

OREGON MARINE FISHERIES

2000 STATUS REPORT



Oregon Department of Fish and Wildlife
Marine Resources Program
Newport, Oregon

Dear Reader,

The Marine Resources Program staff dedicates this edition of the Oregon Marine Fisheries 2000 Status Report to Capt. R. Barry Fisher of Newport, Oregon, who passed away March 17, 2001. Capt. Fisher provided frequent and substantive input into our research planning process over many years. His guidance, suggestions and criticisms were always welcome and will be sorely missed.

We also want to take this opportunity to thank Oregon's marine fishing community who participated in collaborative research and fishery monitoring programs this past year.

Finally, we would like to acknowledge the host of other university, state and federal agencies and organizations who partnered with us this year.

Sincerely,

The Marine Resource Program Staff

Report Cover: Underwater image taken with the ODFW Marine Resource Program's Remotely Operated Vehicle (ROV) off Cape Perpetua in August, 2000 at a depth of approximately 150 feet. The two orange fish in the foreground are yellowtail rockfish. The brown-spotted fish on the left is a brown rockfish and the brown and white fish in the lower right are copper rockfish. A black rockfish occupies the upper right corner. Approximately 60 rockfish species live in Oregon waters and are part of a large group of highly sought-after species in both commercial and recreational fisheries.

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Compiled by Oregon Department of Fish and Wildlife
Marine Resources Program
Newport, Oregon

March 2001

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EXECUTIVE SUMMARY

This is the second report in a new series produced by Marine Resources Program. The report is designed to provide marine fishery and stock status updates from an Oregon perspective, and to describe management changes, critical issues, and research needs. This year we have added two new sections. Section N provides a brief summary of fishery research and studies and includes plans for upcoming research. Section O includes a summary of commercial fishery landings and economic value produced by Dr. Hans D. Radtke and Shannon W. Davis, Agriculture and Natural Resources Economists with The Research Group of Corvallis, Oregon. Marine Resources Program will be updating this report every two years going forward. We invite your comments on the format and content of the report. Please send your comments or questions to:

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Highlights:

- The West Coast groundfish crisis continued to deepen. Rebuilding plans for overfished species of rockfish and lingcod have had impacts on all sectors of the groundfish fishery including sport and commercial fisheries. Additional restrictions may be required in 2001 to minimize bycatch of canary rockfish in the shrimp fishery.
- The Department helped complete a grant application for groundfish disaster relief in cooperation with Oregon Sea Grant Extension, Oregon Department of Community and Economic Development, and Oregon Department of Employment. Marine Resources Program's at-sea research was used to provide much of the \$583,000 state match needed for the grant. The grant is expected to provide an additional \$1.75 million in federal assistance to the fishing industry to help retrain and place individuals seeking to leave the groundfish fishery.
- The Pacific Fishery Management Council adopted a Groundfish Strategic Plan that calls for a reduction in harvest capacity by at least 50%. An industry sponsored groundfish buy-back program proposal may be introduced in Congress. The program would retire all federal and state permits. Two bills were introduced in the Oregon Legislature to reduce the number of permits in state fisheries if the federal buyback program is implemented.
- The pink shrimp fishery has been impacted by imported shrimp. We anticipate changing harvest patterns and marketing strategies as a consequence.
- Dungeness crab landings are cyclic and took a down turn in the 2000-01 season; however, both price and effort have remained high. The Department and industry representatives are considering options for limiting the number of pots used in this intensive fishery.
- The sea urchin fishery is making a comeback as the quality of urchin roe and ex-vessel price improved. Urchin permits are now capped at 30 and are transferable.
- Nearshore research, habitat mapping, and fish inventory continues to expand along the Oregon coast. Sport and commercial users are expressing concern over resource use and

potential conflicts on reefs. The Council's Groundfish Strategic Plan recommends delegating authority for nearshore management of groundfish to the states. Marine Resources Program will be developing an interim management plan for nearshore fishery resources.

- The Developmental Fisheries Program saw rapid development of the sardine fishery in the last two years. The fishery is quota managed under a federal Coastal Pelagic Plan. Oregon's Developmental Fisheries Program limits effort in the fishery off Oregon. Discussions with industry regarding the need to develop a coastwide limited entry program continued.
- Sport and commercial salmon opportunities continue to be constrained by the need to protect ESA listed species. A new ocean selective fishery program has increased opportunities by allowing the take of fin-clipped hatchery coho. Pacific Salmon Treaty research has expanded to help provide much needed information on Chinook salmon stock status.
- Coastal wild chinook salmon assessment studies, required under the Pacific Salmon Treaty, have been expanded beginning in 1998. Current field projects are designed to study present stock status and techniques to better determine adult spawning escapements, abundance forecasts, and stock exploitation rates. Oregon coastal fall chinook, from the Elk River north throughout the Necanicum River, spend one or more years maturing off Canada and SE Alaska. The stocks are intercepted in multiple Treaty area fisheries in these locations, in addition to Oregon waters. The new Treaty "abundance-based" management approach requires better stock information in order to assess stock status and properly manage "Treaty stocks" for sustained, long-term health. Current projects are active in the Nehalem, Umqua, and Coquille River systems using \$624,000 in federal funding through the U.S. section of the Pacific Salmon Commission.
- Bycatch of prohibited species such as halibut and salmon as well as trip limit protected species of groundfish continue to be of concern. A Section 10 review was triggered by excessive bycatch of salmon in the whiting fishery – a problem largely associated with the at-sea catcher/processor fleet. Incentive programs for the shoreside whiting fishery have been effective in keeping bycatch of rockfish at lower levels.
- Marine Resources Program plans to conduct finfish excluder research on shrimp trawls and experiment with flatfish trawl designs to minimize bycatch of trip limit managed species in 2001.

GROUND FISH

Background/History

For over 80 years, management of domestic groundfish fisheries was under jurisdiction of the states of Washington, Oregon, and California. Many of these fisheries overlapped state boundaries and were participated in by citizens of two or more states. Lack of uniformity in management goals, differences in enforcement, and other problems precipitated the need for a coordinating agency. In 1947, the Pacific States Marine Fisheries Commission (PSMFC) was created. PSMFC had no regulatory power, but acted as a coordinating entity with authority to submit recommendations to the states for adoption. In 1976, the Magnuson Fishery Conservation and Management Act (MFCMA) was established. By 1983, an Exclusive Economic Zone (EEZ) in ocean waters from three to 200 miles surrounding the United States was put into place by proclamation. To manage this zone, seven regional councils were established with the primary role of developing, monitoring, and revising management plans for fisheries conducted in the EEZ. One such council - the Pacific Fishery Management Council (Council) - is responsible for management of west coast fisheries.

It is fortunate that this management process came about when it did, because the 1980s represented major changes in the groundfish fishery. During this time the fishery matured, and landings of several species reached, or exceeded, their maximum sustainable yield levels (MSY). Total groundfish landings (Figure A-1) reached an all-time high during 1982 due to large increases in flatfish catch and to dramatic increases in catches of rockfish species such as widow rockfish. From 1982 through 1990 the total catch of groundfish continued to decline as stock assessments were completed and for the most part indicated a reduction in catch. During 1991 the shoreside Pacific whiting fishery began and resulted in total groundfish catch more than twice the recent average. Catch in the shoreside whiting fishery peaked during 1997 when 92 thousand metric tons were landed.

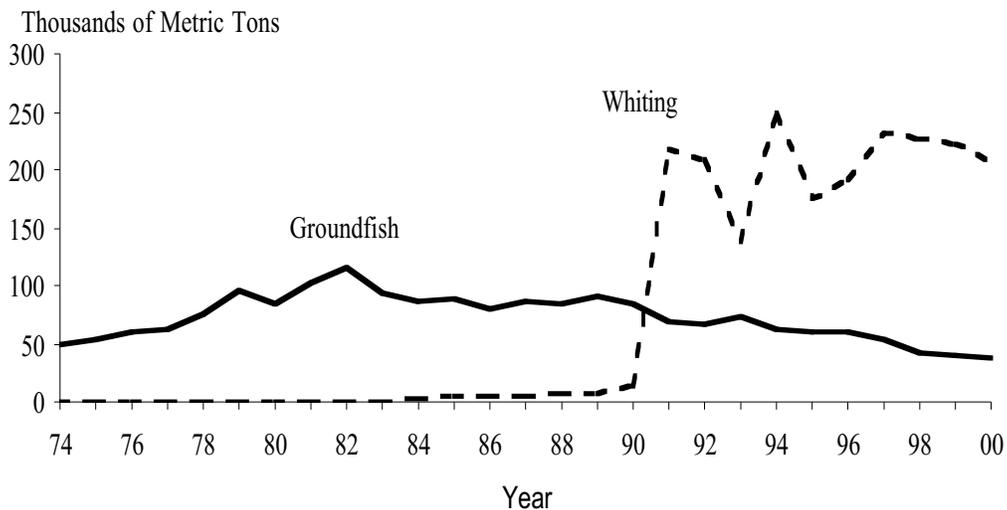


Figure A-1. West coast groundfish and whiting catch, 1974-2000.

During the last half of the 1990s identification of overfished groundfish stocks began the dramatic mismatch between the amount of groundfish fishing effort available (particularly trawl) with the more sharply declining level of available harvest. First yellowtail rockfish, lingcod and canary rockfish were identified as approaching being overfished. By the end of 2000 bocaccio, canary rockfish, cowcod, darkblotched rockfish, lingcod, Pacific ocean perch and widow rockfish were all identified as overfished and fell under the new federal requirement to implement formal rebuilding plans. This action, along with a more conservative harvest policy that was implemented for 2001 harvest levels resulted in a severely depressed groundfish industry. In January of 2000 a groundfish fishery disaster was declared by the Secretary of Commerce. Congress appropriated funds for disaster relief for distribution in 2001. Congress also developed an industry-sponsored buy-back proposal for consideration in 2001.

Management/Regulations

During September of 1982, the federal Pacific Coast Groundfish Fisheries Management Plan (FMP) was implemented. Since that time groundfish management has been accomplished primarily through management actions taken by the Council in consultation with a variety of advisory bodies. These include the Groundfish Management Team (GMT) - federal and state biologists, scientists, economists and managers, the Groundfish Advisory Panel - representatives from the fishing industry, and the Scientific and Statistical Committee - federal, state and university members acknowledged for their expertise in economics, biology, statistics, population dynamics, and other disciplines relevant to sound fisheries management.

As each groundfish stock is exploited, initial surplus of a largely virgin biomass was removed, as expected. As the initial surplus was removed, stock abundance of the stock declines, and biomass available for fishing was reduced. This process is referred to as the fishing down period. To prevent over-harvest, fisheries managers initially used fishing mortality rates of $F_{35\%}$ or $F_{40\%}$ for most Pacific Coast groundfish species. These rates were thought to result in optimum or Maximum Sustainable Yield (MSY) levels of harvest. At MSY, population biomass of spawning females would be reduced to 35% or 40% of un-fished levels of spawning biomass. Stocks below this level are considered to be over-fished. In 2000, the Council adopted the following more conservative harvest rates: Pacific whiting, $F_{40\%}$; *Sebastes/Sebastolobus*, $F_{50\%}$ flatfish, $F_{40\%}$ and other groundfish, $F_{45\%}$.

The groundfish FMP covers many species and encompasses a variety of management tools. The setting of an Acceptable Biological Catch (ABC) level and the use of trip limits to constrain fishery catch are two common tools used to meet the goal of a year-round fishery while also providing adequate stock protection. Three individual species - widow, yellowtail and canary rockfish - are examined in greater detail to portray how useful and effective these tools have been over the last 15 years. In each example, evolution of the fishery and the resulting management follows the path of:

- Exploitation of a largely virgin stock.
- Harvest of virgin surplus biomass.
- Fishing down of the stock begins.
- Initial management concerns regarding high harvest rate; this results in using the best science available to estimate stock abundance.
- Somewhat restrictive trip limits set.
- Fishing down continues.
- Setting of more restrictive trip limits to constrain catch to ABC.
- Effort limitation.
- Greater concern by managers and industry regarding accuracy of the best available science.
- Individual transferable quotas, permit stacking and / or permit buy-back programs.

- Collaborative industry and government research, data collection, and management.

Management has tended to focus on individual species largely because we have neither the information necessary, nor enough understanding to model and manage species as an assemblage or ecosystem of many species. Three examples of species managed as individual units follow. A fourth example - Dover sole, thornyhead, and sablefish (DTS) complex - has been explored in greater detail to portray complications of a multispecies management situation.

Widow Rockfish (Figure A-2)

This species provides an example of a very abundant species, which was initially harvested at a very high level. Management acted rapidly and constrained catches to a new, much lower, long-term production level. Although recent abundance levels have been flat and catches constrained, the lack of recruitment resulted in widow rockfish approaching the over-fished status in 2001.

- In 1982, the Council set an initial ABC of 18,300 metric tons (mt), well below the 1981 record catch of 28,248 mt.
- From 1983 through 1989, various widow rockfish trip limits were used trying to match catch to improved scientific data or stock assessments that resulted in revised ABC levels. In most cases these trip limits were liberal (the equivalent of 30,000 50,000 pounds/trip or week) at the beginning of the year and as a result the fishery was often placed on a very restrictive per-trip limit (3,000 pounds) by sometime during July through September to avoid early attainment of the allowed catch level.

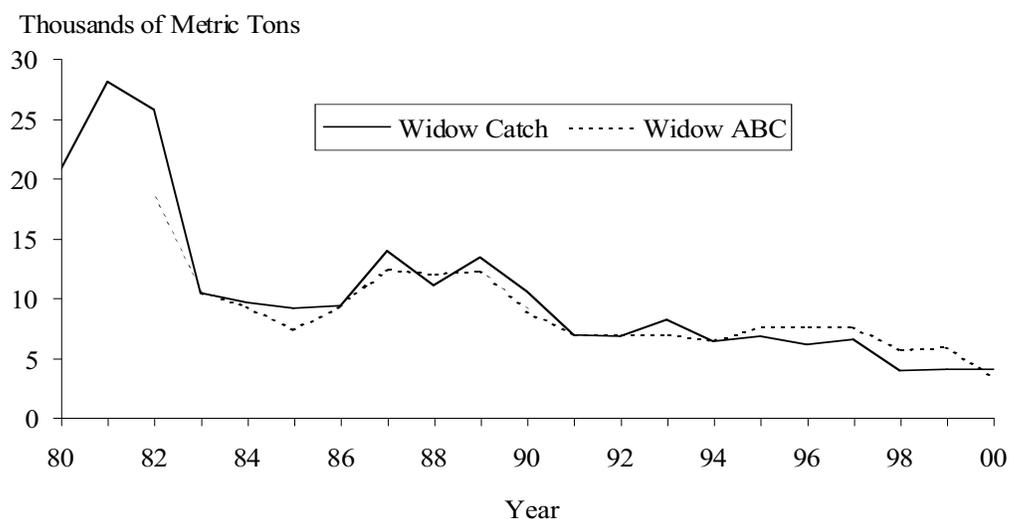


Figure A-2. West coast widow rockfish catch and annual acceptable biological harvest Level, 1980-2000.

- During 1990 and 1991 many larger midwater vessels which relied on large widow rockfish trip limits switched to other strategies, or left the groundfish fishery, as the trip limit was cut in about half to avoid early attainment of ABC. This fact was reflected in the reduced share of widow rockfish catch attributed to use of midwater gear.
- The Council established the use of harvest guidelines (HG) during 1991. These HGs are often set at the same level as the ABC, but may be more liberal based on economic or social needs.
- The developing shoreside Pacific whiting fishery (Figure A-1) provided opportunity for many larger vessels that previously relied on widow rockfish. This trend can be seen as total groundfish catch and widow rockfish catch declined while whiting catch increased sharply during 1991 through 1994.
- From 1992 through 1994 the widow rockfish limit was reduced further to 30,000-pound cumulative per four-week period, then per month. The implementation of long cumulative catch periods allowed some midwater vessels to continue to target widow rockfish and reduced the likelihood of discard. It was still usual to near-HG attainment prior to the end of the year, and as a result a very restrictive trip limit would be put in place. However, near attainment has been delayed until much later in the year (October 1 during 1992, after which the 30,000-pound limit was reinstated for December; December 1 during 1993 and 1994).
- During the early 1980s, virtually all of the widow rockfish catch was taken by midwater trawl; by 1994 midwater gear was taking only about one-third of the total.
- Since 1994, ABC's have been set at a modest level, reflecting current stock status and lack of major recruitment.
- Beginning in 1999, a 3-month cumulative trip limit was implemented during the first fishing period from January through March, followed by three 2-month cumulative limits and then a monthly limit for the last quarter of the year. Corresponding trip limits for the three types of cumulative periods were 70,000 lb, 20,000 lb, and 22,000 lb. Midwater trawlers benefited by this arrangement, as they could fish the first period, participate in Alaska fisheries, and return in time for the whiting season.
- During 2000 widow rockfish was returned to 2-month cumulative limits due to too much harvest during the early part of 1999, and due to the potential for becoming identified as overfished. A limit of 30,000 lb per 2-months was established for midwater trawl gear only to avoid canary rockfish catch (which had been identified as overfished) associated with the on bottom catch of yellowtail rockfish and widow rockfish.

Yellowtail Rockfish (Figure A-3)

This fish provides an example of a highly abundant species that was initially harvested at a high level both as a secondary species to midwater widow rockfish, and as a target species in the general rockfish fishery. Management constrained catch sharply and applied appropriate scientific information to update stock assessments. Revised assessments determined an upward abundance trend, due to incoming strong year classes, and catch restrictions were relaxed in some areas. Subsequently, catch restrictions were re-applied after the 1995 triennial trawl survey indicated poor recruitment.

- The record catch of 8,722 mt is achieved in 1983.
- An ABC level of about 3,000-3,200 mt is established during 1983-1985, but it takes until 1985 to constrain catch to that level.
- During 1986-1989, catch is constrained to slightly more liberal ABC levels of 4,000 mt.
- Assessments detect a slow upward trend in abundance during 1990-1993.
- Management responds by removing trip limits for a larger portion of the southern area (Cape Lookout south) during 1992, but fails to constrain catch.
- Constraining trip limits are reimposed for the area between Coos Bay and Cape Lookout. These limits constrain catch to about three-fourths of the available ABC.

- A much-improved stock assessment during 1993 provides evidence of a strong incoming year class for southern stocks. Management reflects this with an ABC increase to 6,740 mt and appropriate sub-area HG levels for northern and southern stocks. Liberalized trip limits for southern stocks and a declaration procedure for southern trips is implemented to avoid early attainment of the northern HG, and to constrain southern catch to the southern HG.
- During 1994, yellowtail rockfish catch in southern and northern areas was accumulated in a ratio consistent with the ratio between southern and northern HG, but coastwide catch fell well below coastwide ABC.
- The 1995 ABC for yellowtail rockfish remained at 6,740 mt with separate southern and northern sub-area HG.
- A series of upward and downward adjustments were made in ABC's between 1995 and 1998, reflecting uncertainty and variability in survey information and infrequent surveys. The 1998 triennial survey indicates a stock in better condition than was thought based on the 1995 survey. The GMT removed a precautionary 10% reduction in OY based on the new information and current OY is at 3,435 mt.

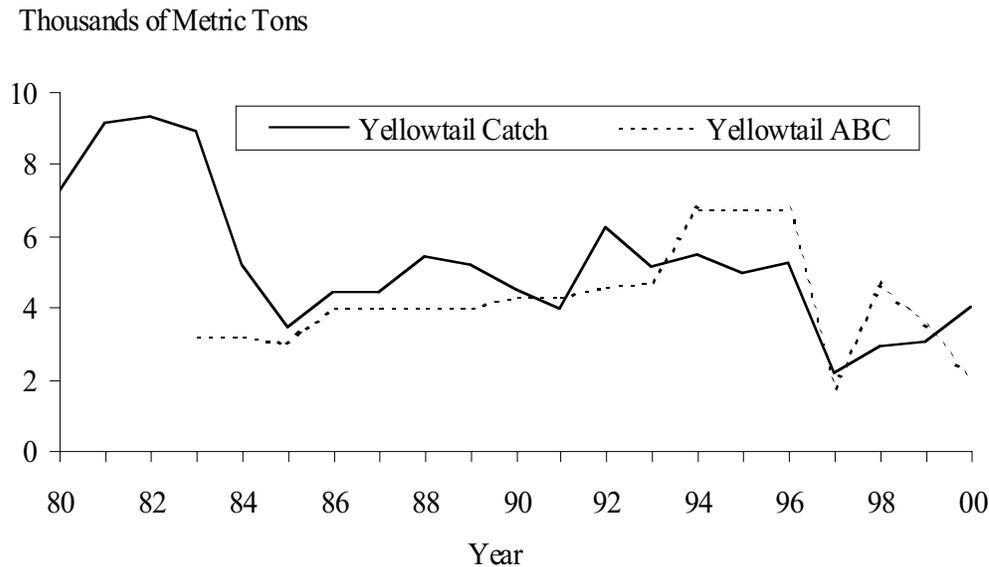


Figure A-3. West coast yellowtail rockfish catch and annual acceptable biological harvest level, 1980-2000.

