

In this review:

A. Recent articles with abstracts

O/A denotes an open access article or journal

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Mascia, M.B., Claus, C.A., and Naidoo, R. **Impacts of marine protected areas on fishing communities.** *Conservation Biology* 24(5): 1424-1429, 2010.

Notes: Marine protected areas (MPAs) are a popular conservation strategy, but their impacts on human welfare are poorly understood. To inform future research and policy decisions, we reviewed the scientific literature to assess MPA impacts on five indicators of human welfare: food security, resource rights, employment, community organization, and income. Following MPA establishment, food security generally remained stable or increased in older and smaller MPAs. The ability of most fishing groups to govern MPA resources changed. Increased resource rights were positively correlated with MPA zoning and compliance with MPA regulations. Small sample sizes precluded statistical tests of the impacts of MPAs on employment, community organization, and income. Our results demonstrate that MPAs shape the social well-being and political power of fishing communities; impacts (positive and negative) vary within and among social groups; and social impacts are correlated with some – but not all – commonly hypothesized explanatory factors. Accordingly, MPAs may represent a viable strategy for enhancing food security and empowering local communities, but current practices negatively affect at least a minority of fishers. To inform policy making, further research must better document and explain variation in the positive and negative social impacts of MPAs.

Tkachenko, K.S. and Soong, K. **Protection of habitat types: A case study of the effectiveness of a small marine reserve and impacts of different habitats on the diversity and abundance of coral reef fishes.** *Zoological Studies* 49(2): 195-210, 2010. **O/A**

Notes: The aim of this work was to compare coral reef fish communities from a small recently established marine reserve (a no-take area, NTA) with 3 nearby fishing areas within Nanwan Bay, southern Taiwan. Two depth zones (shallow at 3-4 m and deep at 8-10 m) of fringing coral reefs were surveyed at each of the 4 study sites. One of the sites was located within a small NTA (1.5 km²) established in 2005 in the western part of Nanwan Bay. Quantitative data on the composition, abundance, and size of fishes and macroinvertebrates were collected by a visual census using 20 x 5 m belt transects (4 transects per depth zone). The coverage of corals, algae, and substratum was estimated using the photoquadrat technique (40 quadrats of 1 m² per depth zone). This will serve as the baseline survey within the marine reserve after it was established. Fish species richness and diversity as well as the abundances of 3 fish families and 2 trophic groups were significantly higher in the NTA than in the 3 other sites in which fishing is allowed. Significant differences in the abundances and sizes of fishes belonging to the Lutjanidae suggest that this family can be used as an indicator to reflect impacts of conservation efforts in the reserve. However, results of multiple regression and correlation analyses suggested that differences in certain reef fish families, especially the Chaetodontidae and Pomacentridae, are attributable to the habitat type and structural complexity of the reefs rather than to conservation efforts alone. This study demonstrates that there is the potential for profound changes toward recovery of fish stocks within small marine reserves over a short time frame.

Pichegru, L., Gremillet, D., Crawford, R.J.M., and Ryan, P.G. **Marine no-take zone rapidly benefits endangered penguin.** *Biology Letters* 6(4): 498-501, 2010.

Notes: No-take zones may protect populations of targeted marine species and restore the integrity of marine ecosystems, but it is unclear whether they benefit top predators that rely on mobile pelagic fishes. In South Africa, foraging effort of breeding African penguins decreased by 30 per cent within three months of closing a 20 km zone to the competing purse-seine fisheries around their largest colony. After the fishing ban, most of the penguins from this island had shifted their feeding effort inside the closed area. Birds breeding at another colony situated 50 km away, whose fishing grounds remained open to fishing, increased their foraging effort during the same period. This demonstrates the immediate benefit of a relatively small no-take zone for a marine top predator relying on pelagic prey. Selecting such small protected areas may be an important first conservation step, minimizing stakeholder conflicts and easing compliance, while ensuring benefit for the ecosystems within these habitats.

Mills, M., Pressey, R.L., Weeks, R., Foale, S., and Ban, N.C. **A mismatch of scales: challenges in planning for implementation of marine protected areas in the Coral Triangle.** *Conservation Letters* 3(5): 291-303, 2010. **O/A**

Notes: Regional systematic conservation planning is an effective approach to marine protected area (MPA) network design, ensuring complementarity, and functional connectivity of areas. However, regional planning and local conservation actions do not properly inform one another. One outcome is the failure of regional designs to guide conservation actions. Another is that site-based MPAs constitute collections rather than functional systems for marine conservation. Understanding decisions related to spatial scale in conservation planning is essential for the development of ecologically functional networks of MPAs. Decisions about scale require that planners address trade-offs between the respective advantages and limitations of different considerations in several parts of the planning process. We provide the first comprehensive review of decisions about spatial scale that influence planning outcomes. We illustrate these decisions and the trade-offs involved with planning exercises undertaken in the Coral Triangle. We provide a framework in which decisions about spatial scale can be made explicit and investigated further. The framework helps to link theory and application in conservation planning, facilitates learning, and promotes the application of conservation actions that are both regionally and locally significant.

