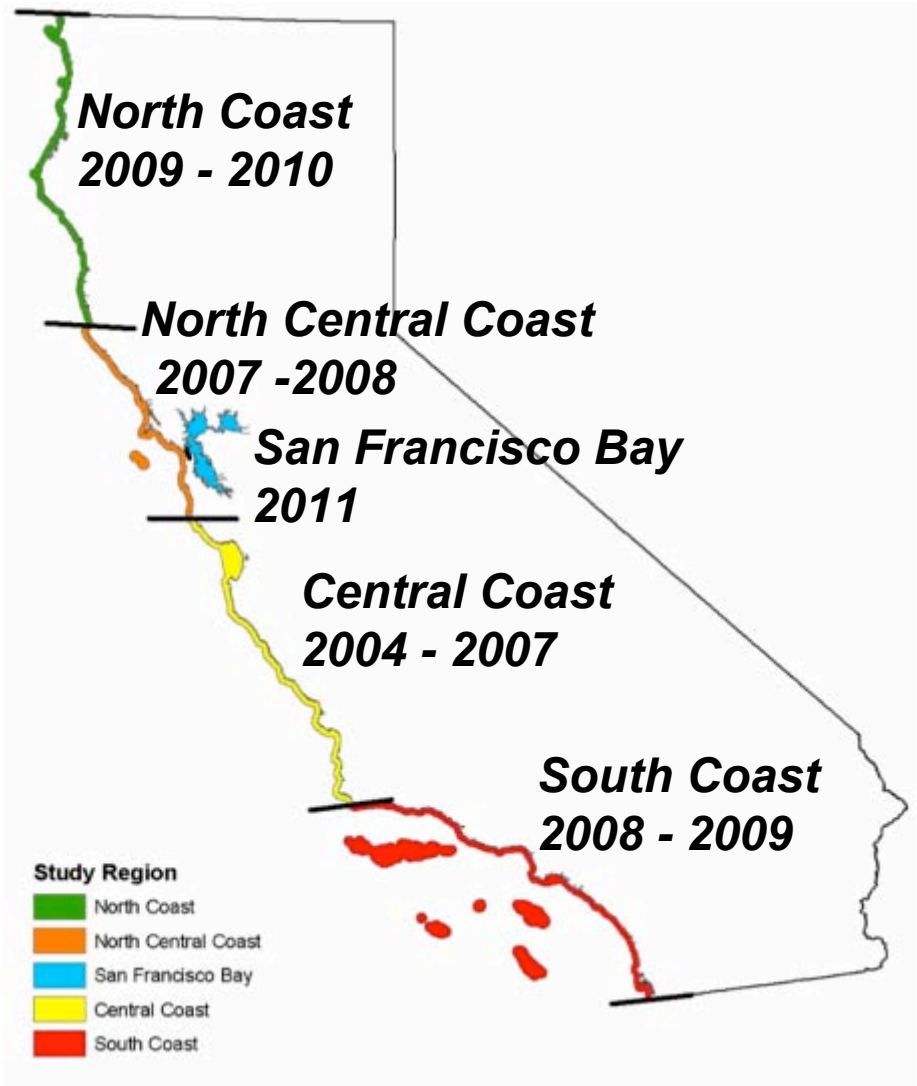
*Science guidance from Master Plan for Marine Protected Areas

