

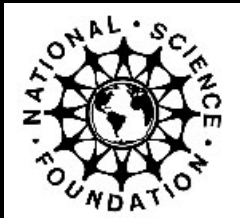
The Role of Marine Reserves in Ecosystem-based Fisheries Management

by

Wynn W. Cudmore, Ph.D.

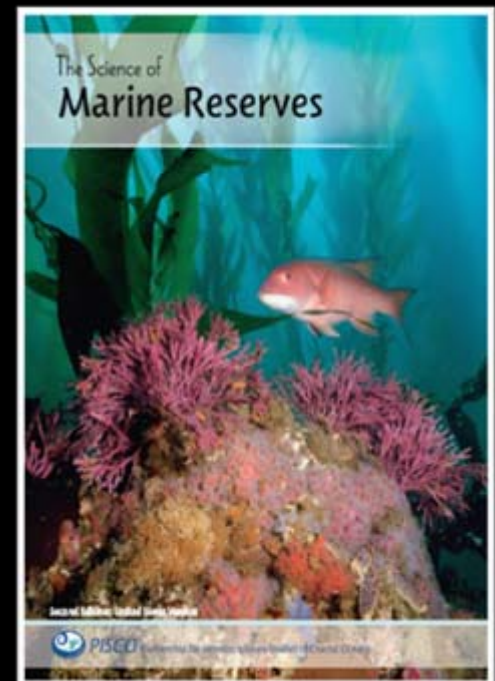
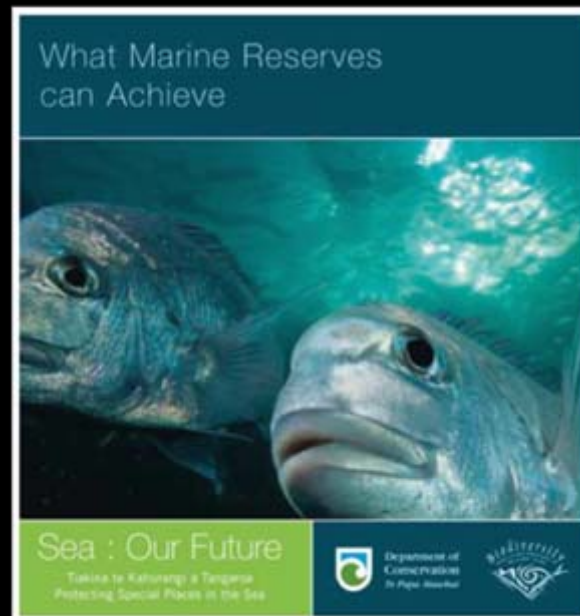
Northwest Center for Sustainable Resources

DUE# 0757239



This project supported in part by the National Science Foundation.
Opinions expressed are those of the authors and
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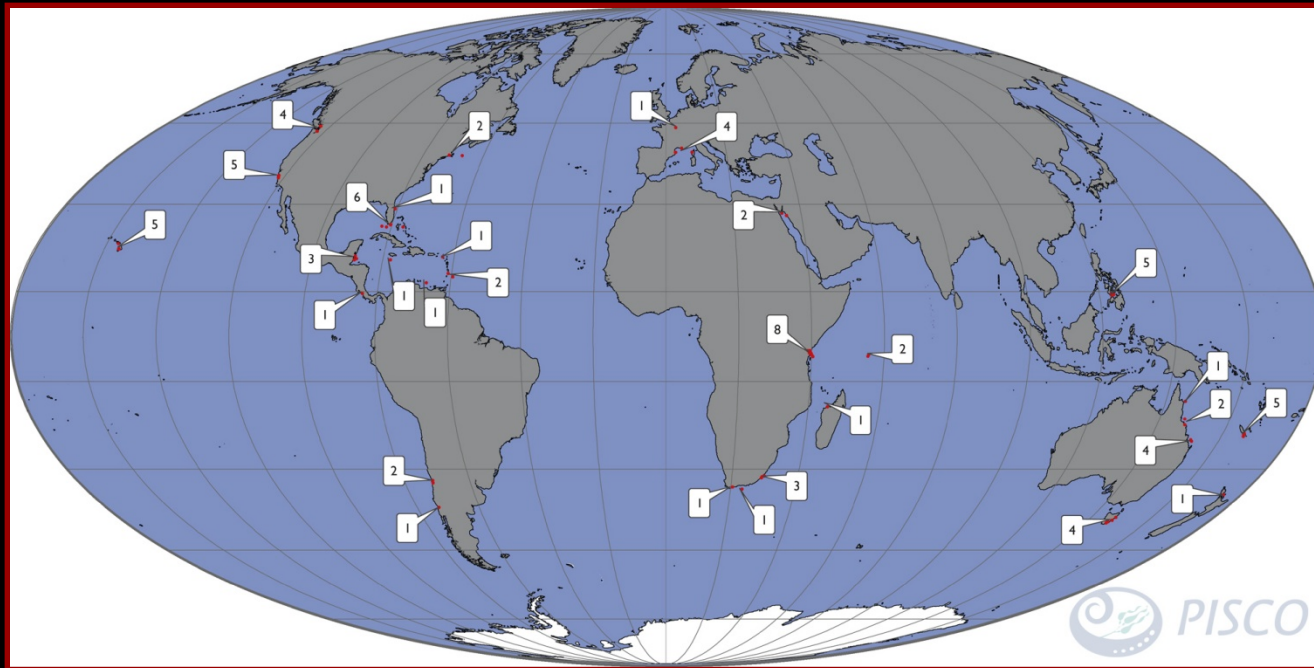