Russ, G.R. and Alcala, A.C. **Decadal-scale rebuilding of predator biomass in Philippine marine reserves.** *Oecologia* 163(4): 1103-1106, 2010.

Notes: No-take marine reserves (NTMRs) provide hope that local carrying capacity may be partially restored if reserves are protected long enough. How long is long enough? We assess the duration of protection required for populations of large predatory reef fish in marine reserves to attain new steady states. We monitored biomass of large predatory fish in two marine reserves at Sumilon and Apo Islands, Philippines, almost annually for 26 years (1983-2009), and fit a logistic model to the data. As duration of reserve protection increased, biomass of predatory fish approached an asymptote, although the models suggest that 20-40 years of protection is required to attain new steady states. Thus, for local carrying capacity to be rebuilt, no-take protection must be effective on decadal timescales.

Huntington, B.E., Karnauskas, M., Babcock, E.A., and Lirman, D. **Untangling natural seascape variation from marine reserve effects using a landscape approach.** *PLoS ONE* 5(8): art. e12327, 2010. **O/A**

Notes: Distinguishing management effects from the inherent variability in a system is a key consideration in assessing reserve efficacy. Here, we demonstrate how seascape heterogeneity, defined as the spatial configuration and composition of coral reef habitats, can mask our ability to discern reserve effects. We then test the application of a landscape approach, utilizing advances in benthic habitat mapping and GIS techniques, to quantify this heterogeneity and alleviate the confounding influence during reserve assessment. Seascape metrics were quantified at multiple spatial scales using a combination of spatial image analysis and in situ surveys at 87 patch reef sites in Glover's Reef Lagoon, Belize, within and outside a marine reserve enforced since 1998. Patch reef sites were then clustered into classes sharing similar seascape attributes using metrics that correlated significantly to observed variations in both fish and coral communities. When the efficacy of the marine reserve was assessed without including landscape attributes, no reserve effects were detected in the diversity and abundance of fish and coral communities, despite 10 years of management protection. However, grouping sites based on landscape attributes revealed significant reserve effects between site classes. Fish had higher total biomass (1.5×) and commercially important biomass (1.75×) inside the reserve and coral cover was 1.8 times greater inside the reserve, though direction and degree of response varied by seascape class. Our findings show that the application of a landscape classification approach vastly improves our ability to evaluate the efficacy of marine reserves by controlling for confounding effects of seascape heterogeneity and suggests that landscape heterogeneity should be considered in future reserve design.

Kenchington, R. **Strategic roles of marine protected areas in ecosystem scale conservation.** *Bulletin of Marine Science* 86(2): 303-313, 2010.

Notes: Responses by management to an increasing range of human uses and impacts on marine ecosystems are a recent phenomenon. They are developing alongside traditional sectoral management of fisheries, shipping, and coastal land uses. Many regimes have been developed for approaching the tasks of integrating management of coastal and marine ecosystems. The role of marine protected areas and conservation agencies in such regimes is often a matter of contention. The application of International Union for the Conservation of Nature (IUCN) protected-area categories to marine ecosystems can cover the broadest range of management regimes, from strict nature reserves with no fishing or collecting to multiple, verifiably environmentally sustainable, levels of use and impact. Here, I address the roles that protected areas and other management categories can play in relation to the multiple scales and strategic objectives for management of marine ecosystems. I draw on experiences of planning, management, and community response to the Great Barrier Reef Marine Park to discuss the opportunities and challenges of using protected-area categories and other strategies in management for conservation and reasonable multiple use at the ecosystem scale.

Klein, C.J., Steinback, C., Watts, M., Scholz, A.J., and Possingham, H.P. **Spatial marine zoning for fisheries and conservation.** *Frontiers in Ecology and the Environment* 8(7): 349-353, 2010.

Notes: Protected areas are an effective tool for reducing biodiversity loss. Current legislation distinguishes various types of marine protected areas, each allowing different levels of resource extraction. However, almost all of the theory for spatial conservation planning is focused on identifying no-take reserves. The current approaches to zoning for multiple types of protected areas could result in suboptimal plans in terms of protecting biodiversity and minimizing negative socioeconomic impacts. We overcame these limitations in the first application of the multizone planning tool, Marxan with Zones, to design a network of four types of protected areas in the context of California's Marine Life Protection Act. We have produced a zoning configuration that entails mean value losses of less than 9% for every fishery, without compromising conservation goals. We also found that a spatial numerical optimization tool that allows for multiple zones outperforms a tool that can identify one zone (ie marine reserves) in two ways: first, the overall impact on the fishing industry is reduced, and second, a more equitable impact on different fishing sectors is achieved. Finally, we examined the tradeoffs between representing biodiversity features and impacting fisheries. Our approach is applicable to both marine and terrestrial conservation planning, and delivers an ecosystem-based management outcome that balances conservation and industry objectives.