Biogeographical Regions

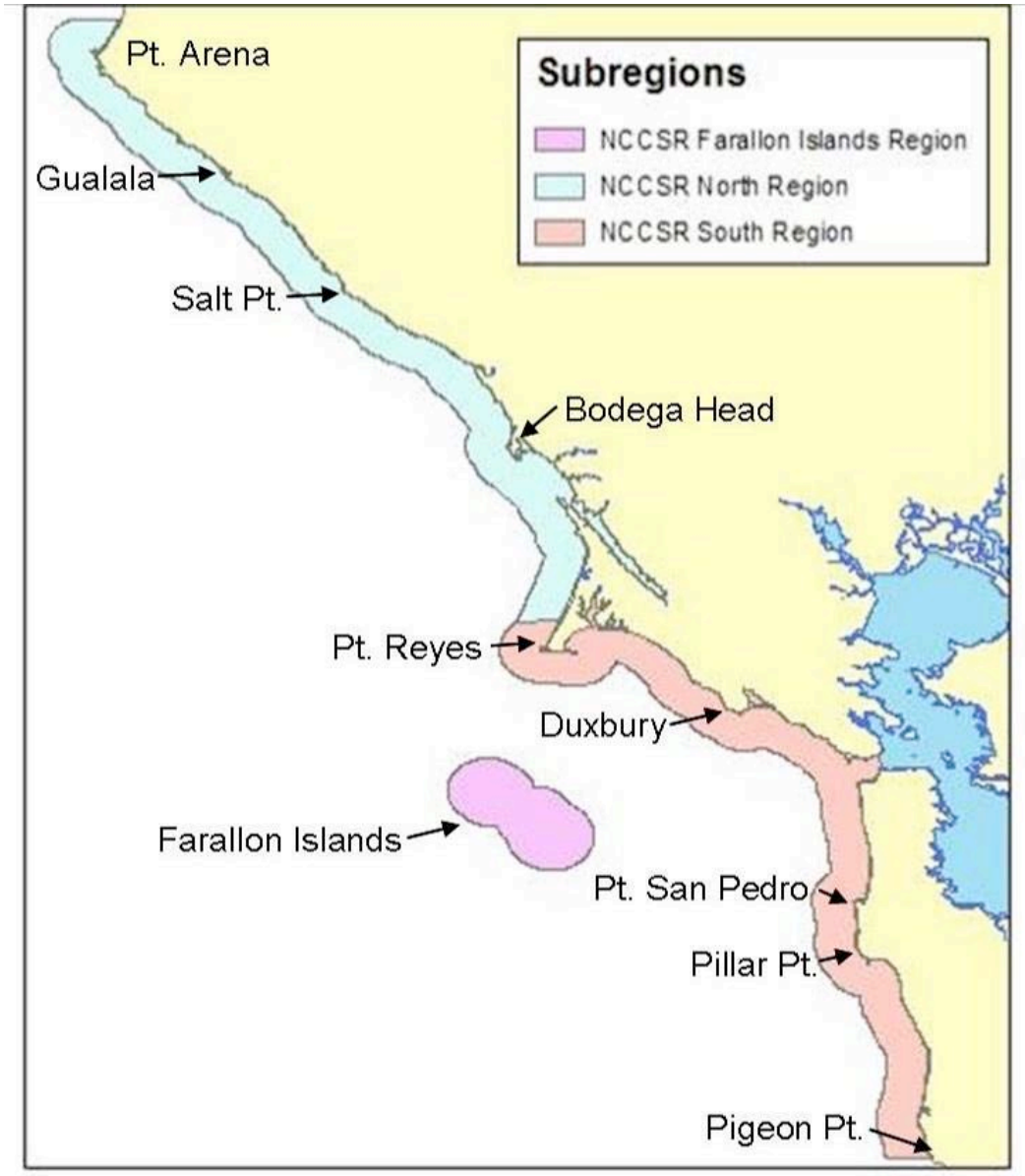
- The MLPA requires marine reserves in each **biogeographical region** of California.
- Two biogeographical regions were identified:
  - California-Oregon border to Point Conception
  - Point Conception to U.S.-Mexico border

Bioregions

- The **north coast study region** falls entirely within the northern biogeographical region of California.
- Within the north coast study region, the Science Advisory Team will identify any unique bioregions.
- A **bioregion** is a biogeographically relevant subregion within the large-scale biogeographical region.



North Central Coast Bioregions



Species Likely to Benefit

- The Master Plan identifies "select species or groups of **species likely to benefit** from MPAs."
- Species likely to benefit include those:
  - directly **targeted** by fisheries
  - caught incidentally (**bycatch**)
  - **indirectly** affected through ecological changes within MPAs
- Species that **move long distances** likely will not benefit significantly from MPAs


Photo: Tom McHugh


Photo: Gus Van Vliet, USFWS

Species Likely to Benefit

- The list of **species likely to benefit from MPAs in the north coast study region** will be developed by the science advisory team.

- To view the list of species likely to benefit from the Master Plan for Marine Protected Areas: http://www.dfg.ca.gov/mlpa/pdfs/revisedmp0108g.pdf


Photo: Rick Heiser


Photo: Terrance J. Fidler

Marine Protected Areas

- **State Marine Conservation Area (SMCA)**
  - Limits recreational and/or commercial extractive activities
- **State Marine Park (SMP)**
  - Prohibits all commercial extractive activities and potentially some recreational activities.
- **State Marine Reserve (SMR)**
  - Prohibits all extractive activities