Marine Protected Areas - definitions

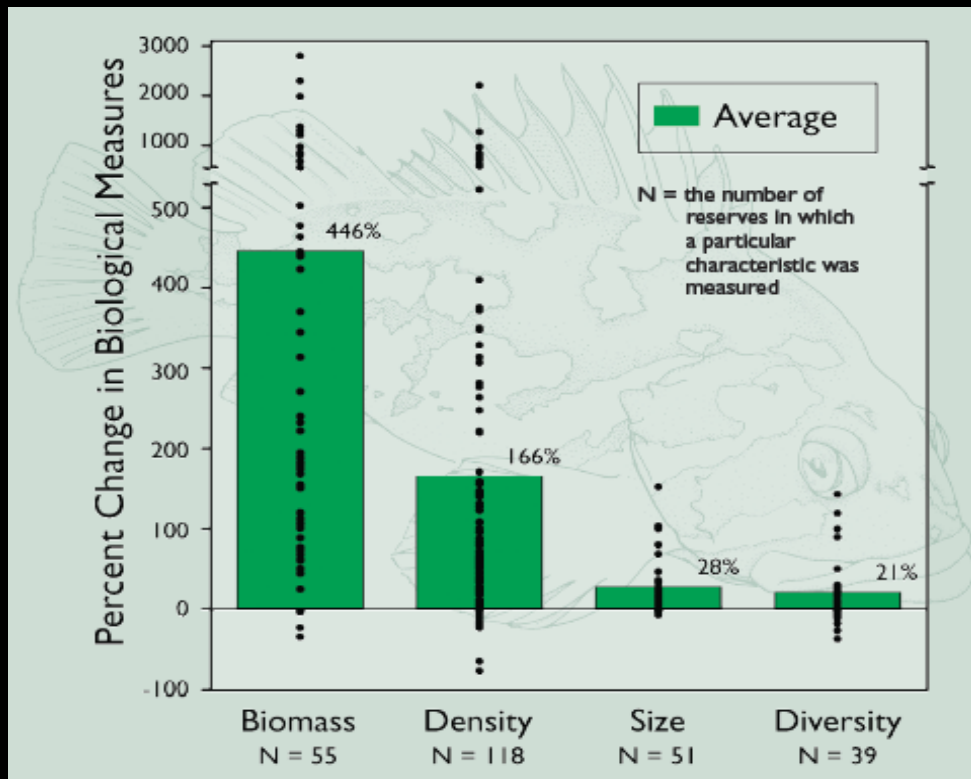
- **Marine protected area (MPA)** – a geographic area that has been designated to enhance the conservation of marine resources
- **Marine reserve** – a type of MPA that prohibits all extractive activities including fishing
- **Marine sanctuary** – a type of MPA that allows fishing but prohibits other extractive activities such as offshore oil development and mining

Worldwide Distribution of Marine Reserves



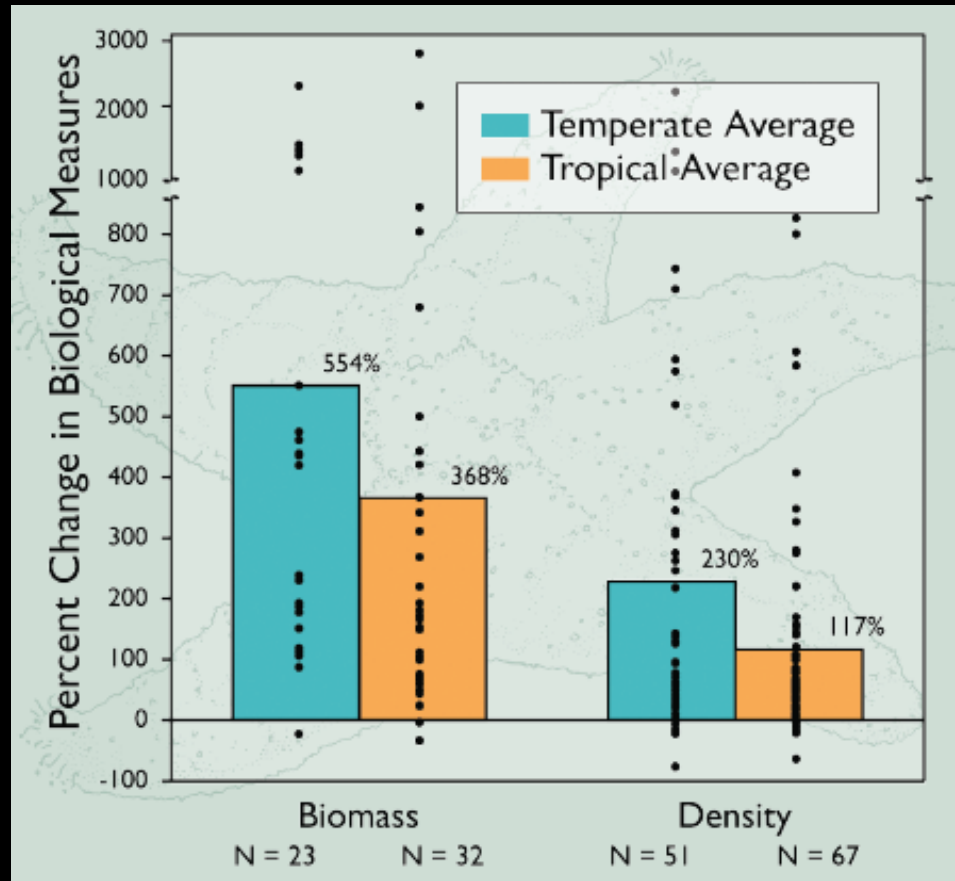
Approximately 0.01% of oceans is designated as marine reserves

What benefits do marine reserves provide within their boundaries?