Anticamara, J.A., Zeller, D., and Vincent, A.C.J. **Spatial and temporal variation of abundance, biomass and diversity within marine reserves in the Philippines.** *Diversity and Distributions* 16(4): 529-536, 2010.

Notes: *Aim* The objective of this study was to investigate the influence of protection duration (years of fishing closure) and location (distance from shore) on reef fish diversity. *Location* Danajon Double Barrier Reef, Bohol, Philippines. *Methods* Reef fish abundance and size structure, by species, were obtained monthly using replicated underwater visual belt transects ($n = 8$; 70 x 5-m belt transects) over 3 years (2002-2005) at eight sites that included six marine reserves and two unprotected reef areas. We analysed species accumulation curves, diversity indices and abundance-biomass comparison (ABC) curves within and across the study sites to assess the influence of protection duration and location. *Results* Analyses showed that longer protection duration impacted reef fish diversity at both inshore and offshore sites by shifting ABC curves from higher abundance than biomass curves at fished sites to higher biomass than abundance curves at most of the protected sites. Protection duration did not significantly influence either the rate of species accumulation within sites or the 12 diversity indices measured across the study sites. The offshore sites consistently showed higher rates of species accumulation and diversity indices values than inshore sites with similar protection duration. One protected offshore young marine reserve site that has been assessed as the least well-managed showed patterns more consistent with the fished sites. *Main conclusions* Analyses showed that protection duration mainly impacted diversity by increasing the dominance of large-bodied species and enhancing total biomass. Besides protection duration, reserve location influenced species accumulation curves and diversity indices.

Diamond, S.L., Kleisner, K.M., Duursma, D.E., and Wang, Y.N. **Designing marine reserves to reduce bycatch of mobile species: a case study using juvenile red snapper (*Lutjanus campechanus*).** *Canadian Journal of Fisheries and Aquatic Sciences* 67(8): 1335-1349, 2010.

Notes: Marine reserves have not been widely used to conserve mobile species because species abundance levels can be highly variable over space and time. Here we explore the potential for marine reserves to reduce bycatch of mobile species using red snapper (*Lutjanus campechanus*) as a case study. Bycatch in Gulf of Mexico shrimp trawls is a major source of juvenile red snapper mortality, and marine reserves may be mandated if bycatch reduction targets are not met. Using geographic information system (GIS) analyses of fishery-independent data, we investigated whether red snapper juveniles concentrate in "hot spots" and examined the trade-offs between

abundance within hot spots (intensity) and predictability over time (persistence). These trade-offs allow fishery managers to tailor marine reserves to meet specific conservation goals. For red snapper, hot spots were primarily located around the 30 m isobath, with hot spots spread along the Texas coast in fall and clustered around the Texas-Louisiana border in summer. Increased intensity of hot spots led to lower persistence due to the smaller spatial area of higher intensity hot spots. Hot spots moved annually but generally persisted in the same locations over time, indicating that marine reserves could reduce red snapper bycatch. This approach provides a foundation for making informed decisions about design and placement of reserves for mobile species.

White, J.W., Botsford, L.W., Moffitt, E.A., and Fischer, D.T. **Decision analysis for designing marine protected areas for multiple species with uncertain fishery status.** *Ecological Applications* 20(6): 1523-1541, 2010.

Notes: Marine protected areas (MPAs) are growing in popularity as a conservation tool, and there are increasing calls for additional MPAs. Meta-analyses indicate that most MPAs successfully meet the minimal goal of increasing biomass inside the MPA, while some do not, leaving open the important question of what makes MPAs successful. An often-overlooked aspect of this problem is that the success of fishery management outside MPA boundaries (i.e., whether a population is overfished) affects how well MPAs meet both conservation goals (e.g., increased biomass) and economic goals (e.g., minimal negative effects on fishery yield). Using a simple example of a system with homogeneous habitat and periodically spaced MPAs, we show that, as area in MPAs increases, (1) conservation value (biomass) may initially be zero, implying no benefit, then at some point increases monotonically; and (2) fishery yield may be zero, then increases monotonically to a maximum beyond which further increase in MPA area causes yield to decline. Importantly, the points at which these changes in slope occur vary among species and depend on management outside MPAs. Decision makers considering the effects of a potential system of MPAs on multiple species are confronted by a number of such cost-benefit curves, and it is usually impossible to maximize benefits and minimize costs for all species. Moreover, the precise shape of each curve is unknown due to uncertainty regarding the fishery status of each species. Here we describe a decision-analytic approach that incorporates existing information on fishery stock status to present decision makers with the range of likely outcomes of MPA implementation. To summarize results from many species whose overfishing status is uncertain, our decision-analysis approach involves weighted averages over both overfishing uncertainty and species. In an example from an MPA decision process in California, USA, an optimistic projection of future fishery management success led to recommendation of fewer and smaller MPAs than that derived from a more pessimistic projection of future management success. This example illustrates how information on fishery status can be used to project potential outcomes of MPA implementation within a decision analysis framework and highlights the need for better population information.