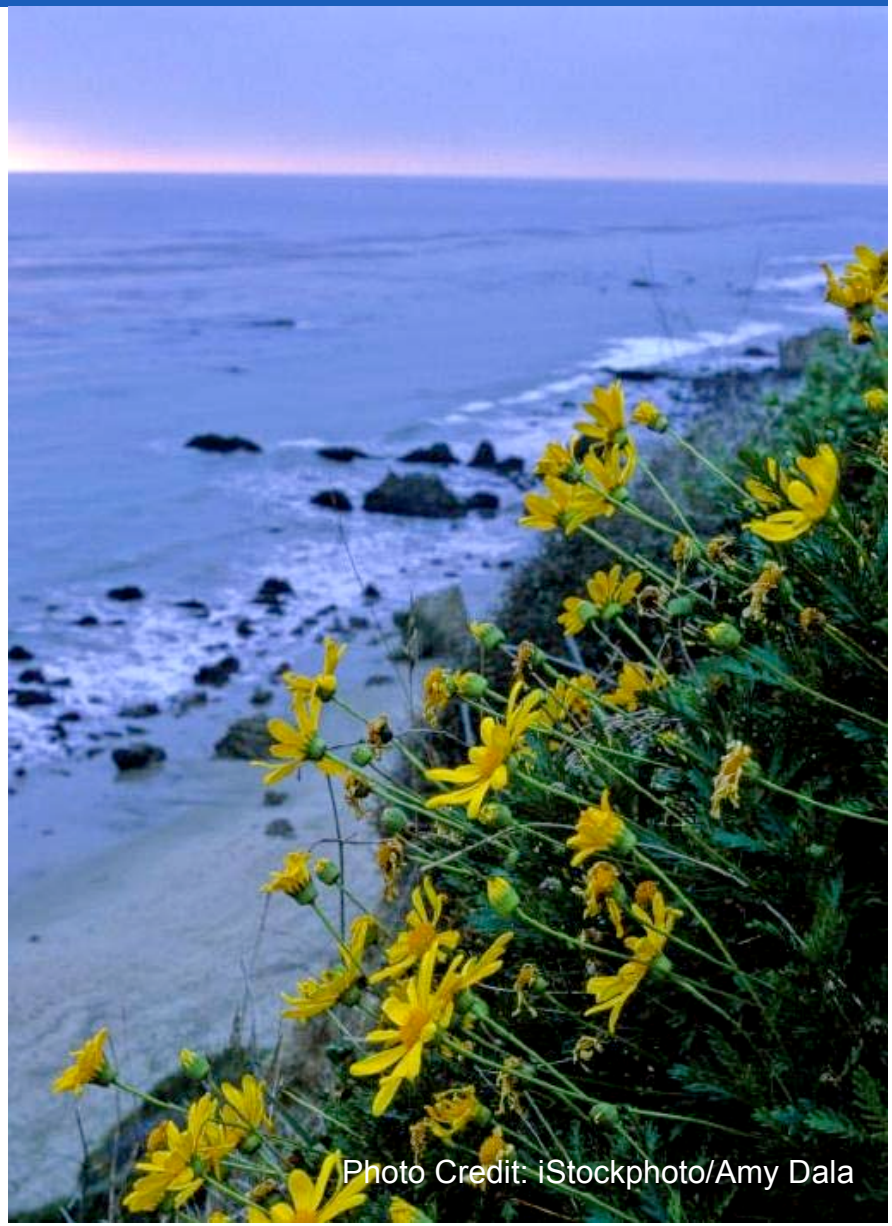


Photo Credit: iStockphoto/Amy Dala

Conceptual Model for Determining LOP

Does proposed activity **alter natural habitat** directly?
(physical habitat damage)

if NO
Is **abundance** of any species in natural habitat (targeted or non-targeted) likely to be **significantly different in the MPA relative to an SMR**? (i.e., Are any removed species likely to benefit?)

if YES
Is habitat alteration likely to **change community structure** substantially?

if NO
Is removal of any species likely to **impact community structure** directly or indirectly?

if YES
Is removal of any species likely to **directly alter natural habitat**? (i.e., biogenic habitats)

if YES
Is habitat alteration likely to **change community structure** substantially?

if NO
Is the altered abundance of any species likely to **alter community structure**? (i.e., species interactions)

if NO
High LOP

if YES
Mod-high LOP

if NO
Mod LOP

if YES
Mod-low LOP

if YES
Low LOP

*Levels of Protection

	Level of Protection	MPA Type	Activities Associated with a Protection Level for the North Central Coast Study Region (NCCSR)
	Very high	**SMR**	No take
	High	**SMCA SMP**	In water depth > 50m: pelagic finfish by hook and line (salmon by troll only); coastal pelagic finfish by seine
	Moderate-high	**SMCA SMP**	In water depth < 50m: pelagic finfish by hook and line (salmon by troll only); coastal pelagic finfish by seine; Dungeness crab (traps/pots), squid (pelagic seine)
	Moderate	**SMCA SMP**	Salmon (non-troll H&L); abalone (diving); halibut, white seabass, shore-based finfish, croaker, and flatfishes (H&L); smelt (H&L and hand/dip nets); clams (hand harvest); giant kelp (hand harvest)
	Moderate-low	**SMCA SMP**	Urchin (diving); lingcod, cabezon, greenling, rockfish, and other reef fish (H&L); surfperches (H&L)
	Low	**SMCA SMP**	Bull kelp and mussels (any method); all trawling; giant kelp (mechanical harvest); mariculture (existing methods)

*Levels of protection from the north central coast study region

Habitat Representation

"*For an objective of protecting the diversity of species that live in different habitats and those that move among different habitats over their lifetime, every "key" marine habitat should be represented in the MPA network."

