OREGON'S GROUNDFISH FISHERIES AND INVESTIGATIONS IN 2010

OREGON DEPARTMENT OF FISH AND WILDLIFE

2011 AGENCY REPORT
PREPARED FOR THE 3-4 MAY MEETING OF THE TECHNICAL SUB-COMMITTEE OF THE CANADA-UNITED STATES GROUNDFISH COMMITTEE

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OREGON DEPARTMENT OF FISH AND WILDLIFE

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OREGON DEPARTMENT OF FISH AND WILDLIFE

A. AGENCY OVERVIEW - MARINE RESOURCES PROGRAM

MRP Program Manager	Dr. Caren Braby
Resource Management and Assessment	Dave Fox
Fishery Management	Gway Kirchner
Technical and Data Services	Maggie Sommer

The Marine Resources Program (MRP) is within the Oregon Department of Fish and Wildlife (ODFW) and has jurisdiction over marine fish, wildlife, and habitat issues coast-wide. MRP is headquartered at Newport in the Hatfield Marine Science Center, with field stations at the coastal cities of Astoria, Tillamook, Charleston, Gold Beach, Brookings, and Corvallis. MRP is tasked with the responsibility for assessment, management, and sustainability of Oregon's marine habitat, biological resources and fisheries. In addition to direct responsibilities in state waters (from shore to three miles seaward), MRP provides technical support and policy recommendations to state, federal, regional, and international decision-makers who develop management strategies that affect Oregon fish and shellfish stocks, fisheries, and coastal communities. Staffing consists of approximately 60 permanent and more than 70 seasonal or temporary positions. The current annual program budget is approximately $8 million, with about 70% coming from state funds including sport license fees, commercial fish license and landing fees, and a small amount of state general fund. Grants from federal agencies and non-profit organizations account for the remaining 30%.

B. MULTISPECIES STUDIES

1. Sport Fisheries Project

Sampling of the ocean boat sport fishery by MRP's Ocean Recreational Boat Survey (ORBS) continued in 2010. Starting in November 2005 major ports were sampled year-round. We continue to estimate catch during unsampled periods in minor ports based on the relationship of effort and catch in minor ports relative to major ports observed during summer-fall periods when all ports are sampled. Two minor ports were sampled, during the winter of 2010-2011, to attempt to validate estimates for unsampled periods. Black rockfish (*Sebastes melanops*) remains the dominant species caught in the ocean boat fishery. Lingcod (*Ophiodon elongatus)*, several other rockfish species, cabezon (*Scorpaenichthys marmoratus)* and kelp greenling (*Hexagrammos decagrammus)* are also commonly landed. Oregon's fishery for Pacific halibut (*Hippoglossus stenolepis)* continues to be a popular, high profile fishery requiring International Pacific Halibut Commission (IPHC), federal, and state technical and management considerations.

The ORBS program continued species composition, length and weight sampling of groundfish species at Oregon coastal ports during 2010. Since 2003, as part of a related marine fish ageing research project, lingcod fin rays and otoliths from several species of nearshore groundfish including rockfish species, kelp greenling and cabezon were gathered. Starting in 2001, from April through October, a portion of sport charter vessels were sampled at sea for species composition, discard rates and sizes, location, depth and catch per angler (CPUE) using ride-along samplers.

Starting in 2003, the harvest of several groundfish species is monitored in-season for catch limit tracking purposes. In-season action was taken in 2010 to prohibit retention of cabezon by anglers fishing from boats. The shore fishery remained open. As in recent years, the retention of canary rockfish (*S. pinniger)* and yelloweye (*S. ruberrimus)* rockfish was prohibited year round. In order to remain within the

yelloweye rockfish impact cap (via discard mortality), the recreational bottomfish fishery was restricted to inside of 20 fathoms from July 23 to the remainder of the year. Landings in the sport Pacific halibut fisheries were monitored weekly for tracking the status of catch limits. The majority of halibut continue to be landed in the central coast sub-area, with Newport having the most landings. Other ODFW management activities included participation in the U.S. West Coast Recreational Fish International Network (RecFIN) process, data analysis, and public hearings to discuss changes to the management of Pacific halibut and groundfish fisheries for 2011 and 2012.