Marine species are more abundant, larger and more diverse inside reserves as compared to outside reserves

Temperate vs. Tropical Marine Reserves



Sea scallops on Georges Bank

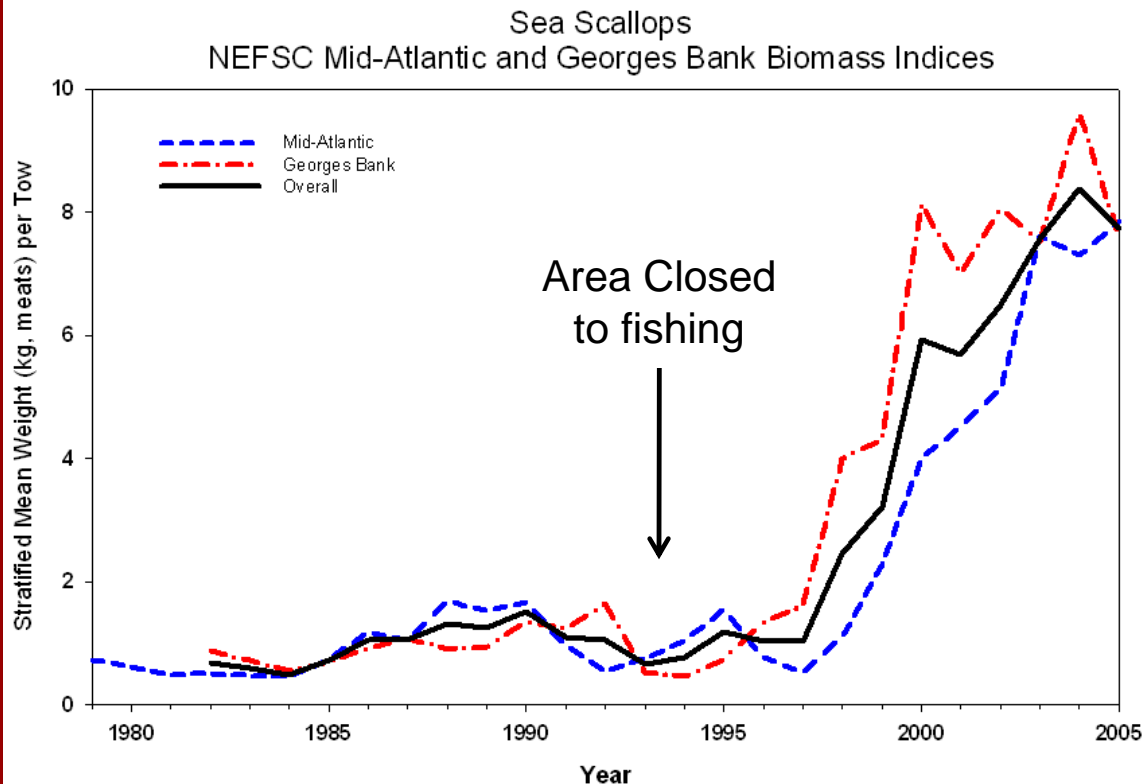
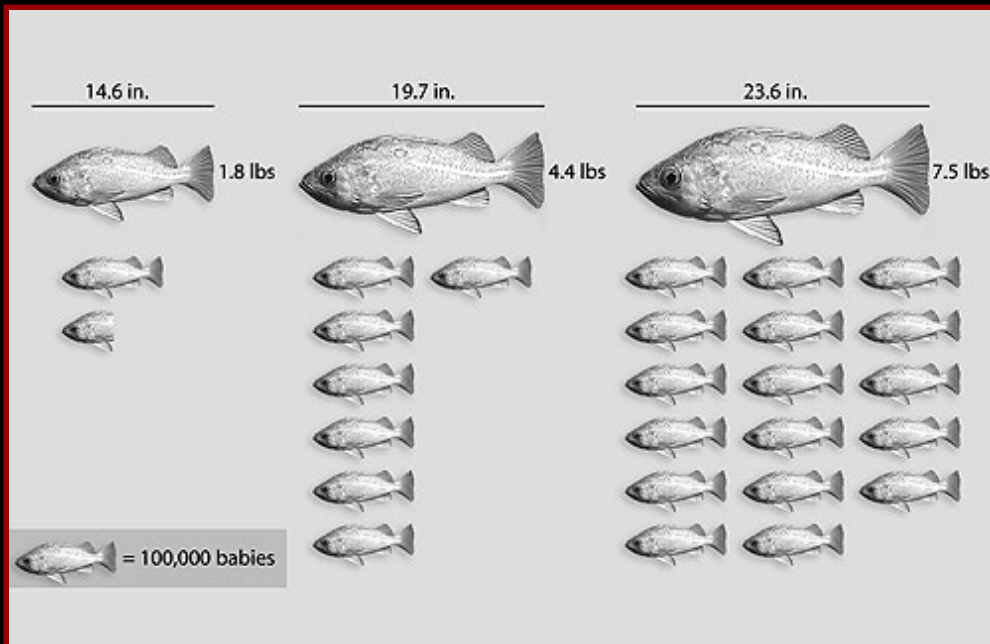


Figure 36.6. Biomass indices (stratified mean weight per tow) for sea scallops in the Mid-Atlantic and Georges Bank regions, and in the two regions combined, from NEFSC sea scallop research vessel surveys.



Large females produce more offspring



Vermillion rockfish

Big Old Fat Females Rule!