*Science guidance from Master Plan for Marine Protected Areas

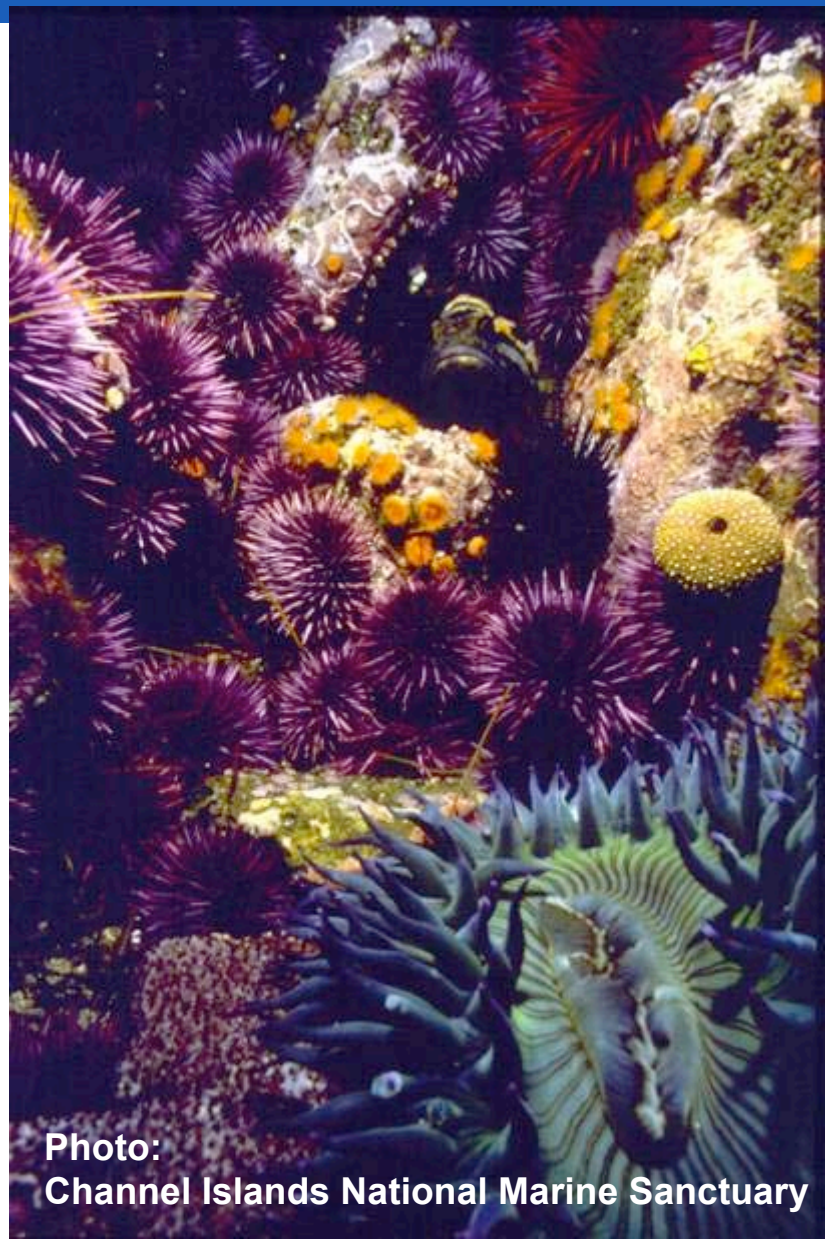


Photo:
Channel Islands National Marine Sanctuary

Key Habitats

Intertidal/Nearshore

- Rocky Shore
- Sandy Beach
- Coastal Marsh
- Tidal Flats
- Estuary
- Eelgrass
- Surfgrass

