 

|  |
| --- |
| **OREGON CHAPTER** |
| **OF THE WILDLIFE SOCIETY** |
| PO Box 2378 |
| Corvallis, OR 97339 |

|  |
| --- |
| **OREGON CHAPTER** |
| **OF THE AMERICAN FISHERIES SOCIETY** |
| PO Box 8062 |
| Portland, OR 97207 |

**OREGON’S MARINE RESERVES**

**Background**

This paper is the joint position statement of the Oregon Chapter of The Wildlife Society (ORTWS) and the Oregon Chapter of the American Fisheries Society (ORAFS) on marine reserves and protected areas within Oregon’s Territorial Sea (0–3 nautical miles offshore). The purpose of Oregon’s marine reserves and protected areas is to:

* Support the conservation of nearshore marine species;
* Support the conservation of pelagic and migratory species that depend on nearshore marine habitats at some point in their life history; and
* Provide an essential resource for ocean research.

In 2009, House Bill 3013 authorized Redfish Rocks Marine Reserve and an associated protected area in Port Orford, as well as Otter Rock Marine Reserve off the unincorporated town of Otter Rock. These sites would be monitored to establish baseline data for site-based biological changes. In 2012, Senate Bill 1510 authorized the designation of an additional three no-take marine reserves and associated protected areas at Cape Perpetua, Cascade Head, and Cape Falcon, and called for a report in 10 years assessing the social, economic, and environmental factors related to the reserves and protected areas.

Oregon’s marine reserves generally prohibit all take of fish, invertebrates, wildlife, and marine macrophytes as well as all ocean development, except as necessary for monitoring or research. Oregon’s marine protected areas allow or prohibit take of specified resources.

**The ecological benefits of marine reserves**

Marine reserves are a spatial approach to conservation and management aimed at protecting and restoring multispecies assemblages and the structure and function of marine ecosystems (Micheli et al. 2004). Marine reserves have been described as an effective tool for contributing to marine conservation and biodiversity objectives (Fenberg et al. 2012; Harrison et al. 2012; Micheli et al. 2012; Yamazaki et al. 2012). A review of 89 studies of marine reserves (Halpern 2003) revealed that, on average, species biomass, organism size and density, and species diversity were higher in reserve areas compared to similar areas outside of reserves, and compared to reserve areas prior to protection. These changes in organism size, abundance, and species diversity occur rapidly and are independent of reserve size. It should be noted that most reserves and most studies of reserves have occurred in tropical areas. A meta-analysis comparing the performance of 124 tropical and temperate marine reserves that measured biomass, population density, organism size, and species richness (Lester et al. 2009), however, suggested all four features improved with protection as marine reserves, and temperate reserves notably performed as well, and in some cases better, than their tropical counterparts (Lester et al. 2009).

Marine reserves can have many ecological, economic, educational, and social benefits, including the recovery or sustained maintenance of ecological systems, maintenance of genetic diversity, protection of areas for scientific reference, reduction of impacts from exploitation and/or natural disasters, increased ecosystem recovery from stresses, a source of revenue for local communities through tourism and recreation, protection of culturally important places and species, and promotion of sustainable fishing practices outside of protected areas through movement of species inside and outside the reserves (Geerlings 2013).

Marine reserves have the potential to make positive contributions to Oregon’s marine ecosystems. Generally, within a species, larger fish produce many more progeny than smaller individuals; thus, the per-capita reproductive potential of fishes and other organisms in reserve areas is expected to be higher compared to outside reserves. Some positive spillover effects on fisheries occurred from fish leaving reserve areas and becoming available to harvest outside reserves. (Russ and Alcala 2011; Harrison et al. 2012). In addition, greater reproductive capacity in reserves is expected to lead to spillover for fisheries through larval export (Harrison et al. 2012). Although many groundfish on the Oregon coast are relatively sedentary, most undertake spawning migrations and use multiple habitats during their life history (Love 2011). Any spillover may also yield fish with minimal avoidance behavior, potentially increasing catchability just outside reserve boundaries (Januchowsky-Hartley et al. 2013).

No-take marine reserves have also realized spillover effects with respect to species richness and complexity at higher trophic levels (Russ and Alcala 2011). Additional documented benefits of no-take marine reserves include increased resilience in benthic invertebrate populations to mass mortality events (Micheli et al. 2012). Invertebrate larvae are important planktonic prey items for many Oregon species of rockfish (*Sebastes* spp.; Love 2011).