Meyer, C.G., Papastamatiou, Y.P., and Clark, T.B. **Differential movement patterns and site fidelity among trophic groups of reef fishes in a Hawaiian marine protected area.** *Marine Biology* 157(7): 1499-1511, 2010.

Notes: We tracked the long-term movements of 70 parrotfishes, surgeonfishes and goatfishes captured inside a small (1.3 km²) marine protected area (MPA: Kealakekua Bay Marine Life Conservation District, Hawaii) by implanting them with small transmitters and deploying underwater monitoring devices inside the bay and along 100 km of the adjacent west Hawaii coastline. Individual fish were detected inside Kealakekua Bay for up to 612 days but many were detected for much shorter periods (median = 52 days). There were species-specific differences in the scale of movements and habitats used, but most fish utilized between 0.2 and 1.6 km of coastline, and individuals of each species showed some degree of diel habitat shift. A wide variety of reef fishes captured inside the MPA swam back and forth across an MPA boundary intersecting continuous reef (i.e., this boundary was porous to reef fish movements), but only 1 of 11 species tagged crossed a wide sandy channel inside Kealakekua Bay suggesting that this feature may function as a natural barrier to movements. Results indicate relatively small MPAs (<2 km of coastline) could provide effective, long-term protection for multi-species assemblages of reef fishes provided that boundaries are situated along major habitat breaks (e.g., large sand channels between reefs) that may serve as natural barriers to reef fish movements. It is crucial that a multi-species approach be used when assessing MPA effectiveness.

Teske, P.R., Forget, F.R.G., Cowley, P.D., von der Heyden, S., and Beheregaray, L.B. **Connectivity between marine reserves and exploited areas in the philopatric reef fish *Chrysolephus laticeps* (Teleostei: Sparidae).** *Marine Biology* 157(9): 2029-2042, 2010.

Notes: 'No-take' marine protected areas (MPAs) are successful in protecting populations of many exploited fish species, but it is often unclear whether networks of MPAs are adequately spaced to ensure connectivity among reserves, and whether there is spillover into adjacent exploited areas. Such issues are particularly important in species with low dispersal potential, many of which exist as genetically distinct regional stocks. The roman, *Chrysolephus laticeps*, is an overexploited, commercially important sparid endemic to South Africa. Post-recruits display resident behavior and occupy small home ranges, making *C. laticeps* a suitable model species to study genetic structure in marine teleosts with potentially low dispersal ability. We used multilocus data from two types of highly variable genetic markers (mitochondrial DNA control region and seven microsatellite markers) to clarify patterns of genetic connectivity and population structure in *C. laticeps* using samples from two MPAs and several moderately or severely exploited regions. Despite using analytical tools that are

sensitive to detect even subtle genetic structure, we found that this species exists as a single, well-mixed stock throughout its core distribution. The high levels of connectivity identified among sites support the findings of previous studies that have indicated that inshore MPAs are an adequate tool for managing overexploited temperate reef fishes. Even though dispersal of adult *C. laticeps* out of MPAs is limited, the fact that the large adults in these reserves produce exponentially more offspring than their smaller counterparts in exploited areas makes MPAs a rich source of recruits. We nonetheless caution against concluding that the lack of structure identified in *C. laticeps* and several other southern African teleosts can be considered to be representative of marine teleosts in this region in general. Many such species are represented in more than one marine biogeographic province and may be comprised of regionally adapted stocks that require individual management.

Ferse, S.C.A., Máñez Costa, M., Schwerdtner Máñez, K., Adhuri, D.S., and Glaser, M. **Allies, not aliens: increasing the role of local communities in marine protected area implementation.** *Environmental Conservation* 37(1): 23-34, 2010. **O/A**

Notes: Various management approaches have been proposed to address the alarming depletion of marine coastal resources. Prominent among them are community-based management and the establishment of marine protected areas (MPAs). The overall poor performance of MPAs can be traced to a failure to effectively include local communities in the design and implementation of relevant measures. Recent efforts have incorporated aspects of community-based management into a hybrid form of management, which ideally builds upon existing local management practices. A key challenge lies in the development of appropriate frameworks that allow for the successful participation of local communities in management. A review of studies on MPA design and community-based marine resource management and fieldwork observations provides suggestions on how to address current socioeconomic shortcomings in MPA design and implementation, successfully involving local communities in order to provide a better local basis for effective larger MPA networks. A combination of MPA tools as the formal frame and community-based natural resource management as the adaptive core that recognizes local communities as allies, not aliens, is needed to develop successful conservation approaches.