Oceanographic

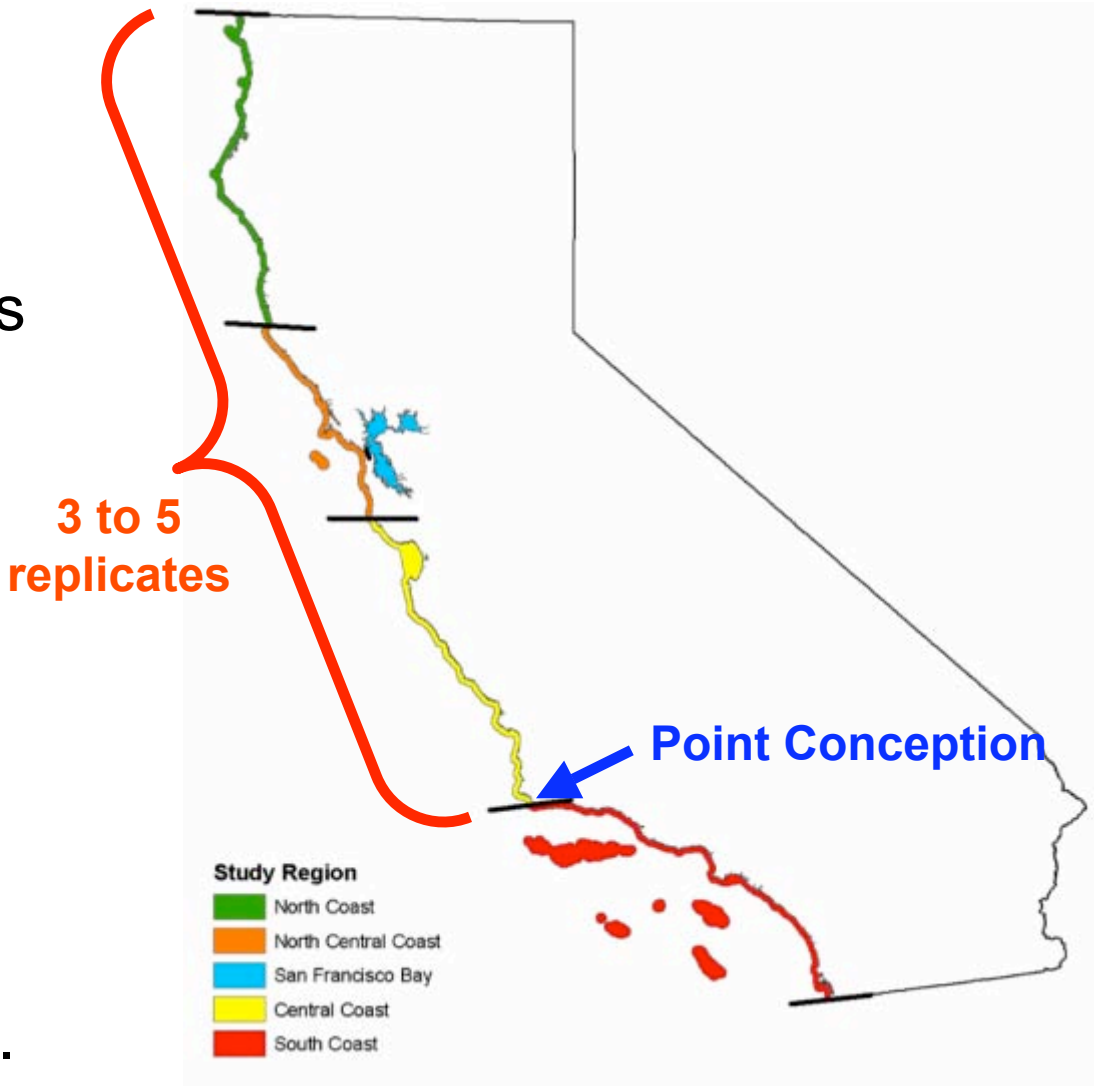
- Upwelling centers
- Retention areas
- Freshwater plumes

Subtidal

- Hard/Soft Bottom
  - 0-30 m
  - 30-100 m
  - 100-200 m
  - >200 m
- Kelp forest
- Canyons
- Seamounts

Habitat Replication

- Science guidance in the Master Plan recommends **3 to 5 replicates** of each key habitat within reserves in each **biogeographical region** (Point Conception to California-Oregon border)
- For the south coast study region, scientists recommended at least **1 replicate** of each key habitat in each **bioregion**.



