



Marine Reserve Science and Monitoring Workshop

Oregon Department of Fish and Wildlife, March 2, 2010

Meeting Purpose

- 1) To learn information and gain insight on marine reserve science and monitoring that can be applied to the monitoring plans for Oregon's Marine Reserve Pilot Sites: Otter Rock and Redfish Rocks.
- 2) To obtain direct feedback on designing baseline studies and a long term monitoring plan.

Workshop Summary

A Marine Reserve Science and Monitoring workshop was held on March 2, 2010 for the Oregon Department of Fish and Wildlife to gather input from the scientific community on the development of a biological monitoring program for the two pilot marine reserve sites at Otter Rock and Redfish Rocks.

Alix Laferriere, ODFW Marine Reserve Research Project Leader, defined the day's goal as a desire to **gain insight on the science of marine reserve monitoring and obtain feedback to aid in developing a draft monitoring plan** for Oregon's two pilot sites.

The meeting was facilitated by Jeff Feldner of Oregon SeaGrant.

ODFW's Anna Pakenham outlined the legislative background of marine reserves in Oregon and ODFW's role in studying, monitoring, and evaluating reserves. Ms. Pakenham and ODFW's Cristen Don discussed and clarified questions pertaining to collaboration and stressed the important role of collaboration through community teams at each pilot site.

Invited Scientists

A host of scientists with expertise on marine protected area monitoring, the Oregon marine environment, and the Oregon marine reserve process were invited to share their experiences and provide input. Their presentations and accompanying discussions are summarized by topic below. An attendance list is provided in Appendix A.

1. Effectiveness of Marine Reserves

Invited speakers Dr. Brian Tissot, Washington State University; Dr. Mark Hixon, Oregon State University

Dr. Tissot and Dr. Hixon discussed a successful network of marine reserves in Hawaii. Dr. Tissot highlighted findings after nine years of cooperative study (plus one year of baseline study) about the effects of marine reserves and other marine protected areas (MPAs) in Hawaii:

- Studied a network of marine reserves along the 100-mile long Kohala-kona coast, equivalent to about a third of the Oregon coast.
- Studied species (e.g., yellow tang) that are similar in terms of life history to important Oregon species (e.g., black rockfish).
- BACI design was used over 23 study sites (both marine reserves and comparison areas) with surveys bimonthly for fish and every 5 years for seafloor habitat.
- Marine reserves resulted in successful replenishment of reef fish populations.
- Some combination of adult spillover and larval seeding from the marine reserves increased fishery productivity. Results of these studies have been published in two articles in peer reviewed journals (2004, *Pacific Science*, 58(2): 175-188; 2009 *Biological Conservation* 142: 1066-1073; 2009 *Coastal Management* 37: 255-273)

Dr. Hixon described a genetic parentage technique for measuring larval dispersal developed by his graduate student, Mark Christie. Larval dispersal from spawning fish inside a marine reserve is a means of seeding fished areas outside and for self-recruitment within marine reserve. Discussion included the importance of oceanographic conditions (currents) and habitat characteristics in influencing what locations receive larvae and experience successful recruitment. The genetic technique is new with broad applications, and has been published in two articles in peer-reviewed journals (2009 *Molecular Ecology Resources* 10:115-128; 2010 *Molecular Ecology* 19:1042-1057) with additional publications forthcoming.

2. Developing a Monitoring Framework

Invited speakers Dr. Elizabeth Whiteman, California MPA Monitoring Enterprise; Dr. Jenn Caselle, UC Santa Barbara; Dr. Mark Carr, UC Santa Cruz

The California MPA network and its goals were introduced. Dr. Whiteman emphasized the importance of both short-term and long-term questions in pursuit of an ecosystem-based management approach. Dr. Whiteman discussed the need to select informative metrics, such as the use of indicator species (Dr. Caselle added invasive species) to assess ecosystem condition and trends. Also stressed were the importance of monitoring for adaptive management and providing results interpretable by a diverse audience. Dr. Caselle and Dr. Hixon cautioned about the dangers of public and managerial expectations and against rushing to make changes after a review of just five years, which should be treated simply as a “checkup.” Ten years is the minimum amount of time suggested for detectable change by Dr. Hixon. Dr. Whiteman suggests working with stakeholders to ensure that information is coming from a variety of angles and recommends the development of communication tools in mitigating false expectations. The use of existing literature and outside studies (particularly student research) will be employed for cost-effectiveness and was emphasized several times throughout the day.

Dr. Carr pointed out that a monitoring program depends on the goals of the reserves and that a clearly-articulated analytical framework should be established early. He framed objectives as including both conservation and fisheries. Dr. Carr stressed the need to employ a multitude of survey tools for the diversity of information needed (ecological, socioeconomic, fishing history).

3. Introduction to Oregon's Marine Reserve Pilot Sites

A brief discussion of the timeline of pilot site milestones was followed by an introduction to the two pilot sites and their biological, physical, socioeconomic, and existing management characteristics. An introduction to their community teams and their important advisory role was also given and the responsibility of ODFW in decision-making, reporting to legislature, and long-term monitoring was explained. The desire to reinvest part of the budget into the community via collaborative research (including fishermen, citizen science, and student research) and the plan to use existing data were also reemphasized during this discussion as well as later in the day.