Starting July 2005, sampling of the shore and estuary fishery was discontinued due to a lack of funding. Black rockfish make up the largest component of the estuary boat groundfish taken and surfperch made up the majority of shore-based catch by weight. Salmon dominate estuary boat landings by weight. Pacific herring historically have comprised the majority of both shore- and estuary-based boat landings by number of fish, but have not dominated catch in recent years. ODFW continues to pursue funding opportunities to reinstate the shore and estuary sampling program.
Contact: Lynn Mattes (541) 867-0300 ext. 237 (Lynn.Mattes@state.or.us)

2. Yellowtail rockfish Exempted Fishing Permit
In 2009 and 2010, the Oregon Chapter of the Recreational Fishing Alliance (RFA-OR) in conjunction with ODFW received an exempted fishing permit (EFP) from the National Marine Fisheries Service (NMFS) to test experimental recreational fishing gear to target under-utilized yellowtail rockfish (*S. flavidus)* while avoiding the overfished yelloweye rockfish on select charter fishing trips. The experimental terminal tackle gear has a long leader (30-60 ft) between the weight and hooks, with a float to keep the line vertical in the water column. Ten charter vessels from three sections of the Oregon coast were to conduct three trips each over the course of the fishing season, to distribute trips spatially and temporally. ODFW supplied onboard samplers for each trip to gather information on total catch, gear set up, location, and to collect biological information from retained fish.

Due to a delay in issuance of the permit by NMFS, no trips under this EFP were conducted in 2010. NMFS issued the permit for 12 months from the data of issue, rather than 12 calendar months. Therefore, it is anticipated that this project will proceed with the planned 30 trips occurring in 2011.
Contact: Lynn Mattes (541) 867-0300 ext. 237 (Lynn.Mattes@state.or.us)

3. Commercial Fisheries Monitoring and Sampling
Data from commercial groundfish landings are collected throughout the year and routinely analyzed by ODFW to provide current information on groundfish fisheries and the status of the stocks. This information is used in management, including inseason adjustments of the commercial nearshore fishery, which is conducted in state waters. Species composition sampling of rockfish continued in 2010 for commercial trawl, fixed gear, and hook and line landings. Biological data including length, age, sex, and maturity status continued to be collected from landings of major commercial groundfish species (Table 1).
Contact: Carla Sowell (541) 867-0300 ext. 222 (Carla.Sowell@state.or.us)

Table 1. Fish ticket landings, age and length data collected for major groundfish species.

Species	mt	Structures Collected	Lengths Collected*
Flatfish			
Arrowtooth flounder	2,295	1412	2232
Dover sole	6,885	1978	3163
English Sole	129	180	210
Pacific sanddab	100	804	834
Rex Sole	377	270	330
Flathead sole	2	10	10
Rockfish			
Black rockfish	102	1016	4208
Blue rockfish	3	349	427
Yellowtail rockfish	93	1083	1638
Nearshore rockfish[1]	7	88	658
Nominal shelf rockfish[2]	7	492	564
Nominal slope rockfish[3]	172	3742	3984
Thornyheads[4]	1,571	3469	4757
Other species			
Cabezon	23	9	769
Chub mackerel	49	1	1
Giant wrymouth	0	0	1
Greenlings[5]	18	49	1828
Jack mackerel	3	9	9
Longnose skate	764	399	1110
Other skates[6]	170	96	361
Other grenadiers	0	10	40
Pacific cod	55	342	374
Pacific grenadier	43	190	220
Pacific whiting (hake)	31,538	1130	3145
Sablefish	2,852	3744	4253
Spiny dogfish	125	50	113
Rebuilding species			
Canary rockfish	4	341	366
Darkblotched rockfish	149	2322	2824
Lingcod	77	214	1155
Pacific ocean perch	58	1971	2442
Petrale sole	507	2008	2753
Widow rockfish	31	1294	1381
Yelloweye rockfish	1	2	2