Canary Rockfish (Figure A-4)

This species provides an example of a commonly caught rockfish managed in a complex with many of other rockfish species. Hindsight indicates that previously established ABC levels were too high. As a result, industry noticed lack of abundance of this once common species. A revised stock assessment was too late to prevent a drastic reduction in catch. Canary rockfish were determined to be over-fished and a rebuilding plan was developed in 2000.

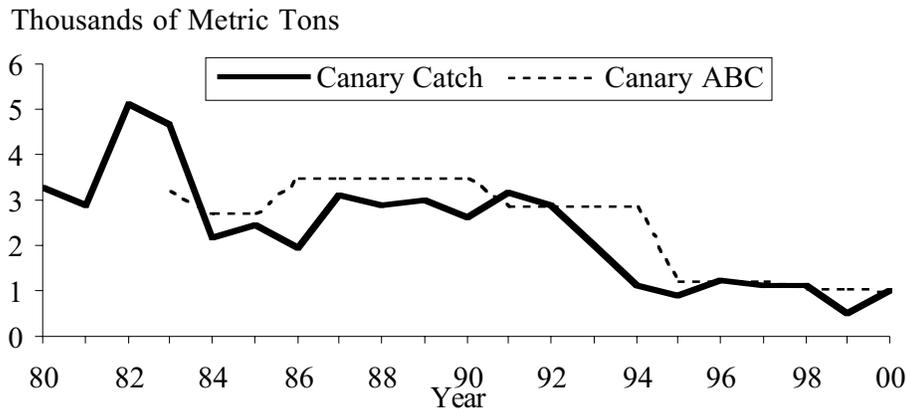


Figure A-4. West coast canary rockfish catch and annual acceptable biological harvest level, 1980-2000.

- The first ABC for canary rockfish of 3,200 mt was used during 1983, but catch exceeded it by 25 percent (3,983 mt).
- Record canary rockfish catch of 5,200 mt occurred in 1982.
- During 1984 and 1985 the ABC was reduced to 2,700 mt. Catch during those years fell well below the ABC.
- During 1986-1990, a more liberal 3,500 mt ABC was used, but catch never attained this level. As a result, management showed little concern for canary rockfish.
- A new assessment brought the ABC back down to 3,000 mt for 1991 and 1992, and catch reached the ABC level during both those years.
- For two years (1992 and 1993) industry communicated more frequent and certain concerns that canary rockfish abundance was on a sharp decline. Catch dropped sharply to only 1,940 mt. Efforts to complete a revised assessment during that period were hampered by lack of new information (specifically - collected otoliths that were not aged due to a cutback in age reading capability).
- A revised assessment was completed during 1994, and canary rockfish catch dropped to only 1,047 mt.
- The new assessment established a 1,250 mt ABC and HG.
- To ensure canary rockfish catch remained low, a trip limit of 6,000-pound cumulative per month was established for 1995.
- There was no indication canary rockfish biomass has rebounded. After reviewing assumptions made in the 1996 assessment, the GMT concluded spawning biomass was between 18 and 33% of virgin spawning biomass. OY was set at 857 mt. A new assessment is underway in 1999.
- A new assessment completed during 1999 resulted in an ABC of 287 mt, and an OY of 200 mt for 2000.
- The rebuilding plan specified severe restrictions in all fisheries for 2001 with an OY of only 93 mt.

DTS Complex (Figure A-5)

Sablefish and thornyhead are the two most valuable groundfish species (on a per-pound ex-vessel value basis). As a result, trawl effort has continued to increase on this complex, which also includes Dover sole, over the last several years. During 1997, the catch of this complex accounted for 46 percent of Oregon's groundfish catch (excluding Pacific whiting), and nearly 70 percent of the ex-vessel value. Because of the substantial economic value of these species, information to supplement stock biomass assessments and management regulation impact is badly needed.

Reduced stock size, increasing effort, increasing market value and the allocation of sablefish to non-trawl users have all contributed to the need for reducing trip limits in the DTS complex fishery. Trip limit reductions are implemented to constrain the landed catch (Figure A-5) to a level that allows the directed DTS fishery to continue throughout most of the year. Unfortunately, these limits have eroded to the point that many vessel operators find it increasingly difficult to operate profitably.

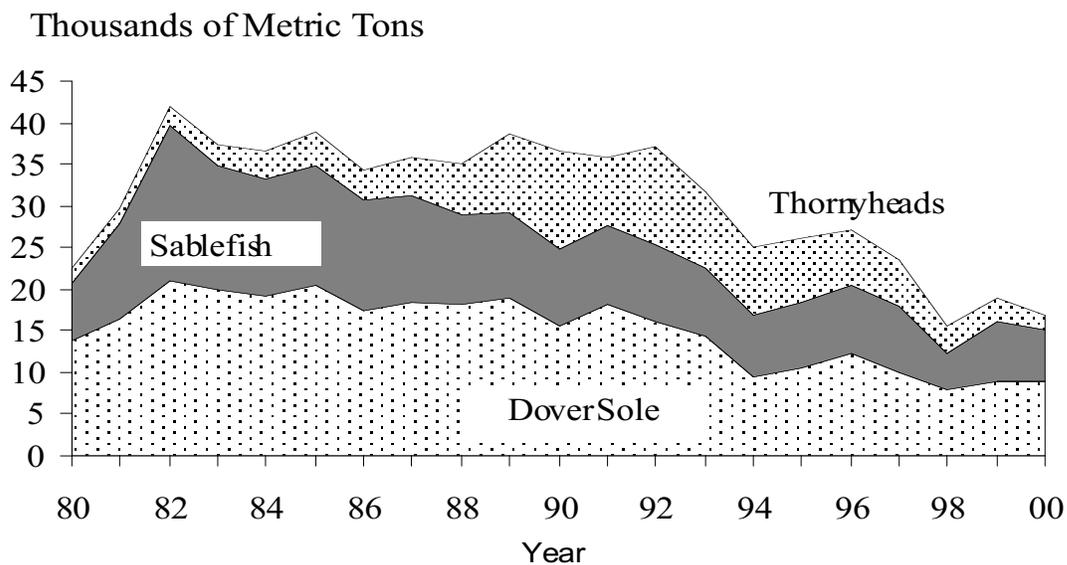


Figure A-5. Catch of DTS species, 1980-2000.

Current models indicate substantial decreases in stock biomass for DTS species. However, many vessels in the groundfish bottom trawl fishery continue to rely heavily on a fishing strategy that targets these three species. The need to continue this fishery at an economically productive level continues because many other species and species complexes (e.g., Sebastes complex) also are thought to be at reduced stock levels.

A discussion of individual DTS species follows:

Sablefish (Figure A-6)

- Since 1987, sablefish harvest has been allocated between trawl (52 percent) and non-trawl users (48 percent).
- As the fishery for thornyhead began increasing during 1989, sablefish catch associated with this target fishing began to constrain the overall DTS fishery.
- In October 1989, the per-trip trawl limit for sablefish was reduced from 45 percent of the DTS complex to 25 percent in an effort to hold catch to the 52 percent trawl allocation.
- From 1990-1994, curtailment of the DTS complex fishery has continued to occur as a result of too little sablefish. Constraining sablefish catch has been accomplished primarily by reducing trip limits.
- During 1990, the equivalent monthly cumulative sablefish catch allowed was about 27,000 pounds. Through 1998, the equivalent monthly cumulative limit was 6,000 pounds.
- For 1999, the equivalent monthly limit ranged from 4,000 to 5,000 pounds, depending on the month, and the 2000 monthly equivalent was further reduced to 3,500 pounds.

Thousands of Metric Tons

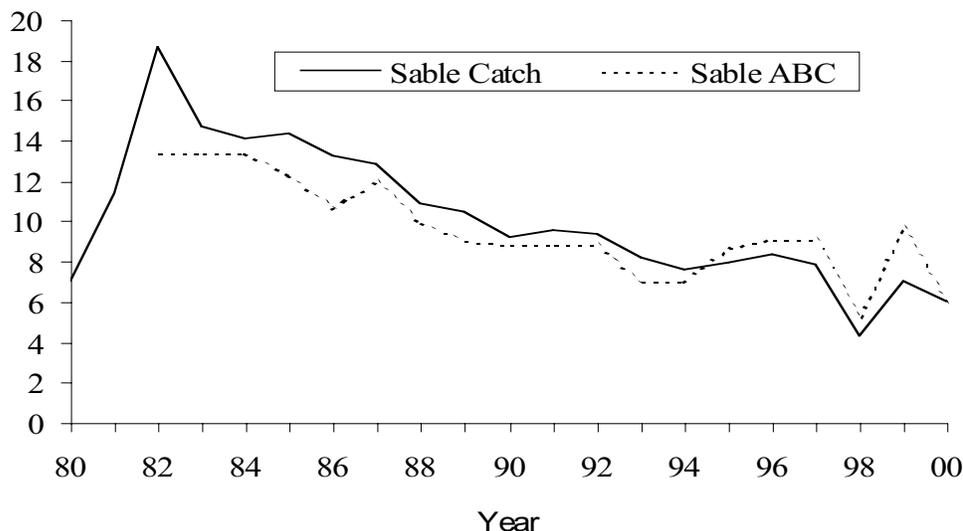


Figure A-6. West coast sablefish catch and annual acceptable biological harvest level, 1980-2000.

Thornyheads (Figure A-7)

- Initial stock assessments for thornyhead in 1991 indicated the fishery was near, or even over the overfishing level for shortspine thornyhead.
- This concern initiated closer management of both species, and complicated DTS complex management. Due to uncertainty in the first assessment, the Council set a 7,900 mt HG for the Monterey through Columbia areas that was well above the 5,900 mt ABC recommended by GMT. This was done in part to ease reduction from the 1990 thornyhead catch of just over 10,000 mt.

- Shortspine and longspine thornyhead were managed together from 1991 through 1994 under a joint HG because it was believed sorting the two species was impractical.
- During 1992, thornyhead management was refined to take into account potential for reaching the $F_{20\%}$ overfishing level for shortspine thornyhead (about 3,500 mt). At the time it was expected that shortspine thornyhead would constitute 50 percent of the combined thornyhead catch. A 7,000 mt HG was set for the Monterey through Columbia area to account for this catch ratio and to provide shortspine thornyhead
- Strong market demands and increasing ex-vessel value for thornyhead increased participation and accelerated catch sharply during May and June 1994. On July 1, the thornyhead trip limit was reduced from 30,000 pounds cumulative per month to only 8,000 pounds to avoid HG attainment by August. This aggressive trip limit reduction slowed catch enough to delay HG attainment to the end of the year.
- It was estimated that during 1995 that combined thornyhead HG would likely be reached by midsummer, assuming the market stayed as strong as during 1994. As a result, the Council adopted a separate species management scenario developed by industry, ODFW and the GMT.

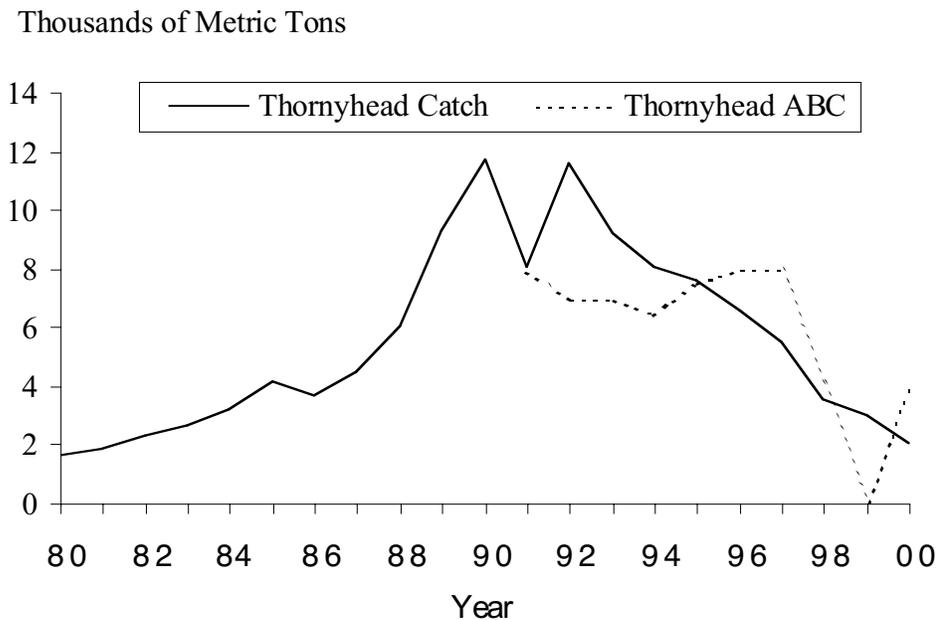


Figure A-7. West coast thornyhead catch and annual acceptable biological harvest level, 1980-2000.

- During 1995, each species of thornyhead will be sorted to facilitate better monitor-in of the shortspine thornyhead overfishing level. A trip limit of 20,000 pounds cumulative per month, of which only 4,000 pounds may be shortspine thornyhead, should allow access to the much higher longspine HG (6,000 mt) prior to reaching the shortspine HG (1,500 mt).
- Thornyhead identification classes were given during December 1994 to help ensure that this management option was successful.
- The current (1999) monthly equivalent limit for shortspine thornyhead has fallen to only 1,000 pounds per month.

Dover Sole (Figure A-8)

- The last several Dover sole assessments have indicated a decline in available surplus for harvest, particularly in the Columbia area.
- Markets for Dover sole have not been strong in recent years. This lack of market, combined with much higher demand for sablefish and thornyhead, allowed a step down from annual catches over 10,000 mt in the Columbia area.
- The 1992 HG was 6,000 mt for the Columbia area; catch remained well below that level.
- The 1994 Columbia area HG was 4,000 mt; the catch was approximately 3,300 mt.
- This 1995 catch (2,625 mt) was below the 2,850 mt HG set for 1995.
- Since 1996, the all area landed catch of Dover sole has been well below the ABC (10,880 – 12,883 mt), due to relatively low trip limits designed to minimize the discard of sablefish and shortspine thornyhead.
- A new assessment and a more conservative harvest policy resulted in an ABC of only 9,426 mt during 2000.

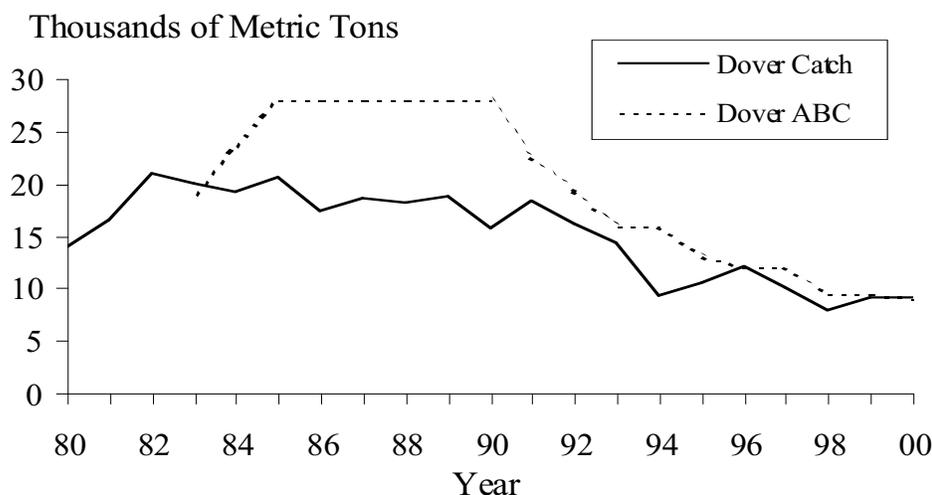


Figure A-8. West coast Dover sole catch and annual acceptable biological harvest level, 1980-2000.

Critical Issues and Research Needs

Trip Limit Induced Discard and Survival of Discarded Fish

The Council currently reduces allowable harvest by amounts ranging from as low as five percent for Dover sole and eight percent for thornyhead, to as high as 16 percent for many rockfish species and 20 percent for sablefish, to account for discard mortality. To the degree that these estimates are higher than what actually occurs, we may be forgoing biologically safe additional harvest of some species. Just as important is determination of whether some of these assumed discard rates may be too low. In this situation, over-exploitation could occur without knowledge. Whether actual discard is higher or lower than is currently estimated, it is essential to have the most accurate estimate of total removals - catch, discard mortality, and natural mortality - to help ensure that our stock assessment models are accurate. Higher or lower discard rates do not

automatically mean more or less fish to harvest - a more accurate model could estimate a higher biomass, even though the assumed discard rate was higher as well.

Bycatch (Discard) of Non-marketable and Prohibited Species

The decline of west coast salmon stocks and focus of the environmental community and general public on the marine environment has brought about increasing concerns regard-in the species and amount of fish which are killed and wasted as a result of target groundfish fisheries.

At-sea work to obtain quantitative data on fishery bycatch and discard mortality rates is expensive. Core programs for state and federal agencies have not historically contained a budget for this work. New funding sources need to be developed for data collection and analysis required.

Research progress in this area has largely been brought about by responsible and forward-looking members of the groundfish industry who have worked hard to develop special projects with ODFW. The very existence of these projects has relied heavily on voluntary industry funding and cooperation.

The Department and the shoreside whiting industry have successfully operated an observation project from 1992 through 1998, and are continuing to operate the project in 1999. High quality data on prohibited species and non-target groundfish bycatch have resulted from the project. This success, and the need for similar information, prompted the Oregon Trawl Commission to begin working with ODFW during 1995 to implement a similar study in the general groundfish trawl fishery. The study, named the Enhanced Data Collection Project (EDCP) distributed and collected discard logbooks and sent observers out aboard trawlers beginning in 1996. The field phase was completed December of 1998. Data are scheduled to be available for analysis by June 30, 1999. Preliminary data sets were made available for analysis during September, 1999. A final report and data release is pending as of this report. An analysis of the DTS (Dover sole, thornyhead and sablefish) fishery conducted by the National Marine Fisheries Service, Northwest Fisheries Science Center, Fisheries Research and Analysis Division result in a useful model for anticipating the discard associated with this fishery. The Oregon Trawl Commission recently granted a contract to analyze the usability of vessel discard logbook data as compared to data collected via at-sea observers. National Marine Fisheries Service (NMFS) received 2.5 million dollars to implement a partial observer program in 2001. It is hoped the program will be funded at the 5 million dollar level in the near future. Oregon will partner with NMFS to establish a state coordinator for the observer program.

Aging Capability

Over the last several years, reductions in state and federal positions have resulted in the loss of several age reader positions. Elimination of these positions has come at a time when the need for this capability is increasing due to the need for age-based assessments on additional species, while also continuing to provide age data to update and improve existing assessments. Models exist which do not rely on age data, but in general these models are less likely to produce results as accurate as those from a well supported age-based model. A Cooperative Aging Project (CAP) was established during 1995, which supports three full-time aging biologists. This project enabled more comprehensive sablefish and Dover sole assessments to be completed. Additional aging capability is still needed, however. A fourth position was added during the fall of 1999, and a fifth position is anticipated for 2001.

At-sea Research

In response to the groundfish crisis, the Legislative Emergency Board provided Oregon State University funding Marine Extension Agent who specializes in groundfish. In addition, the Board provided ODFW funding to begin at-sea research projects and improve groundfish assessments. A fixed gear study was conducted in 1998-99 to determine a suitable gear for sablefish surveys off west coast. Additional at-sea research will be directed toward identifying stocks of groundfish, examining trawl catchability, and looking at methods of reducing by-catch through gear modifications (See Section N: Summary of Research).

Additional identified issues and research needs include:

- Species composition by time and area
- Improved single species stock assessments
- Multispecies and/or more ecologically based assessments (see section G, Nearshore Reefs and Fishery Issues)
- Allocation of catch (limited entry versus open access, trawl versus nontrawl, shoreside versus at-sea processing)
- Additional effort reduction
- Interaction of fishing gear on fish habitat
- Improving shoreside and at-sea sampling, logbook, and catch reporting systems

PACIFIC WHITING

Background/History

Pacific whiting provides the largest biomass of any food fish species off Oregon. While they occur off Oregon for most of the year, they are a migratory species. Pacific whiting spawn off Southern California and Baja California in the winter, make an annual migration northward to feed off northern California, Oregon, Washington and British Columbia, and then move south during the fall months.

