LEGEND
- State Boundary
- Sanctuary Boundary
- State Marine Protected Areas
  - Green: State Marine Reserve
  - Blue: State Marine Conservation Area

Marine Reserves

0  10  20  30 Kilometers

State Boundary
Sanctuary Boundary
State Marine Reserve
State Marine Conservation Area

Marine Reserves
What is a marine reserve?

Places in the ocean that are completely & permanently protected from uses that remove plants & animals or alter their habitats.
Reserves Around the World

- > 100 marine reserves established worldwide
- Encompass < 1 % of world’s oceans
- < 0.01 % of U.S. waters
- Usually quite small, median reserve size is < 1.5 sq. mi.
What good are reserves?
What good are reserves?

Bigger, more abundant animals in reserves produce more young than smaller neighbors in unprotected waters.
Case Study: Anacapa Is., CA

Inside reserve:
Lobster = 6 times more abundant
Red Urchins = grow 1.7 times larger
Sheephead = 3 times more plentiful
Kelp = 5 times more dense & persist longer
Case Study: Anacapa Is., CA

A Web of Life

California Sheephead → Purple Urchin → Giant Kelp → California Spiny Lobster

Non-Reserve Reserve

- Purple Urchin:
  - Non-Reserve: 32.8362 (#/m²)
  - Reserve: 2.4417 (#/m²)
- California Spiny Lobster:
  - Non-Reserve: 0.00201 (#/m²)
  - Reserve: 0.0127 (#/m²)

(% cover)

- Giant Kelp:
  - Non-Reserve: 5%
  - Reserve: 26%

# / m² = average number per square meter
Can reserves produce benefits outside their boundaries?

Animals from reserves may move outside to supplement surrounding populations = **Spillover Effect**

**Diagram:**
- Spotted Seatrout
- Red Drum
- Sheepshead
- Black Drum
- Striped Mullet
- Common Snook

**X-axis:** Maximum Distance from Reserve (km)

**Y-axis:** Type of Fish
Can reserves produce benefits outside their boundaries?

Larvae & plant propagules that disperse out of reserves may seed & boost populations in surrounding waters.
Can reserves benefit migratory organisms?
Things to consider when designing reserves

How long does it take to see a response?
Do all habitats need protection?
Can reserves protect species that are affected by climate change and pollution?
Ocean processes, natural catastrophes

Connectivity: Spring Upwelling Period

Point Conception
Santa Barbara
San Miguel Island
Santa Rosa Island
Santa Cruz Island
Anacapa Island
Santa Barbara Island

MFA Network
SMR
SMCA

0 10 20 30 Kilometers
Does size and number matter?

Data from Mace, P.M., and M.P. Sissenwine. 1993. How much spawning per recruit is enough? Canadian Special Publication of Fisheries and Aquatic Sciences 120:110-118.
Does size and number matter?

Composite of all published recommendations for reserve size to achieve goals for fisheries.
Effective Reserve Sizes

Networks of reserves (Connectivity)
Social & Economic Issues
Relative Number of Fishing Operations
Channel Islands National Marine Sanctuary

Sum of 1999 Commercial Fishing Value: Channel Islands NMS


Year | Pounds (millions) | Total
--- | --- | ---
88 | $5,950,000
89 | 50
90 | 45
91 | 40
92 | 35
93 | 30
94 | 25
95 | 20
96 | 15
97 | 10
98 | 5
99 | 10

Rockfish Catch in California: 1988-1999

Spiny Lobster Catch in California: 1988-1999

Abalone Catch in California: 1988-1999

Channel Islands Marine Reserves

- 10 years ago, fishermen developed initial map where they thought reserves should be

- Committee of scientists to come up with best areas for reserves, scientifically (other studies said 40%, panel suggested 30 – 50%).

- Other stakeholders consulted and more maps produced

- 5 years (1998) of intensive work to get proposal on table to Fish and Game Commission

- April 9, 2003 regulations implemented

http://channelislands.noaa.gov/welcome.html
Effective April 9, 2003

Size: 132 nmi$^2$

**LEGEND**

- **State Boundary**
- **Sanctuary Boundary**
- **State Marine Protected Areas**
  - **State Marine Reserve**
  - **State Marine Conservation Area**
CINMS Marine Protected Areas Network

- **Marine Reserve (MR)**
- **Marine Conservation Area (MCA)**
  - Allows recreational harvest of lobster and pelagic finfish
- **Marine Conservation Area (MCA)**
  - Allows commercial and recreational harvest of lobster and recreational harvest of pelagic finfish
- **Designation pending final decision by the California Fish and Game Commission**

\(\checkmark\) CINMS (Mean High Water to 6 nm)
\(\checkmark\) State Waters (Mean High Water to 3 nm)

**In effect July 2007**
California Reserves: Past & Present

13,600 nautical square miles = total state waters

Past: 8 nautical sq. mi = no take

Present: 480 nm² = no take (19 no take areas total)

10 (132 nm²) of the 19 are in Channel Is.