

Effectiveness of MPAs for Fisheries Management: The Western Pacific Experience

Marine Protected Areas (MPAs) have become an article of faith for the environmental community although spatial management of fisheries has been central to management of fisheries in the Western Pacific Region. Indeed, the fervor for implementing MPAs seems to be an act of faith resonant of the Kevin Costner film, *Field of Dreams*: ‘if you close it, they will come.’ Intuitively, the closure of any fishing ground needs to be compensated by an equivalent positive response in fishing success in the remaining areas open to fishing. Thus if half of a fished area is closed, catch rates in the remaining half must double to maintain fishery production at the same pre-closure levels.

This brief paper looks at a variety of spatial management areas and tries to evaluate their success in terms of fishery enhancement, even though they may not have been implemented for those purposes. Moreover, the paper notes that in some occasions where fishery enhancement has been touted as an MPA benefit, over time this objective may be expunged or modified reminiscent of Stalinist revisionism. The MPAs examined here include:

- The Papahānaumokuākea Marine National Monument in the Northwestern Hawaiian islands
- The Fagatele Bay National Marine Sanctuary in American Samoa
- The West Hawaii marine protected area network
- Marine reserves on Guam
- The Western high seas pockets closures implemented by the Western and Central Pacific Fishery Commission

The Papahānaumokuākea Marine National Monument

This monument comprises one of the world’s largest MPAs. It began life as the Northwestern Hawaiian Islands (NWHI) coral reef reserve under the administration of President Bill Clinton, and had multiple objectives, including regulating fishing, conserving corals and reef biota, and to protect the endangered Hawaiian monk seal. It was destined to become one of the National Marine Sanctuaries and was in the midst of this process that President George W. Bush used the Antiquities Act to implement the monument and to close out virtually all fishing. Native Hawaiians were allowed to fish but must consume their catch within the monument boundaries.

Fishing in the monument was in a state of decline with reef fishing ceasing in the early 1970s, lobster trapping in the late 1990s and bottomfishing in 2009. Part of this decline was due to the stringent management regulations implemented by this Council for bottomfish. The vast size of this MPA would suggest that there would be a major fishery enhancement effect on fisheries downstream in the Main Hawaiian Islands (MHI). This would be accomplished by spillover, i.e. net export of post-settlement fish; and by replenishment effects, i.e. increased reproductive output that increases population size and ultimately landings in connected areas.

Surveys of the reef fish biomass in the monument show a stark difference with much greater biomasses in the NWHI, and with a much higher proportion of the biomass comprising apex reef predators. Nevertheless, studies of connectivity between the MHI and NWHI have highlight that the MHI are isolated in terms of resource management and will not receive substantial subsidy from the Papahānaumokuākea MNM. Then flow of fish and invertebrates appears to be from the MHI to the NWHI. In a simple analogy, the NWHI are like an attic or lumber room where objects pile up year after year. Unfortunately the biomass flow from the MHI and augmentation by recruitment from the NWHI is of no benefit to fishermen in the MHI, as large volumes of fish pile up in the attic.

One would assume that there would be some winners from this cornucopia of fish, namely the Hawaiian monk seal would be free to feast on this vast biomass of reef fish, while its poor relations in the MHI would starve due to fishery competition. In what appears to be a divinely inspired act of perversity, the reverse scenario obtains, with MHI monk seals thriving and the NWHI population segment collapsing by 5% a year through the starvation of post weaned juveniles unable to reach breeding age, surrounded as they are by a massive fish biomass.

Unsurprisingly, one would look long and hard to find any mention of fishery enhancement and monk seal benefits in contemporary literature touting the success of the monument, which is now focused on preserving bio-diversity and operating as a buffer or reserve in the event of climate change. Unfortunately, results from studies elsewhere have shown that impacts to coral reefs from macro-events such as bleaching affect protected and unprotected reefs equally negatively, and the absence of fishing may only protect fish biodiversity. Thus the major achievement of the monument has been the creation of additional bureaucracy and secure employment for public servants whose function is mainly to review research proposals and activities by the fortunate few scientists who can access this area.