Habitat Replication

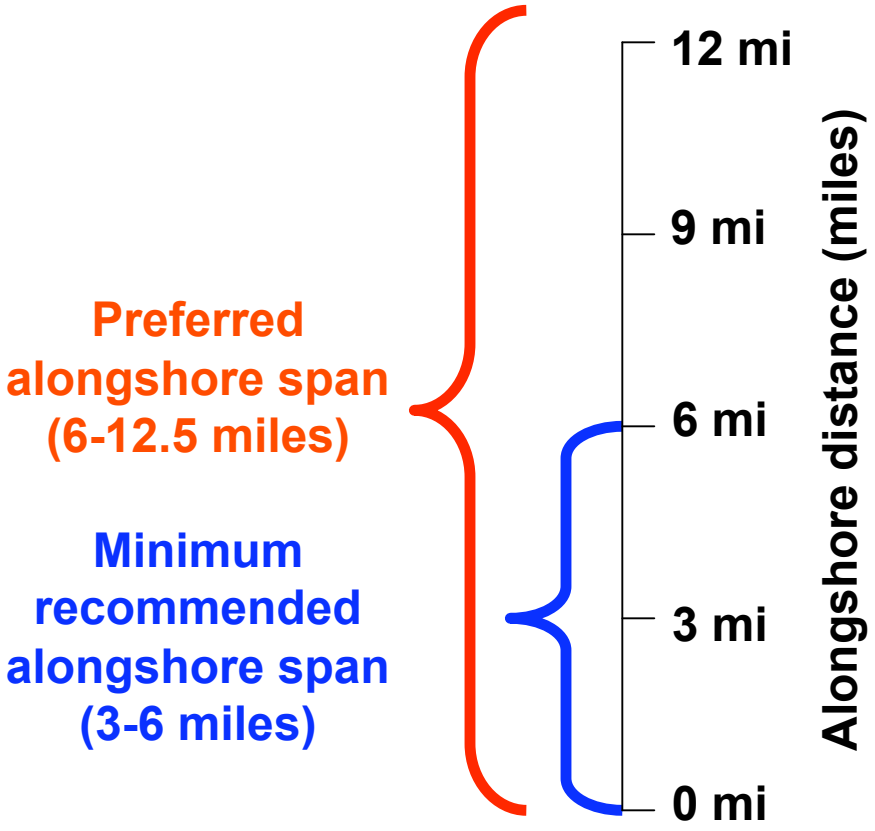
*90% threshold for different habitats

Habitat	Area or Length of a Replicate	Data Source
Rocky Intertidal	**~0.5 linear miles**	PISCO Biodiversity
Shallow Rocky Reefs/Kelp Forests (0-30 m)	**~1 linear miles**	PISCO Subtidal Surveys
Deep Rocky Reefs (30-100 m)	**~0.1 square miles**	Starr Surveys
Sandy Beaches *	**~1 linear miles**	
Soft-Bottom Habitat (0-30 m)	**~1 linear miles**	Based on shallow rocky reefs
Soft-Bottom Habitat (30-100 m)	**~10 square miles**	NMFS Triennial Trawl Surveys (1977-2007)
Estuary	**0.12 square miles (77 acres)**	

*Estimates for the north central coast study region

Guideline for MPA Size

"*For an objective of protecting adult populations, based on adult neighborhood sizes and movement patterns, MPAs should have a minimum alongshore span of 5-10 km (3-6 miles) of coastline, and preferably 10-20 km (6-12.5 miles)."