Notes: (1)Nearshore rockfish species are black and yellow, China, copper, gopher, grass, and quillback rockfish, (2) Shelf rockfish species are bocaccio, chilipepper, cowcod, greenspotted, greenstriped, pygmy, redstripe, rosethorn, rosy, silvergrey, speckled, stripetail, tiger, and vermilion rockfish, (3) Slope rockfish species are aurora, bank, blackgill, redbanded, rougheye, sharpchin, shortraker, splitnose, and yellowmouth rockfish, (4) Thornyhead species are longspine and shortspine thornyhead, (5) Greenling species are kelp, rock, and whitespotted greenling, and (6) Other skate species are big, black, California, sandpaper, and starry skate, and (*) Lengths include lengths collected with age structures and length only measurements.

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4. Maturity Studies

We continued research begun several years ago to produce histologically verified female maturity data for a variety of species for which maturity data is unavailable or outdated. A manuscript summarizing the aurora rockfish maturity study was accepted for publication in *Environmental Biology of Fishes*. Additional sampling of Pacific ocean perch (*S. alutus)* was also conducted to examine interannual variation in abortive maturation (skip spawning) as a function of maternal age. Lab work analyzing maturity data for female quillback (*S. maliger)* and china (*S. nebulosus)* rockfish was completed and development of a report summarizing these results was started.
Contact: Bob Hannah (bob.w.hannah@state.or.us)

5. Marine Finfish Ageing Unit

In 2010, the following primary tasks were completed by the age and growth specialist: 1) completion of production age reading for commercial black rockfish otolith samples from 2006 through the end of 2009; and 2) completion of production age reading for recreational black rockfish samples from 2006 to 2007. Since the age and growth specialist spends a significant amount of time on black rockfish age determination each year, the possibility of using otolith weight as a reliable predictor of age was explored. Age estimates, fork lengths and otolith weight data were collected from 535 black rockfish and analyzed. No significant difference was found between the weight of the left and right otolith. Results showed that fork length was significantly correlated with otolith weight, but similar to fork length, otolith weight measurements varied greatly among individuals from the same age class. It was clear that the same conclusion would be made even with the use of validated age data. In summary, since somatic and otolith growth vary widely among individuals, even within the same region and sex, otolith weight is not a good predictor of age for this species.

Additionally, progress was made on two age method comparison studies. In a cooperative study with WDFW, we have been testing the usefulness of otoliths as an alternative structure for lingcod age determination by comparing the age data and precision statistics for otoliths with similar data for fin ray age structures, which require significantly more time to collect and prepare. The preliminary results show that age reading precision is greater for fin ray sections than it is for broken-and-toasted otoliths, though this conclusion will not be finalized until age estimates are produced by a second age reader for each structure type. We are also working on a new and improved preparation method for longnose skate vertebral centra. A set of 135 longnose skate centra representing all available size classes of both males and females was selected from commercial landing samples. Age data was collected from centra pairs; one centrum prepared via the traditional thin-sectioning method, and another centrum, from the same individual, prepared via the histological method. Preliminary results from one age reader show that, on average, the histological method produces a larger number of growth bands, though a validation study would be required to determine correct interpretation of the bands. Also, the histological method produced more distinguishable growth bands when compared to the traditional method.

The age and growth specialist was away from work for the last two months of the year, working for ODFW's Recreational Fisheries Program as part of a job rotation opportunity.
Contact: Josie Thompson (541) 867-0300 x247 (Josie.E.Thompson@state.or.us)

6. Movement of rockfishes using acoustic telemetry

A manuscript describing the spatial and vertical movements of eight species of rockfish at Siletz Reef, a high-relief rocky reef on the open Oregon coast, was accepted at the *North American Journal of Fisheries Management*. A 4-month study of the movements of quillback, copper (*S. caurinus)*, black and brown (*S.*

auriculatus) rockfish at Cape Perpetua, an area of low-relief emergent structure being considered for marine reserve status, was conducted in 2010. The data from this study, which utilized Vemco's VPS acoustic telemetry technology, is currently being analyzed to estimate home range and other movement parameters.
Contact: Bob Hannah (bob.w.hannah@state.or.us) or Polly Rankin (polly.s.rankin@state.or.us)