Halpern (2003) and Lester et al. (2009) demonstrated that measurable conservation benefits can be found even in small marine reserves. Moreover, there is substantial evidence that the size of the marine reserve does not dictate levels of productivity (Gell and Roberts 2003; Halpern 2003; Micheli et al. 2004; Lester et al. 2009). Stock rebuilding of many species, such as rockfishes, is dependent on highly variable recruitment events that are driven by ocean conditions (Love 2011). Most species show occasional strong year class pulses that drive population dynamics (Smith 1995). Marine reserves may contribute to increased numbers of progeny, and increased progeny survival. Because of the spatial and temporal variability between oceanographic processes and marine ecosystems, however, it may be difficult to detect the relationship between marine reserves and the population trends of species.

Studies on the efficacy of marine reserves and marine protected areas (MPAs) for enhancing fish populations are not uniformly positive. Walters et al. (2007) modeled fish abundance in a series of California MPAs, which were designed to protect Bocaccio (*Sebastodes paucispinis*), Widow Rockfish (*S. entomelas*), Lingcod (*Ophiodon elongatus*), and Cabezon (*Scorpaenichthys marmoratus*). That study suggested that protected areas may be less effective for fishes whose life histories involve migration, and that management in waters beyond reserve and protected area boundaries can be paramount (Walters et al. 2007).

Marine reserves can contribute to changes in and recovery of benthic habitats. In the Leigh Marine Reserve in New Zealand, rock flat barrens dominated and maintained by sea urchins were replaced over time with kelp forest or shallow mixed seaweeds, likely a result of increasing populations of Spiny Rock Lobster (*Jasus edwardii*) and Snapper (*Pagrus auratus*) preying on urchins, which reduced urchin densities, allowing for regeneration of macrophytes (Leleua et al. 2012). A similar response was seen in the Anacapa Island Ecological Reserve in the Southern California Bight, where kelp forests grew five times more densely and persisted longer in the marine reserve than in adjacent waters (Lafferty and Kushner 2000).

Although the benefits of marine reserves and protected areas have been demonstrated primarily for non-migratory fishes and invertebrates, benefits to less sedentary marine taxa, although more challenging to demonstrate, are also likely. There have been relatively few studies examining the influence of marine reserves and protected areas on other taxa that depend on healthy marine ecosystems, especially “non-fish” top marine predators (i.e. seabirds, marine mammals). Some marine planners have even questioned the validity of MPAs for conservation of highly mobile predators (Game et al. 2009), such as seabirds and cetaceans. Nevertheless, research on seabird reproductive and foraging ecology has informed marine reserve/marine protected area site identification and assessment (Thaxter et al. 2011). One study indicated that the endangered South African Penguin (*Spheniscus demersus*), with lower mobility than volant seabirds, has benefited from relatively small no-take coastal marine reserves that were set aside specifically to protect penguin forage resources (Pichegru et al. 2010), although intense fishing pressure at reserve boundaries subsequently limited those benefits (Pichegru et al. 2012). Péron et al. (2013) obtained convincing evidence, however, that a highly mobile seabird, the Yelkouan Shearwater (*Puffinus yelkouan*), experienced substantial conservation benefits from several coastal MPAs in the Mediterranean Sea. The Sooty Shearwater (*Ardenna griseus*) is seasonally the most abundant seabird species in the Oregon Territorial Sea and, like the Yelkouan Shearwater, is likely to benefit from coastal MPAs in its migration route along the California Current.

The Oregon list of threatened and endangered wildlife species includes two coastal seabird species listed as “Endangered” (Brown Pelican [*Pelecanus occidentalis*] and California Least Tern [*Sterna antillarum browni*]), one oceanic seabird species listed as Endangered that uses the Oregon Territorial Sea (Short-tailed Albatross [*Phoebastria albatrus*]), and one coastal seabird species listed as Threatened (Marbled Murrelet [*Brachyramphus marmoratus*]). All four of these seabirds that are listed in Oregon are likely to benefit from marine reserves and protected areas in the Oregon Territorial Sea. The Marbled Murrelet, for example, is likely to benefit from the five MPAs in Oregon because these reserves encompass known hotspots at-sea for Marbled Murrelet, along the Oregon coast, and are situated just offshore of tracts of late successional/old growth forest that are occupied by nesting Marbled Murrelets. The Tufted Puffin (*Fratercula cirrhata*) is a highly charismatic seabird species that has declined dramatically in Oregon, and has been proposed for endangered species listing by the State of Washington. The factors responsible for the drastic decline of this species are not known, but its nesting habitat along the Oregon coast is almost entirely protected, so the establishment of marine reserves that protect forage fish resources on which Tufted Puffins depend, such as juvenile rockfish, is likely a major component of successfully restoring the species.

