

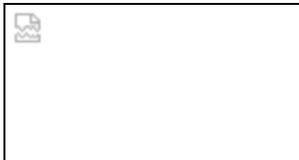


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Marine refuges offer haven for Puget Sound fish

Posted April 2001

Summary

Deep in Puget Sound several marine refuges offer protection for large and long-lived bottomfish species such as rockfish and lingcod. The first few in a planned network of marine protected areas closed to most or all fishing, the sites act as natural hatcheries for slow-growing fish that can live longer than most humans. Like scientists in other areas of the world, WDFW biologists and marine resource managers are monitoring fish populations in designated refuge areas to determine the sites' effectiveness in protecting and bolstering fragile bottomfish species. A visit to an underwater marine refuge visible on this site with streaming video is like a trip back in time to glimpse what Puget Sound looked like before settlement and heavy harvest activity.

By Wayne A. Palsson, Fish Biologist
WDFW Marine Resources Division

Marine refuges are any place in the world's oceans that protect one or all species from the impacts of fishing. Refuges are one kind of Marine Protected Area (MPA), which are areas that afford organisms and their habitats some level of protection from disruption or harvesting activities through regulations or voluntary efforts. The concept of creating a network of MPAs in the world's marine areas has become the centerpiece of marine research and a potential piece of the solution to the diminishing resources of the oceans. In Puget Sound and along the coastal waters of Washington, many agencies and groups are planning and promoting the creation of a network of MPAs. The Washington Department of Fish and Wildlife (WDFW) has been major force in this process by conducting research and planning for the strategic creation of a science-based MPA network.

IN FOCUS

Marine refuges and management

By Mary Lou Mills,
Marine Resources Manager
WDFW Marine Resources Division

It was serendipitous that the Washington Department of Fish and Wildlife (WDFW) had a 30-year-old marine refuge in place when the department began serious work on what refuges could do for fishery management. The Edmonds Underwater Park was established when local divers approached the City of Edmonds and later WDFW, to ask that the area be closed for harvest so they could see fish when they dove there.

Anecdotal reports indicate the Edmonds refuge area had only a few fish when closed, and looked no different from other parts of Puget Sound. Now it is home to huge rockfish and lingcod, and diving there is like looking back in time to what Puget Sound was like before heavy harvest.

The Washington Fish and Wildlife Commission and WDFW are interested in establishing a network of marine refuges, as part of the management of long-lived fish species that have high site fidelity. In 1998, the Commission adopted a policy on Marine Protected Areas that recognizes them as a fish management tool.

The network has been started



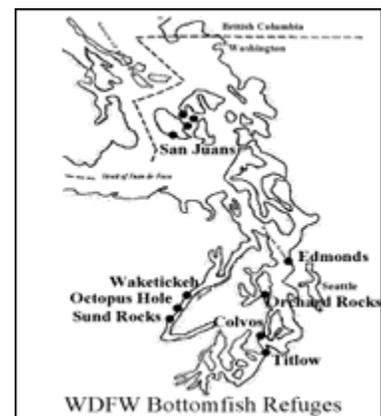
WDFW Photo
Copper Rockfish

A number of no-take refuges that protect bottomfish and other species already exist within Puget Sound. Among these refuges are some implemented by WDFW to promote non-consumptive recreation, facilitate research and education, protect habitat, and conserve marine populations. Most of WDFW's Puget Sound refuges protect bottomfish and shellfish resources by prohibiting fishing by non-tribal commercial and recreational fishers and beach gatherers. Four of the subtidal WDFW refuges and three of the intertidal ones are "Conservation Areas" (a designation within WDFW regulations where the harvest or taking of any organism is prohibited). Not all species lend themselves to protection by creating refuges, but those that are attached to the bottom or with small home territories are the species most likely to benefit. Fishes such as copper and quillback rockfishes and some lingcod have been shown to spend the majority of their life in very small areas on rocky reefs, and their populations have been shown to be in poor condition in many or all areas of Puget Sound. It is expected that these species would show the greatest response to protection offered by the creation of no-take refuges.