In 1966, a large fleet of Soviet vessels began an intensive trawl fishery off Oregon and Washington, catching 128,000 mt of Pacific whiting. In 1978, U.S.-foreign joint-venture fisheries began with U.S. trawlers delivering their catches to foreign at-sea processing vessels. Annual domestic shore-based processing of whiting was usually below 1,000 mt during the years of high foreign catch (Figure B-1) slowly rising to 8,100 mt. All participation by foreign vessels was eliminated in 1991. That same year, domestic at-sea processing rose to 196,900 mt, and domestic shore-based processing rose to 20,600 mt. More recently, tribal participation began in 1996 with landings close to 15,000 mt. Recent (since 1997) domestic total allocation has been 232,000 mt (511,467 lbs).

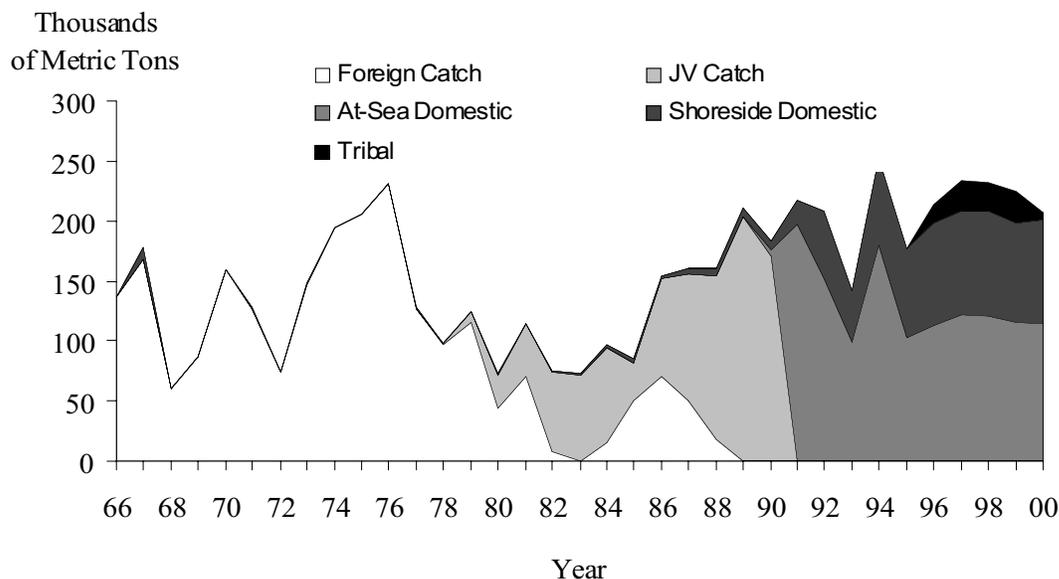


Figure B-1. Annual Pacific whiting catch, 1966-2000.

Oregon shoreside landings and processing of Pacific whiting were below 1,000 mt annually until 1990 (Figure B-2). Since then they have risen to a high of 73,727 mt in 1997.

In 1993, a three-year agreement (1994-1996) was made to allocate available U.S. harvest of whiting between at-sea and shore-based processors. Under this agreement, the first 60 percent of U.S. annual harvest would be taken in open competition with the remaining 40 percent being reserved for shore-based processing. If the shore-based sector appeared unable to harvest its allocation, the surplus would be made available for at-sea processing August 15 or later.

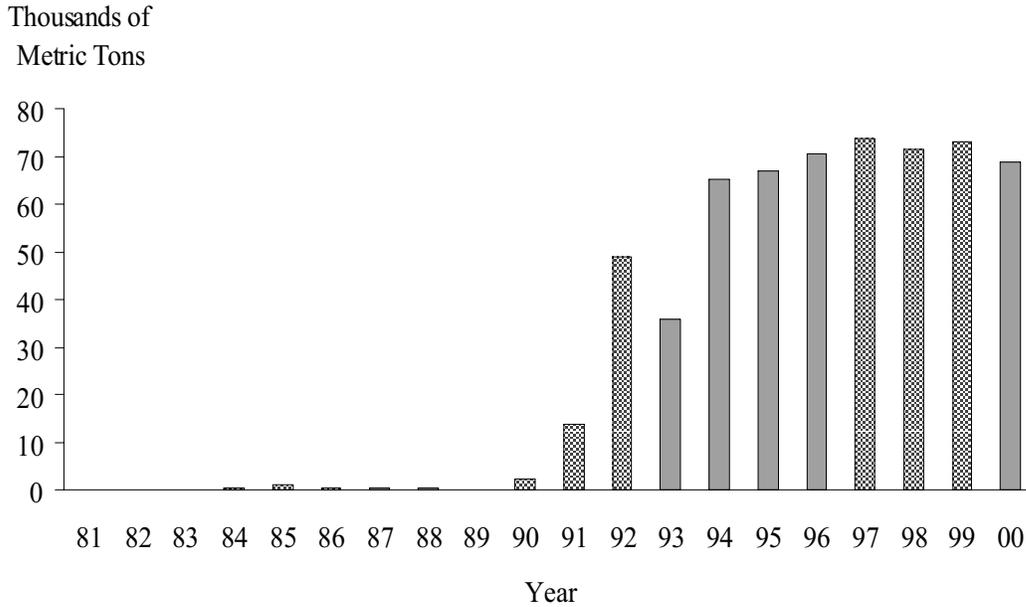


Figure B-2. Annual shoreside landings of Pacific whiting for Oregon ports, 1985-2000.

The domestic fishery for Pacific whiting is a mid-water trawl fishery harvesting a large volume at a low ex-vessel value. Catch usually consists of a few large year classes, and in recent years, a majority of the catch has come from the 1993-95 year classes. Fish are usually considered too small for the market until they reach about 12 inches in length, about three years of age. Processors also typically reject very large fish (over several pounds). The market requires whiting flesh of high quality, such that they must be dumped unsorted as quickly as possible into the refrigerated seawater in the boat's tanks, chilled and delivered to a plant within few hours of catch. As a result, prohibited species such as salmon and halibut may be delivered along with the catch. These fish are then turned over to hunger relief agencies. Whiting are processed for surimi, fillets and headed & gutted (H & G) markets.

Recent stock assessment by National Marine Fisheries Service (NMFS) shows that stock size is declining. A new, strong year class must appear before stock size is expected to increase. Fishermen reported seeing large numbers of young-of-the-year whiting in 1998; if this is truly a strong year class, some of these fish may appear in the 2001 Pacific whiting landings.

Management/Regulations

Pacific whiting are managed under the federal Pacific Coast Groundfish Management Plan (GMP). The Council sets a HG and a season. Canada also participates in the fishery and establishes a separate HG and season for its harvesters. The National Marine Fisheries Service coordinates an observation and sampling program for whiting processed at sea. State fishery agencies in Oregon, Washington and California participate in a shoreside observation program in cooperation with the fishing industry. Each state fishery agency also conducts shoreside biological sampling of whiting landings.

The principal management measures are seasons, trawl mesh restrictions, experimental fishing permits, limited entry, closed conservation zones, and a catch quota or harvest guideline. In recent years, catch has been allocated between at-sea and shoreside processors. Continued but unsuccessful attempts have been made to allocate catch between the U.S. and Canada.

HG is established through stock synthesis modeling using a combination of survey and biological data. Catch data are used to provide a time series of catch-at-age information, and biomass estimates are determined from bottom trawl and acoustic/mid-water trawl surveys.

A timeline summary of management measures and regulations is as follows:

- 1967 Bilateral fishing agreement between U.S. and USSR for trawling off WA, OR and CA by USSR vessels.
- 1973 USSR agreed to limit its catch of Pacific whiting to the 1971 level of 150,000 mt.
- 1977 Foreign trawl fisheries within the FCZ off WA, OR and CA were regulated under terms of the Preliminary Fishery Management Plan (PMP).

About

- 1978 Whiting may not be taken with trawl nets with mesh less than two and a half inches.
- 1982 FMP implemented placing management of groundfish, including Pacific whiting, under the Council. Foreign processing prohibited south of 39° N Lat.
- 1992 April 15 set as opening date for Pacific whiting season and additional restrictions:
 - At-sea processing prohibited south of 42° N Lat. (OR-CA border)
 - Prohibited night fishing between 0001 hrs and one-half hour after sunrise
 - Prohibited fishing for Pacific whiting in the Columbia River Conservation Zone

Shoreside Observation Program established and EFP's assigned to cooperating vessels, authorizing them to land unsorted catch of whiting
- 1993 Night fishing prohibited only south of 42° N Lat.
- 1994 Limited entry became effective, and only vessels with limited entry trawl permits could fish for Pacific whiting

Three-year sharing agreement begins. This allocated 40 percent of the U.S. HG to shoreside processors if they could utilize that amount.
- 1996 Delayed the opening date of the Pacific whiting season from April 15 to May 15. Established a 15,000 mt allocation of Pacific whiting for the Makah tribe.
- 1997 Set allocation of the commercial whiting harvest guideline among the non-tribal sectors at: 42% shoreside, 24% for motherships, and 34% for catcher-processors. Opening dates set at: May 15, catcher-processors and motherships; June 15, shorebased fleet. The Makah tribal allocation set at 25,000 mt.
- 1999 The Makah tribal allocation increased to 32,500 mt.
- 2000 Individual vessel bycatch rate cap set at 12 kg/mt of whiting for yellowtail rockfish.

Critical Issues/Research Needs

International Allocation

Equitable allocation of whiting between U.S. and Canadian harvesters is needed. The two governments have not been able to agree on sharing this stock. Result of this disagreement is that combined catch has exceeded acceptable biological catch (ABC) by 6 to 27 percent since 1990 (Figure B-3). This issue must be resolved so total catch does not continue to exceed the ABC. Fishery managers of both nations are concerned that continued overharvest will eventually harm the fishery.

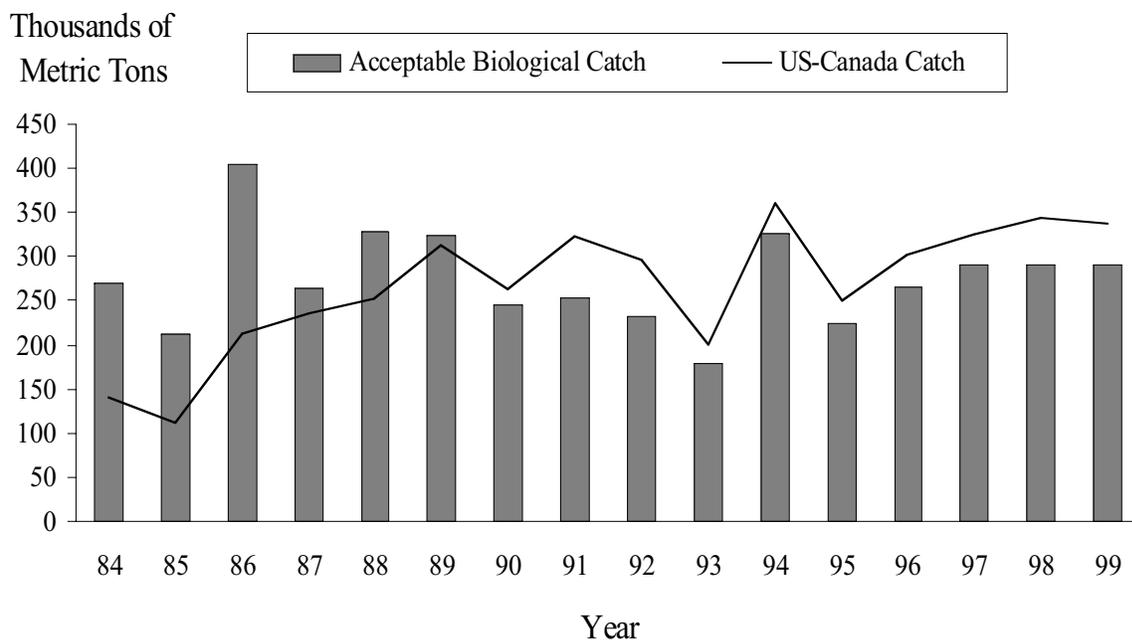


Figure B-3. HG and U.S.-Canada catch of Pacific whiting.

Domestic Allocation

Allocation between the different sectors and now the Makah tribe continue to be high profile issues. Consensus between these different groups is challenging. Related to this issue is concern for the stability of the shoreside processing industry and its vessels. A viable fishing industry is important to the economies of several Oregon port towns. With poor years for salmon, certain rockfish species, and other traditional fisheries, the availability of whiting over several months is important to keep plants and vessels operating, thus ensuring stable employment.

Bycatch

As restrictions for other groundfish species become tighter, bycatch of these species in this large volume fishery is a major issue. As a result, accurate reporting by processors becomes even more important, as does biological sampling of bycatch species. The vessels must also play their part by not targeting on non-whiting species if the exempted fishing permit program is to survive. This is becoming more and more important as recent stock assessment information indicates widow rockfish (a main bycatch species in the whiting fishery) is overfished. A bycatch program was also initiated in 2000 to reduce yellowtail rockfish bycatch as it continued to increase from 1997 levels, reach a high in 1999 and impacted other fisheries. Salmon bycatch for the entire domestic whiting fishery was high in 2000, triggering NMFS to reinitiate consultation on the biological opinion.

Biological Sampling

Biological sampling must be continued. Since whiting HG's are driven by strong year-classes, early detection of these can be beneficial. Industry strongly desires an annual pre-recruit survey in order to better forecast stock conditions. Currently, whiting surveys are only conducted every three years. Biological sampling of bycatch species must also be continued as they provide valuable information to stock assessors especially when considering the uniqueness of the whiting fishery in that all fish are retained and delivered shoreside.

COMMERCIAL ALBACORE

Background/History

Albacore is a highly migratory species found in all the world's oceans. Albacore caught off Oregon belong to the North Pacific stock and are generally juvenile fish that have not spawned. They make trans-oceanic migrations, being targeted by fisheries off several nations including the U.S., Canada and Japan at different times of the year. The U.S. West Coast fishery exploits this stock during summer and fall months.

Oregon has had a directed commercial fishery on albacore since the mid-1930s when albacore fishing expanded from the traditional grounds off southern California to Oregon and Washington. For many years, both baitboats and jigboats fished for albacore off Oregon, but in recent years landings have been predominantly jig (troll)-caught fish. The fleet today consists of small "combination" boats which may fish crab, salmon or bottomfish at other times of the year, and large freezer boats that travel the north and south Pacific, fishing principally albacore.

Oregon albacore landings have been highly variable, ranging from a low of 27,600 pounds in 1936 to a high of almost 38 million pounds in 1968 (Figure C-1). In the last decade, landings in Oregon have averaged about 6 million pounds. Variability in landings can be attributed to several factors. For example, in 1968 (the record year in Oregon), oceanic conditions diverted a large part of the albacore migration more northward, resulting in poor fishing off California and very good fishing off Oregon. Environmental conditions such as warm water patterns determine seasonal appearance, distribution and abundance of albacore. Weather conditions affect amount and distribution of effort; market conditions such as price and availability of buyers affect landing location.

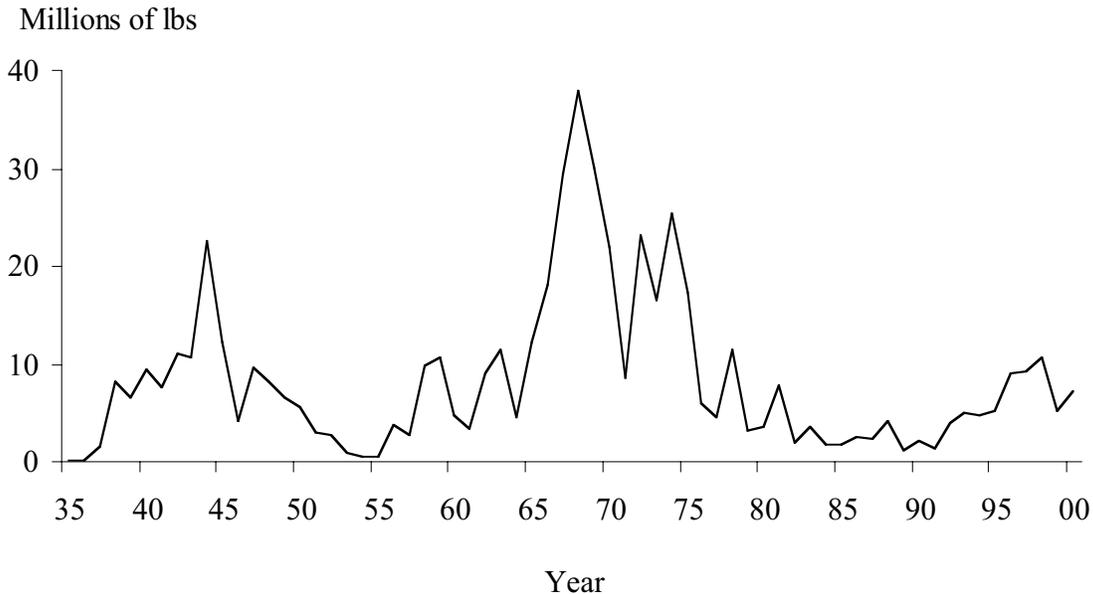


Figure C-1. Oregon albacore landings in pounds, 1935-2000.

Management/Regulations

Fishery scientists believe that the MSY for the North Pacific albacore stock is between 80,000-100,000 metric tons. The stock has been rebuilding since the ban on high seas drift-netting in the early 1990's and in the last few years, total annual North Pacific catch has reached MSY levels. Most fishery scientists agree that the population of North Pacific albacore is in a healthy condition and responding favorably to exploitation rates at this time.

In the past, there has been no active management regime for North Pacific albacore. For the last three years, fisheries managers and scientists from 28 Pacific nations and territories have been working together to establish a multi-national fisheries treaty for conservation, management and enforcement of the high seas tuna fisheries. This Western and Central Pacific (WCP) Convention was finalized in the fall of 2000 but still needs to be ratified. Several key nations have refused to sign the treaty.

In 1999, state and federal scientists, economists and managers also joined together to form a Highly Migratory Species Plan Development Team (HMSPDT). This team is gathering information, which will be used in developing a Fishery Management Plan (FMP) for highly migratory species off the West Coast.

Also being considered is the possibility of limited entry. The Pacific Fishery Management Council (PFMC) adopted a control date of March 9, 2000 for limited entry into highly migratory species fisheries. This control date is in place as a notice that a limited entry program may be established in the future.

A final issue in the west coast albacore jig fishery is the U.S./Canada Treaty. The large influx of Canadian vessels into the U.S. Exclusive Economic Zone (EEZ) recently has raised concern among U.S. fishermen and required that the treaty be revisited to discuss problems and clarify its provisions. Treaty discussions will take place in the fall of 2000.

Critical Issues/Research Needs

Alternative Markets

Recent issues in the albacore fishery have centered around product form and market concerns. Presently, over 80 percent of the worldwide tuna harvest is canned. With no major canneries remaining in Oregon, albacore is shipped to southern California, American Samoa, Puerto Rico, Guam or Europe. However, studies show good potential to diversify from a canned product to alternate forms and markets. Research in the last few years has focused on developing alternative markets for albacore and adding value to products currently being caught.

In October of 1999, the Oregon Albacore Commission was formed. This commodity commission assesses fees from both producer and processor for funding education, research and promotion of albacore.

Product Quality

Another recent issue in the fishery concerns product safety and quality. Albacore belong to the family Scombridae that is made up of histamine-forming species. Histamine is a toxin that can form in improperly handled fish and lead to food poisoning. Recent research has focused on monitoring the handling of albacore on vessels and gathering information on fish temperatures and other factors that affect chilling rates, as well as gathering samples to be analyzed for the

presence of histamine toxin. This research will provide information to harvesters on steps needed to assure a safe product.

Because of competition and at times an excess of albacore supply, users unable to find a place in traditional cannery markets have turned to value added markets. Some fishermen custom can or vacuum pack their fish. Others sell their fish directly off their vessels, using a Limited Fish Sellers license. Recently, some fishermen selling this way have offered loining/filleting of tuna as a service to customers. Health concerns and lack of consistent standards for handling fish resulted in an adoption of rules by the Fish and Wildlife Commission in May of 1999. These guidelines allow for filleting of fish on board a vessel only after meeting certain guidelines and passing an Oregon Department of Agriculture inspection.

- The Oregon Department of Agriculture initiated rulemaking process in 2000 to establish enforceable guidelines for filleting fish aboard fishing boats, after sale to ultimate consumers.