During the discussion of habitat, Cristen Don and Scott Heppell noted that efforts have been made to ensure that representative habitat types and ecoregions are encompassed by marine reserves. Dave Fox noted that ODFW is moving forward with what has already been established and that boundaries were no longer up for debate. The question of bioregion scale raised concerns about limited availability of reference areas. It was suggested that if a reference area was selected at the bioregion level using OPAC's defined bioregion delineator of Cape Blanco, then the nearest replication to Redfish Rocks may be in Northern California.

4. Selecting Reference Areas

Invited speaker Dr. Dan Malone, UC Santa Cruz

Dr. Malone discussed the importance of baseline data and the challenges of selecting reference areas. Reference areas must be selected far enough from a reserve so as not to be affected by the reserve (via spillover, larval export) with multiple reference areas employed to increase statistical power and spaced to ensure independence (not influencing each other). They must have environmental characteristics similar to the study site. The discussion considered permanent sample sites vs. randomized sites and examined the tradeoffs of each.

Dr. Caselle introduced a method used in MPAs in the Monterey area that made use of randomly-located sampling within larger fixed sampling cells. Other key points included ensuring that transects cover the habitat gradient present within a site, that biogeography is accounted for, and the use of a response ratio as a major abundance metric in monitoring.

Key points from the ensuing discussion included the following: multiple reference areas should be established as soon as possible; where time is limited, surveys should be scaled back in time per survey rather than in number of surveys and area surveyed; spatial over-sampling early will allow for logical cutback later as needed; and the most important consideration for reference area selection is their similarity to the study site.

5. Identifying Key Factors for Reference Area Selection

Alix Laferriere, Brian Tissot, Bill Peterson, Jim Golden, Mark Hixon, Mike Donnellan, Selina Heppell, Elizabeth Whiteman, Mark Carr, Dick Vander Schaaf, Chris Romsos

While ODFW staff organized the input from the breakout group session, Ms. Laferriere initiated a discussion on the important factors for choosing a reference area. Key points included:

- depth and habitat need to be similar at reference sites and marine reserve sites
- oceanographic features, such as ocean circulation patterns and swell exposure, and fishing effort are other key factors
- use of existing information will help to answer some questions
- consider how fishing effort will change with establishment of marine reserves in selecting a reference site (will fishing now shift to what's been chosen as reference site?)-this is a variable that cannot be controlled, but is critical to monitor as it will affect analysis
- multiple reference sites will be required to account for limitations and natural variation
- reference site(s) don't have to be close to each marine reserve

6. Breakout Group Summary

The workshop broke into a “breakout group” phase during the afternoon session. Groups were balanced by expertise and gathered to discuss and develop a list of key oceanographic, species, and habitat metrics for monitoring marine reserves and selecting reference sites.

Dave Fox of ODFW summarized the input gathered from the breakout groups by category:

Oceanographic

- It will be important to characterize the sites in the context of regional oceanography.
- A number of groups are doing oceanography work in Oregon. It is economically sensible to collaborate with such groups and take full advantage of these measurements and summary data.

- An OOS cable is going in near the Otter Rock site, offering a data opportunity.
- Many oceanographic variables are to be considered. Some are variables with minimal cost to measure and should be incorporated into other activities since they are easy to measure.
- Pilot sites seem to be in the lee of headlands so eddies should be factored in.
- Acidification is an important factor and experts should be consulted on this.

Habitat

- In the face of limited time and money, ground-truthing and mapping should be a priority, especially for developing a proxy for biodiversity.
- Groups discussed metrics contributing to measure of biodiversity and human impacts on biodiversity
- Geological and biogenic features must be considered.
- Look at changes in habitat over time due to human activities. Explore the concept of habitat stability in terms of seasonal inundation of rocky habitat with sand, status of habitat-forming organisms, human activities, and other factors.
- Can you use visual methods as you are surveying to keep an eye on changes and re-prioritize as necessary? This will be accommodating to the goal of adaptive management.
- Explore species-habitat relationships and key communities in each habitat type.
- Understand history of impacts on habitat.

Species Metrics

- Measure for a core group of species:
 - abundance
 - size/age
 - reproductive output
- It may be valuable to use methods that are comparable to California methods where possible in order to ensure compatibility of data, continuity.
- Consider fish movement; this will affect what level of protection is actually afforded to certain species
- Even though marine reserves in Oregon are not necessarily fisheries management tools, spillover will be important.
- Our methods might involve counting a lot of species. It doesn't cost extra to count all species, however, analyses should be selective, which emphasis on indicator species.

7. Next Steps

ODFW will move forward using input from this meeting in close collaboration with the pilot site community teams, local scientific experts, attending scientists, and

OPAC's Scientific and Technical Advisory Committee (STAC), to develop draft biological baseline assessments and monitoring plans for the sites.

March 2, 2010 Workshop Attendance

Tom Calvanese
Mark Carr
Jenn Caselle
Cristen Don
Mike Donellan
Chris Eardley
Jeff Feldner
Dave Fox
Jim Golden
Chris Goldfinger
Kirsten Grorud-Colvert
Bob Hannah
Gayle Hansen
Sarah Henkel
Scott Heppell
Selina Heppell
Mark Hixon
Alix Laferriere
Andy Lanier
Dan Malone
Keith Matteson
Kristen Milligan
Melissa Murphy
Anna Pakenham
Bill Peterson
Chris Romsos
Charles Steinback
Suzanna Stoike
Rob Suryan
Brian Tissot
Dick Vander Schaaf
Bill Weiler
Elizabeth Whiteman
Noelle Yochum