WDFW Photo
Cabezon

with several marine refuges around Puget Sound adopted by the Commission in addition to the underwater park at Edmonds. These refuge sites are noted in the WDFW [sport fishing rules pamphlet](#) on the Internet. Several in-water conservation areas-- at Orchard Rocks, Octopus Hole and Wahketickeh Creek-- are closed to all harvest. In partnership with local public agency landowners the following intertidal areas were made into conservation areas: 239th Street Park in DesMoines, the City of DesMoines Park and Saltar's Point Beach in Steilacoom. Another group of areas, called marine preserves, are closed to the harvest of most species (Sund Rock, Titlow Beach, Colvos Passage and five San Juan Marine Preserves). Information on the first in-water conservation areas and marine preserves, including an online map of sites, is available online as part of a WDFW electronic slide show.



Click here or on the map above to view the slideshow "[Conservation of Marine Resources in Puget Sound.](#)"

The concept of setting aside some marine areas without harvest has strong parallels to lands where parks and wilderness areas have been established. The idea of using

WDFW refuge research

A research program begun by WDFW staff in 1992 has examined whether rockfishes, lingcod and other bottomfish respond to the protection from harvest afforded by marine refuges. Since 1992, a variety of studies using scuba diving and video cameras have been undertaken to determine whether fish are more abundant, larger, and have greater reproduction potential within WDFW refuges. During the study, scuba divers count and measure bottomfish within known areas at selected index sites in the San Juan Islands and in Central Puget Sound. Among these sites are marine reserves including the oldest refuge (established in 1970) at the Edmonds Underwater Park, where reef habitat is supplied by artificial material, and Shady Cove, a natural reef in the San Juan Islands, which was established in 1990. Comparable and nearby fished areas including artificial and natural reefs are also surveyed for comparison.

The study results clearly showed that more and larger copper rockfish and lingcod occurred at the Edmonds refuge than at any of the comparable fished areas in central Puget Sound. Copper rockfish numbers at the long-term Edmonds refuge were 15 times greater than at the fished sites. Large copper rockfish exceeding 16 inches in length were uncommon at the fished sites but were the most common sizes at Edmonds. Quillback rockfish of all sizes were most abundant at one of the central Sound fished sites but large quillback rockfish were seen in much greater numbers at Edmonds. Lingcod were more than twice as abundant at the long-term refuge where they averaged almost one yard in length compared to only 24 inches at the fished sites in central Puget Sound.

The responses of rockfish and lingcod to the creation of a refuge may take some time to be fully observed. The younger Shady Cove refuge near Friday Harbor had only been in existence for seven years when the study period ended (for four years when the study began). Copper rockfish were about twice as dense at the Shady Cove refuge as at nearby fished site, but there were no differences in sizes between the refuge and fished sites. Lingcod were more abundant at the San Juan refuge than at the fished site and larger lingcod were more frequent in the refuge as well. Lingcod surveyed during their spawning season had three times the number of nests in the Shady Cove refuge than in the fished area.

The abundance and size results from the Puget Sound study suggest that the reproduction per acre in a long-term MPA is 20 or more times greater than nearby

such areas in marine waters as "natural hatcheries" has a great deal of appeal. WDFW has embarked on a major management change by incorporating marine refuges as an integral part of our conservation planning.

Despite the positive effects seen in small areas throughout Washington and in worldwide marine waters, success of this approach as a management tool has yet to be proven on a larger scale in Puget Sound. Effects within the sites created, the connections between the sites, the relationship of the network to traditional harvest management tools, and the effects of the sites on fish populations throughout the Sound are some areas of interest.

Active monitoring of our marine fish resources will be required to determine the benefits that may accrue from a network of marine refuges. We will need continued high-quality science to test our cautious optimism and an adaptive approach to management of the network as we learn more about how it functions.

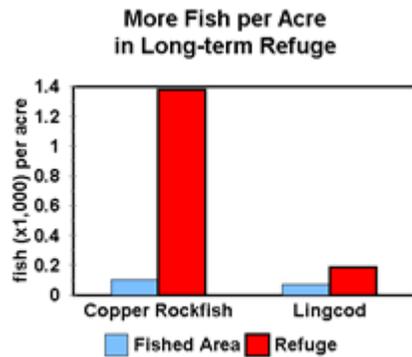


WDFW Photo
Lingcod

fished sites, a finding that indicates fished populations are far below the best reproductive conditions under optimal fishing conditions.

