

Benefits, Results and Challenges for Marine Reserves

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Closed areas of marine habitat allow an endangered and vulnerable species populations to rebuild. Most closures are rescinded as soon as the population recovers. Long term, essentially permanent closures, include Marine Protected Areas (MPAs) and Marine Reserves (MRs). MPAs are designed to allow maximum human use, as long as a particular biological, ecological or cultural phenomenon is protected. MR's are designed to protect local ecosystems, sensitive habitats and vulnerable species. True Marine reserves are designated "zero take" of any organism from that area. Many recreational activities are allowed with the exception of taking or collecting any plant or animal (1,2,3). Current records of the World Database of Protected Areas shows there are now over 5000 MPAs (comprising 0.7% of the ocean) with the United States having over 750 (16). Interestingly none are recorded for the state of Washington (16).

Modern fisheries management is evolving to ecosystem-based management where traditional regulations manage specific species and MPA's manage human interference, and marine reserves manage ecosystems and habitats. Traditional regulations, MPAs and MRs are all necessary to preserve and protect our ecosystems and create sustainable fisheries (8,9,10,11,12,15,18,19).

Fisheries management skills for freshwater ecosystems are remarkably well-developed and effective. Freshwater ecosystems are much simpler, much smaller and well contained. Marine ecosystems, in contrast, are extremely complex. This complexity is due to an enormous number of species – often with complex biology's, and extremely variable home ranges from very large to very small and very different habitats. Tidal influences, many different ocean currents, many different styles of fishing, often unreported and illegal, and many other factors also contribute to the complexity. Fisheries management skills for marine ecosystems have not achieved the level of effectiveness of management skills for freshwater ecosystems. This problem, in combination with past subsidies to fishing fleets and an over-capacity of our fishing fleet is responsible for the depressed state of our oceanic fisheries. We need many more years of research and development on oceanic ecosystems and management skills and we also need marine reserves to restore and protect our fisheries and marine ecosystems (6,13). We also need unmanaged marine reserves to act as a comparison to judge the effectiveness of managed areas. Poaching remains a persistent problem for MRs and MPAs (14).

Marine Reserves work well if (1,2,3,4):

- ✓ They are large enough to actually support a large reproducing population of endemic species. This is a careful balance between having a protected spawning stock biomass large enough to supply the much larger area that needs to be replenished.
- ✓ They are carefully and scientifically designed. They must support all stages of the lifecycle of all species concerned, especially the juveniles in protected bottom habitat, eelgrass beds and kelp beds and estuaries. Shoreline Management Plans management plans are essential.
- ✓ They have an adequate amount of time for ecosystem recovery. Generally positive results are seen within five to eight years for temperate areas. Unfortunately, very long-lived species like rockfish (estimated to be as long as 90 – 205 years for some species) or species with especially severely depressed populations will require more time for recovery.

Ecosystem Benefits from Marine Reserves (1,2,3,4,20):

- ✓ Increased density of fish and other organisms – usually double sometimes more.
- ✓ Increased total biomass by the production of offspring – usually double to triple after three to five years, but sometimes produce as much as four times after five years of protection. Decades later Merritt Island reserve in Florida showed a 2 to 13 times greater abundance. Reserves older than 15 years had as much as a 446% increase in biomass.
- ✓ Restoration of the size and age structure for all individuals in a population. Increased individual size (28%) of many different fish species. This means the enormous reproductive capacity of large old fish is restored.
- ✓ Increased biological diversity in all functional groups of that ecosystem - usually 20-30% higher than unprotected areas.
- ✓ A huge potential for ecosystem-based management (EBM) of wildlife populations and ecosystem protection. Simplifies enforcement and compliance.
- ✓ Restoration of marine food web.
- ✓ Help restore and protect populations of endangered species.
- ✓ Enhanced nearshore and shoreline protection that is especially important for kelp and eelgrass beds that function as fish nurseries for larval fish of many species.
- ✓ Increased ecosystem resilience necessary for resistance to global climate change.

Corollary Benefits to Marine Reserves (1,2,3,4,19):

- ✓ Help mitigate the mortality due to bycatch and ghost or derelict fishing equipment and gear.
- ✓ Help preserve rare and unique habitats, species and marine communities.
- ✓ Provide sites for education and research in near-pristine habitats.
- ✓ Protect sensitive habitats from damage by fishing gear like anchors, downriggers, technological development (tidal power generation), trawls, nets, etc.