Dumas, P., Jimenez, H., Leopold, M., Petro, G., and Jimmy, R. **Effectiveness of village-based marine reserves on reef invertebrates in Emau, Vanuatu.** *Environmental Conservation* 37(3): 364-372, 2010.

Notes: Despite the current expansion of community-based marine conservation initiatives in the Pacific, few studies have specifically addressed their ecological efficiency to restore or enhance reef invertebrate resources. This paper investigated the effects of two very small (< 0.05 km²) recent village-based marine reserves (tabu areas) located along the shallow fringing reef of Emau island, Vanuatu. Surveys focused on heavily harvested species (namely trochus, giant clams and green snails) and involved both experienced scientists and local villagers. Abundance, density and individual size data were collected by snorkelling along random transect belts located inside and outside the tabu areas, using simple PVC measuring tools specifically developed for participative monitoring. Habitat was assessed using a photographic method to quantitatively describe varied reef substrata. Resource recovery varied between the areas as a result of species-specific responses to contrasted reserve characteristics and local management practices. Fast-growing mobile *Trochus niloticus* exhibited strong positive abundance and size responses only within the older larger tabu area through the combined effects of protection from harvesting and translocation actions by local fishers. Similar trends were observed to a lesser extent for sessile slow-growing giant clams (*Tridacna* spp.), but these were not significant after four years of closure. Despite historical evidence of their presence in the area, surveys emphasized the severe population collapse of the heavily targeted green snail (*Turbo marmoratus*). Under certain conditions, very small-scale reserves, such as those implemented by village-based conservation initiatives, can rapidly and efficiently enhance local reef invertebrate resources. It is still unclear whether the changes are sufficient to restore critical levels of spawning biomass at larger scale and reverse the severe depletion of invertebrate resources occurring in Vanuatu.

Parsons, D.M., Morrison, M.A., and Slater, M.J. **Responses to marine reserves: Decreased dispersion of the sparid *Pagrus auratus* (Snapper).** *Biological Conservation* 143(9): 2039-2048, 2010.

Notes: Quantifying the movement of exploited species inside marine reserves is a popular research topic, yet few studies have quantified movement inside and outside of reserves. If individuals inside reserves behave differently to those outside, this information should be incorporated into reserve design and in management efforts to avoid the selective removal of certain behaviors. We used acoustic telemetry to monitor the movements of the sparid *Pagrus auratus* (snapper) inside and outside a marine reserve (the Leigh Marine Reserve, north-eastern New Zealand). We tagged 39 snapper within an array of acoustic receivers that encompassed reserve and fished areas. Nineteen snapper were resident over a 5-month period; the remainder either left the array or died. Residential fish expressed two home range types. One group had uni-modal home ranges that on average encompassed c.900 m linear distance. All nine residential snapper from the reserve displayed this behavior, as well as five of ten residential fish from the non-reserve area. The second group (five fish, all from the non-reserve area) had home ranges with two separate modes (bi-modal home ranges), which on average encompassed c.2100 m linear distance. We suggest that some aspect of the marine reserve environment encourages extreme residency by either the modification of individual

behaviors or through the removal of selective exploitation. If true this suggests that reserves and populations of exploited animals may become dependent on the life history characteristics of the individuals they encourage or select for.

Libralato, S., Coll, M., Tempesta, M., Santojanni, A., Spoto, M., Palomera, I., Arneri, E., and Solidoro, C. **Food-web traits of protected and exploited areas of the Adriatic Sea.** *Biological Conservation* 143(9): 2182-2194, 2010.

Notes: This study presents a comparative analysis of protected and exploited Mediterranean Sea food webs using standardized ecological models of two ecosystems: the Central-North Adriatic Sea (highly exploited) and the Miramare Natural Marine Reserve (Northern Adriatic Sea, protected since 1986). Food webs are analysed in terms of structural and functional traits including trophic levels, transfer efficiency, trophic role of species and keystone species, trophic spectra and other synthetic ecological indicators. Our results highlight similarities between food webs of the Adriatic Sea, differences that are likely due to the impact of fishing and differences that should be related to other factors. Analysis of biomass distribution along functional groups and of trophic spectra indicates that protected area presents higher mean trophic level of the community, higher biomasses, lower production and generally lower transfer efficiency than fished area. Our results indicate that measures of food web complexity (system omnivory index and ascendancy), as well as pelagic/demersal and fish/invertebrates biomass ratios are higher in the protected area than in exploited ecosystem due to fishing-induced changes. Thus, this study highlights that marine protected areas can efficiently contribute to maintain structural and functional traits of marine ecosystems.

Cullis-Suzuki, S. and Pauly, D. **Marine protected area costs as "beneficial" fisheries subsidies: A global evaluation.** *Coastal Management* 38(2): 113-121, 2010.