The benefits of marine refuges

These results clearly show that rockfish and lingcod increase in abundance and size with harvest closures even in small areas such as the Edmonds Underwater Park. The corollary to this finding is that, to a great degree, fishing controls the abundance and size of fishes living on reefs in Puget Sound. While the theory of fishing predicts great differences between fished and unfished populations, the observed differences between fished and refuge sites in Puget Sound likely exceed the expectations for a healthy population. These results for rockfish and lingcod are similar to findings in British Columbia, California, and offshore Washington. The response of rockfish and lingcod to refuge protection is also consistent with a growing body of scientific literature from around the world that finds fish and large invertebrates are larger, more abundant, and have more reproductive output in refuges than in fished sites.



The implications for traditional management techniques such as size limits, seasons, and bag limits may indicate that these are only partially effective at managing slow growing, late maturing, and territorial species such as rockfish and lingcod. There may be greater ecological and evolutionary aspects that can not be adequately controlled by traditional management techniques. For example, we are only now beginning to understand such issues as genetic overfishing, vulnerability of rare species, collapse of age and size

structure, changes in growth and maturity schedules, and predator-prey relationships. These shortcomings of traditional management and the findings of WDFW and other researchers are fueling the creation of a system of marine refuges in Puget Sound, Washington, and other parts of the world.

Creating reserves may have other benefits besides restoring and protecting habitat and fish populations. Edmonds Underwater Park is the most popular dive spot in Washington where the large lingcod and rockfish are watchable wildlife. The WDFW refuges established in Hood Canal have also become popular dive sites. These areas may have potential economic benefit to surrounding communities.

A marine refuge network for Puget Sound

For exploited populations, the main benefit of creating more refuges may be that they will act as natural hatcheries to produce young. The offspring produced will not only sustain populations at the refuge site but will be exported to nearby fished sites where they will grow and contribute to sustainable fisheries. There are many other reasons to create marine refuges and they are as diverse as those for protecting ancient forests. Marine refuges can protect biodiversity, preserve age and size structure, and maintain ecosystem integrity. The role of marine refuges has already been identified by WDFW as a fisheries management tool in the Puget Sound Groundfish Management Plan and by the Washington Fish and Wildlife Commission's policy on MPAs. These documents cite MPAs as a method to preserve habitat, fisheries, recreation and heritage.

Within Washington, the successful creation of a system of no-harvest refuges certainly depends upon co-management with Washington Treaty Tribes. Each tribe has rights to harvest in their usual and accustomed fishing, which may include existing or potential MPA sites. WDFW

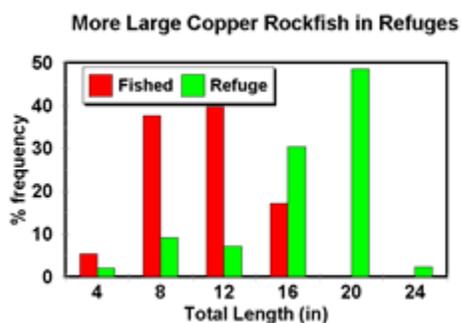


looks forward to discussions regarding co-management of the state's groundfish resources and to cooperative development of management approaches for these species, including a network of marine reserves.



WDFW Photo
Quillback Rockfish

A host of other state and federal initiatives are taking place to develop a network of refuges and MPAs not only in Puget Sound, but around the country. Among state agencies, the Department of Natural Resources (DNR) and the Puget Sound Action Team have been developing MPA programs. DNR has been creating aquatic reserves, which are areas withdrawn from leasing to protect habitat and the so-called "embedded resources" such as clams, oysters and mussels. The Puget Sound Action Team has identified creating an MPA network as a feature of the Puget Sound Plan, and has formed a coordinating committee to foster MPA development. The federal government has created the MPA Initiative to help agencies and states create a national MPA network. In addition, Congress has created and funded the Northwest Straits Initiative -- a program to create citizen-based stewardship of marine resources in northern Puget



Sound. The Northwest Straits Initiative includes a commission composed of appointees and one member from each of the seven county Marine Resource Committees. These voluntary committees and the NW Straits Commission are charged with creating a system of MPAs in the next few years. To this mix, add University researchers and a host of non-governmental organizations such as People for Puget Sound, The Nature Conservancy, the Center for Marine Conservation, and many others who are

busy planning and advocating for the creation of an MPA network.

There are many avenues to approaching MPAs, and citizen participation is a natural and desired feature of a successful network. Already, the San Juan County Marine Resources Committee has created the Bottomfish Recovery Program, which consists of a series of eight voluntary refuges. At the Edmonds Underwater Park, the amount of nesting lingcod has compelled a group of volunteers to conduct weekly survey dives during the winter to monitor nesting activity. The diving community has also been integrally involved in proposing and adopting marine refuges in Hood Canal and Puget Sound.