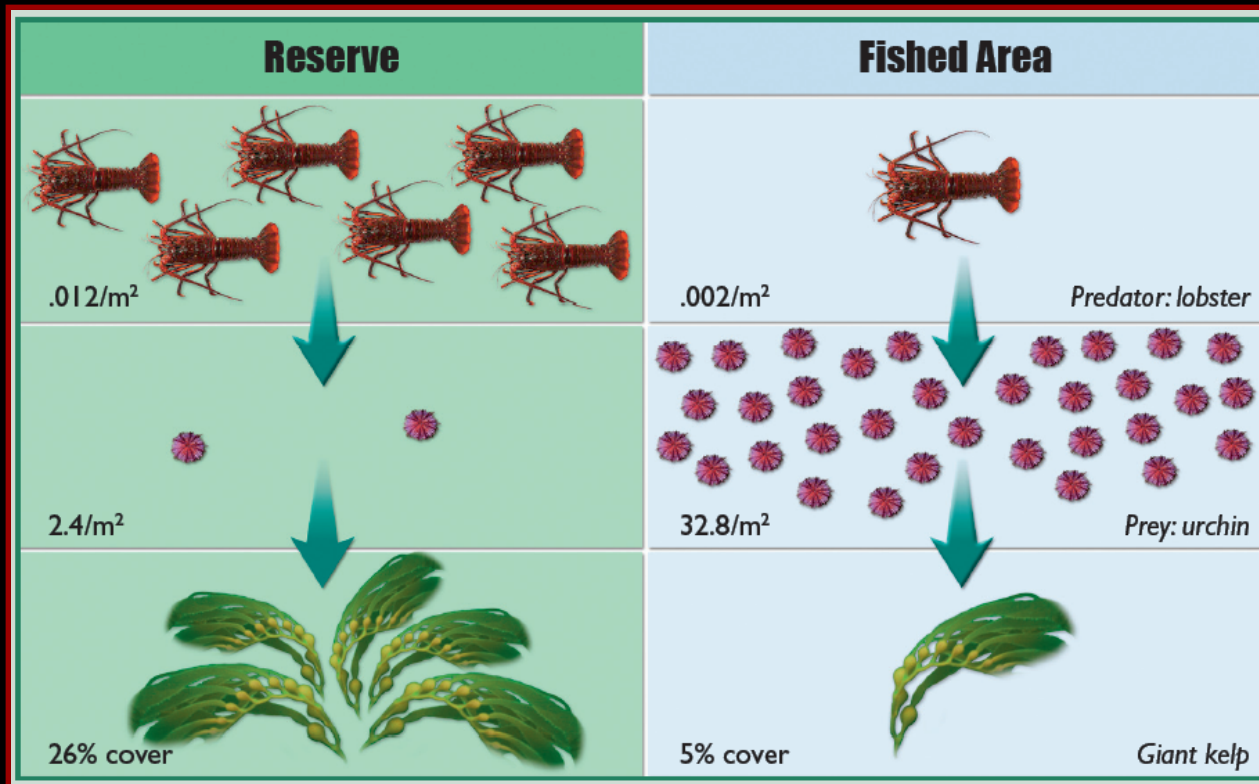
Short-raker rockfish

Bering Sea, Alaska

60 lb. female

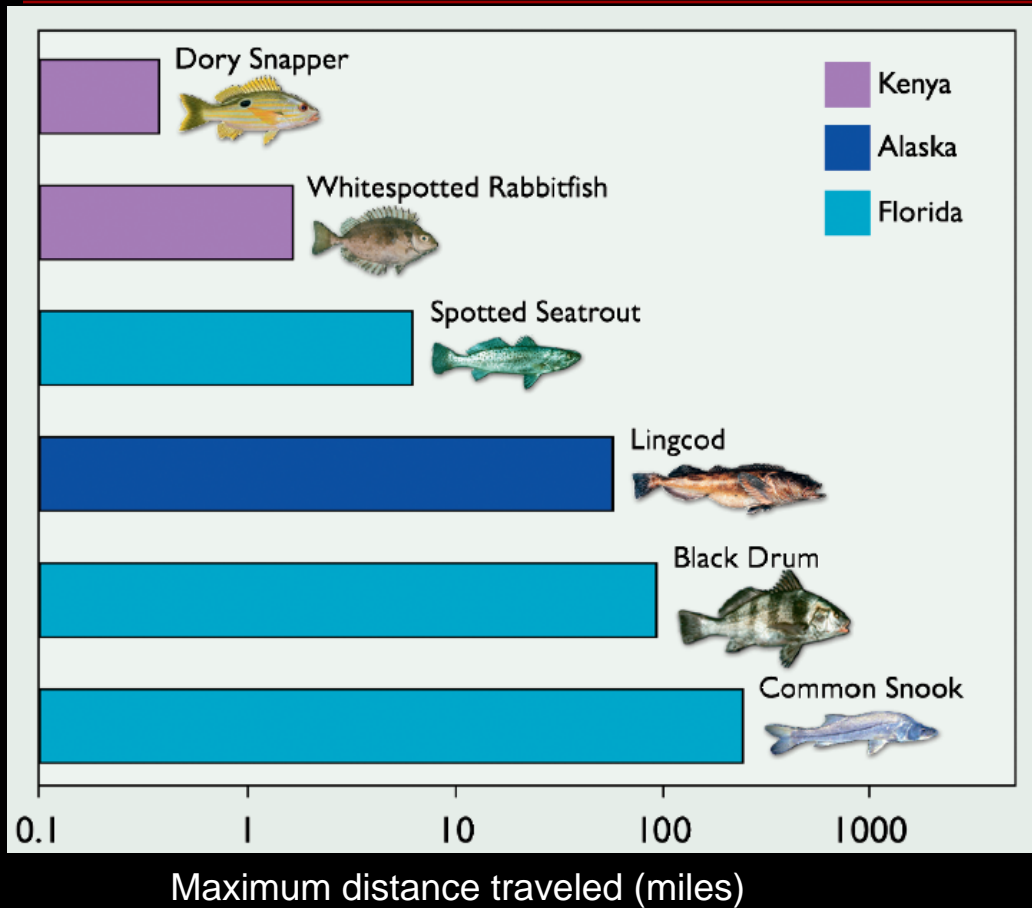
90-115 years old

Marine reserves can restore ecological balance



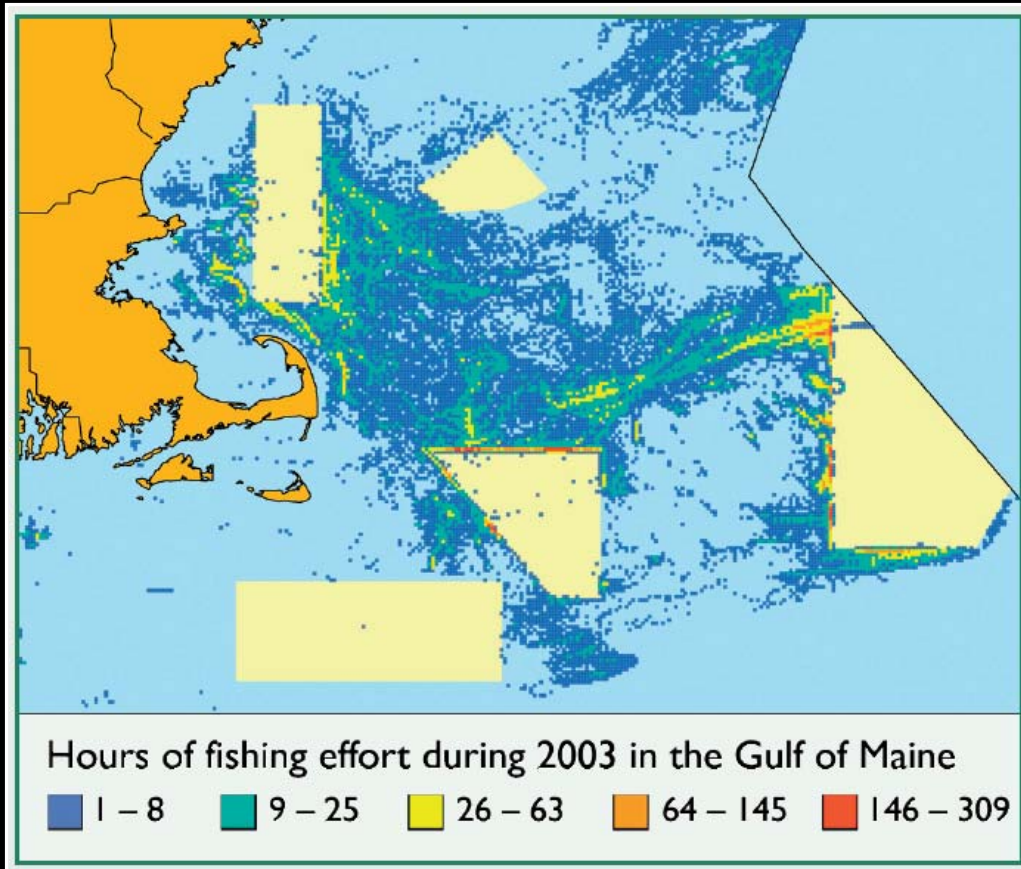
Anacapa Island
Marine Reserve,
California

What benefits do marine reserves provide outside their boundaries?



Spillover from reserves to non-reserve areas

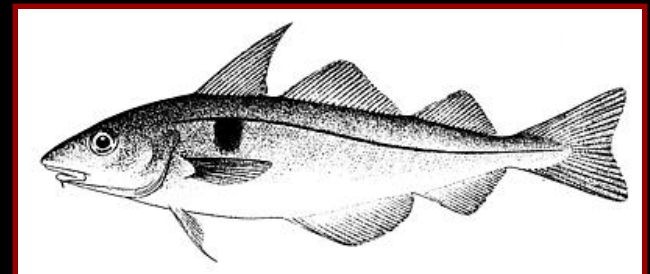