PINK SHRIMP

Background/History

The pink shrimp fishery has developed from a modest beginning in the mid-1950s to become one of Oregon's major fisheries with landings exceeding 40 million pounds in several years (Figure D-1). Most of the development of this fishery happened in the 1970s. Effort grew dramatically (Figure D-2). Gear also improved as the fleet switched from mostly single-rigged vessels with low-rise trawls, to mostly larger, double-rigged vessels fishing high-rise trawls. As the fishery developed, the shrimp population began to show signs of the "fishing-down" process. Age composition of the catch changed; a roughly equal balance of ages one, two and three shrimp in the early years was replaced by catches generally dominated by age-one shrimp (Figure D-3). Average catch-per-unit effort declined around this time (Figure D-4), and average count of shrimp landed also rose somewhat (Figure D-5).

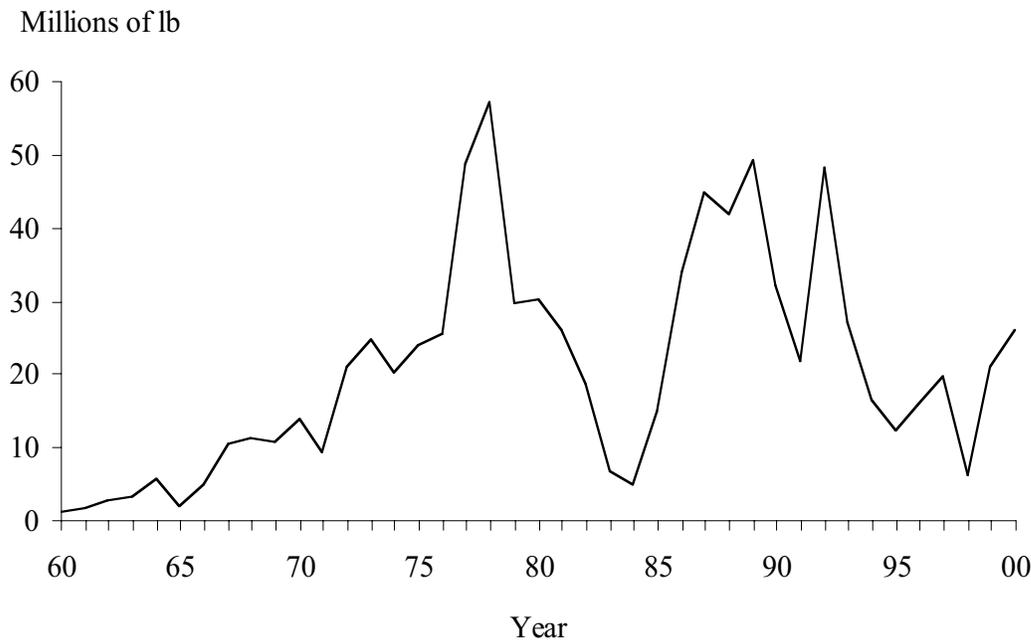


Figure D-1. Oregon shrimp landings, 1960-2000.

Despite rapid development of this fishery and abundant evidence of "fishing down," this fishery resource is considered healthy. Some evidence of overfishing has recently been found, but it is considered preliminary until more years of data can be accumulated. Recruitment of age-one shrimp is highly variable and has been shown to be mostly environmentally driven. As a result of "fishing down" and variable recruitment, catch can vary substantially between years. One reason that pink shrimp have not become overfished, at least so far, is that they have a life history which is resistant to overfishing.



Figure D-2. Fishing effort expended to catch pink shrimp landed in Oregon, 1970-2000, in single-rig equivalent hours.

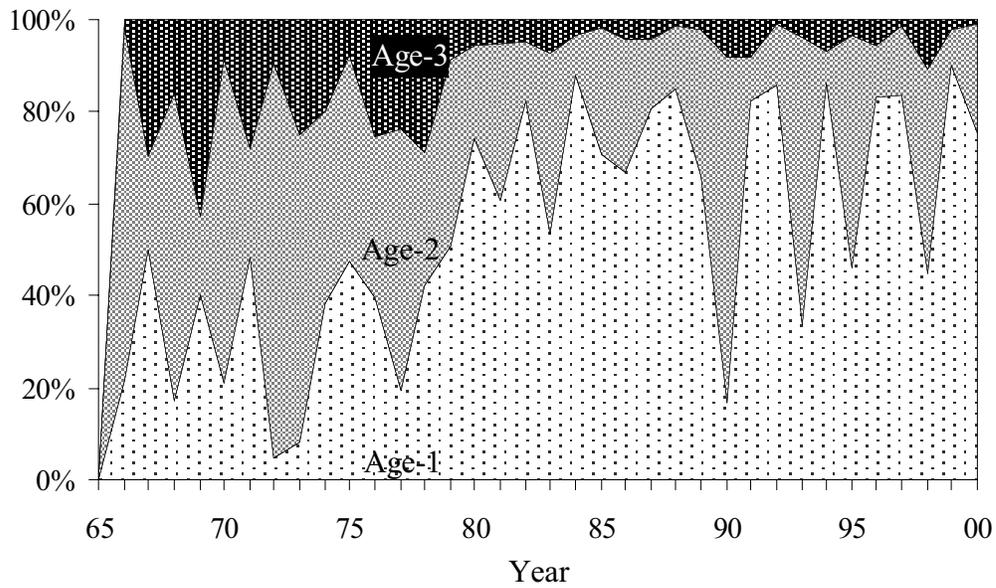


Figure D-3. Age composition of shrimp catch, 1965-2000.

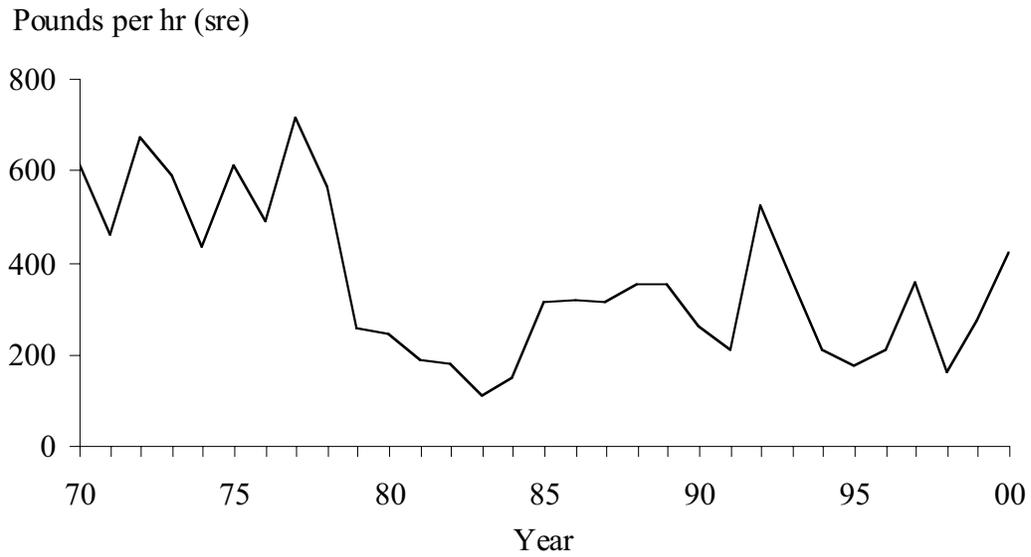


Figure D-4. Shrimp fishery catch-per-unit effort (lbs/single-rig hours) 1970-2000.

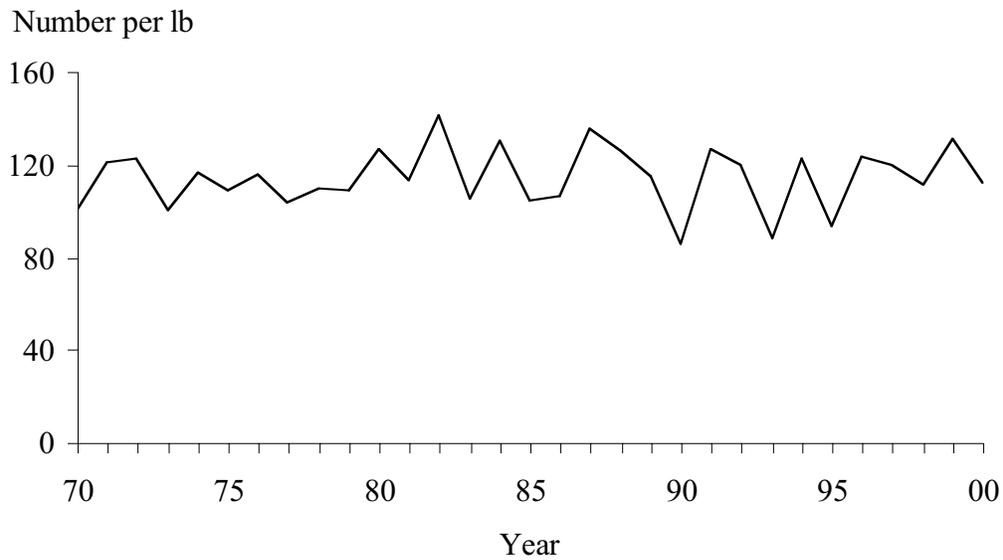


Figure D-5. Average count-per-pound (catch-weighted) of Oregon shrimp landings, 1970-2000.

First, pink shrimp are short-lived and begin breeding at age-one. They are also protandrous hermaphrodites, meaning that individuals change from male to female as they age. Pink shrimp have the ability to alter the age of sex change, depending on age structure of the population. When older shrimp are scarce, some age-one shrimp change into females, maintaining a balanced sex ratio and allowing some successful reproduction even when the population has been greatly reduced. Females annually produce approximately 1,000 to 5,000 eggs, depending on their size. There is also some evidence that as shrimp have been "fished down" in the 1970's growth of surviving individuals increased, compensating somewhat for fishery removals.

Management/Regulations

This fishery is managed using consistent state regulations in Washington, Oregon and California, rather than through a federal fisheries management plan. The principal management regulation is a maximum count-per-pound (CPP) rule specifying that all landings in excess of 3,000 pounds must have an average count of 160 CPP or lower. In general, there are no catch quotas or HGs and trawl mesh size is unrestricted. One exception is that a minimum codend mesh size of 1-3/8 inches between the knots is required in California waters. Most coldwater shrimp fisheries throughout the world are managed using a minimum codend mesh size and a catch quota in combination. So, by world standards, this fishery is managed very liberally. To support this management approach, the fishery is monitored closely for signs of overfishing. This requires the steady collection and analysis of logbook and market sample data. As a result of this continued effort, an excellent long-term database exists for pink shrimp. If fishery-driven declines in recruitment start to occur, they should be readily detectable.

Another important management regulation in this fishery is a limited entry system put in place in the mid-1980s in Oregon, and more recently in the other two states. Taken together, these systems limit the total number of vessels that can participate full time in this fishery. While this is a good start towards curtailing potential growth in the fleet, these systems still leave room for increases in total effort. This is because the total number of permitted vessels far exceeds the current full-time fishing fleet, and upgrades to larger vessels are still allowed. Accordingly, this is still a fishery where, under the right economic conditions, overfishing is a distinct possibility.

Critical Issues/Research Needs

Limiting Fishing Mortality

The principal biological issue that needs to be addressed for this fishery is how to hold down fishing mortality, should the need arise. At present time, the fishery is limited mostly by the market for shrimp. It's possible that this fishery will continue to be healthy with no further constraints. However, if steady growth in ex-vessel prices occurs, causing major increases in fishing effort, it could become necessary to place some limits on this fishery. At present time, no consensus exists on the best way to accomplish this.

A related problem is that it has proved very hard to measure fishing mortality in this fishery. The methods developed to do this rely heavily on assumptions about the average efficiency of shrimp nets. In turn, a better estimate of average efficiency would improve our knowledge of fishing and natural mortality rates of shrimp.

Net Economic Yield

A related issue in this fishery is how to maximize net economic yield. At times, large volumes of small shrimp entering the market depress average ex-vessel price. Some fishermen have suggested that by requiring a lower CPP, or by implementing a minimum codend mesh regulation, quality of product could be improved and a higher price obtained, increasing economic yield. Most fishermen support the concept of striving for quality, but feel the industry should do this on its own. Previous work suggests that natural mortality rates are too high in this species to gain yield by increasing age-one escapement. However, these studies did not incorporate a higher value for larger shrimp.

ODFW is currently involved in a cooperative study with Oregon State University (funded by Sea Grant) to develop a bio-economic model of the shrimp fishery. This model can then be used to determine how to maximize net economic yield. An example of how this model could be used is to determine if a lower CPP regulation, or a change in mesh size, would change the economic value of the catch.

Bycatch

Last, but not least, bycatch is a major issue in this fishery. While pink shrimp is a very clean fishery by world standards recent changes in the groundfish regulations have great potential for increasing discard. ODFW's approach in this area is to work in partnership with industry to test and improve methods for minimizing bycatch, focusing on approaches that complement, rather than interfere with, the process of catching shrimp.

As we approach 2001, the need for efficient fish excluders in this fishery is increasing. Shrimp industry leaders have appealed to the fleet, asking for full voluntary use of excluders to reduce canary rockfish bycatch. For 2001, ODFW is planning several research projects that should help develop improved fish excluder technology. One project is aimed at developing and testing an electronic device for measuring shrimp trawl footrope height above bottom. This is a critical parameter for evaluating the shrimp catching efficiency of an individual net, allowing a more accurate determination of shrimp loss caused by the excluder. We also hope to test one new excluder design and some modifications to existing excluder designs this year.

DUNGENESS CRAB

Background/History

The Dungeness crab fishery in Oregon has a long history, with catch records going back to 1889. The management strategy for Dungeness crab is derived from these records, the characteristics and conduct of the fishery and our knowledge of crab life history. Management of a single-species fishery such as this should be a simple matter compared to a multi-species fishery, especially with the biologically conservative regulations that currently exist. Nevertheless, the Dungeness crab fishery has changed from a simple fishery to one with complex issues. Over the past 35 years, the fishery has been in transition. In recent years, fishery issues have gone beyond biology and state boundaries, and are primarily social and economic in nature.

The west coast Dungeness crab fishery off Washington, Oregon, and California is managed as a “recruitment” fishery; all adult male crab above a minimum size are available for harvest. Specific seasons are established. There are no quotas. This is commonly known as “3-S” (size, sex, season) management.

Oregon regulations insure continuing levels of annual reproduction, protect all females from harvest and adult males below the commercial minimum size of 6.25 inches, thus allowing for two or more years as breeding adults prior to recruiting to the fishery. Season regulations are designed to insure that most harvest occurs well after or before major molting periods, allowing newly-molted soft-shell crabs of legal size (“recruits”) to “harden-up” and reach an acceptable meat content. West Coast harvest strategies traditionally close the season during the period when the majority of adult male crabs are “soft-shelled”, in order to optimize yield from the resource. However, both Oregon and Washington seasons extend into low production level summer fisheries (July-August) when molting activity and soft-shell abundance is typically high.

Oregon Dungeness crab season regulations have been an active issue since the early days of the crab fishery. As early as 1911, there were regulations that recognized the months of July, August and September as the time when crabs were in poorest condition. In 1948, season closure and opening criteria were established on the basis of at-sea sampling. When more than 10 percent soft-shells were present, the season was closed. Since then, fixed season dates have been established, modified and extended. In 1984, following several years of high-volume fishing on low quality (soft) crabs at the end of the season, the Commission set the season closure date to the current August 14. Late-season (“summer”) landings and effort declined for several years but soon began to increase. In 1992, the Commission enacted a summer harvest quota, requiring the Director to close the season if landings after May 31 exceed ten percent of the previous December through May total landings. This regulation was effective with the 1993 summer season. The ten percent limit was approached but not exceeded during the 1993-1998 summer seasons.

In 1999, the Commission enacted additional summer fishery regulations to discourage the potential for expanding soft-shell crab landings, higher levels of fishing effort and increased sorting and associated mortality. Regulations restricted landings to 1,200 cumulative pounds per vessel per week during the period beginning with the second Monday in June through August 14. Total landings during this period were limited to a catch ceiling of 7 percent of the previous December-May harvest. This action preserved a modest historic low volume summer fishery directed towards available hard-shell crab and coastal consumer markets.

Catch

Catch records date from 1889, but there is no way to verify their accuracy up to about 1946. For many years crab were landed by the dozen and then converted to pounds using 25 pounds to the dozen. The actual weight in pounds was recorded in about 1963 and along with more improvements in 1977, provided more accurate landing statistics.

The catch exceeded one million pounds for the first time in 1933 and showed a steady increase up to 1948 when ten million pounds were landed. Crab landings have fluctuated since then, with an annual average of 9.0 million pounds (Figure E-1).

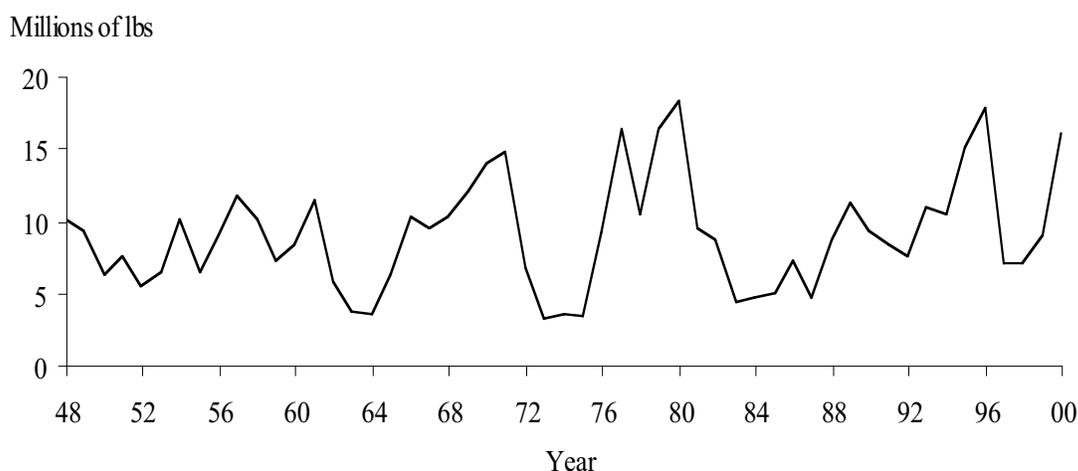


Figure E-1. Oregon ocean Dungeness crab harvest, 1948-2000.

For many years, the peak of the landing for each season occurred from March to May. By 1960, the peak months were December and January. During the last ten years, over 65 percent of the annual catch have been landed by the end of January.

Effort

Effort can be measured by the number of boats, pots, or fishing trips. The number of boats and pots shows a dramatic change through time. Through 1968, fewer than 100 boats were in the crab fleet (except for five years, 1960-1963, 1965). Since 1969 there has been a steady increase in the number of boats to over 500 in 1980 (Figure E-2). Over 300 have fished each year since 1973. The number of boats does not correlate well with catch, although for the record years of 1977 through 1980, the number of boats increased substantially. Catch decreased in the early 1980's while the number of boats remained high.

The number of pots fished has also shown a marked increase from 20,000 in 1960 to 100,000 in 1979, then varied from 85,000 to 151,000 pots (a record level) during the years of 1979-1990. Since start of the limited entry program (1995) a range of 113,000 to 141,000 pots (minimum number) have been estimated in the fishery based on preseason vessel hold inspections and interviews. During the 1980's vessels averaged about 250-300 pots per boat, increasing to about 400 pots per vessel during the last four years (Figure E-3).

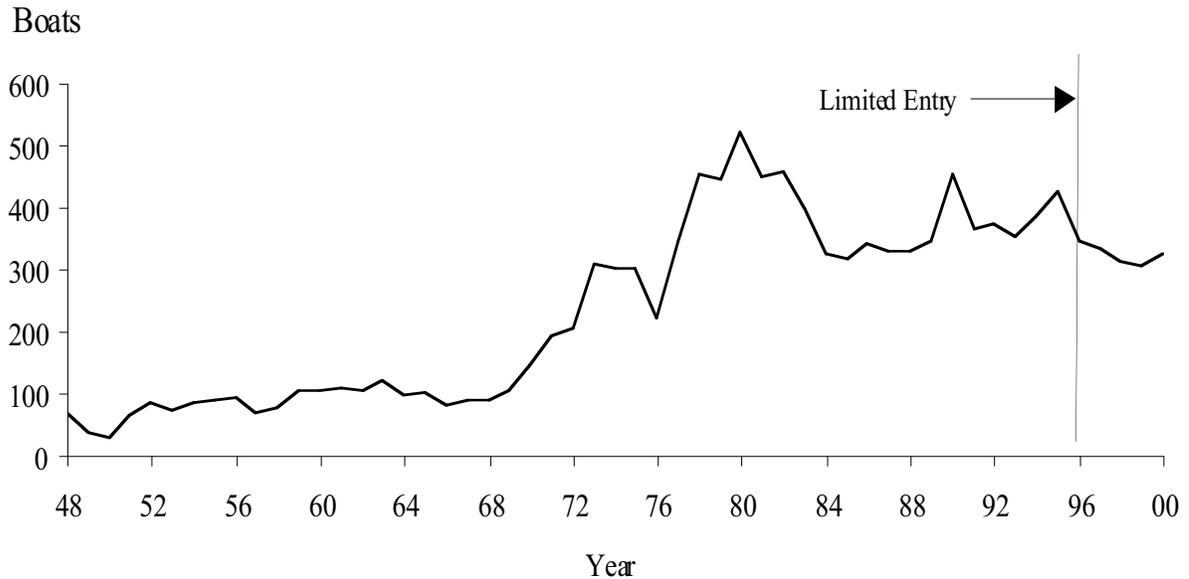


Figure E-2. Oregon ocean Dungeness crab fishery effort; number of boats, 1948-2000.