*Science guidance from Master Plan for Marine Protected Areas

Scales of Adult Movement

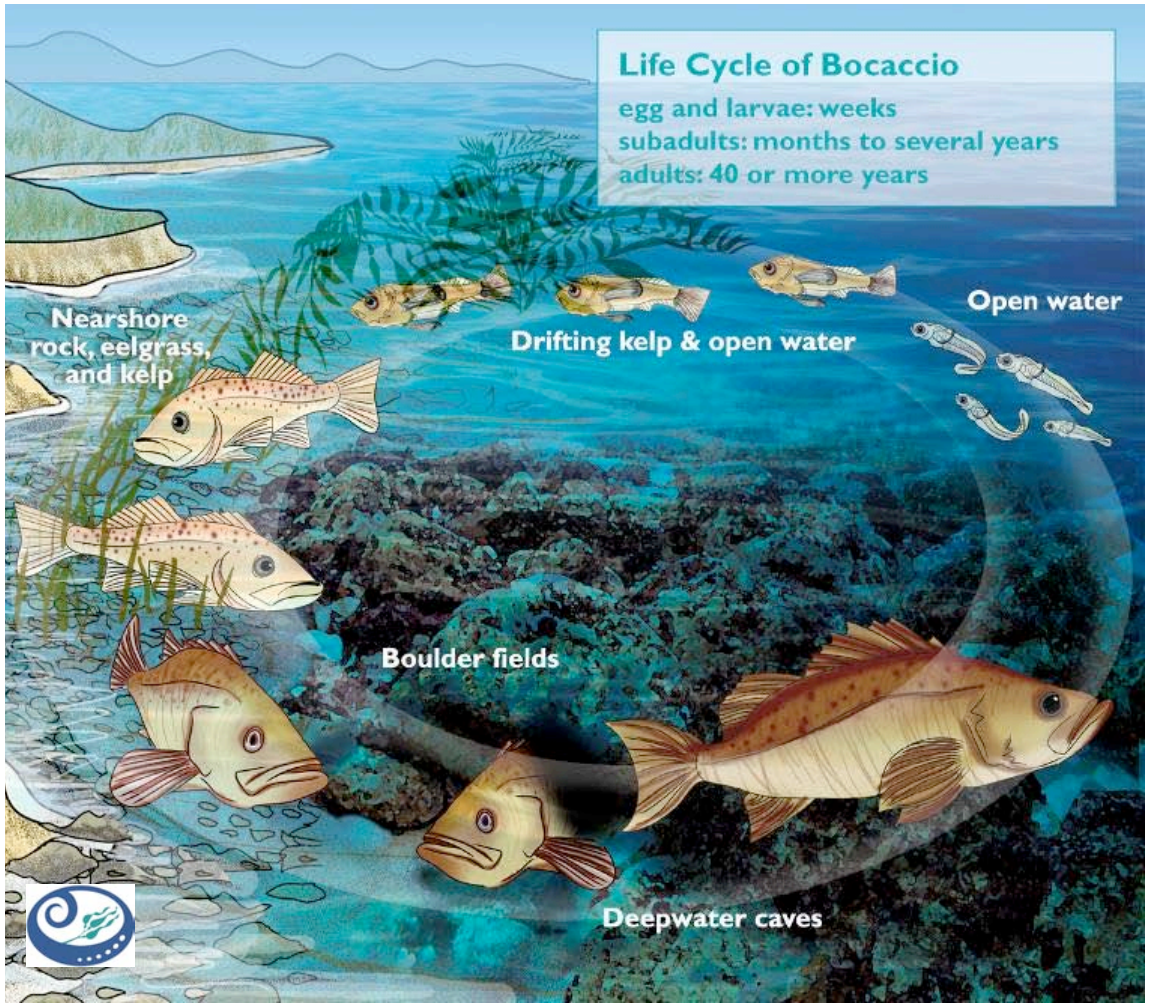
0-1 km	1-10 km	10-100 km	100-1000 km	>1000 km
Invertebrates: abalone, mussel, octopus, sea star, snail, urchin **Rockfishes:** black & yellow, brown, copper, gopher, grass*, kelp, quillback, starry, treefish, vermilion **Other Fishes:** cabezon, eels, greenlings, giant seabass, black, striped and pile perch, pricklebacks	**Rockfishes:** black, China, greenspotted*, olive, yelloweye **Other Fishes:** walleye perch* 	**Invertebrates:** Dungeness crab** **Rockfishes:** blue, bocaccio, yellowtail **Other Fishes:** California halibut, lingcod, starry flounder **Birds:** gulls, cormorants **Mammals:** harbor seal, otter	**Rockfishes**: canary **Other Fishes:** anchovy, big skate, herring, Pacific halibut, sablefish**, salmonids**, sole, sturgeon **Birds:** gulls** **Mammals:** porpoise, sea lion**	**Invertebrates:** jumbo squid** **Other Fishes:** sardine, shark**, tunas**, whiting** **Reptiles:** turtles** **Birds:** albatross**, pelican**, shearwater**, shorebirds**, terns** **Mammals:** dolphins, sea lion**, whales**

**** Studies of this species included fewer than 10 individuals***

***** Seasonal migration***

Guideline for MPA Size

*To protect species at different depths and ontogenetic movements, MPAs should extend from the intertidal zone to deep waters offshore.



Art by Ryan Kleiner

*Science guidance from Master Plan for Marine Protected Areas

Guideline for MPA Size

*Taking into account these two guidelines, the science advisory team recommended a minimum area of 9–18 square miles for each MPA, and preferably 18–36 square miles.