Evidence of Spillover



From 2001-03:

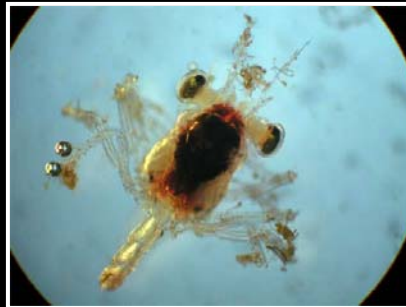
42% of total U.S. haddock catch was within 0.6 mi. of closed areas

73% within 3.1 mi.

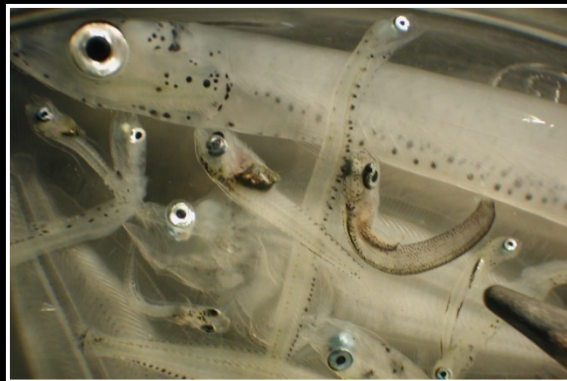


Reserves can also export larval fish and invertebrates to other areas

“Seeding”



Larval crab



Larval fish



Year-old sea scallops on
Georges Bank

What factors should be considered in the design of marine reserves?