Although some boats have landed large quantities of crabs, the average annual pounds landed per boat have dramatically decreased since 1970 (Figure E-4).

Another measure of fishing effort is size and mobility of the vessels. Thirty-five years ago most of the crab vessels were small to medium size, but in more recent years this composition has changed towards larger vessels. Newer, larger and better-designed vessels have the capacity to transport hundreds of pots at one time, hold more crab on board, fish in marginal weather and sea conditions, and can operate over much larger areas of the ocean. With the influx of larger vessels, efficiency also increased. Multi-day trips, sophisticated electronics, larger hold capacity, and the advent of deck lights, has made ocean commercial crabbing a 24-hour-a-day operation for much of the fleet.

Price

The Oregon ex-vessel price (paid to fishermen) for crab fluctuates widely depending on crab abundance and market conditions. Monthly minimum, maximum, and average prices for crab have been compiled since 1978. Several trends are evident. In general, there has been a clear increase, although price was low when production was high. There is also a general trend showing lower prices early in the season (December-January) with increases as the season progresses through late winter and into the Spring-Summer portion of the fishery, and crab volume decreases. The high prices at the end of the season (late Spring-Summer) reflect small specialty and/or consumer markets that individual crabbers have developed. Prior to 1999, low prices late in the season usually reflect a high volume of poor quality crab.

In the past two commercial seasons (1998-99 and 1999-00), starting price (December) ranged, on average, from \$1.55 to \$1.74 per pound (ex vessel), increased to \$2.30 to \$3.00 during the late winter-early Spring (February-June) and dropped back to about \$2.00 to \$2.50 in summer (July-August) following the trends noted above.

Thousands of Pots

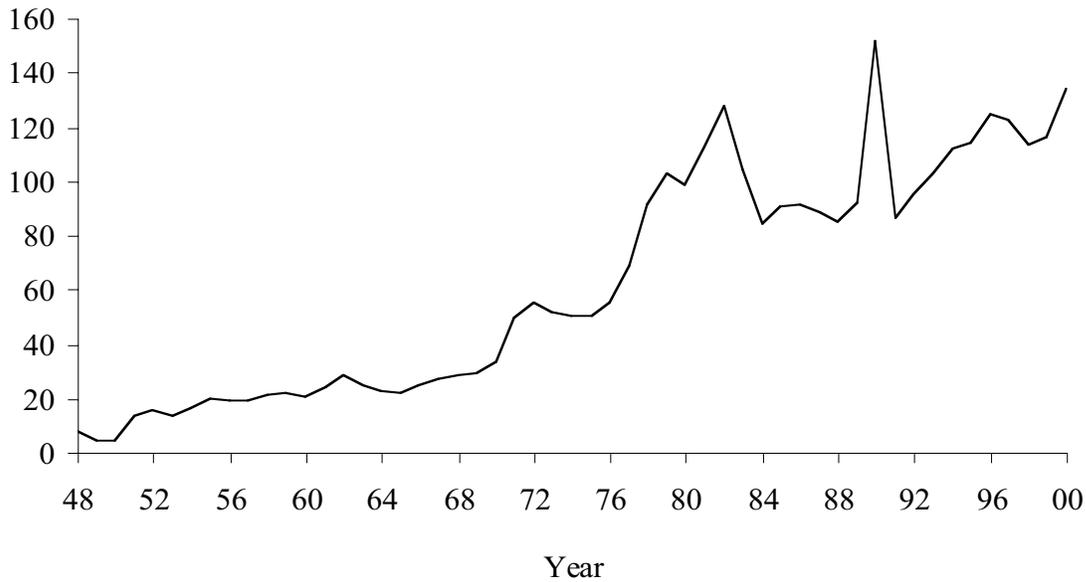


Figure E-3. Oregon ocean Dungeness crab fishery effort; number of pots, 1948-2000.

Thousands of lbs

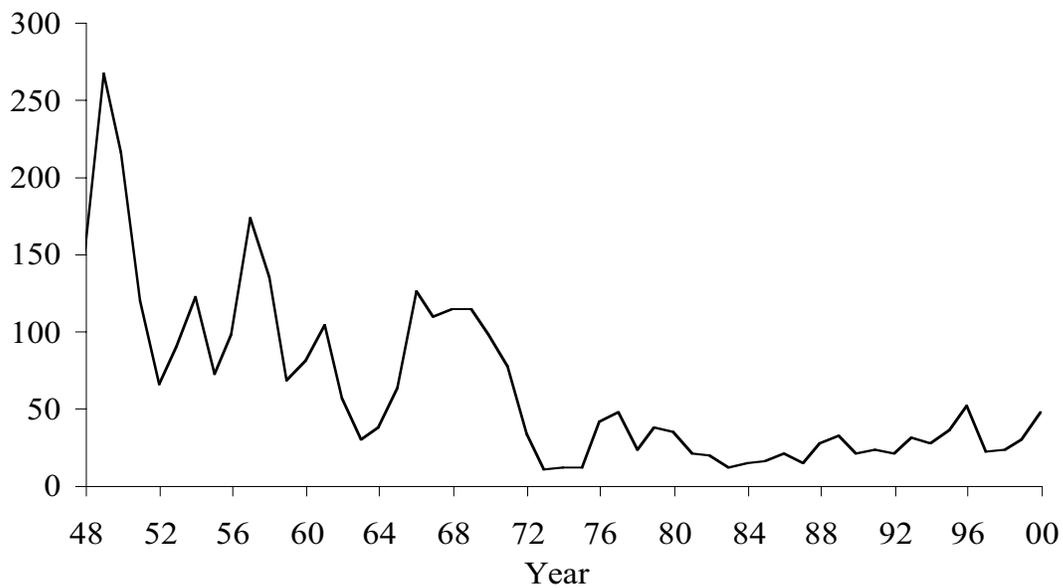


Figure E-4. Oregon ocean Dungeness crab fishery pounds per boat, 1948-2000.

Management/Regulations

Season

Prior to 1948, the season was open all year and included female crabs. Summer and fall closures and banning female crab catch was initiated in 1948-1949 when the legislature created a state agency to manage commercial fisheries. From 1950 through 1963 the open season south of Cascade Head was from November 15 to August 15, while north of Cascade Head the open season was December 15 to September 15. From 1964 to 1993, the season in both areas was December 1 to August 15 with some extensions.

In 1992, rules were adopted allowing the Director of ODFW to implement a pre-season delay and area management to avoid harvest of soft-shell crab. In October of 1993, the Oregon Fish and Wildlife Commission (Commission) adopted rules requiring harvesters to wait for 30 days before fishing an area opened after a season delay, if harvesters previously fished an open area on or about December 1. In December 1994, this option was exercised for the first time, with the season south of Cape Falcon opening on December 1 and the season north of Cape Falcon opening on December 16. In December 1995 the season was again delayed due to soft-shell crab with the season north of Cape Falcon opening December 16. The season has opened coastwide on December 1 since 1995 until the current 2000-01 season, when the season north of Cape Lookout was delayed until December 16.

Preseason Crab Quality Testing

State imposed season delays have resulted from crab quality problems as identified in preseason crab quality testing conducted by the ODFW, Marine Resources Program since 1992. Prior to the 2000-01 season, testing took place only in the area north of Cascade Head, mostly in the Tillamook Head to Columbia River sub area. In October 2000, the Commission, accepted a staff plan to extend preseason sampling to the remainder of the Oregon coast prior to the 2000-01 season start in December. At-sea sampling at selected sample sites coastwide from late October-November now collect crab to determine meat content (“pick out”) percentage relative to desired industry standards. Sampling also notes crab condition based on shell hardness, another factor indicating crab are well past the summer molt period, hardened up, and full of meat.

Fishing Gear

The Oregon Administrative Rules define crab pot construction requirements for use in the commercial fishery. Pots are the conventional gear and have been the dominant gear type used over several decades. Crab pots (or rings) are the only legally defined gear at this time. In the recent past, other gear such as longline crab pot systems that secure several pots on a longline instead of individually buoyed pots, was experimented with and utilized during commercial seasons in the 1980’s and early 1990’s by some fishermen. They wanted to gain better access to crab in deeper waters and to fish in areas of heavy commercial vessel traffic. Longline gear was partially prohibited in the ocean Dungeness crab fishery (inside of 40 fathoms) in October 1994 and outside 40 fathoms after August 15, 1997.

Harvest Guidelines

Historically, harvest guidelines or quotas have not been set in the general “Winter-Spring” portion of the Oregon ocean fishery. In 1992, a harvest “catch ceiling” was adopted by the Commission for the summer (June-August) fishery and was set at ten percent of the December through May harvest. Its intent was to prevent high fishing effort and catch on soft-shell crabs in the summer period. This regulation was amended by the commission for the 1999 fishery. A

harvest ceiling was reduced to only seven percent of the previous December-May catch and a vessel's landings were limited to a cumulative 1,200 pounds per week from the second Monday in June through the end of the season on August 14. Since implementation, the summer fishery has not attained either harvest guideline.

Preseason Gear Placement

Beginning in 1960, intense competition at the beginning of the season created conflicts between big and small boats. Skippers of smaller boats sensed a disparity between themselves and the larger boats. Skippers of small boats stated they needed a pre-season pot setting time to avoid being forced to take more chances in order to compete for space to fish. This conflict resulted in a regulation enacted in 1967 to allow gear to be set before the season opened. The reasoning was that the extra time would give the smaller vessels parity with the big boats at the start of the season. Since the big boats also set gear early, they still have an advantage in selecting fishing grounds.

Regulatory Bodies

The PSMFC Tri-State Crab Committee was formed in 1990 to assist the states of Washington, Oregon, and California and the crab industry in achieving consensus on several issues related to crab management. Consistency in seasons, limited entry programs, preseason crab quality testing, and management of soft-shell crab were committee objectives.

In September 1993, Washington, Oregon, and California state directors signed a memorandum of understanding (MOU) regarding management of the Pacific Coast Dungeness crab fishery. In the MOU, the directors agreed to take whatever measures necessary to implement Tri-State Dungeness Crab Committee recommendations for managing soft-shell crab problems at the beginning of the season. The agreement was updated in 1996.

The Dungeness crab population has shown cycles in abundance. Current fishery management practices are sufficient to protect reproductive capability of the stock. Issues facing the Dungeness crab fishery are more economic and social than biological. The dramatic increase in effort in the fishery has fostered keen competition for space and crabs, and considerable unrest among fishermen and processors. The ex-vessel price of crab increased dramatically in the late 1970s. A few times in the 1980s, competition and early season fishing adversely affected price and markets by glutting the market, sometimes with soft crabs. A coastwide pre-season crab quality testing program for the fishery and the OFWC action (1999) limiting weekly catch in the summer months have helped control this problem.

Additionally, under the revised Magnuson/Stevens Sustainable Fishery Act, authority was given to the West coast states to enforce ocean Dungeness crab regulations outside of state territorial waters, within the Exclusive Economic Zone (EEZ); known as Public Law 105-384 (1998). In other actions, recent federal court decisions entitle tribal nations access to shellfish and finfish resources off of portions of the State of Washington. Regulatory authority was needed by the State of Washington, in particular, to implement joint domestic and tribal management plans. The authority extends to all aspects of the crab fishery management except state limited entry programs.

For the most part, the states of Washington, Oregon, and California, continue to manage their own ocean commercial (and sport) Dungeness crab fisheries under the laws, agreements, and court decisions as noted above, through their respective fish and wildlife commissions and/or legislatures.

Limited Entry

Washington and California adopted limited entry systems in 1995. After Oregon Senate Bill 911 failed during the 67th Legislative Assembly, House Bill 3094 was successfully introduced during the 68th Legislative Assembly. Limited entry for the ocean Dungeness crab fishery in Oregon became effective December 1, 1995. Approximately 444 vessels make up the current Oregon limited entry fleet.

Critical Issues/Research Needs

Pot Limitation Systems

Limited entry programs in Washington, Oregon, and California historically did not place limits on the amount of crab gear fished. West coast states (Alaska and Washington) and British Columbia have actively considered and adopted pot limits in several ocean commercial Dungeness crab fisheries in recent years. Washington was the most recent enacting their multi-tiered crab pot limit program with the 2000-01 fishing season. Multiple factors have driven pot limitation discussion including: (1) Indian treaty sharing (Washington), (2) overcapitalization of pots in fisheries, (3) economic destabilization in other fisheries, (4) increased “derby fishery” conditions and resulting shorter seasons, (5) safety considerations in the intense winter fishery, (6) West Coast groundfish disaster declaration and strategic planning to reduce fishery and capacity bringing new vessels and gear into crab fisheries, (7) effort transfer from Alaska tanner/king crab and groundfish fisheries, and (8) the industry’s fear of further “industrialization” where larger capacity vessels take more of the product during increasingly shorter seasons.

Although Oregon has considered legislative bills to develop pot limits (1999), these attempts failed. With final implementation of an ocean, non-treaty fishery pot limitation system in Washington (December 2000), Oregon’s pot limitation discussion has escalated among Oregon fishermen for a corresponding Oregon program. This is particularly acute and important to north coast Oregon crabbers in the Pacific City/Garibaldi/Astoria/Columbia River border area where high levels of crab gear have traditionally flowed back and forth between Oregon and Washington fishing grounds. Now, with a WA pot limitation, Oregon waters (both state and federal) and fishery are at a disadvantage with excess Washington gear being “dumped and fished” in the “open” Oregon crab fishery creating a high level of pot gear in this area. Fishermen from the remainder of the Oregon coast also see this as an important and immediate issue that needs discussion.

Overall, active pots in the Oregon fishery has climbed almost continuously since 1990 and reached an estimated 141,000 pots (minimum number) during the 2000-01 season, after a 15% increase (to 134,000 pots) between the 1998-1999 and 1999-00 season.

The ODFW staff has discussed pot limits with the Commission on several occasions; May and October 1999, and again in October 2000. The Commission (October 2000) gave staff direction to initiate a discussion with the Oregon crab industry on this issue, recognizing the Washington pot limitation system had been implemented. The Marine Program staff, Oregon Dungeness Crab Commission (ODCC), and Oregon crab industry are now actively discussing this issue. A discussion with fishing industry and Commission will include: (1) a mail out questionnaire polling all 444 Oregon crab limited entry license holders, (2) formation of an industry advisory group, (3) implement a series of public meetings with this advisory group and crab fishermen at coastal ports to evaluate and develop options for industry and Commission discussion, (4) a briefing to the ODFW Commission in near future, and (5) if ODFW and a

majority of fishermen can progress on this issue, present options to the Commission for consideration.

Marketing

Many individuals in the crab industry would like to spread out the yearly catch of crab over several months to improve marketing prospects and increase value to fishermen. This must be balanced by the fact that crab are in the best condition in the winter months. While the summer fishery limitations (seven percent of December through May harvest and a weekly 1,200 landing limit) discourage summer soft-shell crab landings, there is no definite mechanism in place to insure longer balanced production levels during the winter-spring period of the fishery.

Bay Crab Fisheries

Another area of concern is the potential for effort to increase in the commercial bay crab fishery. Even though there is coastwide limited entry for the ocean fleet, there has not been a shift in effort towards Oregon's open access bays and estuaries. Product availability and limits on gear and season appear to provide sufficient constraints on this open access fishery. Because the bay crab resource is shared with sport fishers, potential for user group concerns is a concern and is actively discussed. Additional sport users, guides and charter boats for hire continue to increase sport effort in certain popular bays and in the ocean near harbors. A data gap exists in that staff has no good way to detect trends in the sport catch and effort, as there has never been a routine census of statewide sport crab catch and effort.

Ocean Sport Crab Fisheries

Oregon's ocean sport crabbing activities continue to increase as a popular recreational activity as anglers seek a variety of fishing opportunities. There are several issues involving this fishery depending on a fishermen's involvement. Recreational crabbers complain that the larger amounts of commercial crab gear placed in nearshore waters hinder their activities. Commercial crab fishermen voice complaints that the increasing sport catch, and smaller minimum size limits in the recreational fishery are impacting the economic potential of their historic fishery. The Marine program staff began a sport creel program to assess the level of ocean catch coastwide with the 1999 summer fishery and continued to collect data in 2000. This survey will be continued in 2001. Available information will be summarized in a report in the near future.

SEA URCHIN

Background/History

The sea urchin fishery is one of Oregon's youngest fisheries to develop into a significant industry. Before the Oregon industry had really developed, the 1987 legislature created a restricted participation system. Stated goals of the legislation are "...to provide a sea urchin commercial fishery with optimum profits to those engaged in the fishery and to prevent a concentration of fishing effort that would deplete the resource" (ORS 508.760).

The first landings of red sea urchins were made in 1986 and rapidly rose to a peak of 9.3 million pounds in 1990, declining to a low of 248,283 pounds in 1999. Landings for 2000, however rose to 966,287 (Figure F-1). During the period form 1988 to 1990, the average catch per trip was at its peak (approximately 2,300 pounds per trip), but has since leveled out and in 2000 was 1,300 (Figure F-2). Rapid development of this fishery was aided by a number of factors, particularly strong markets and favorable exchange rates in Japan, and developed fisheries in California, Washington and British Columbia. Oregon's red urchin stocks thus attracted an efficient industry in just a few years. Purple urchin harvest began in 1992 and reached a high in 1994 of 190,218 pounds. Purple urchin harvesting has been limited by quality and marketing fluctuations, and will probably be very seasonal. An additional, special permit process is used to control harvest areas and quantities.

Landings and catch-per-unit effort reductions reflect both the fishing up process and reduced abundance as well as effort reductions due to permit attrition. In addition, marketing problems have plagued the industry since 1996. In 1997-98, Premium Pacific Seafoods of Port Orford shut down the sea urchin processing portion of its facility. The company still purchases urchins for transport to processing plants in California and Washington. Currently, most divers are involved in the Oregon commercial live fish fishery as their primary source of income, diving for urchins only under the best ocean conditions and when prices are high enough to make the considerable effort worthwhile.

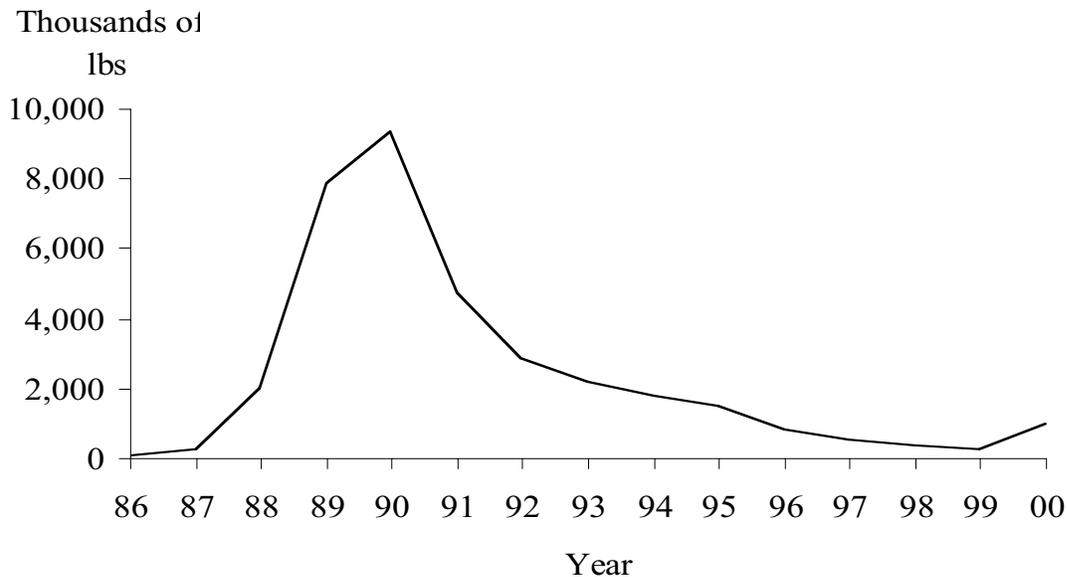


Figure F-1. Oregon red sea urchin harvest, 1986-2000.