Notes: Marine protected areas (MPAs) are now generally accepted as important tools in the protection of coastal biodiversity. It is also likely that they play a positive role in enhancing fisheries. Yet currently, less than 1% of the global oceans are protected, although international agreements have targets ranging from 10-30% coverage. Despite its minuscule size, we consider the current MPA "network" to be beneficial to fisheries, and its running or maintenance cost, therefore, to be a positive contribution to the sustainability of fisheries, or a "beneficial" subsidy ("harmful" subsidies enhance fishing capacity and effort). A method was derived from data in Balmford et al. (*PNAS*, 101: 9694-9697) to estimate the annual cost of maintaining MPAs as a function of their size, and of the degree of development of the country in question. We provide national costs of the 53 countries that jointly contribute 95% of global fisheries catch and, assuming that this type of subsidy, in a given country, cannot exceed 15% of the ex-vessel value of its fisheries catches, estimated a global MPA subsidy to fisheries of 870 million US\$. Given that total subsidies to fisheries currently range from 30-34 billion US\$ annually (without MPA costs), this amounts to only 2.5-2.8% of total subsidies to fisheries being devoted explicitly to the maintenance of the biodiversity that sustains them.

Pike, K., Johnson, D., Fletcher, S., Wright, P., and Lee, B. **Social value of marine and coastal protected areas in England and Wales.** *Coastal Management* 38(4): 412-432, 2010.

Notes: The U.K. government is committed to establishing a coherent network of marine protected areas by 2012 and the recent Marine and Coastal Access Act, 2009 will designate marine conservation zones and provide wider access rights to the coast. To fulfill these goals, this article argues the need for a clearer, shared understanding of the social value of protected areas in creating new designations and managing existing ones. Although marine and coastal environments attract many people and are vitally important in terms of realized and potential social value, the majority of the public in the United Kingdom lacks understanding and awareness regarding them. Combined with this, the social value of marine and coastal protected areas (MCPAs) have been largely ignored relative to conservation and economics, with the latter invariably taking precedence in environmental policymaking. Social value reflects the complex, individual responses that people experience in a given place. Many reasons determine why one area is valued above another, and this research investigates the social value of MCPAs from a practitioner's perspective through a series of interviews. Understanding why we "socially" value MCPAs will ultimately equip managers with an informed understanding of these spaces, influence management decisions, and, potentially, policymaking. This article defines social value in the context of MCPAs in England and Wales from a practitioner perspective, explores key concepts, and suggests possible improvements in decision-making.

Linares, C., Bianchimani, O., Torrents, O., Marschal, C., Drap, P., and Garrabou, J. **Marine Protected Areas and the conservation of long-lived marine invertebrates: the Mediterranean red coral.** *Marine Ecology Progress Series* 402: 69-79, 2010.

Notes: Intensive harvesting has caused important shifts in the size structure of the Mediterranean red coral *Corallium rubrum*, and continues to hinder the total recovery of exploited populations. Marine Protected Areas (MPAs) offer an excellent opportunity to observe their recovery in the absence of fishing pressures. In this study, we analysed the demographic structure of red coral populations from 3 of the

oldest Mediterranean MPAs. The population structures at the beginning of each reserve and after 30 yr of similar management efforts were also forecasted. The 3 MPAs displayed higher size values than those reported for most of the shallow populations and deep-dwelling populations. Differences in the observed size distributions were more closely related to the structure at the beginning of the reserve than to the number of years of protection. The estimated future size distributions showed a significant increase in large colonies; however, the maximum values predicted are far from those measured in pristine populations. Comparisons of harvested and protected populations using different parameters allowed us to identify the percentages of colonies with basal diameter greater than 7 mm or colony height greater than 100 mm as the most useful descriptors for evaluating the conservation status of each population. The vulnerability of long-lived marine invertebrates to disturbances is due to their slow population dynamics, hence the importance of active management within MPAs to promote delayed but long-term positive effects on these species. This study provides helpful information for the evaluation of the effectiveness of management measures for coral populations.

Lamb, R.W. and Johnson, D.W. **Trophic restructuring of coral reef fish communities in a large marine reserve.** *Marine Ecology Progress Series* 408: 169-180, 2010.