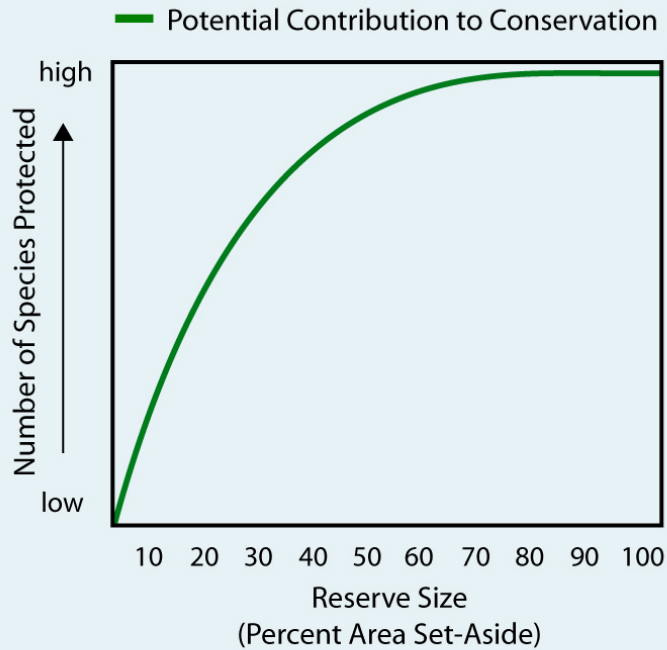
■ Location

- Range of habitat types
- Species-specific spawning or feeding areas
- Locations of rare species
- Vulnerability to natural and human impacts
- Compatibility with human activities

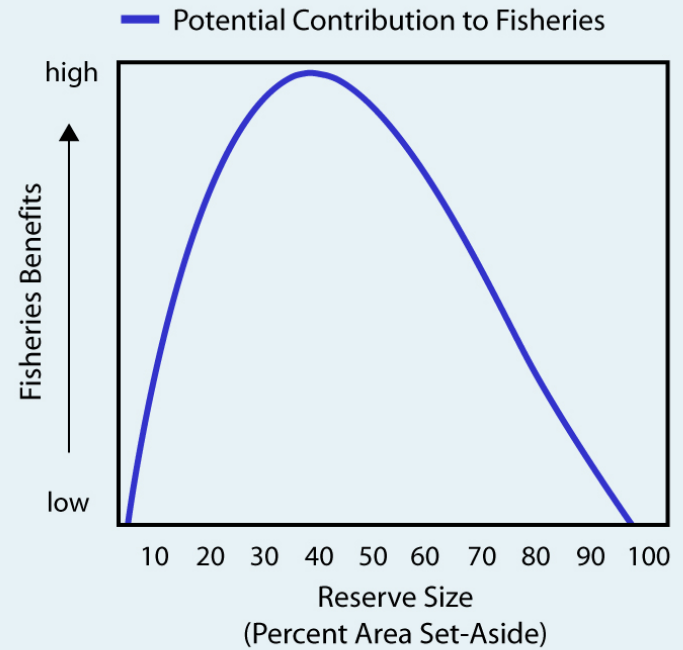
What factors should be considered in the design of marine reserves?

- Location
- Size
 - Contribution to conservation
 - Impact on fisheries

Marine Reserve Size



(Data courtesy Channel Islands NMS Science Advisory Panel)



(Data courtesy Channel Islands NMS Science Advisory Panel)



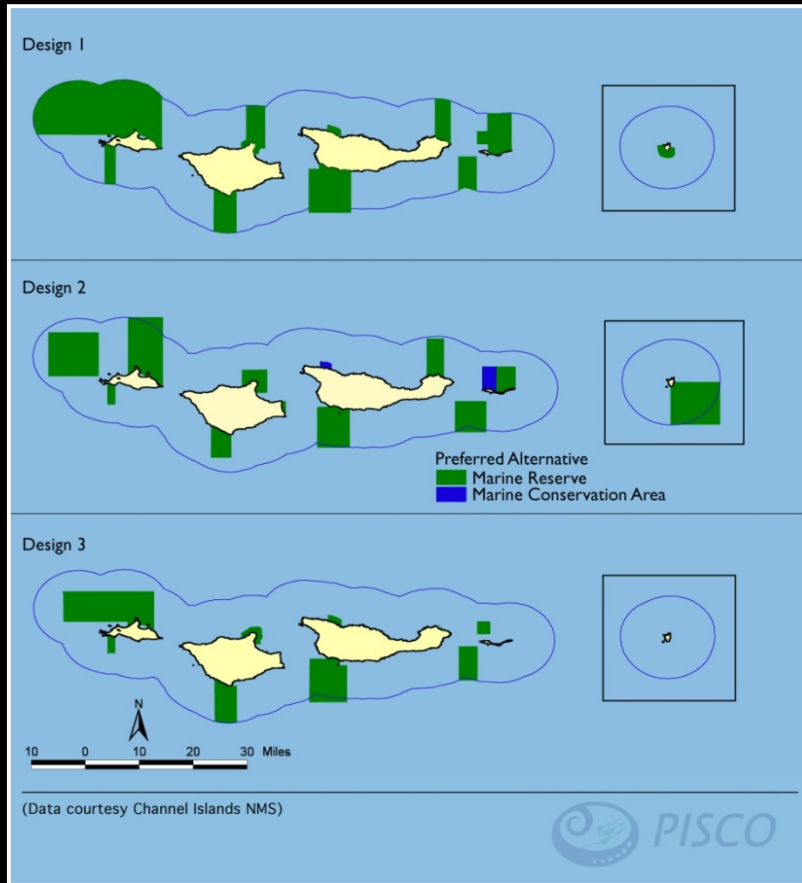
What factors should be considered in the design of marine reserves?

- Location
- Size
- Number in an area
 - Protect 30% (10-65%) of the targeted fishery
 - Protect 15-30% of ocean area

What factors should be considered in the design of marine reserves?