7. Discard mortality of rockfishes
A study of the 48 h post recompression survival of seven species of pacific rockfish was completed using a purpose-built individual caging system designed to minimize cage effects. A manuscript is in preparation describing the results from this study. In 19 field deployments of 10-16 individual cages, 287 rockfish from 7 species were captured, scored for barotrauma, evaluated behaviorally and caged on the seafloor to determine survival. With the exception of 3 blue rockfish (*S. mystinus*), fish condition after cage confinements ranging from 41-71 h (and in one case up to 17 d) was uniformly excellent. At capture depths up to 54 m, post-recompression survival was 100% for yelloweye (n=25) and copper rockfish (n=10) and 77.8% for blue rockfish (n=36, solid sub-type). At capture depths up to 64 m, survival was 100% for canary (n=41) and quillback rockfish (n=28) and 90.3% for black rockfish (n=144). In black rockfish, survival was negatively associated with capture depth (m, $p<0.01$) and with surface-bottom temperature differential (°C, $p<0.01$). In blue rockfish, survival was negatively associated with capture depth ($p<0.01$). Severe barotrauma and surface behavior scores were not good indicators of survival potential across rockfish species, but were useful within species. Severe barotrauma was negatively associated with survival in both black and blue rockfish ($p<0.01$). Higher scores on reflex behaviors at the surface were positively associated with survival in these two species ($p<0.01$). These findings, in light of other research on rockfish submergence abilities after surface release, suggest that requiring hook-and-line fishers to use recompression devices or techniques like venting to help discarded rockfish submerge may increase survival of some species.
Contact: Bob Hannah (bob.w.hannah@state.or.us), or Polly Rankin (polly.s.rankin@state.or.us)

8. Development and testing of a video lander for studying demersal fishes on nearshore rocky reefs.
We continued to work on determining the utility of a video lander to study the abundance and distribution of demersal fish living on nearshore rocky reefs. Work in 2010 included completed surveys of portions of Stonewall Bank, Siletz, Seal Rocks, and Cape Perpetua reef systems. To date, more than 700 drops have been completed and only a handful of the "sacrificial base" portions of the lander have been lost. Visibility has been excellent at offshore reefs, such as Stonewall Bank, and variable, but mostly acceptable, at nearshore reefs. The data suggest that the lander design has a high retrieval probability from all types of reefs.
Contact: Bob Hannah (bob.w.hannah@state.or.us) or Matthew Blume (matthew.blume@state.or.us)

9. Shrimp trawl impacts on mud seafloor macroinvertebrate populations
In 2010, we conducted a study to directly evaluate seafloor impacts from shrimp trawl footropes using an underwater video system. We filmed several replicates of 1 h tows with each of 4 types of footropes and have analyzed the video data to generate counts and severity of interactions between the footropes and seafloor invertebrates. Not surprisingly, elevating portions of the footrope or utilizing low-friction components in footrope construction reduced the incidence and severity of these interactions.
Contact: Bob Hannah (bob.w.hannah@state.or.us), Steve Jones (steve.a.jones@state.or.us), Mark Lomeli (PSMFC), Waldo Wakefield (NWFSC).