- ✓ Enhance and diversifies economic and social opportunities – scuba diving, bird watching, guided fishing trips (around reserve edges), kayaking, whale watching, etc.
- ✓ Provide and improve an area for feeding other wildlife (whales, birds, etc.) without physical disturbance due to excessive boat traffic.
- ✓ Act as buffers for mistakes in fisheries management. Marine reserves function as experimental controls for gauging changes in adaptive fisheries management.
- ✓ Help stabilize population fluctuations and ensure against population crashes in fished areas.

Functional Benefits to Fisheries Management (3,4,5,6,19):

- ✓ Support a spawning stock biomass for vulnerable and fishable species and provides for the export of larvae and juveniles to fishable surrounding areas.
- ✓ Support trophy fisheries in areas around larger marine reserves.
- ✓ Protect the genetic structure of fish populations – small fish reproduce more small fish in overfished areas and large fish reproduce more large fish in protected areas.
- ✓ Help prevent the loss of genetic variability produced by overfishing .
- ✓ Help prevent the loss of genetic fitness associated with a loss of genetic variability due to overfishing.
- ✓ Help prevent the loss of genetic fitness produced in hatchery fish propagation. Marine Reserves help fisheries perform better than Marine Protected Areas (MPA). Unfortunately, MPAs have not protected our marine fishery stocks. MPAs have too many complicated regulations and complicated multijurisdictional enforcement problems and consequent poaching problems.
- ✓ Much more cost effective for fisheries restoration than hatchery production.

Benefits and Challenges to Socio-Economic Parameters (3,4,5,6,7,8,17,18,19,20): Networks of marine reserves help recover important fishery populations so they become sustainable and provide a local source of food.

- ✓ Enhanced recreational and cultural and spiritual activities for local communities and indigenous tribes.
- ✓ Enhanced community empowerment and economy by participation in governance and better enforcement.
- ✓ Coordinated and more consistent global, national, state and local governance for marine natural resources. This includes co-management with the tribes.
- ✓ Reduced conflicts between users/stakeholders (recreational, commercial, tribal, environmental concerns, etc.) for the same natural resources.
- ✓ After depressed fisheries recover, there are more diversified sources of income and greater local household income.
- ✓ Enhanced environmental awareness and a sense of the value of wilderness areas.
- ✓ Balance multiple objectives across sectors such as energy, fisheries, hazard mitigation, transportation, tourism, conservation and ecosystem restoration. These are important challenges presently facing marine planners and managers.

Challenges Creating Marine Reserves (3,5,6,7,18):

- ✓ **Five major factors are driving the worldwide decline of marine and coastal ecosystems: overfishing, pollution, coastal development, climate change and fractured governance.**
- ✓ **Loss of fishing access to fishing grounds.** Although MPAs have considerable variability in management strategies, many establish zero-take zones (marine reserves) in ecologically critical areas. Over the long-term, this loss of access is compensated for by the eventual benefits of a sustainable fishery. Short-term measures (training, compensation or unemployment insurance) may need to be considered to alleviate loss of income.
- ✓ **Inequitable Benefits.** While MRs and MPAs can ultimately provide significant economic opportunities, there is a risk that the recipients of those economic benefits will be the larger corporate and commercial businesses that take advantage of these opportunities. Local peoples and artisanal businesses often do not get their fair share of the fisheries. Both decision-makers and resource stakeholders need to address this problem early with training, financial help and controls of ownership.
- ✓ **Dependence on project assistance.** The creation and management of MRs and MPAs often leads to an influx of technical expertise and funding from outside the immediate area. This influx can be from government, nongovernmental organizations, or the private sector. This support may be critical for initiation and the creation of the MPA's. It must be understood that the entire project, in the long-term, needs to ultimately be self-financing and sustainable and goals must be identified early in the MR or MPA creation process.
- ✓ **Unmet expectations.** With any new Marine Reserve or Marine Protected Area, there will likely be quite variable expectations amongst stakeholders. Unfortunately all expectations cannot be met. The most common expectation is that MRs and MPAs will provide immediate benefits. The reality is ecological and socioeconomic changes can take years

for recovery. Policymakers and managers must identify what is reasonable, over what time span, and what kinds of measures are needed to achieve the goals.

- ✓ **Marine Conservation Agreements** - information for non-governmental organizations, government agencies, and eco-friendly businesses that are interested in understanding how agreement mechanisms, effectively culminating in payments for ecosystem services, can better assure success of ocean and coastal conservation efforts (17).

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