- Location
- Size
- Number in an area
- Proximity to each other

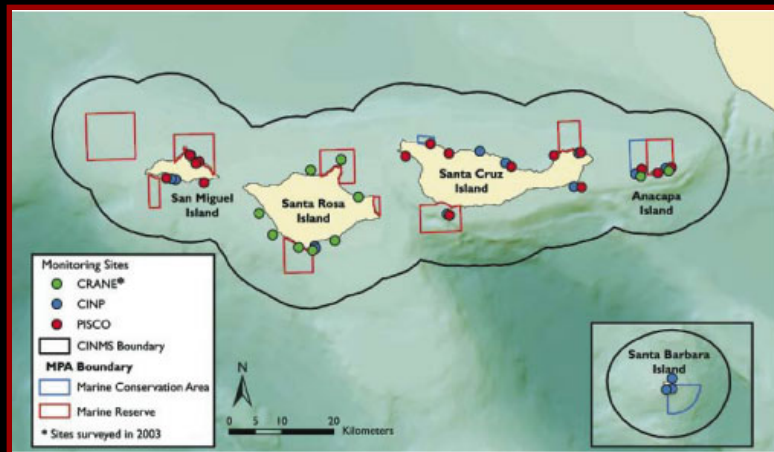
Marine reserves – Proximity



Networks of small reserves may be more practical than a single large reserve

Many designs are possible

Established marine reserves – some examples



Channel Islands Marine Reserves,
California



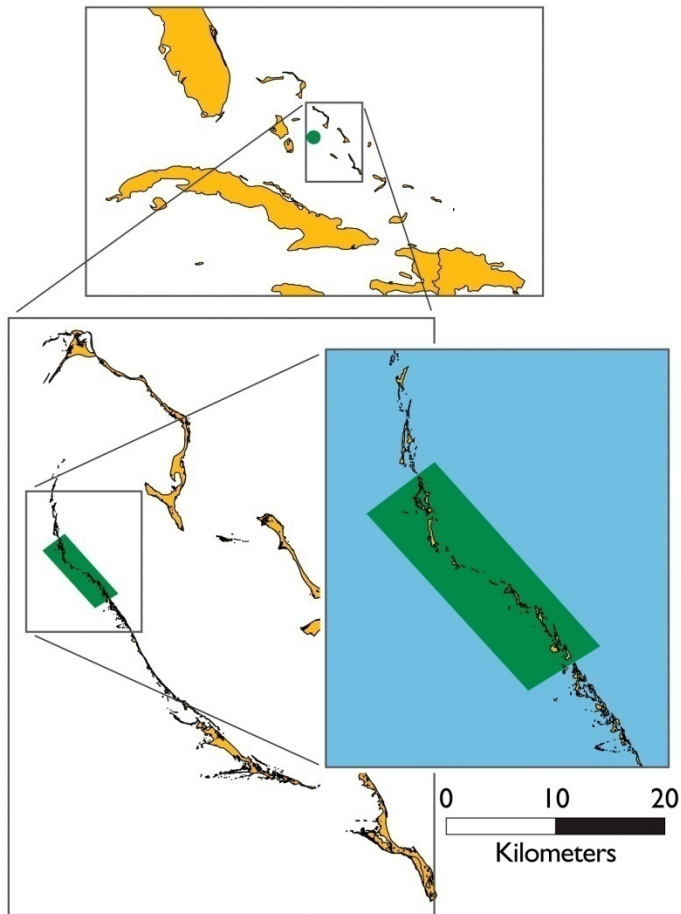
Central California Coast
Marine Reserves