10. Tests of Bycatch Reduction Devices (BRDs) with reduced vertical bar spacing in shrimp trawls

We conducted a field study in 2010 that examined how reduced spacing of vertical bars in rigid-grate BRDs reduced bycatch in shrimp trawls, with special emphasis on bycatch of eulachon smelt. Reducing bar spacing in a rigid-grate BRD from 25.4 mm to 19.1 mm reduced eulachon bycatch by 16.6% ($p<0.05$), with no reduction in ocean shrimp catch ($p>0.05$). It also reduced bycatch of slender sole, other small flatfish and juvenile darkblotched rockfish by 36.8%, 71.8% and 76.3% ($p<0.01$) respectively, with no effect on bycatch of whitebait smelt or YOY Pacific hake (*Merluccius productus*, $p>0.05$).
Contact: Bob Hannah (bob.w.hannah@state.or.us), Steve Jones (steve.a.jones@state.or.us)

11. Reducing eulachon entrainment at the footrope of a shrimp trawl
We conducted a field study in 2010 examining how footrope changes can be used to reduce entrainment and subsequent bycatch of eulachon and other small demersal fish in a shrimp trawl. An experimental footrope, modified by removing the central one third of the trawl ground line, reduced eulachon bycatch by 33.9%, ($p<0.001$). It also reduced bycatch of slender sole (*Lyopsetta exilis*), other small flatfish, and juvenile darkblotched rockfish (*Sebastes crameri*) by 80% or more ($p<0.001$), but had no effect on bycatch of whitebait smelt (*Allosmerus elongatus*) or Pacific herring (*Clupea pallasii*). The experimental ground line also reduced the catch by weight of ocean shrimp by 22.2% in hauls yielding commercial quantities of shrimp (>194 kg/haul, $P<0.0001$) and by 23.2% in all hauls. Variation in catch of ocean shrimp and eulachon in response to differences in fishing line height (FLH) between the paired semi-pelagic trawls indicated that reducing FLH may help reduce shrimp loss with the experimental ground line without a proportional increase in eulachon bycatch.
Contact: Bob Hannah (bob.w.hannah@state.or.us)

12. Developing an improved rockfish species composition expansion model
Work was initiated to develop a better model to apply species composition data collected by port samplers to fisheries catch data. The original framework relies on a series of borrowing rules based on temporal (quarterly) and spatial (nearest major port) factors. Documentation on the original borrowing rules and rationale are no longer available. However, researchers at Oregon State University recently developed a model to estimate the existing borrowing rules. While many different fish families are affected by these rules, rockfish, due to the species diversity and nominal category designation (i.e. slope, shelf, and nearshore) are most in need of a better expansion model. This work consists of two prongs. First, develop a better model to apply the species composition data historically (from 1987-present); second, develop a statistical model and improve port sampling effort so there are fewer unsampled strata and to eliminate the need to "borrow" data from across quarters and nearby ports. Recent work includes a correspondence analysis of rockfish species composition across ports from 2005-2009 and exploration of the potential strata designation (spatial area defined, depth, gear, etc).
Contact: Susan Hilber (Susan.E.Hilber@state.or.us)

13. Marine reserves in Oregon
In 2009, the Oregon legislature passed marine reserves legislation (HB 3013) that directed state agencies to implement marine reserve recommendations made by the Oregon Ocean Policy Advisory Council (OPAC), provided for funding of marine reserves work, and required ODFW to develop a marine reserves work plan.

The specific call of the legislation was to implement the OPAC recommendations by:

1) Adopting rules to establish two marine reserve pilot sites;
2) Studying and evaluating potential marine reserves at three additional areas; and
3) Supporting the development of a new marine reserve proposal at one final area.

ODFW hired marine reserves staff to work on implementation of HB 3013, and a marine reserves work plan was finalized in November 2009, for work to be conducted during the 2009-2011 biennium. A summary of completed and planned work follows.

Pilot sites:

- The two pilot sites were established through state agency rule making. Harvest prohibitions are to take effect after baseline data have been collected.
- ODFW staff worked with external scientific experts and local community members to develop ecological and human dimension (socioeconomic) monitoring programs for current and future sites.
- ODFW staff is working with pilot site community teams to develop management plans for each site. Management plans are to be completed by June 2011 and will include: ecological and human dimensions monitoring plans, strategies for outreach and education, and strategies for compliance and enforcement.
- Biological and human dimensions baseline/year zero data for long term monitoring began in July 2010 and will continue through 2011.
- ODFW will provide monitoring reports in early spring of 2012.