Photo: Gretchen Hofmann

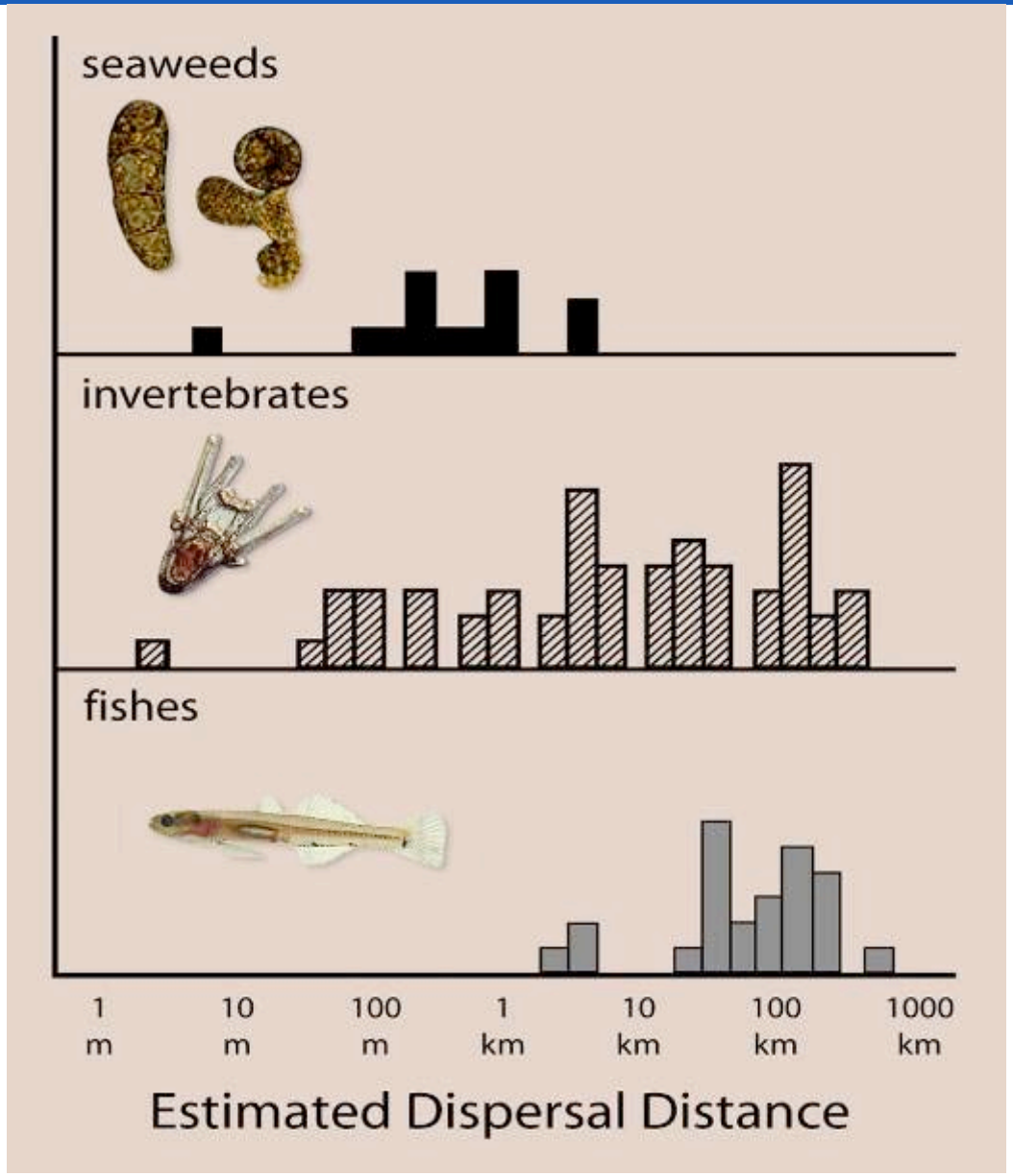
*Science guidance from Master Plan for Marine Protected Areas

Guideline for MPA Spacing

"*For an objective of facilitating dispersal of important bottom-dwelling fish and invertebrate groups among MPAs, based on currently known scales of larval dispersal, MPAs should be placed within 50-100 km (31-62 miles) of each other."

*Science guidance from Master Plan for Marine Protected Areas

Scales of Larval Dispersal



Other Science Guidance

Scientific evaluation of proposed MPAs also considers:

- Locations of marine mammal haulouts, bird colonies and rookeries
- Water and sediment quality


Photo: Jeffrey Slovin


Photo: Rick Heiser

Summary

Summary of science guidance for MPA design:

- Include all key habitats.
- Minimum size is no less than **9 square miles**, preferred is no less than **18 square miles**.
- Each key habitat should be replicated in **3-5 MPAs** in a *biogeographical region* with at least **1 MPA** in a *bioregion* (subregion).
- Minimum spacing is no more than **62 miles** between MPAs, preferred is no more than **31 miles**.

For More Information

For more information about science guidelines:

- Master Plan for Marine Protected Areas http://www.dfg.ca.gov/mlpa/masterplan.asp
- Draft Methods Used to Evaluate Marine Protected Area Proposals www.dfg.ca.gov/mlpa/pdfs/agenda_061809c1.pdf