The Cape Perpetua Marine Reserve/Marine Protected Area is recognized as the Oregon marine reserve that clearly encompasses a hotspot for marine birds (see “For the Birds: Diving into Seabird Research” at <oregonmarinereserves.com>). Studies on breeding Western Gulls (*Larus occidentalis*), Brandt’s Cormorants (*Phalacrocorax penicillatus*), and Pelagic Cormorants (*P. pelagicus*) within the Cape Perpetua MR/ MPA are designed to investigate the extent to which these seabirds rely on the habitats within this MPA during the nesting period. Results from this ongoing research will help clarify the role that Oregon’s marine reserves play in protecting Oregon’s seabird resources.

There is less empirical evidence that MPAs are effective at restoring marine mammals of conservation concern than there is for highly vagile seabirds. A MPA set aside specifically to help restore endangered Hector’s Dolphin (*Cephalorhynchus hectori*) was estimated to have improved mean annual survival significantly, corresponding to an approximate 6% increase in mean annual population growth rate (Gormley et al. 2012). The Oregon list of threatened and endangered wildlife species includes seven species of whale that are listed as Endangered, including Blue Whale (*Balaenoptera musculus*), Fin Whale (*B. physalus*), Gray Whale (*Eschrichtius robustus*), Humpback Whale (*Megaptera novaeangliae*), North Pacific Right Whale (*Eubalaena japonica*), Sei Whale (*B. borealis*), and Sperm Whale (*Physeter macrocephalus*). These listed cetaceans utilize the Oregon Territorial Sea, some of them extensively (e.g., Gray Whale), and likely benefit from the benthic invertebrates and forage fishes protected within Oregon’s marine reserves and protected areas.

**Human dimensions as part of ecosystem-based management**

Ecosystem-based management (EBM) must involve studying human dimensions - the social attitudes, processes, and behaviors related to how people maintain, protect, enhance, and use natural resources. The goal of EBM is to conserve, maintain, and restore ecosystem functions to promote the economic and ecological sustainability of marine ecosystems and human communities, both coastal and more broadly, that depend on the services they provide (McLeod et al. 2005; Levin and Lubchenco 2008). Key to integrating the biophysical and human dimensions of EBM is the concept of ecosystem services (Fisher et al. 2009; Crowder and Norse 2008; Freeman et al. 2014). These can be defined as “aspects of ecosystems used (actively or passively) to produce human well-being” (Fisher et al. 2009). Ecosystem services have become an important focus in natural resource management as a way of integrating economic, ecological, and other considerations into ecosystem-based decision-making systems (Millennium Ecosystem Assessment 2005; Fisher et al. 2008; Fisher et al. 2009; Barbier 2012).

Engaging stakeholders in the identification and assessment of ecosystem and other services uses group deliberation to inform knowledge about ecosystem services, societal relationships to ecosystem benefits, and the value of benefits (Cowling et al. 2008). It also has wider benefits including: (1) understanding the potential for conflict over multiple objectives for spatial management of coastal ecosystems; (2) better specification of existing interactions between ecosystems services and the communities that depend on them; and (3) disseminating knowledge about ecosystem services and benefits to coastal and other communities, decision-makers, and stakeholders, thereby fostering community participation in marine spatial planning (Lynam et al. 2007; Kumar and Kumar 2008; Pomeroy and Douvere 2008).

**Looking Forward**

Oregon’s marine reserves are generating baseline ecological, economic, and social data; however, data gaps exist within each of these three categories. Extensive evidence from networks of marine reserves throughout the world, including those in temperate regions, suggests that reserves are likely to increase the abundance, size, and reproductive output of coastal species, as well as species diversity. Reserves serve to facilitate the recovery of valuable habitat features that are important to the survival and growth of many marine species. However, increases in abundance, species richness, biodiversity, and general biomass take time to observe, and will need long-term monitoring, particularly for long-lived species of rockfish and other groundfish, before the efficacy of the reserves can be gauged. Also, the nature and magnitude of the social and economic effects of Oregon’s marine reserves are less certain and, in the context of ecosystem-based management, warrant long-term monitoring and evaluation of those features.

**The Position of ORTWS and ORAFS**

ORTWS and ORAFS support Oregon’s system of marine reserves and protected areas. Moreover, we support and value the efforts of the Ocean Policy Advisory Council, the Oregon Department of Fish and Wildlife, and the Oregon Ocean Science Trust in the research, management, and monitoring of Oregon’s five marine reserves and associated protected areas within Oregon’s Territorial Sea.