Notes: Marine reserves can directly replenish heavily fished species. However, community-wide effects of reserves are less clear. Marine reserves directly reduce fishing mortality rates, but through the restoration of apex predators, reserves may have strong indirect effects on non-target species. We explored the effects of a large, fully protected marine reserve in the Bahamas on the community of coral-reef fishes. We examined the effect of the reserve on fish biomass by comparing the density and size of all fishes on similar reefs located inside and outside the reserve. Total biomass of fishes was approximately 7 x higher in reserve sites, where biomass was strongly concentrated in species of higher trophic levels. Analysis based on the relative magnitude of individual species' responses indicated that, on average, the largest species increased in biomass within the reserve, intermediate-sized species decreased, and the smallest species exhibited variable responses. Species' responses to the reserve were also examined by pooling species into 9 trophic categories using consumptive relationships, which provided corroborating results. Large piscivores (e.g. sharks, large groupers) were on average larger and more abundant inside the reserve. Mid-trophic-level groups (e.g. small piscivores) had higher average biomass outside of the reserve, where the number of species and biomass of large predators was lower. Finally, some low-trophic-level groups (e.g. planktivores) had higher biomass within the reserve, while others (e.g. small herbivores) did not respond strongly. Overall, these results suggest that marine reserves can substantially alter the composition and structure of reef fish communities.

Taylor, B.M. and McIlwain, J.L. **Beyond abundance and biomass: effects of marine protected areas on the demography of a highly exploited reef fish.** *Marine Ecology Progress Series* 411: 243-258, 2010.

Notes: The success of marine protected areas (MPAs) in facilitating recovery of over-exploited stocks has been well documented. Few studies, however, have explored the effects of MPAs on the demographic profiles of reef fish populations. We tested the assumption that areas closed to fishing for >7 yr accumulate older individuals of a heavily targeted species, *Lethrinus harak*. Our survey design included 2 protected sites and 2 comparative fished sites. Using an age-based length-conversion method, a novel approach in tropical fisheries, otolith-derived demographic information was supplemented with underwater visual census data. This approach provided valuable insights into the population dynamics of this species at small spatial scales (<2 km²). We found considerable site-specific differences in the age structure of *L. harak*, with protected sites having greater mean ages and lower total mortality. There was indication of density-dependent growth as greater size-at-age occurred in fished sites where biomass had been depleted. Although female *L. harak* reach 50% maturity at 208 mm fork length (FL) or age 3.8 yr, it is the largest and oldest females (>260 mm FL and >9 yr) who make a disproportionate contribution to overall reproductive output, as ovary weight increases exponentially with both length and age. Currently size (L_c) and age (t_c) at first capture is ~100 mm and 2 yr below the size (L₅₀) and age (t₅₀) at first maturity. Numerous management scenarios based on minimum size limits were evaluated to determine which scenario would increase spawning biomass without compromising yield estimates. Our results demonstrate that effective implementation of MPAs allows a larger and older population to accrue, thus yielding considerable reproductive benefits.

Claudet, J. and Guidetti, P. **Improving assessments of marine protected areas.** *Aquatic Conservation: Marine and Freshwater Ecosystems* 20(2): 239-242, 2010.

Notes: 1. The use of experimental design and statistical analysis to evaluate the effects of marine protected areas (MPAs) is increasingly popular throughout the world. 2. However, in looking at historical approaches to MPA evaluations, flaws were identified in the execution of theoretically correct designs, as well as disconnects between the stated objectives of MPAs and those of assessment studies. 3. MPA assessments can be improved by: (1) considering the enforcement/compliance level; (2) linking explicitly the choice of indicator(s) to the MPA objectives; (3) accounting for habitat structure; (4) taking into account the age and size of the MPA; and (5) quantifying the fishing pressure outside the MPA (including possible displacement effects). 4. Neglecting social factors, using inappropriate indicators, and/or

ignoring relevant covariates, carries the risk of having MPAs dismissed as an effective management tool. Societal expectations are strong that MPAs will confer benefits, and thus assessment studies need to be progressively improved using new methodologies and the best available scientific evidence.

Yasué, M., Kaufman, L., and Vincent, A.C.J. **Assessing ecological changes in and around marine reserves using community perceptions and biological surveys.** *Aquatic Conservation: Marine and Freshwater Ecosystems* 20(4): 407-418, 2010.

Notes: 1. Well-enforced partial or total no-fishing zones (collectively known as marine protected areas, or MPAs) can help restore degraded coral reefs and enhance fish populations. 2. A comparison was made of community perceptions of ecological changes in an MPA with concurrent scientific data on these changes in the same MPA. Such analyses are particularly important in community-based MPAs where local support is a key determinant of ecological success. 3. The no-take MPA in question was initially launched in partnership with the community in 1995 and formalized in 1998. The perceptions data come from interviews with community members in 1999 and 2004, the biological data come from underwater visual censuses of the MPA from 1998 to 2004. 4. Community members perceived more fish within the MPA and slight increases in catch outside the MPA. In contrast, fish censuses showed a high degree of stochastic variation and only minor increases in fish abundance, size and diversity in and around the MPA between 1998 and 2004. 5. Possible explanations for these discrepancies include different temporal, spatial or species frames of reference and/or limitations to the biological survey technique. Other options include wishful thinking, external influences, a desire to please, or confounding with other benefits. 6. This study demonstrates some of the strengths and weaknesses of community perceptions and biological data. In order to improve our understanding about the changes that occur over time in an MPA and engender community support for the long-term viability of MPAs, it is important to develop diverse and efficient monitoring schemes.