The field of MPA and marine refuge science and management has many questions and challenges in the near- and long-term future. MPAs will continue to come into the limelight, and WDFW will be intimately involved in the creation of a science-based network in Puget Sound and along the coast. The challenges are exciting and the potential for restoring and conserving marine populations and ecosystems is great.

Definitions

Marine Protected Area: The generic term for an area in which some or all resources are protected by law or other effective means. Protection might be related to restrictions on harvest or impacts from other activities.

Marine Refuge: As used in this article, a marine refuge is an area where fishing is



WDFW Photo

not allowed.

WDFW Photo
Copper Rockfish

Conservation Area: Under WDFW regulations, an area where all harvest is closed.

Marine Preserve: Under WDFW regulations, an area where harvest of most species is closed.

Transgenic: Something that crosses generations. In marine fish research, transgenic marking involves marking adult fish so they will produce marked juveniles.

Marine Sanctuary: As used at the federal level, a National Marine Sanctuary is a marine area designated under federal rules. Fishing is not precluded but areas may be considered for closure in the management plan for each sanctuary. Extraction of non-renewable resources is generally precluded.

Related research

The research on the response of rocky reef fishes to marine refuges has been primarily funded by federal Sportfish Restoration Act sources. While these funds have been eliminated for Puget Sound marine fish studies, state funds under the year 2000 supplemental budget for bottomfish recovery in Puget Sound have continued support for establishing and monitoring marine protected areas in Puget Sound. WDFW staff are continuing and expanding their monitoring to survey new refuges as they are created. In addition, they are identifying the criteria for selecting individual refuges and forming a network of refuges. A new marking technique has also been under development as a cooperative project with a Tacoma aquarium. It involves marking juveniles while still carried as eggs in adult females. If continued tests prove the approach successful, so-called "transgenic marking" may become a way to trace the offspring produced in marine refuges.

Related work on bottomfish and marine refuges consists of stock assessments using fishery information and regional surveys funded by general and supplemental funds. On the Washington coast, WDFW staff is participating in interstate and federal committees examining the roles of MPAs in ocean fisheries management and conserving essential fish habitat.

WDFW staff is using the results from refuge studies and regional surveys in study and planning efforts of other entities including Washington Treaty Tribes, the University of Washington, Friday Harbor Laboratories, The Nature Conservancy, and People for Puget Sound.

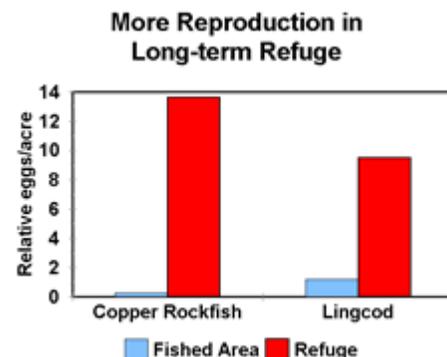
Related links

For further information, visit the websites of the following organizations:

Federal Government's National MPA Initiative:
<http://www.mpa.gov>

Consensus of marine scientists views calling for the creation of MPAs via the University of California, Santa Barbara:
<http://www.nceas.ucsb.edu/consensus>

Northwest Straits Initiative and the role of MPAs at the Northwest Strait Commission:



<http://www.nwstraits.org>

San Juan County Marine Resources Committee and the Bottomfish Recovery Project:

<http://co.san-juan.wa.us/mrc>

The planning for the Orca Pass MPA through the People for Puget Sound:

<http://pugetsound.org/mpa>

Author Biography



Wayne Palsson is a Fish and Wildlife Biologist for the Washington Department of Fish and Wildlife and studies groundfish populations in Puget Sound. For over 20 years, he has focused on saltwater fishes in Puget Sound . Palsson has worked for WDFW for over 16 years. He graduated with a Bachelor of Arts degree in Zoology from the University of California at Berkeley in 1977, and received a Master of Science degree in Fisheries Science from the University of Washington in 1984. As WDFW's senior groundfish biologist for Puget Sound, Palsson conducts stock assessments, advises fishery managers and leads surveys and studies designed to understand the ecology and fisheries of groundfish resources . He has been the lead investigator monitoring marine refuges in Puget Sound and has been contributing to the criteria for designing a refuge network.

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