Evaluation sites:

- Community teams representing diverse and balanced stakeholder interests, as prescribed in HB 3013, were formed for each of the three evaluation sites. Teams met January-November 2010, one to two times per month.
- Each team evaluated the original proposal recommended by OPAC in 2008, as to whether the site met sideboards established by Governor's Executive Order 08-07. The teams concluded that the site is large enough to allow scientific evaluation of ecological benefits, but small enough to avoid significant economic or social impacts.
- In November 2010, all three community teams forwarded final marine reserve recommendations to ODFW.
    - The recommendations for the Cape Perpetua and Cascade Head sites were made with strong support of the community teams. The results are compromise proposals that included a marine reserve and less restrictive protected areas.
    - All voting members of the Cape Falcon community team voted in support of some type of modified marine reserve at the site, but could not reach full agreement on the exact size, shape and conditions for the reserve. In the end, the Cape Falcon team narrowly adopted the original marine reserve proposal forwarded to the team by OPAC.
    - ODFW used the community teams' recommendations and the information gathered throughout the community team process to forge marine reserve recommendations.
- ODFW consulted with OPAC in December 2010. Given the lack of strong support for the team's final recommendation for the Cape Falcon site, ODFW worked with OPAC and individual members of the Cape Falcon community team to modify the proposal to reduce negative social and economic impacts while maintaining a sound ecological footprint. ODFW also presented additional recommendations for marine reserve implementation that included details regarding: review and evaluation of the marine reserve system, commitment to funding, community engagement, monitoring and research, and mitigation associated with potential marine reserve sites. These recommendations were based on concerns raised during the community team process and were further bolstered during consultation with OPAC. After deliberation and discussion, OPAC reached a consensus supporting the ODFW package of site proposals and additional recommendations.

Contact: Cristen Don (Cristen.N.Don@state.or.us)

14. Hypoxia effects on seafloor communities

As part of an Oregon Sea Grant research grant, personnel from ODFW's Marine Habitat Project partnered with the Partnership for Interdisciplinary Study of Coastal Oceans (PISCO) to continue and expand documentation of the ecological effects, including disturbance and recovery, of recently discovered hypoxia events on seafloor communities. We conducted a survey of seafloor biota offshore of Cape Perpetua, Yaquina Head (Newport), and Siletz Reef with a Remotely Operated Vehicle (ROV) during spring and summer 2010. In concert with PISCO's efforts to collect oceanographic data (e.g., temperature, salinity, dissolved oxygen content), which documented the spatial extent and degree of hypoxia in the study area over a seasonal time scale, we collected video footage of organisms occurring on the seafloor along a previously-established (i.e. "fixed") transect line. Our objective was to continue the nearly-annual time series of ROV video data along a "permanent" transect line. We have monitored the Cape Perpetua reef complex regularly since 2000. Hypoxic events occurred on the inner shelf in 2010, but the oceanographic extent and duration of these events were not as extreme as in prior years (e.g., 2002 and 2006). However, we were not able to document post-hypoxic conditions.
Contact: Mike Donnellan (Michael.D.Donnellan@state.or.us)

15. Baseline Remotely Operated Vehicle survey of benthic biota in the Redfish Rocks Marine Reserve (MR) and Marine Protected Area (MPA) and associated reference sites

We completed baseline surveys of benthic biota occurring on deep rocky reefs (20-50 m) within the Redfish Rocks MR and MPA, and associated scientific control sites at Humbug Mountain and Orford Reef. Our objective was to conduct the first stage of a Before-After-Control-Impact study to assess the performance of these MPAs by rigorously quantifying the distribution and abundance of fish communities prior to administrative closure of the Marine Reserve and Marine Protected Area to fishing activities in January 2012. These data will be compared to data from a companion survey(s) conducted at a future date (TBD, pending funding availability and a determination of interval necessary for a reserve to "mature"). We used a ROV, newly equipped with a high definition video camera, and obtained approximately 45 hours of video footage over the course of 40+ 500-m strip transects within each area. Data processing is ongoing and a report will be produced during 2011.
Contact: Mike Donnellan (Michael.D.Donnellan@state.or.us)