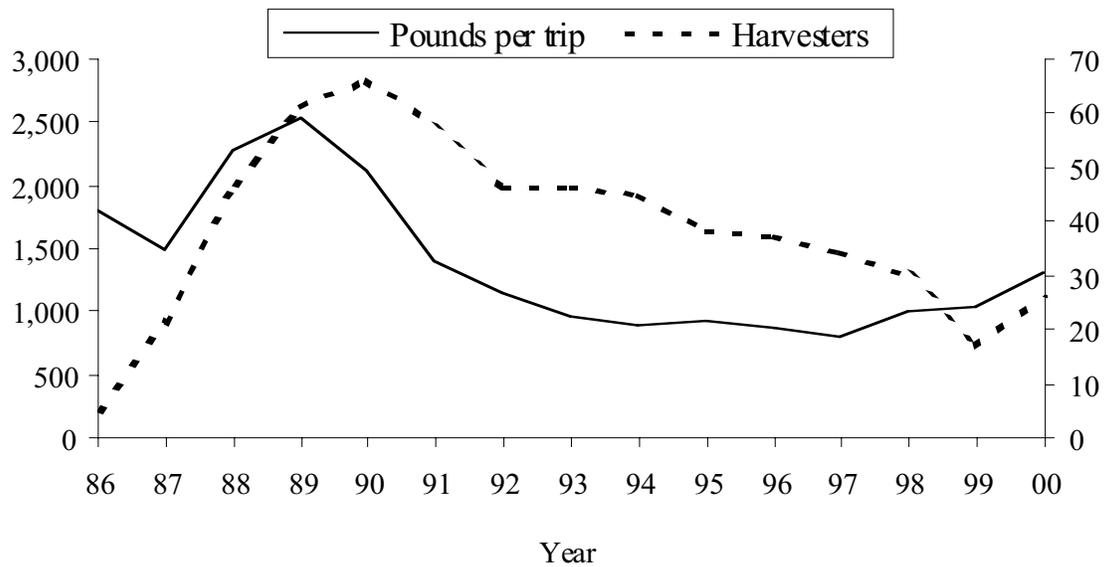


Figure F-2. Oregon red sea urchin average pounds per trip and number of harvesters, 1986-2000.

Management/Regulations

1988

The Commission developed the legislatively mandated limited entry program for the sea urchin fishery to: 1) create a management system that facilitates optimum resource harvest and responsible fishery management; and 2) produce optimum economic and social benefits at a reasonable cost to the people of Oregon. Elements of the program included:

- * Maximum of 92 non-transferable permits
- * 20,000 lb renewal requirement every two years
- * Lottery for unissued permits

Other regulations included:

- * three-inch minimum size limit, ten-foot minimum harvest depth, a logbook requirement, and a maximum of two divers in the water per boat

1989

In the spring, the Commission reviewed commercial sea urchin regulations. The Commission took no action, but directed staff to move in a conservative direction to analyze options to control effort due to concerns of economic overharvest of sea urchins. In the fall, the Commission made the following changes:

- * Set target number of permits to 46, allowed reduction through attrition
- * Changed renewal requirement to 20,000 lb annually
- * Restricted the number of non-permitted people on a boat to two
- * Allowed medical transfers of permits with a two-year time limit for transfers

1990

The Commission established 1,000-ft buffer zones closed to urchin fishing around three major sea lion rookeries from May 1 through August 31 after the NMFS listed the Northern sea lion as threatened under the federal Endangered Species Act (ESA). Industry cooperated with ODFW in maintaining buffer zone markers and educating boat operators about need to minimize disturbance of sea lions.

1991

ODFW evaluated the effects of increasing the minimum size of harvest for red sea urchins after industry raised concerns that urchins were being overharvested economically. The Commission made the following changes:

- * Increased the minimum size to three-and-a-half inches, with a tolerance of 100 urchins between two and three-and-a-half inches
- * Established a two-inch minimum size limit for purple urchins with a special harvest permit provision to allow for controlled harvests and to aid in assessing biology, availability, and distribution of purple urchins
- * In addition, changes were made to the medical transfer rules which specified total allowable harvest by a transferee and a review of each transfer after 90 days

1993

The 1993 legislature mandated a comprehensive review of all limited entry programs in Oregon (Senate Bill 938). As a result of this unfinished process and at the request of the urchin permit holders, the Commission took action by conference call in March 1994 to suspend the lottery for unissued permits below the 46 permit ceiling until the legislative permit review is completed.

1995

Two subtidal research reserves were added to complement the existing Whale Cove Research Reserve. In addition, a seasonal closure from May 1 to October 31 at Orford Reef was established

1996

As a consequence of SB 938 during the 67th Legislative Assembly and HB 3444 during the 68th Legislative Assembly, all state limited entry programs were reviewed and updated. The Legislature gave the Oregon Fish and Wildlife Commission direction to revise permit numbers for the urchin fishery. Beginning in 1996, the Commission set the permit numbers to 30 and instituted a system whereby permits could be purchased and combined on a 3 to 1 basis to encourage reduction of permits. Permits would become freely transferable once the target level of 30 permits was achieved. The permit renewal requirement was reduced to 5,000 pounds of urchin landings.

1999

Permits reached 30 at the end of 1998 and became freely transferable. The medical transfer provision was eliminated. In 1999 several permit holders that were unable or unwilling to make the minimum 5000 pounds required to renew their permits, exploited a loophole in the transfer regulations. Permits were transferred to spouses or relatives with the expectation that the permit would be transferred back to their original holders in the following year. In 2000 the permits were transferred back to their original holders, effectively avoiding the 5000-pound landing permit renewal requirement for two years.

2000

Landings totaled 966,287 pounds, up dramatically from the 248,283 pounds in 1999, reversing a nine-year trend of declining harvest (Figure F-1). Urchin divers report that urchins are once again abundant at Orford Reef, possibly due to depressed fishing efforts and good recruitment.

Critical Issues/Research Needs

Markets

Market conditions have recently deteriorated with the near collapse of major sectors of the Asian economy-affecting dollar to yen ratios. In addition, urchin roe quality has declined during recent El Nino events. Kelp production has been poor since 1990, but is making a slow recovery.

Harvest Management

Recruitment has been good but growth is poor along the Oregon coast. Much of the urchin population is below the legal size limit. Older urchins seem to have poor roe quality. As mentioned above, an optimum number of permits have been achieved due to recent Legislative and Commission action. These factors and the reduced amount of fishing effort associated with them have diminished the need to implement additional harvest management measures, such as quotas.

Inventory

We need to continue monitoring abundance, recruitment and condition factors in key areas along the coast. The death of ODFW staff shellfish biologist, Neil Richmond, in a 1999 diving accident, cut short population studies at Orford Reef. Anticipated populations studies at Depoe Bay were not attempted.

Kelp abundance is being monitored annually in near or in important urchin beds along the southern Oregon coast where sea urchins are most concentrated.

Research

In the future, we need to conduct new research on the relationship of urchins to kelp habitat. We continue to support graduate research in cooperation with Oregon State University to determine the importance of sea urchin refugia to population health.

NEARSHORE REEF FISHERY AND HABITAT ISSUES

Background/History

Oregon is facing increasing pressure to utilize living marine resources of nearshore rocky reef areas. Much of the increase has resulted from a shift toward nearshore reef fisheries due, initially, to the dramatic decrease in traditional salmon harvest, and now to a reduction of traditional groundfish fishing opportunities. The West Coast groundfish fishery is now in a state of crisis. This crisis manifests itself differently in different segments of the fishery. Nearshore rocky reef environments comprise an area where fishing pressure continues to increase rapidly, stocks appear to be declining, and we have little information upon which to base management decisions. Public pressure to obtain the necessary information and establish credible conservation policy is growing rapidly. The Marine Resources Program is beginning a nearshore planning process in 2001 that will address near- and long-term management and research needs for nearshore reef fisheries.

This section discusses the interrelated issues concerning nearshore fisheries, reef habitat, and kelp beds.

Nearshore Fisheries

Our nearshore reefs are home to a variety of rockfish and other species that have supported stable sport and small commercial fisheries for many years. Recent decline in ocean salmon fishing opportunity has resulted in effort shifts in both fisheries. Many of these commercial harvesters have been excluded from federal limited entry fisheries and have had no option but to expand into the growing hook-and-line "open access" fishery. Figure G-1 shows trends in hook and line fishing trips since 1991. Rockfish and lingcod make up the majority of the hook and line catch (Figure G-2).

Fishers and processors seeking to add value to catch began delivering live fish in Oregon in 1997 and intensified activity in 1998 (Table G-1). In addition to cabezon, greenling, and lingcod, there is overlap with some rockfish species caught in the commercial live fish fishery compared to the recreational fishery (Figure G-3). Of particular concern is the recent development of a live fish fishery for black rockfish late in 1999 and in 2000.

Habitat

Bottom habitat is a vital component for life stages of many nearshore and offshore species. Management plans for reef species must incorporate a habitat component. There is very little information available on reef habitats. Recognizing this lack of information the Marine Resources Program has, for the last 10 years, been inventorying reef habitats and participating in resource management forums affecting or considering these habitats.

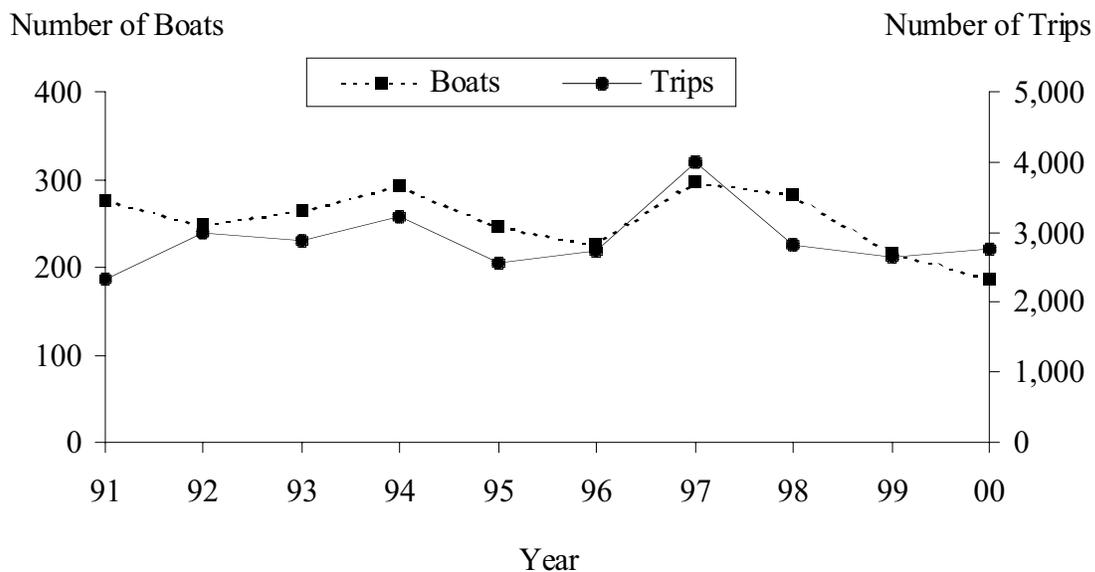


Figure G-1. Commercial hook and line or open access effort, 1991-2000. The open access fleet was defined in 1994. Effort beginning in 1994 does not include a few trips made using open access pot or bottom-longline gear types.

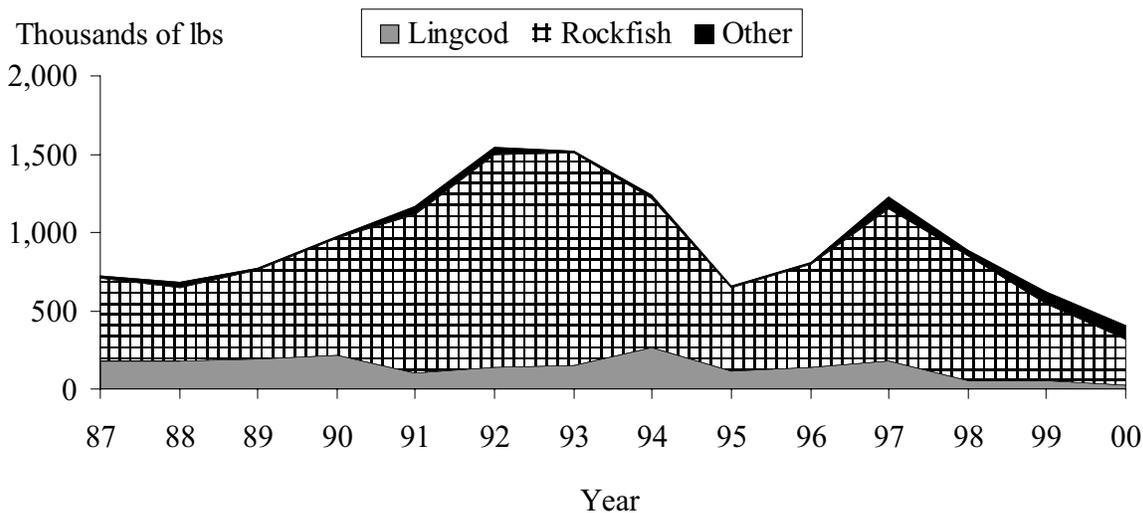


Figure G-2. Commercial hook and line landings of rockfish from open access fishery from 1987 through 2000. The open access fleet was defined in 1994. Catch beginning in 1994 does not include a few trips made using open access pot or bottom-longline gear types.

Table G-1. Oregon landings of live fish in pounds, number of boats, dealers and deliveries, 1997-2000.

	1997	1998	1999	2000
<u>Species</u>				
Cabezon	23,881	50,833	51,624	60,145
Greenling	19,404	19,996	51,359	39,751
Lingcod	39,061	22,133	30,649	20,190
Black Rockfish	333	339	1,412	17,171
Other Rockfish	7,908	35,743	62,374	40,283
Other Species	1,098	2,459	2,437	4,074
Total	91,685	131,503	199,855	181,684
Live Fish Boats	56	64	88	94
Live Fish Dealers	6	12	10	13
Live Fish Deliveries	691	1,051	1,878	1,856

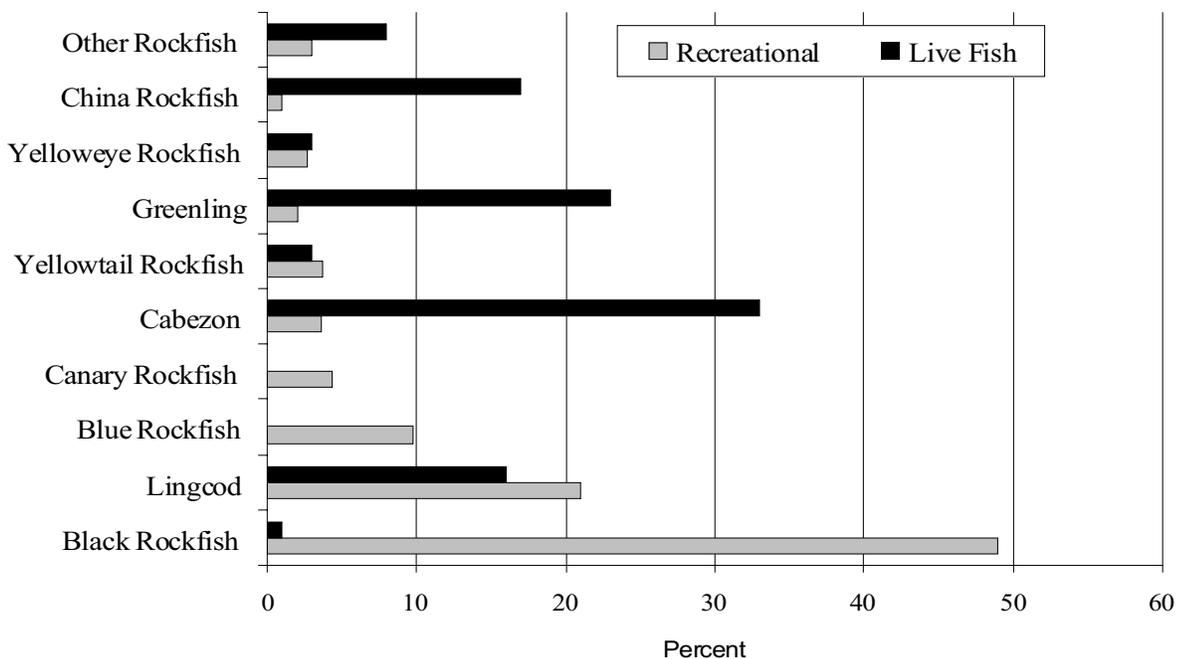


Figure G-3. Species composition of recreational fishery compared to commercial live fish fishery on Oregon's nearshore reefs. Values for recreational landings adapted from RecFin data, 1980-2000 and live fish landings adapted from ODFW landing data, 1998-2000.

Habitat (continued)

Characterizing and mapping reef habitat provides resource agencies with a tool to increase the effectiveness of fisheries management. Identifying and mapping habitats allows resource managers to predict and track organism abundance, and geographically subdivide human uses in an ecologically meaningful way. Knowledge of fish habitat serves a variety of purposes, including:

- 1) allowing for the partitioning or zoning of human uses according to habitat location,
- 2) designing and locating special management areas and marine protected areas,
- 3) improving stock assessments,
- 4) monitoring and protecting important habitat, and
- 5) improving research design.

Recognizing the importance of habitat in fisheries management, the 1996 reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act requires identification and consideration of essential fish habitat in fisheries and other ocean use decisions.

There are numerous types of rocky, soft sediment, and water column habitats across the continental shelf and slope that affect fisheries. Our work over the past 5 years has focused on nearshore (0 – 50 m water depth) rocky reefs and their associated kelp beds. In particular, we have concentrated on the benthic portion of the reefs, which provide habitat for several rockfish species, and other groundfish such as lingcod, cabezon, and kelp greenling.

Kelp

Over the years there has been sporadic interest from commercial ocean harvesters in harvesting the macro algae, *Nereocystis leutkeana*, commonly known as bull kelp. The only recent documented commercial bull kelp harvest in Oregon occurred from 1988 through 1992, when a company obtained a lease to harvest kelp in southern Oregon. They harvested a total of about 70 tons during that time. In 1996, the state issued an experimental harvest lease to a different entity for a 5-year period. The lease expired in 2000 with no harvest having occurred during the 5 years. This was due to low biomass in the early years of the lease and waning interests of harvesters and processors. As a part of the experimental lease process, ODFW conducted annual kelp surveys throughout the lease period.

Management/Regulations

Nearshore Fisheries

In the case of black rockfish, management could not wait for full understanding before action had to be taken. Declining stocks caused managers to reduce the sport bag limit and separate sport and commercial fisheries. If both fisheries had grown and increased their harvest from the same areas at the same time, stock impacts could be too quick and severe for managers to respond before serious depletions occurred.

One effect of black rockfish regulations was allocation between sport and commercial fisheries, and this is to be repeated among open access gears and/or fisheries for lingcod and other species of rockfish. If the fisheries grow, conflict may develop over space and access to fish on all reefs. Open access participants are allotted a portion of the HG for many species, and the quota may be further allocated among open access harvesters in the future. Participants in the open access fishery want more assurance they will be able to take their current quotas. Currently HG's apply

to all fisheries and tracking of open access harvest began in 1998 using allocation percentages established in the groundfish Fishery Management Plan.

Lingcod became a species of concern in 1998 and was deemed to be in an overfished state. Managers had a year to develop a rebuilding plan. Conservation measures implemented in 1999 affected the nearshore reef fisheries. An open access season for lingcod was established from April 1 through November in 1999 and users were limited to 250 pounds per month and in 2000, the season was ran from to May 1 through July, with a 400 pound per month limit. Recreational users experienced a bag limit reduction from three to two fish in 1999 and from two to one in 2000. Minimum size limit for both sport and commercial users was set at 24 inches.

Habitat

Our management activities include participating in policy bodies that establish plans for use and conservation of habitats, and taking actions to minimize adverse effects of development on marine habitat. Primary activities include participation in the Ocean Policy Advisory Council (OPAC) and on committees within the Pacific Fishery Management Council (PFMC). OPAC is a policy coordinating body representing state agencies, users, and general public with a role in managing Oregon's marine resources. It was established by the 1991 Oregon Legislature and is chaired by the Governor's Natural Resource Advisor. The Council develops state policy and management plans that address many ocean resource management issues. We also participate on the Habitat Committee and Marine Reserves Committee of PFMC. In addition to participating in these management forums, we provide Department input on all non-fishery ocean management issues that could adversely affect ocean resources under Department jurisdiction. This primarily involves providing input into activities such as dredging and dredged material disposal, and submarine fiberoptic cable installation. We also have primary responsibility within the Department for responding to ocean oil spills.