Kopp, D., Bouchon-Navaro, Y., Louis, M., Mouillot, D., and Bouchon, C. **Herbivorous fishes and the potential of Caribbean marine reserves to preserve coral reef ecosystems.** *Aquatic Conservation: Marine and Freshwater Ecosystems* 20(5): 516-524, 2010.

Notes: 1. The development of macroalgae to the detriment of corals is now one of the major threats to coral reefs. Herbivorous fishes are partly responsible for algal regulation on coral reefs and their overexploitation favours the shift from scleractinian coral-dominated systems towards macroalgae-dominated systems. 2. Marine protected areas (MPAs) that have been established worldwide may benefit coral reefs through the maintenance of high densities of herbivorous fishes which regulate algal growth. 3. The paper assesses whether small MPAs in the Caribbean are able to enhance herbivorous fish stock and by controlling macroalgae help to maintain reef ecosystems. A visual census using band-transects was undertaken around Guadeloupe island where marine reserves have been in place since 1979. The effects of MPAs on both benthic communities and herbivorous fishes are examined. 4. Inside MPAs, herbivorous fish biomass was almost twice as high as outside MPAs and macroalgal cover was significantly lower. Fish size class distributions revealed that large individuals occurred mainly inside MPAs and that few male individuals were found outside MPAs.

de Groot, J. and Bush, S.R. **The potential for dive tourism led entrepreneurial marine protected areas in Curacao.** *Marine Policy* 34(5): 1051-1059, 2010.

Notes: Despite the successful establishment of marine protected areas in the Netherlands Antilles, such as Saba and Bonaire, government-led protection of the reefs surrounding Curacao has repeatedly failed. In the absence of effective state regulation, dive operations have taken *de facto* control over dive sites, establishing conservation through a range of private initiatives akin to what have been referred to as entrepreneurial marine protected areas (EMPAs). The paper analyses the potential of these EMPAs to regulate access and control to dive sites and good diver practices. Using data from interviews with key actors in the dive industry and a survey of tourist divers the paper shows that achieving an island wide system of EMPAs is dependent on issues related to ownership over the reef, geographical location, and market competition. The paper concludes that the viability of such a system is not only dependent on the dynamics of the local and international dive market, in which all actors pursue their own interests, but also on the establishment of meta-governance arrangements that can provide incentive-based oversight to the entrepreneurial conservation practices of dive operations.

Sen, S. **Developing a framework for displaced fishing effort programs in marine protected areas.** *Marine Policy* 34(6): 1171-1177, 2010.

Notes: As marine protected areas (MPAs) continue to be established, measures to address displaced effort are likely to become increasingly relevant. Recent experiences of displaced fishing effort programs for MPAs and recreational fishing reserves in Australia, together with two

examples from the United States, are described. A practical framework for addressing displaced fishing effort is developed, which explores the likely displaced-effort scenarios and options when planning spatial commercial fishing closures for an MPA.

Glaser, M., Baitoningsih, W., Ferse, S.C.A., Neil, M., and Deswandi, R. **Whose sustainability? Top-down participation and emergent rules in marine protected area management in Indonesia.** *Marine Policy* 34(6): 1215-1225, 2010.

Notes: A review of a major community-based marine protected area programme (CB-MPA) in an Indonesian island archipelago is the point of departure for this article. Despite a well-designed institutional structure to facilitate local participation, local knowledge about the CB-MPA is found to be low and resource access and influence on decision-making in the programme is negligible for the majority of islanders. At the same time, most of those who know about the programme consider it as pertaining to the public authority only. These findings stand in contrast to evidence on non-formal ways of protecting and managing marine areas in the same geographical area but outside the formal MPA institutional framework. In particular, the article identifies a number of emergent rules-in-use in marine management, which operate parallel to legally established MPAs. It is argued that emergent forms of marine area protection such as non-formal self-organising island exclusion zones (IEZ) offer as yet mostly unused potentials for formal MPA development, particularly in those coastal and marine areas without traditional forms of marine and coastal management.

Yagi, N., Takagi, A.P., Takada, Y., and Kurokura, H. **Marine protected areas in Japan: Institutional background and management framework.** *Marine Policy* 34(6): 1300-1306, 2010.

Notes: Information on the location and area for all MPAs in Japan was collected through a comprehensive survey targeting government officials and local stakeholders. It was verified that at least 1161 MPAs exist in Japan. Of these, 1055 are implemented in conjunction with fishery regulations in the form of no-take zones. More than 30% of the individual MPAs in Japan were established by self-imposed instruments agreed by members of fishery co-management organizations. It was suggested that the autonomous MPAs are not a product of simple altruism, but rather are logical extensions of the tenure system guaranteed by the government legal system.