C. BY SPECIES

1. Black Rockfish PIT Tagging

Oregon's primary recreational groundfish fishery targets the nearshore species, black rockfish. Historically, assessments of black rockfish have relied on CPUE data from recreational fisheries to estimate the trend of relative population abundance. However, these data are not robust to problems of sampling bias, or to changes in fishing distribution, bag limits, or fishing power. The need to independently estimate exploitation rates and population abundances for black rockfish off Oregon prompted us to investigate the use of passive integrated transponder (PIT) tags for a mark-recapture program. Because PIT tags are invisible to anglers, there is no tag non-reporting problem, and tag detection rates can be estimated directly. Tags were injected in the hypaxial musculature below the gill arches, determined to be the best site by a previous PIT tag retention study. At tagging, categorical barotrauma symptoms were noted and fish with significant barotrauma symptoms were recompressed by immediate submersion in a cage and released at depth. PIT tags (12mm x 2mm) were inserted in 4,133 black rockfish in 2010 during 20 days of fishing near Newport, Oregon. The total number of black rockfish tagged since the project began in 2002 is now 29,679. Carcasses of black rockfish are counted

and electronically scanned for tags year-round upon being landed by recreational fishers. In 2010, 76% of the black rockfish landed in Newport and 31% of those landed in Depoe Bay were scanned for tags. We recovered 519 tags, all in Newport. All nine tag cohort years were recovered. We have had good recoveries each year and exploitation rates are less than expected for assessment values of approximately 5%. However, survival rate estimates remain poor and imprecise, likely due to problems with non-mixing. If catch rates allow, the number of fish tagged in 2011 will increase in an effort to increase tag recoveries and decrease variation in parameter estimates. Black rockfish populations off Oregon and California underwent a full assessment in 2007. Results from this study were included in the 2007 stock assessment as an index of abundance for the assessed population and may be incorporated in future assessments.
Contact: Greg Krutzikowsky (Greg.Krutzikowsky@state.or.us)

2. Photograph based length estimation of recreational yelloweye rockfish discards
In 2010, we carried out a pilot project designed to collect data on the length distribution of yelloweye rockfish discarded in the recreational bottomfish and halibut fisheries off Oregon. Due to the prohibition on retention in most U.S. west coast fisheries, data of this type has become extremely limited in recent years. Anglers were asked to photograph any yelloweye encountered with a known-size reference object in the photograph frame. The relationship between the length of the fish and the size of the reference object in the photograph can then be used to estimate the length of fish using computer software. We used different approaches to collecting data from charter and private vessels because of their different operational modes. For the charter vessel fleet, we provided digital cameras to crewmembers of participating vessels, and asked that they photograph all yelloweye rockfish they encountered over the course of the season. For private vessels, we solicited participation at launch sites, provided participants with disposable film cameras, asked that they photograph any yelloweye rockfish encountered on their trip, and provided receptacles at convenient points for the cameras to be returned to. In terms of participation, our results were positive. For charter vessels, 20 vessels participated and all equipment was returned intact. For private vessels, we distributed 199 disposable cameras, of which 180 have been returned to date. In terms of usable photographs, results from the charter fleet were much more encouraging than from the private fleet. The charter fleet returned 115 photographs, of which 112 are useful for estimating yelloweye rockfish lengths. Private vessel participants returned only 13 photographs, most of which were not of yelloweye rockfish. Species photographed included canary, quillback, and copper rockfish. Only 3 photographs useful for estimating yelloweye rockfish lengths were returned by private vessel participants. We are currently working on estimating lengths from all photographs, and are conducting comparisons of Adobe® Photoshop® and a software application specifically designed for this purpose, PHOFLEM, which was developed by Dr. Ta-Te Lin of the Department of Bio-Industrial Mechatronics Engineering, National Taiwan University.
Contact: Troy Buell (troy.v.buell@state.or.us)

D. PUBLICATIONS

Hannah, R. W. and P. S. Rankin. (in press). Site fidelity and movement of eight species of Pacific rockfish at a high-relief rocky reef on the Oregon coast. N. Amer. J. of Fish. Mgt.