Kelp

The Division of State Lands (DSL) has jurisdiction over all submerged lands in state waters and the plants that are attached to those lands. DSL regulates kelp harvest by leasing portions of submerged lands for harvest. ODFW acts as the biological advisor to DSL in any actions that may affect public fish and wildlife resources and their habitats. For a complete summary of the history of the kelp lease, refer to ODFW's 1999 Status Report.

Critical Issues/Research Needs

Existing scientific information on nearshore reefs is inadequate to address current management needs. Data gaps occur at the population, species, and ecosystem levels. Examples of missing information include:

- stock assessments on most species of nearshore fish,
- adequate maps of the location, extent, and composition of reefs,
- reef-specific and coastwide demographic information on many of the harvested fish species,
- fishery monitoring on a reef-specific basis,
- fishery-independent population estimates, and
- a management model that accounts for both the biological and socio-economic characteristics of the nearshore reef fisheries.

Clearly, an integrated research effort is needed to develop information required to meet new management challenges. The information gaps listed above cover a broad spectrum of data types including populations statistics, habitat inventories, fishery-dependent information, fishery-independent information, economic data, and social information. The Oregon and California Coastal Zone Management agencies have initiated a tri-state process to develop a nearshore rockfish research plan that will be submitted to NOAA for possible funding beginning in the 2003 field season. A draft plan has been developed by representatives from Oregon, Washington and California fish and wildlife agencies, NMFS and sea grant staff. The final plan will be submitted in April 2001. If funded, the research will begin to address many of the information gaps listed above.

Nearshore Fisheries

Most nearshore rocky reef fish species are not formally assessed in the PMFC fishery management process. Managers, therefore, have no estimates of stock status to support management actions. Stock assessments require a suite of information, including data on fish removals and population demographics. One key piece of information required is fishery-independent population estimates, which is used to tune and verify population models. The continental shelf and slope fisheries rely on large-scale NMFS trawl surveys to develop fishery-independent population estimates. No such survey exists for the nearshore area. In addition, rocky reefs are particularly difficult to sample because of limitations to the type of fish sampling gear that can be used on rugged seafloor environments. Alternative survey options include hook and line sampling, visual surveys, and hydroacoustic surveys.

From 1995 through 2000, staff has been developing survey techniques to characterize rocky reef habitat and survey fish abundance on the reefs. Work has included mapping reefs with side scan sonar and multibeam sonar and developing visual and hook and line survey techniques that are habitat specific. These techniques, when applied on a coastwide scale, should be able to provide fishery-independent direct abundance estimates and information on changes in abundance over time. Staff is also beginning a project to survey young-of-the-year rockfish using beach seines with the goal of developing a recruitment index for some nearshore rockfish species.

Other challenges to managing the open access fishery include effective monitoring of landings of all species. It is extremely difficult to adequately sample this diverse and widely dispersed collective of gears and boats. Errors assigning fisheries overages records from limited entry permitted fisheries to open access emphasized the need to improve state and PacFin catch tracking systems to meet today's requirements.

Also, managers have been able to assign fairly liberal trip limits because open access operators have generally not caught them. If gear becomes more efficient and trips limits are taken more frequently, there will not be room for many boats in this fishery; will limited entry be necessary here, too?

In recent years, we have grown concerned about species' stock status and ability of the reefs to support increasing harvest. Researchers and managers have little understanding of fish community dynamics on these reefs. Effects of harvest on the full assemblage is not known; some work has begun on the nearshore reefs to determine whether fishing changes the fish community, but we have a long way to go.

Habitat

Current critical issues affecting marine habitat include the lack of scientific information upon which to base management decisions (discussed above), and a recent push by state and federal agencies to develop policies for marine protected areas. A marine protected area (MPA) is defined as an ocean area that is closed to all or some types of harvest or use. The primary management entities working on marine protected area policy include PFMC and OPAC.

Management entities considering marine protected areas have supported the principle that designation of protected areas should be guided by specific goals and be based on scientific information. Designing a MPA program for nearshore reefs will entail reviewing the entire suite of reef areas along the coast and selecting candidates based on selection criteria designed to achieve stated goals. To accomplish this, reef areas need to be classified, compared, and contrasted based on biological, physical, and socio-economic information.

The primary categories of information needed for MPA development include:

- 1) location, extent, and physical structure of the reefs,
- 2) biological characteristics of reefs,
- 3) oceanographic influences on the reefs,
- 4) biological linkages among reefs and other ocean areas,
- 5) fishery uses,
- 6) non-fishery uses,
- 7) human impacts of reefs, and
- 8) social and economic characteristics of individuals and coastal communities utilizing the reefs.

Each of these categories encompasses a number of data types, and the total range of data types covers a broad spectrum of availability, format, and accessibility. Some of the data types can be developed using existing information, while others require gathering new information. For example, existing fishery information can be synthesized to describe fishery use on nearshore reefs. Some of the biological characteristics of reefs, such as location of kelp beds, have already begun to be described, while others, such as characteristics of fish and invertebrate communities require collection of new data in the field.

Kelp

Though there is currently no apparent interest in harvesting kelp for commercial purposes, there is an increasing interest in kelp as a barometer of the health of the nearshore reef environment. The National Marine Fisheries Service is currently developing designations of "habitat areas of particular concern" as part of their efforts to identify essential fish habitat. The designation will require higher levels of protection for these areas, and kelp bed habitat will likely be one of the first "habitat areas of particular concern". In Governor Kitzhaber's *State of the Environment Report* kelp beds were classified as the primary indicator species for monitoring the health and status of the nearshore reef environment. ODFW now has five years of data in the time-series database of kelp bed dynamics, providing the only data set available on bull kelp beds in Oregon. This will be a necessary and valuable piece of information for federal and state fisheries managers as they begin to develop nearshore management strategies and rely on habitat protection as a management tool. In addition, if there is renewed interest in kelp bed harvest, the time series data set will be invaluable in designing an impact study and setting appropriate kelp harvest guidelines. ODFW plans to continue the annual kelp biomass estimates, provided adequate funding and staff time are available.

The data for the 2000 kelp biomass estimate have been collected, however the biomass estimate and comparative analysis is still in progress at the writing of this report. The 2000 kelp biomass

estimate will be available in a separate ODFW information report. A visual scan of the aerial photographs of the kelp beds indicates that the beds are neither as dense nor as extensive as they were in 1999. High density and extensive surface area of the 1999 beds were responsible for the largest biomass recorded to date, at 5 to 10 times higher than in the previous three years of our estimates (Figure G-4) (Fox, et al. 1999). We can speculate that the biomass for 2000 will be somewhat lower than in 1999 since both density and surface area appear lower. Fishermen familiar with long term trends on the nearshore reefs have speculated there will be a few years of low biomass following the dramatic growth of kelp in 1999.

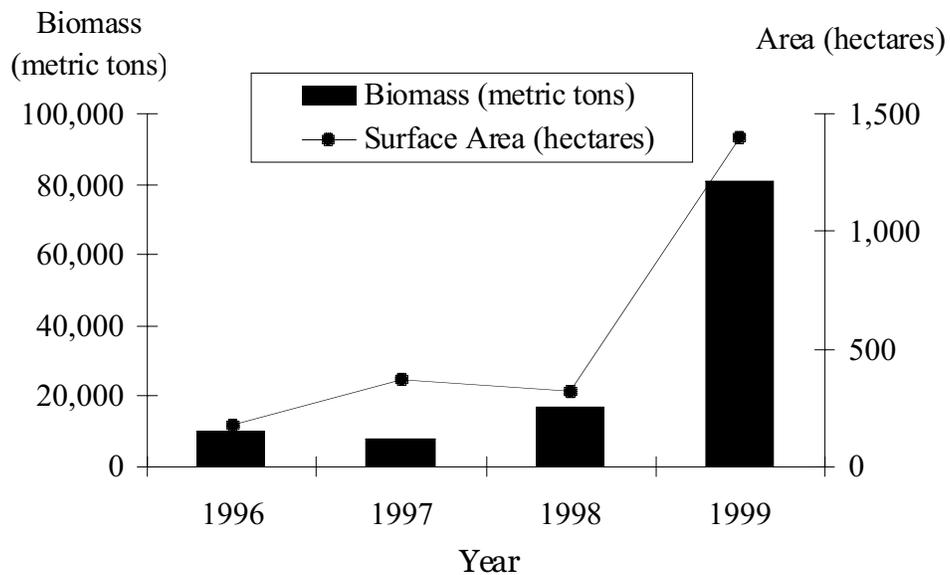


Figure G-4. Kelp biomass in metric tons and kelp bed surface area in hectares off the southern Oregon coast at Blanco, Orford, Redfish, Humbug and Rogue reefs.

BAY CLAMS

Background/History

Recreational

The number of shellfish harvesters participating in the Oregon recreational fishery was estimated to be approximately 100,000 in 1985 in a national survey conducted by the U. S. Fish and Wildlife Service. Assuming half of those harvesters are clam diggers and applying recent estimated Oregon dollar values to the catch, recreational clam digging in Oregon is estimated to be at least a 5 million dollar annual industry.

Commercial

Records of commercial clam harvest in Oregon go back to 1928, however, separation of razor clams and bay clams in the total harvest figures did not take place until 1941. The number of diggers participating and total pounds of bay clams harvested in 1941 was 131 and 214,000 pounds, respectively (Figure H-1). Comparable figures for 1999 were 18 diggers and 87,534 pounds. The ten-year average (1990-1999) is 94,497 pounds annually. The value of bay clams to the harvesters in 1999 was approximately \$50,000. Coos, Tillamook, and Nehalem Bays have shown the greatest commercial production over the years (Figure H-2). Gaper, native littleneck, and cockle clams have provided the greatest commercial bay clam harvest (Figure H-3).

Harvest methods for bay clams have changed dramatically over the years. Harvest through the 1950s was all by hand and in the intertidal areas. Some mechanical harvest using clam dredges was allowed in Coos and Yaquina Bays during the 1960s and again in the 1980s. It proved to be far too effective and destructive to the habitat, and the use of mechanical harvest was banned in 1985. Currently, the bulk of all commercial bay clam harvest is done subtidally using SCUBA. A minimal commercial take of clams comes from the intertidal areas by harvesters using rakes and shovels.

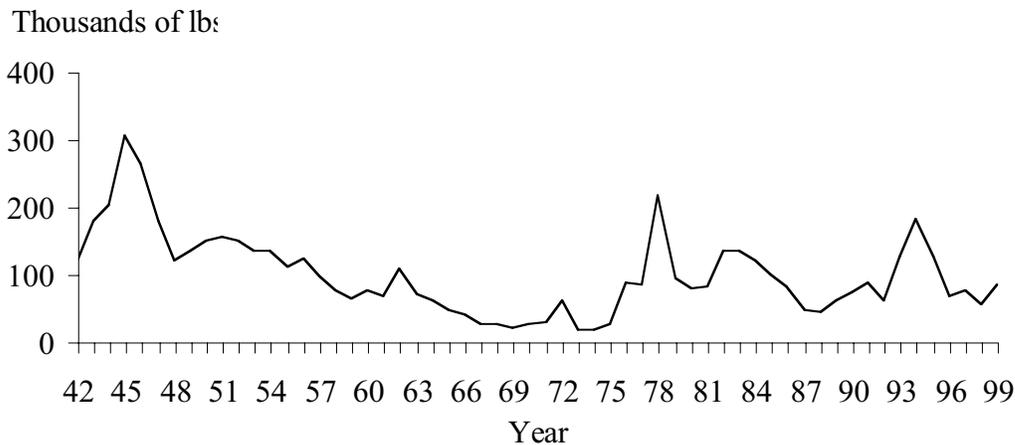


Figure H-1. Commercial harvest of bay clams, 1942-1999.

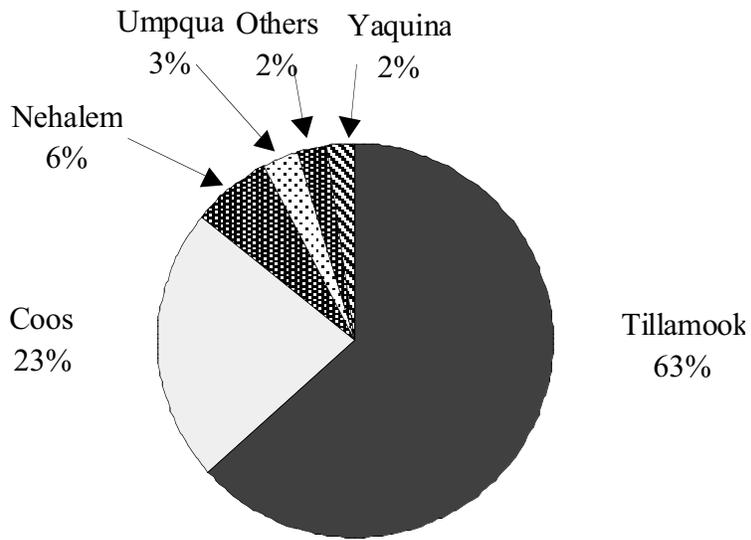


Figure H-2. Commercial clam harvest in percent by bay, 1989-1999.

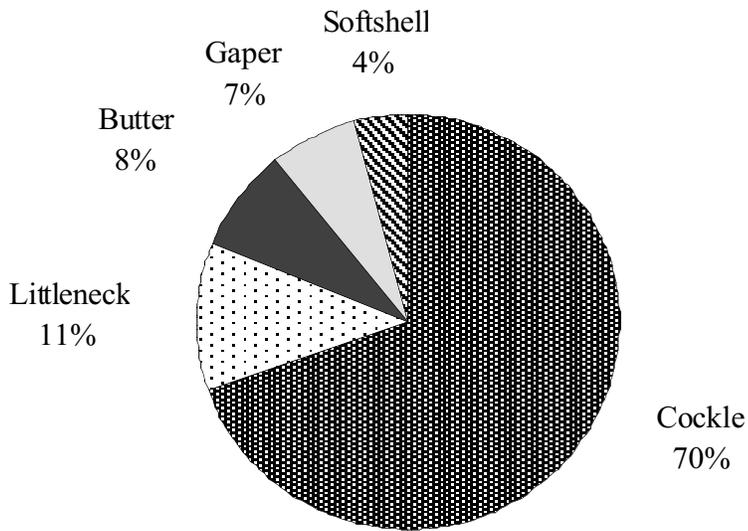


Figure H-3. Commercial clam harvest, percent by species, 1989-1999.

Management/Regulations

Recreational

The history of recreational bay clam digging regulations is as follows:

Prior to 1948, coastal counties regulated the harvest of bay clams.

- 1948 A statewide daily bag limit of 36 bay clams was approved; only 18 of the 36 could be gaper clams and no sorting was allowed. There was no recreational harvest January 1 - June 30 for gaper clams.
- 1960 Gaper bag limit changed; only 12 of the 36 bay clams could be gaper clams. The seasonal restriction on recreational gaper clams was also removed.
- 1977 Bag limit changed to 20 bay clams per day, of which 12 could be gaper clams. In addition, 36 of the incidental species, including the soft-shell clam, could be taken. Sorting of unbroken butter, cockle, and littleneck clams was allowed.

Commercial

The history of commercial clam harvest regulations is as follows:

Prior to 1948 coastal counties regulated the harvest of bay clams.

- 1948 Commercial harvest of gaper clams was prohibited from January 1 - June 30.
- 1963 The use of mechanical equipment to commercially harvest intertidal clams was made unlawful, and a permit was required to harvest subtidal clams.
- 1985 All commercial clam diggers were required to have a free permit and fill out a monthly log book reporting their catch.
- 1996 Bay clams harvested with dive gear were incorporated into the Developmental Fisheries Program. Effort limited by specified number of permits – see Developmental Fisheries Section I.
- 1998 Commercial razor clamming season closure was formally extended to match the recreational season closure from July 15th through September 30th each year.

Stock Assessment

Intertidal: During the past several decades, ODFW has conducted numerous studies that provide an insight into the status of intertidal stocks. A coastwide study documenting recreational fisheries in 11 estuaries was completed in 1971. Results of this survey revealed that the recreational bay clam fishery in Oregon was an important component of the total sport use of estuaries. ODFW estimated over 103,000 digger trips were made, they expended 152,000 hours, averaged 17.5 clams per trip and harvested 1.8 million clams.

Recreational bay clam user surveys for nine key estuaries have been conducted by ODFW during selected low tides in the spring and summer since 1978. Information gathered includes peak digger counts, species composition, catch per unit of effort, length frequency, and digger origin. The data collected were the minimum needed to analyze management decisions. This valuable survey was dropped in 1991 due to budget reductions. A modest volunteer program initiated in 1993 and again in 1996 has helped collect some of this information in five major estuaries in order to continue the database series.

Subtidal: Nearly all the commercial harvest of bay clams comes from the subtidal stocks and very little recreational harvest occurs subtidally. Most of the limited information we have on the status of our subtidal clam stocks comes from surveys ODFW conducted in the 1970's. Subtidal clam stocks of ten estuaries were systematically surveyed, and the distribution and relative abundance of each species was mapped. Some additional surveys for those areas appearing to have commercial clam harvest potential were also conducted during the late 1970s and early 1980s. Information on size, age, and biomass estimates was gathered. Subtidal and intertidal clam populations were surveyed in portions of Tillamook Bay as a part of the Tillamook Bay National Estuary Project in 1996. It should be emphasized that most of Oregon's 15 to 20 year-old data are incomplete and badly outdated. Commercial management decisions are very difficult to make in the absence of updated subtidal clam survey data.

Critical Issues/Research Needs

Recreational/Commercial Conflicts

High commercial harvest of cockle clams in Tillamook Bay during 1994 raised serious questions about managing a commercial resource with limited inventory data. Local recreational clam harvesters were concerned about overharvest and a major conflict between the two user groups has developed. A meeting with both user groups resulted in recommendations for the commercial harvest of cockles in Tillamook Bay, which included an annual quota, a minimum size limit, and closed areas to protect broodstock and around two key recreational harvest areas. Similar concerns surfaced in Netarts Bay.

Inventories

The need for clam inventory data in all major estuaries is of critical importance. Increased interest in commercial and recreational clams in Oregon estuaries will put more demand on managers for complete and accurate survey data. Most of our clam surveys are nearly 20 years old, incomplete, and badly outdated. The shellfish project that deals with clam management issues does not have adequate personnel or budget to gather this vital information, and a solution is needed. A subtidal and intertidal clam survey was conducted in Tillamook Bay in 1996 as a part of the Tillamook Bay National Estuary project. Clam populations were determined to be healthy with respect to recent harvest levels.

RAZOR CLAMS

Background/History

Commercial and recreational harvest of razor clams has ranged from a high of 2.4 million clams in 1955 to a low of 118,000 in 1983 (Figure H-4). Harvest was completely excluded in 1992, 1993 and most of 1994 due to a toxic algal bloom, which produced domoic acid in clams. Utilization of razor clam stocks has changed significantly over the last 50 years. In the 1940s, about 90 percent of the

harvest was taken commercially. In recent years, sport diggers take the bulk of the harvest. The ten-year average (1990-1999) indicates an annual average of 91 commercial diggers participating in the fishery that harvested 13 percent of the total catch. Recreational razor clammers have averaged 87 percent of the total annual take and have taken about 45,000 digger trips annually. Total economic value of Oregon's sport razor clam fishery is estimated to be approximately 1.5 million dollars annually. The estimated value of the commercial razor clam fishery from 1990 to 1999 was approximately \$35,000.

Management/Regulations

Prior to 1954, the sport limit on razors was 36 clams per digger per day.

- 1954 The recreational limit was reduced to the first 24 clams dug per day regardless of size. Commercial diggers were prohibited from digging in the Seaside Cove area and had a three-and-a-half inch minimum shell length regulation. The minimum shell length for commercial harvest was increased to four-and-one-quarter inches.
- 1963 The Seaside Cove restriction for commercial diggers was lifted.
- 1967 A summer closure was established to reduce wastage and increase the size of harvestable clams. Clatsop beaches were closed from July 15-August 31.
- 1972 Minimum commercial shell length was reduced to 3 3/4 inches, and this regulation remains the same today.
- 1992 Clatsop County ocean beaches were closed to harvest of razor clams due to a series of toxic phytoplankton blooms. The blooms produced domoic acid and then a toxic responsible for paralytic shellfish poisoning (PSP)
- 1994 Clatsop County ocean beaches were re-opened in November of 1994.
- 1997 Razor clam bag limit reduced from 24 to 15 clams. Season closure extended one month – closure from July 15 through September 30.
- 1998 Clatsop County ocean beaches closed again due to domoic acid in clams from phytoplankton.