The Fagatele Bay National Marine Sanctuary

This sanctuary was established about 30 years ago in response to what was then perceived to be a major threat from an outbreak of crown-of-thorns starfish population. Fagatele Bay is a remote inlet and uninhabited, although belongs to the village of Futiga. As with other protected areas

such as the Papahānaumokuākea MNM, the function of this MPA has morphed over time, usually in the direction of the prevailing conservation meme, such as fishery replenishment and protecting biodiversity in the event of climate change. Further, the establishment of a location where nothing much is supposed to happen brings with it the usual bureaucratic baggage and attendant public servants, who in the case of the National Marine Sanctuary Program function primarily in a public relations role.

After three decades of nothing much happening, the National Marine Sanctuary Program was galvanized into action by the Executive Order establishing the Rose Atoll MNM. This instructed the Secretary of Commerce to initiate the process to add the marine areas of the monument to the Fagatele Bay National Marine Sanctuary in accordance with the National Marine Sanctuaries Act. The Sanctuaries Program thus embarked on a proposed massive expansion of its role in American Samoa, proposing to include the Rose Atoll Marine National Monument, a volcanic mud-hole 13,000 ft on the abyssal plain and areas of reef to be closed to fishing on Tutuila, Ma'anua and Swains Island. The document supporting this proposal is a masterpiece of spin-doctoring that offers no concrete scientific rationale for this expansion. There is no added conservation value in overlaying areas that have in American Samoa that have existing management measures in place; rather, this creates confusion amongst the regulated community and tension between agencies, which negates the goal of fostering partnership and interagency cooperation. Additional sanctuary units would reduce the currently limited fishing grounds, displace fishermen to potentially more dangerous fishing areas, and likely hamper both commercial and non-commercial fisheries development. It is also unclear how expanding the sanctuary system and the scope of "sanctuary resources" fits within the *matai* or hierarchical chiefly system, which has successfully served to manage nearshore resources for thousands of years in American Samoa. Lastly, the current federal budget and enforcement capabilities are inadequate to support an expanded sanctuary.

The West Hawaii marine protected area network

The aquarium or exotic fish trade in Hawaii is focused primarily on juvenile or young-of-the-year of the yellow tang *Zebrasoma flavescens*, caught mainly along the west coast of the island of Hawaii. Catches of the yellow tang are substantial with between 200,000 and 400,000 individuals caught from the west Hawaii coast.

The establishment of a network of areas along the west Hawaii coast closed to aquarium fishing, on the prime-target species yellow tang enabled researchers to evaluate the impacts of these MPAs on long-term fishery sustainability. Between 1999, when 27.8% of the coastline was closed to collecting, and 2007, the number of active fishers and total catch of yellow tang doubled. Prior to MPA establishment, yellow tang densities were similar at sites open to fishing and those slated for closure. By 2007, closed areas had five times the density of prime targeted

sized fish (5–10 cm), and 48% higher density of adults than open areas. Densities of adults in ‘boundary’ areas (open areas <1 km from nearest MPA boundary) were significantly higher than in open areas far from MPA boundaries, which was indicative of spillover at that scale. Given the long life-span of yellow tang (>40 years) relative to the duration of protection and the increasing intensity of fishing, the likelihood is that protected areas will become increasingly important sources for the adult fishes which will sustain stocks and the fishery over the longer term.

Unlike the sanctuaries or marine national monuments, where the objectives are vague and unsupported by any serious science, the west Hawaii MPA network had a set of clear goals and a process by which the MPAs could be evaluated. Additional studies have shown that there are indeed the desired spillover effects of post-settlement yellow tang between MPAs and open areas. In short, the west Hawaii MPAs appear to have been a success in enhancing the aquarium fish fishery. Unfortunately, this success does not appear to have impressed some environmentalists based on other islands who have called for the State Government to outlaw all fishing activity for the aquarium trade.