San Juan Islands, Washington



Lingcod

Exuma Cays Land and Sea Park, Bahamas



■ Marine Reserve

Exuma Cays Land and Sea Park,
Bahamas

Established as a national park in
1959

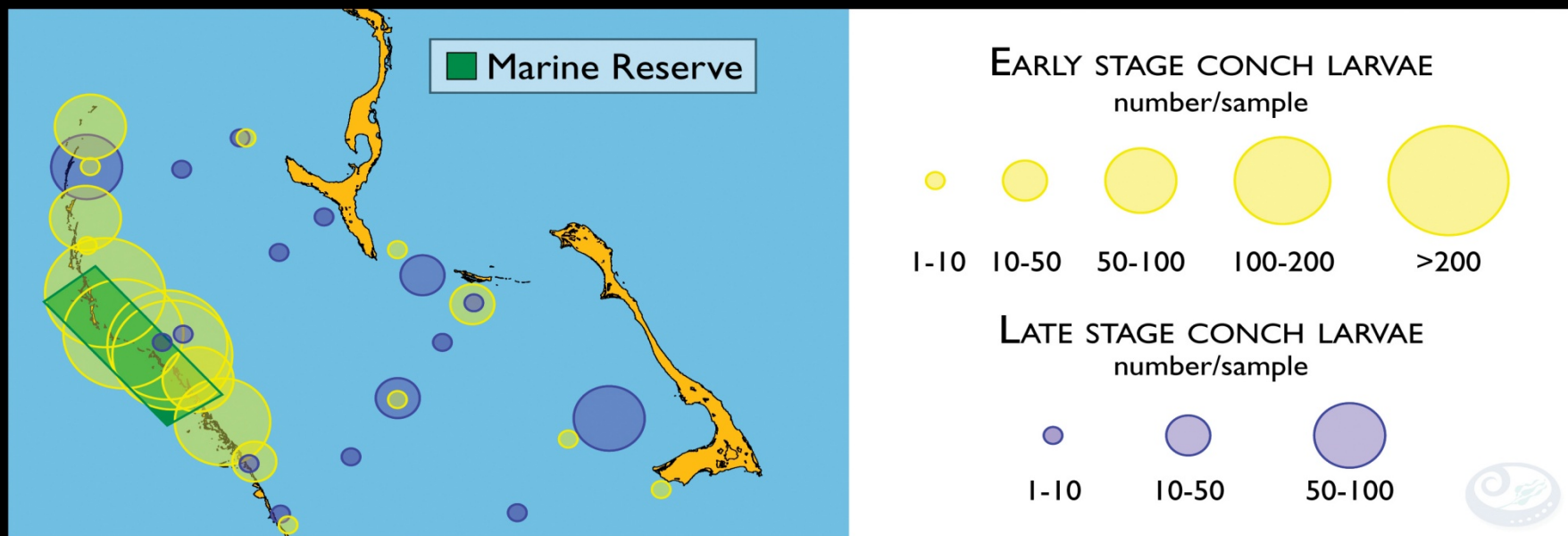
No-take provision added in 1986

Used as a model to establish
marine reserves in the Florida
Keys Marine Sanctuary



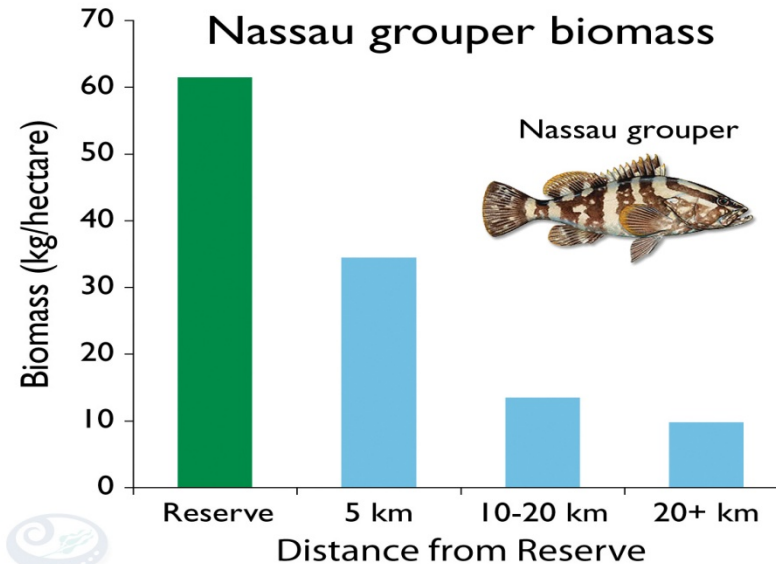


Exuma Cays Marine Reserve – Evidence for “Seeding”



The youngest conch larvae were most abundant in and near the marine reserve. Slightly older larvae were found throughout the region. This finding suggests that most young conch were produced inside the reserve and were dispersed outside by currents. *Data: Stoner et al. (1998) Journal of Shellfish Research*

Exuma Cays Marine Reserve – Evidence for “Spillover”



Biomass of Nassau grouper was highest in the marine reserve and decreased with distance from the reserve. This pattern strongly suggests that grouper from the reserve move into adjacent fished areas. *Data: Sluka et al. (1997) Proceedings of the 8th Annual International Coral Reef Symposium*

The Complexity of Marine Reserves as a Management Tool

- Marine reserves may be less effective for migratory species
- Fishing effort may be displaced to areas of higher species diversity
- Illustrates critical importance of:
 1. marine reserve placement
 2. considering entire community
 3. combining with fishing effort reductions



Supporters say that marine reserves will

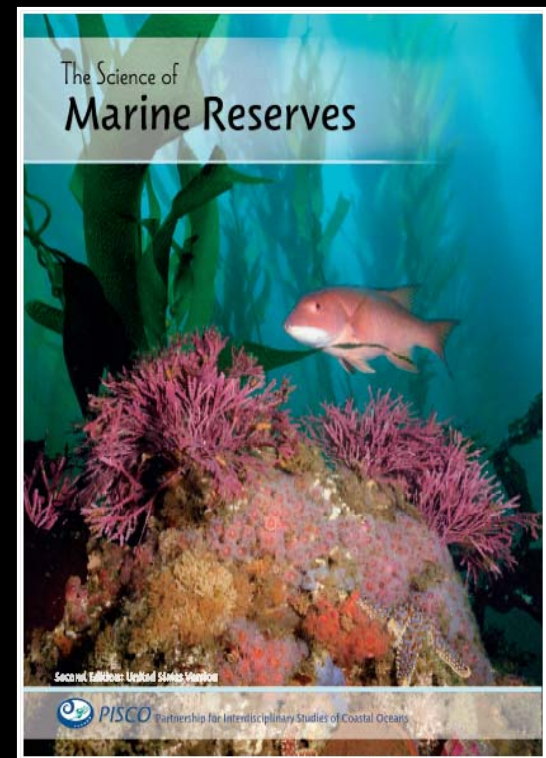
- promote sustainable fisheries and enhance fishery yields by providing 'spillover' of adult fish
- provide a buffer against errors in fishery management
- provide reference areas for comparison to fished areas
- protect marine biodiversity
- help buffer marine ecosystems against other disturbances

Detractors of marine reserves contend that

- benefits of reserves have not been conclusively demonstrated
- sustainable fisheries management is better obtained by controls on fishing effort
- adding reserves will require that quotas be reduced
- adding reserves to a fishery will reduce the area that can be fished
- reserves will shift fishing effort to other areas
- reserves could lead to increased seafood imports from countries with fewer restrictions

Marine Reserves:

- are a type of marine protected area that excludes all extractive activities including fishing
- can be a useful management and conservation tool
- provide benefits both within and outside their boundaries
- cover only 0.01% of ocean area
- must be designed with both conservation and socioeconomic factors in mind
- should be used in conjunction with other management tools



Marine Reserve Video



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