We support ongoing and future research and monitoring efforts that consider the full range of ecological, social, and economic objectives of Oregon’s marine reserves.

We support adaptive management measures that would inform the understanding and advancement of population connectivity among the five marine reserves and other areas in federal and state waters where extractive uses are restricted (see for example, Agardy et al. 2011; Fenberg et al. 2012).

We support a diversity of scientific studies within and adjacent to Oregon’s marine reserves and protected areas to assess changes in species abundance and habitat distribution for a suite of species that represent key marine guilds off the Oregon coast.

Many of Oregon’s nearshore fish, seabird, and marine mammal species are long-lived, thus it may take decades to fully assess the effects of marine reserves on focal fish and wildlife species; including related social and economic effects. Consequently, we support ecological, social, and economic monitoring of marine reserves beyond the 2023 timeline, to evaluate their success and help guide the conservation of Oregon’s marine resources into the future.

**References**

Agardy, T., G.N. di Sciara, and P. Christie. 2011. Mind the gap: Addressing the shortcomings of marine protected areas through large scale marine spatial planning. Marine Policy 35:226–232.

Barbier, E.B. 2012. Progress and challenges in valuing coastal and marine ecosystem services. Review of Environmental Economics and Policy 6:1–19.

Cowling, R.M., B. Egoh, A.T. Knight, P.J. O'Farrell, B. Reyers, M. Rouget, D.J. Roux, A. Welz, and A. Wilhelm-Rechman. 2008. An operational model for mainstreaming ecosystem services for implementation. Proceedings of the National Academy of Science USA. 105:9483–9488.

Crowder, L. and E. Norse. 2008. Essential ecological insights for marine ecosystem-based management and marine spatial planning. Marine Policy 32:772–778.

Fenberg, P.B., J.E. Caselle, J. Claudet, M. Clemence, S. Gaines, and others. 2012. The science of European marine reserves: Status, efficacy, and future needs. Marine Policy 36:1012–1021.

Fisher, B., R.K. Turner, M. Zylstra, R. Brouwer, R. De Groot, S. Farber, P. Ferraro, R. Green, D. Hadley, J. Harlow, P. Jefferiss, C. Kirkby, P. Morling, S. Mowatt, R. Naidoo, J. Paavola, B. Strass- burg, D. Yu, and A. Balmford. 2008. Ecosystem services and economic theory: Integration for policy-relevant research. Ecological Applications 18:2050–2067.

Fisher, B., R.K. Turner, and P. Morling. 2009. Defining and classifying ecosystem services for decision making. Ecological Economics 68:643–653.

Freeman, P., R. Rosenberger, G. Sylvia, S. Heppell, and M. Harte. 2014. Guide for valuing marine ecosystem services to support nearshore management in Oregon. ORESU-H-13-002. Corvallis, OR: Oregon Sea Grant. 74 pp.

Game, E.T., H.S. Grantham, A.J. Hobday, R.L. Pressey, A.T. Lombard, L.E. Beckley, K. Gjerde, R. Bustamante, H. Possingham, and A.J. Richardson. 2009. Pelagic protected areas: the missing dimension in ocean conservation. Trends in Ecology and Evolution 24:360–369.

Geerlings, C. 2013. International obligations for the creation of the Australian National Representative System of marine protected areas. Cairns and Far North Queensland Environment Center. 42pp.

Gell, F.R., and C.M. Roberts. 2003. Benefits beyond boundaries: the fishery effects of marine reserves. Trends in Ecological Evolution 18:448–455.

Gormley, A.M., E. Slooten, S. Dawson, R.J. Barker, W. Rayment, S. du Fresne, and S. Brager. 2012. First evidence that marine protected areas can work for marine mammals. Journal of Applied Ecology 49:474–480.

Halpern, B. 2003. The impact of marine reserves: do reserves work and does reserve size matter?

Ecological Applications 13(1, supplement):117–137.

Harrison, H.B., D.H. Williamson, R.D. Evans, G.R. Almany, S. Thorrold, and others. 2012. Larval export from marine reserves and the recruitment benefit for fish and fisheries. Current Biology 22:1023–1028.

Januchowski‐Hartley, F.A., N.A.J. Graham, J.E. Cinner, and G.R. Russ. 2013. Spillover of fish naïveté from marine reserves. Ecology Letters 16:191–197.

Kumar, M., and P. Kumar. 2008. Valuation of ecosystem services: A psycho-cultural perspective.

Ecological Economics 64:808–819.