Marine reserves on Guam

Fishing on Guam’s fringing and nearshore coral reefs have gradually over the years been increasingly restricted by the imposition of closed or managed areas and areas under military control. The prevailing winds on Guam blow predominantly from the east, such that the western leeward coast has been the preferred fishing location for Guam’s fishermen targeting reef fish. MPAs or managed areas have over time meant that Guam fishermen have had to fish increasingly on the eastern or windward coast of the island. A study conducted by the National Institute for Occupational health and Safety (NIOSH) concluded that the loss of sheltered fishing grounds on Guam’s west coast more than doubled the risk of drowning for indigenous Chamorro fishermen after MPAs were enforced. Non-Chamorro fishermen experienced a sharp decrease in the risk of drowning after MPAs were established since they appeared unwilling to take the same risks as Chamorro fishermen.

Studies of the impacts to fishery enhancement of Guam’s reef MPAs are interesting in that they showed that reef fish biomass was significantly higher inside the MPAs as opposed to areas open to fishing. However, biomass for four out of five reef fish species studied showed little or no net movement out of MPAs. Moreover, in a related MPA study conducted for the Council, the researcher ignored the small difference between total mortality rates for a common parrotfish, which yielded a modest fishery exploitation rate. Instead the researcher used a model generated value for natural mortality to erroneously assert that the parrotfish was grossly overfished. In summary, the utility of Guam’s MPAs for fishery enhancement is equivocal at best, even when

researcher conformational biases are accounted for, and led to significant mortality risks for Chamorro fishermen, and dissuaded non-Chamorro fishermen from continuing to fish.

The Western high seas pockets closures

The Western and Central Pacific Fishery Commission's (WCPFC) Conservation and Management Measure 2008-01 resulted in the closure of two large high seas pockets lying within the mosaic of EEZs of Micronesian, Melanesian and Polynesian nations. All fishing within the pockets was closed from January 31st 2010. The pockets have not been reopened apart for ice ring and purse seine vessels from the Philippines, which in 2012 may fish in the western most pocket with up to 36 vessels.

These closures were part of a package of measures that were intended to reduce fishing mortality on juvenile bigeye and yellowfin tunas. Unfortunately, the fishing effort that was historically expended in the high seas pockets simply moved into adjacent EEZs and the expected reductions in bigeye fishing mortality did not occur. This was discussed at length at the seventh WCPFC Science Committee and the 8th regular session of the WCPFC, with the clear recognition that the high seas pockets closures were a failure.

Nevertheless, the faith-based approach adopted by the environmental NGOs prevents them from abandoning a central tenet of their faith. The usual unsupported assertions were trotted out by the E-NGOs that the high seas pockets are 'special' when they are nothing more than political abstractions resulting from the mosaic of Pacific Islands EEZ boundaries. Among the reasons advanced for maintaining no fishing within the pockets were benefits to bigeye spawning, amelioration of the effects of the El Niño-Southern Oscillation (ENSO) on the distribution of tropical tunas, benefits to leatherback turtles migrating from New Guinea to the US West Coast, and that old chestnut (explored at some length in other examples in this paper), potential increased yields through the export of larvae and spillover of fish.

The Parties to the Nauru Agreement¹ require nations engaging in bilateral fishing access agreements to abandon purse seine fishing on the high seas and only fish within the EEZs of PNA countries under their vessel day scheme (VDS). There is no conservation benefit in this requirement and is a means to gouge more money out of the distant water fishing nations who need access to these waters. The PNA is now pursuing similar VDA and high seas closures for longline fishing bilateral agreements. Again, the objective is clearly to maximize revenues, not to conserve fish.

¹ A subset of the Pacific Forum nations that surround the Pacific War Pool which contains most of the skipjack and yellowfin resource

However, this doesn't stop the E-NGO calls for the high seas pockets closures despite the concrete evidence to the contrary. Moreover, our own government appears to colluding in this delusion by funding conservation groups like the Marine Conservation Institute to produce a study on the utility of high seas MPAs.