Hannah, R. W. (in press). Use of a pre-recruit abundance index to improve forecasts of ocean shrimp (*Pandalus jordani*) recruitment from environmental models. CalCOFI Rep.

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E. PROJECTS PLANNED FOR YEAR 2011

1. Maturity studies

Work will continue on a report summarizing our maturity work on quillback and china rockfish.
Contact: Bob Hannah, (bob.w.hannah@state.or.us)

2. Rockfish movements

Analysis and write-up of the 2010 acoustic telemetry data from Cape Perpetua is planned.
Contact: Bob Hannah, (bob.w.hannah@state.or.us), or Polly Rankin (polly.s.rankin@state.or.us)

3. Testing a video lander for surveying rocky reefs

Work planned for 2011 includes a high-density lander survey of the northern portion of Stonewall Bank to evaluate the suitability of the boundaries of the yelloweye rockfish conservation area, as well as a pilot survey of Heceta Bank and Three Arch Rocks reefs, and development of a high definition version of the lander and a stereo-video version to try and obtain fish lengths from drop data.
Contact: Bob Hannah (bob.w.hannah@state.or.us), or Matthew Blume (matthew.blume@state.or.us)

4. Shrimp trawl impacts on mud seafloor macroinvertebrate populations

We will continue analysis and write-up of the 2010 data.
Contact: Bob Hannah, (bob.w.hannah@state.or.us)

5. Reducing eulachon entrainment at the footrope of a shrimp trawl

We plan to conduct a follow-up experiment to our 2010 footrope work to determine if reduced fishing line height can be used, with an absent central ground line, to improve shrimp catch without a commensurate increase in eulachon entrainment.
Contact: Bob Hannah (bob.w.hannah@state.or.us), Steve Jones (steve.a.jones@state.or.us)

6. Evaluation of eulachon behavior when exiting a shrimp trawl

We plan to conduct a study using high-definition stop-motion video to view the condition of eulachon and other fishes as they exit the escape opening of a bycatch reduction device in a shrimp trawl. The goal is to develop methods to evaluate the degree of exhaustion and residual reflex behaviors to shed light on the potential for post-exclusion mortality.
Contact: Bob Hannah (bob.w.hannah@state.or.us), Steve Jones (steve.a.jones@state.or.us)

7. Discard mortality of rockfishes

Additional planned work for 2011 to extend 2010 studies on yelloweye and canary rockfish into deeper waters has been postponed due to concerns that the modest impacts on yelloweye cannot be sustained without impacting Oregon's recreational fishery seasons. This work can hopefully be conducted in the next few years after allowable impacts have increased.
Contact: Bob Hannah (bob.w.hannah@state.or.us)

9. Continue developing an improved rockfish species composition expansion model

We plan to continue to explore the coefficient of variations (CVs) for various potential strata to include in the new model as well as to collaborate with fisheries scientists and statisticians at Oregon State

University to develop a better historical model to apply to existing catch data as well as develop a statistical model, and potentially reform port sampling protocol, to eliminate borrowing of data across quarters and ports, and introduce error terms into the predicted species compositions.
Contact: Susan Hilber (Susan.E.Hilber@state.or.us)

10. Marine Reserves
ODFW has forwarded recommendations to the 2011 Oregon Legislature. The Legislature is currently considering a marine reserves policy bill and ODFW Marine Reserves Program funding for the 2011-2013 biennium.
Contact: Cristen Don (Cristen.N.Don@state.or.us)

11. Baseline Remotely Operated Vehicle survey of benthic biota in the Redfish Rocks Marine Reserve (MR) and Marine Protected Area (MPA) and associated reference sites
Data processing is ongoing and a report will be produced during 2011.
Contact: Mike Donnellan (Michael.D.Donnellan@state.or.us)