Lafferty, K.D., and D.J. Kushner. 2000. Population regulation of the purple sea urchin, *Strongylocentrotus purpuratus*, at the California Channel Islands. Cited in PISCO (Partnership for Interdisciplinary Studies of Coastal Oceans; 2002) The science of marine reserves.

Leleua, K., B. Remy-Zephira, R. Gracee, and M.J. Costelloa. 2012. Mapping habitats in a marine reserve showed how a 30-year tropic cascade altered ecosystem structure. Biological Conservation 155:193–201.

Lester, S.E., B.S. Halpern, K. Grorud-Colvert, J. Lubchenco, B.I. Ruttenberg, and others. 2009. Biological effects within no-take marine reserves: A global synthesis. Marine Ecology 384:33–46.

Levin, S.A., and J. Lubchenco. 2008. Resilience, robustness, and marine ecosystem-based management. Bioscience 58:27–32.

Love, M.S. 2011. Certainly more than you want to know about the fishes of the Pacific Coast: A postmodern experience. Santa Barbara, Really Big Press.

Lynam, T., W. de Jong, S. Sheil, T. Kusumato, and K. Evans. 2007. A review of incorporating com- munity knowledge, preferences and values into decision making in natural resources management. Ecology and Society 2:5. [online] URL: <http://www.ecologyandsociety.org/vol12/iss1/art5/>

McLeod, K, J. Lubchenco, S.R. Palumbi, and A.A. Rosenberg. 2005. Scientific Consensus Statement on Marine Ecosystem-based Management. Available [at www.compassonline.org/marinescience/](http://www.compassonline.org/marinescience/) solutions\_ecosystem.asp

Micheli, F., B.S. Halpern, L.W. Botsford, and R.R. Warner. 2004. Trajectories and correlates of com- munity change in no-take marine reserves. Ecological Applications 14:1709–1723.

Micheli, F., A. Saenz-Arroyo, A. Greenley, L. Vazsquez, M. Espinoza, and others. 2012. Evidence that marine reserves enhance resilience to climatic impacts. Public Library of Science One 7:pp. e40832.

Millennium Ecosystem Assessment. 2005. Ecosystems and human well-being: Synthesis. Island Press, Washington, DC.

ODFW (Oregon Department of Fish and Wildlife). 2014. Oregon marine reserves: Ecological monitoring report 2010-2011. Marine Resources Program, Newport, OR.

ODFW (Oregon Department of Fish and Wildlife). 2014. Oregon marine Reserves: Human dimensions monitoring report 2010-2011. Marine Resources Program, Newport, OR.

Péron, C., D. Grémillet, A. Prudor, E. Pettex, C. Saraux, A. Soriano-Redondo, M. Authier, and J. Fort. 2013. Importance of coastal Marine Protected Areas for the conservation of pelagic seabirds: The case of vulnerable yelkouan shearwaters in the Mediterranean Sea. Biological Conservation 168:210- 221.

Pichegru, L., D. Grémillet, R.J.M. Crawford, and P. G. Ryan. 2010. Marine no-take zone rapidly benefits endangered penguin. Biological Letters 6:498–501, doi:10.1098/rsbl.2009.0913.

Pichegru, L., P.G. Ryan, R. van Eeden, T. Reid, D. Grémillet, and R. Wanless. 2012. Industrial fishing, no-take zones and endangered penguins. Biological Conservation 156:117-125.

Pomeroy, R., and F. Douvere. 2008. The engagement of stakeholders in the marine spatial planning process. Marine Policy 32:816–822.

Russ, G.R., and A.C. Alcala. 2011. Enhanced biodiversity beyond marine reserve boundaries: The cup spillith over. Ecological Applications 21:241–250.

Smith, P.E. 1995. Development of the population biology of the Pacific hake, *Merluccius productus*. California Cooperative Oceanic Fisheries Investigations Reports 36:144—152.

Thaxter, C.B., B. Lascelles, K. Sugar, S.C.P. A.S.C.P. Cook, S. Roos, M. Bolton, R.H.W. Langston, and N.H.K. Burton. 2011. Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. Biological Conservation 156:53–61.

Walters, C., R. Hilborn, and R. Parish. 2007. An equilibrium model for predicting the efficacy of marine protected areas in coastal environments. Canadian Journal of Fisheries and Aquatic Sciences 64:1009–1018.

Yamazaki, S., Q.R. Grafton, T. Kompas, and S. Jennings. 2012. Biomass management targets and the conservation and economic benefits of marine reserves. Fish and Fisheries 15:196–208.