Stock Assessment

Oregon's razor clam stocks have been investigated since 1947. Stocks have been utilized by both commercial and recreational users. Over 90 percent of the fishery is located on the 18-mile Clatsop Beach between Tillamook Head and the Columbia River. Other isolated populations exist along the entire Oregon coast, however, harvest numbers from these areas are relatively low and catches sporadic.

Recruitment, size, age composition, and catch per unit of effort data have been collected for many years. Biological concern for the razor clam resource due to excessive harvest of the intertidal population has not been a major worry since we assumed the existence of a large subtidal broodstock was present off the Clatsop beaches. An exploratory dive off Seaside in 1992 revealed that a substantial subtidal population was present to at least one-half mile beyond the area of intertidal harvest.

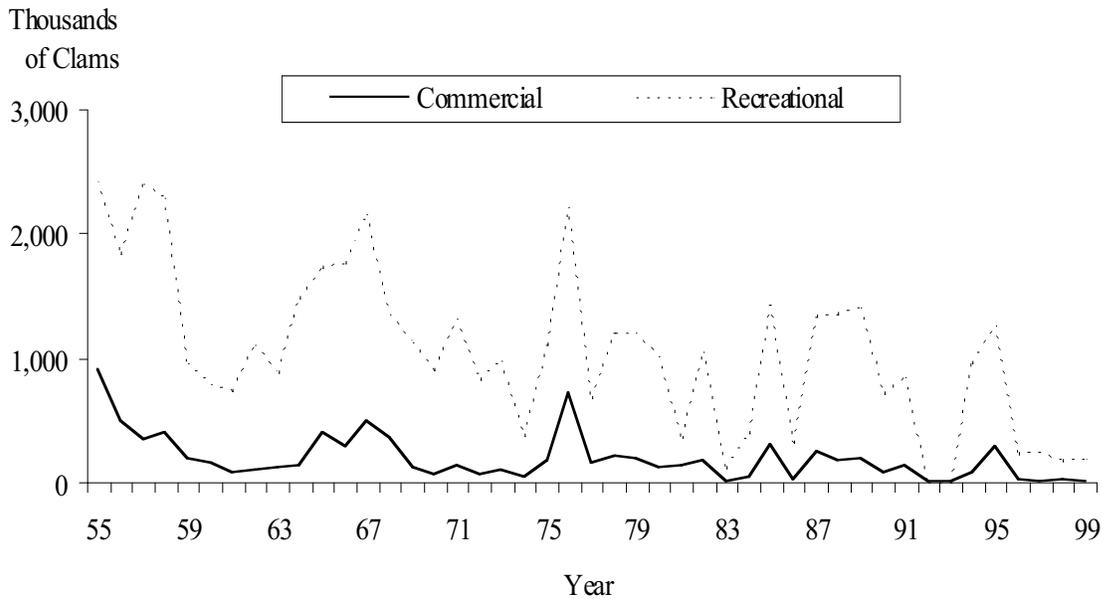


Figure H-4. Commercial and recreational harvest of razor clams, 1955-1999.

Critical Issues/Research Needs

Resource and User Issues

The razor clam fishery in Clatsop County reopened November 1, 1994, after being closed for three years, and harvest levels were anticipated to be high. Interviews conducted during the first three days of the 1994 season indicated 10,580 sport diggers had taken 208,270 clams and five to seven percent of the users were from out of state. We issued 162 commercial permits to razor clam diggers who took 12,600 pounds in the first two months of the 1994 season. An estimated 60 percent of that harvest went for crab bait. High intertidal harvest levels do not present a biological problem. However, allocation concerns between individual recreational harvesters and sport and commercial harvesters is a concern. For the present, recent regulation changes seem to have satisfied the public. Current closures due to high domoic acid levels may lead to a repeat of what happened in 1994. There is a continuing need to support research on causes of increasing toxic phytoplankton blooms in the nearshore ocean environment.

Disabled Permit

We issued 28 and 31, and 30 permits to disabled clam diggers in 1997, 1998, and 1999 respectively.

OYSTERS

Background/History

Native oysters (*Ostrea conchaphila*) are the only oyster that is native to Oregon. The first commercial oyster association was formed in the late 1800s in Yaquina Bay to harvest these two-inch bivalves. Natives were also taken commercially from Netarts Bay. Pollution and overharvest eliminated the commercial fishery for natives about 1910. Four species of oysters have been successfully cultivated in Oregon since the early 1930s, with Pacific oyster (*Crassostrea gigas*) being the most successful. Oysters have been cultured in most Oregon estuaries; however, Tillamook, Coos, Yaquina, and Netarts have provided the bulk of the harvest.

Management/Regulations

ODFW began a program to rebuild Oregon's native oyster populations in several key estuaries, in 1993. That effort continued with successful re-introductions in Netarts and Alsea Bays. A population of native oysters in Coos Bay, thought to be extinct in 1991, is currently rebuilding naturally in large numbers.

Oyster growers filed claims with the state legislature on estuarine lands to grow oysters prior to 1969. In 1969, the oyster plat system was created, and leased oyster plats were handled by the state. Oyster growers were required to pay the State of Oregon \$2.00 per acre leased and \$0.05 per gallon harvested. Prior to 1982, ODFW had jurisdiction over cultured oysters. In 1982, regulatory authority was transferred from ODFW to the Oregon Department of Agriculture (ODA).

Critical Issues/Research Needs

Leases

Much of the tidelands leased for oyster culture is not being utilized. Many people feel no new leases should be issued until all leased plats are in production. Effective 1996, the Oregon Legislature passed legislation authorizing ODA to allow cultivation of clams within 10 percent of existing oyster plats. ODA is considering "taking back" grower's leases, if they are not in compliance with the lease agreement. In 1996, ODA raised the annual lease fee to \$4.00 per acre, and 10¢ per gallon harvested double the previous fees.

Eelgrass

There is much concern about the impact of ground-cultured oysters on standing crops of eelgrass. Eelgrass beds need to be surveyed for all estuaries. Current survey information is old and incomplete.

DEVELOPMENTAL FISHERIES PROGRAM

Interest in finding new fishing opportunities is rising with the decline in the salmon industry and limited access to the groundfish fishery. The Developmental Fisheries Program creates a conservative approach toward developing the state's renewable fisheries resources. The program provides controlled development to encourage those who might pioneer a fishery to invest their time and energy. The program will also meet the need to develop information for management plans and long-term sustained use of developmental fisheries species.

Background / History

Legislation

At the request of the fishing industry, the 1993 Legislature created the Developmental Fisheries Program to allow for controlled development of new fisheries. Legislation established policy for the State of Oregon **"to institute a management system for developmental fishery resources that addresses both long-term commercial and biological values and that protects the long term sustainability of those resources through planned commercial development when appropriate"** (emphasis added). The term "developmental fishery" was defined as "activity for the development of commercial taking of an underutilized foodfish species."

Developmental Fisheries Board

Under the legislation, the Commission appointed to the Developmental Fishery Board nine members and five ex-officio members from a broad range of fishing interests (Table I-1). During 1994, the Board or committees of the Board met numerous times to develop draft administrative rules including a list of developmental species and an appropriate number of permits for each species to establish limited access. In addition, six information workshops were held in coastal communities to gather public input regarding the developmental fishery program and draft administrative rules. Since the first year, the Board as met at least twice a year to continue to gather public input regarding the developmental fishery program and draft administrative rules.

Table I-1. Developmental Fisheries Board membership

Harvesters

Gerald Gunnari -	Charleston
Jerome Grant -	Siletz
Linda Brown -	Brookings
Stan Schones -	Siletz
Leonard VanCurler -	Florence
(chair)	

Agency

Jim Golden - OR Dept. Fish & Wildlife
Dalton Hobbs – OR Dept. of Agriculture

Ex Officio

Frank Dulcich (The Pacific Group)

Processors

Bill Schriber -	Garibaldi
(vice-chair)	
Scott Adams -	Charleston

Joe Easley (OR Trawl Commission)
Paul Heikkila (Sea Grant Extension)
Tom Shafer (OR Fisheries Congress)

Management / Regulations

Program Design

The goal of the Developmental Fisheries Program is to provide sustainable economic development of underutilized fishery resources. The program seeks to conserve renewable resources, allow opportunities for development, and safeguard investments of harvesters who develop new resources. Limiting the number of participants will provide an incentive for experimentation and a means to collect sufficient information to: 1) understand effects of fishing, 2) determine sustainable harvest levels, and 3) determine how to minimize impacts on other marine resources.

In order to develop a harvest program for a new fishery and establish the appropriate level of harvest and effort, information is needed to understand the impacts and relationship of the fishery to ocean resources. The level of available biological information will be considered to scale the number of permits and conditions of use to minimize risk of overfishing and habitat disruption while a fishery is developing. When there is little available information, the numbers of permits and conditions of use will be conservative in order to minimize disturbance or disruption to other marine resources while obtaining needed information through the fishery to determine long-term sustainability. As the level of biological information increases, the number of permits and conditions of use may become more liberal in order to determine optimum levels of yield and effort and to develop a long-term management plan. Actual use of permits shall be monitored throughout the year and reviewed at least once a year to determine if the numbers and conditions of use need to be adjusted to protect resources, habitats, or to insure sufficient information is being gathered.

In order to qualify a species as a developing fishery, a species must be underutilized. Each species is then placed into one of three categories (Tables I-2 and I-3):

Category A species have the best potential to be economically viable and are not under another state or federal management plan.

Category B species have unknown or less potential to be economically viable and also not under another state or federal management plan.

Category C species are already under other regulations (i.e.. FMP).

While the program presently focuses on determining whether adequate fish resources are available, successful development of any new fishery will largely depend on development of markets.

Permits

Beginning in 1995, permits were required to harvest species in category A. Several fisheries, such as swordfish, spot prawns, bay clams, and brine shrimp, have had all available permits issued each year. The number of permits issued for other fisheries has varied with interest.

Critical Issues / Research Needs

Level of Research

Focus and level of research depends on the amount of existing information. Some species have been harvested in Oregon in the past (i.e. squid, herring, and hagfish) and information needs to be gathered to determine optimum harvest levels and appropriate gear specifications.

Other species (i.e. blue shark, swordfish and, spot prawns) are harvested in other areas, however, information on Oregon populations is limited. Still other species (i.e. box crab, snails, and Oregon hair crab) have very little information available. Marketing and harvest techniques need to be developed for many species (i.e. box crab and snails).

In the last three years, staff has collected biological data on a number of developmental species: surveys on bay clams were conducted in Tillamook Bay; a commercial vessel was chartered to obtain distribution, abundance, sex and size composition, maturity, and fecundity data on box crab; population and habitat data on brine shrimp has been collected at Lake Abert; we worked cooperatively with California Department of Fish and Game to collect data on coonstripe shrimp; stomach samples of mackerel have been collected to determine the role of mackerel in salmon predation; and we worked with the Washington Department of Fish and Wildlife to develop consistent management for spot prawns.

Funding

Funding could become an issue. Funding for costly at-sea research is needed to collect information necessary to develop long-term management plans.

Table I-2. Developmental fishery species, category A and permits issued annually.

Category A species - best economic potential						
FISH	permits allowed	permits issued				
		1995	1996	1997	1998	1999
Pacific hagfish	25	14	12	12	8	13
blue shark	10	6	2	4		
swordfish	10 other gear	10	10	10	10	6
	20 longline	9	1	2	3	4
northern anchovy & Pacific herring	15	7	5	4	10	1
Pacific sardine & Pacific saury	15				12	15
Pacific sandfish	10					
smelt spp.	20	1				
Pacific pomfret	10	2				
slender sole	10					
INVERTEBRATES						
box crab	25	18	8	25	14	3
Oregon hair crab & scarlet king crab & grooved tanner crab	10	10	10	10	4	1
spot prawns	6 trawl	6	6	6	6	6
	10 other gear	10	10	10	10	10
coonstriped shrimp & sidestriped shrimp	10 pot gear	(b)	(b)	(b)	10	10
cockle clams (ocean)	5	5	1	1	1	
bay clams	10 coast wide	(a)	20	10	10	10
	5 south coast	(e)	(e)	(e)	(e)	5
giant octopus	10	10	1	10	9	9

squid	30 trawl 30 other gear	22 10	14 2	9 17	34(d) 39(d)	18 8
fragile urchin	6 trawl 6 other gear	1				
sea cucumber	6 trawl 10 dive 10 other gear	6 9	3	1 6	6 3	1 1
snails	10	3	2	3	2	4
brine shrimp	3 adults 1 cysts	(a)	(a)	3 1	3 1	1 1

(a) species not on list or not in category A this year.

(b) combined with spot prawns until 1998.

(c) in 1996 the number of permits available was 20, then lowered to 10 in 1997.

(d) extra permits authorized due to interest.

(e) category not available

Table I-3. Developmental fishery species, categories B and C.

Category B species - unknown economic potential

Fish

salmon shark	Eelpouts	carp	brown bullhead
black hagfish	skilfish	yellow perch	northern squawfish

Invertebrates

euphausiids (krill)	Pacific sand crab	freshwater mussels
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Category C species - under other management plan

Fish

spiny dogfish	cabezon	shortbelly rockfish	rock sole
soupin shark	sculpins	sharpchin rockfish	sand sole
skate	kelp greenling	splitnose rockfish	lemon sole
American shad	jack mackerel	Pacific sanddab	spotted ratfish
Pacific cod	Pacific mackerel	butter sole	wolf-eel
Pacific flatnose	greenstriped rockfish	English sole	walleye pollock
Pacific grenadier	redstripe rockfish	rex sole	

Invertebrates

red rock crab	purple sea urchins	crayfish
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Table I-3. Developmental fishery species, categories B and C.

Category B species - unknown economic potential			
<u>Fish</u>			
salmon shark	Eelpouts	carp	brown bullhead
black hagfish	skilfish	yellow perch	northern squawfish
<u>Invertebrates</u>			
euphausiids (krill)	Pacific sand crab	freshwater mussels	
Category C species - under other management plan			
<u>Fish</u>			
spiny dogfish	cabezon	shortbelly rockfish	rock sole
soupfin shark	sculpins	sharpchin rockfish	sand sole
skate	kelp greenling	splitnose rockfish	lemon sole
American shad	jack mackerel	Pacific sanddab	spotted ratfish
Pacific cod	Pacific mackerel	butter sole	wolf-eel
Pacific flatnose	greenstriped rockfish	English sole	walleye pollock
Pacific grenadier	redstripe rockfish	rex sole	
<u>Invertebrates</u>			
red rock crab	purple sea urchins	crayfish	

OCEAN SALMON

Background/History

Oregon's salmon species have, for most of this century, been prominent in the catch of ocean commercial and/or recreational fishers. Unique among marine species harvested off Oregon, they are anadromous, beginning life in freshwater, migrating to the ocean to mature and returning to spawn in freshwater. Salmon are harvested in ocean, estuary, and river fisheries. Oregon salmon are migratory with coho stocks harvested from California to southern British Columbia, and chinook stocks from California to SE Alaska. Salmon stocks from other states also migrate through Oregon's offshore waters producing variable impacts on a variety of West Coast stocks. Oregon's ocean fisheries have developed and evolved based on these varied life history stock distributions. Many factors have changed this century-old fishery from one of abundance and unrestricted catch to a highly structured fishery, limited to entry, and with fewer opportunities for fishers. Several factors have contributed to this change: 1) creation (and several revisions) of the Magnuson Fishery Conservation and Management Act (1976) and its establishment of national standards and formalized fishery management plans, 2) severe stock declines or stock extinction, 3) listings of multiple Oregon and other west coast salmonid stocks under the federal Endangered Species Act, 4) major changes in both freshwater and marine environments, and 5) the recent implementation of mass marking of regional hatchery production (mostly coho at this time) as a basis to implement "selective" fisheries on hatchery fish only.

Ocean Troll Fishery

The Oregon ocean commercial troll salmon fishery was evolving quickly by 1912 with the development and application of gasoline engines and conversion of Columbia River gillnet vessels to ocean troll vessels. By 1919, one to two thousand boats were trolling ocean waters off Oregon primarily off the Columbia River. Landing information was not available until 1925, when the state of Oregon began separating river gillnet catches from ocean landings.

After 1920, vessels specifically designed for ocean troll fishing began exploring further offshore with larger, more powerful, and efficient vessels. Power equipment such as power winches or gurdies also increased the fishermen's catch efficiency. By the 1930's, the troll fishery was well established in most major ports along the Oregon Coast. Oregon's troll fleet decreased in size somewhat from an early peak after World War I through World War II. Following World War II, another expansion in vessel size and efficiency began as new technology became available. In the 1950's and early 1960's the "trip" boat further expanded and was the dominant sector of the fleet. In the mid 1960's, the "dory" and day boat fleet expanded dramatically, fueled by low capital investment, new technology which allowed powering gurdies from take-off units on small engines, and an abundance of hatchery produced coho salmon available for harvest.

From the mid 1960's until the late 1980's, these small "day boat" dories and other small trollers (less than 30 feet overall) made up about 50% of the Oregon troll fleet. In the early 1990's with the onset of highly restrictive troll fisheries, participation of these smaller vessels dropped to about one third of the total fleet. By 1997, the "day boat" fleet represented less than 25% of the fleet and only 6% of the targeted chinook catch.

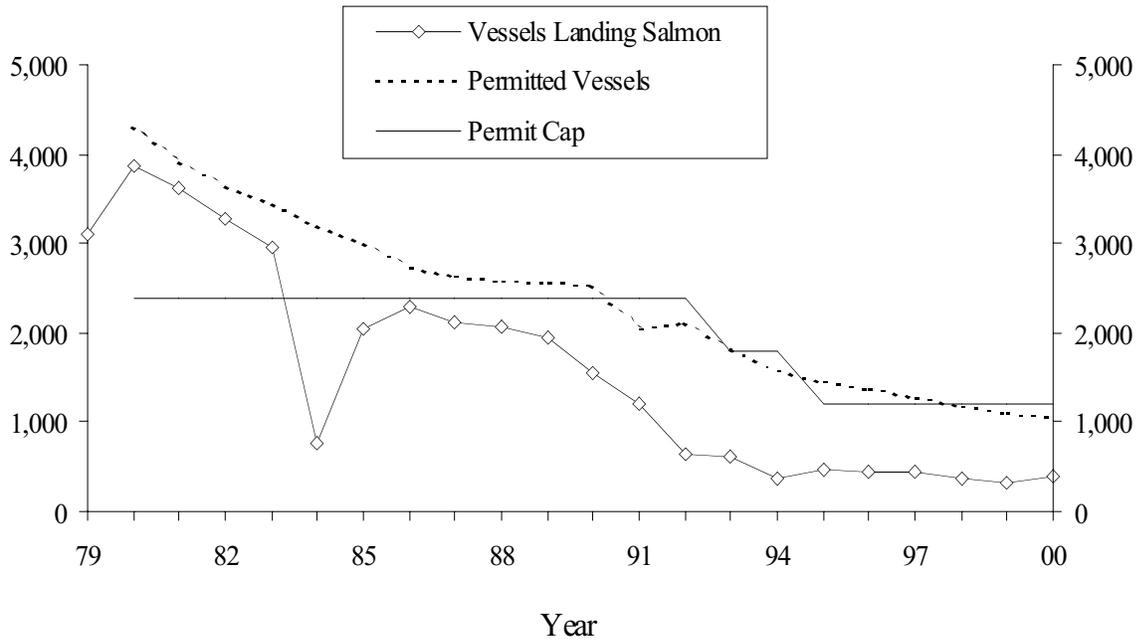


Figure J-1. Number of commercial troll vessels permitted, landing salmon, and legal permit cap in Oregon's commercial troll salmon fishery, 1979-2000.

Historically, the top 10% of the fleet harvests about 50% of the salmon and the top 50% of the fleet harvest 90%. Despite recent changes in fleet composition, this relationship still holds true.

By the early 1970's, Oregon's commercial troll fleet grew to about 2,000 active vessels and reached a maximum of 4,311 trollers in 1980 (Figure J-1). The emergence of region-wide management issues, lower salmon abundance, and more restrictive seasons have reduced active permits to 1,054 and the fleet to 399 active boats in 2000. Troll effort averaged about 33,000 boat days during the period of 1979-1991. In 1992, the troll effort dipped below 10,000 boat days for only the second time since records of boat days began to be kept. From 1992 to 2000, troll effort has averaged only 7,370 boat days per year, never climbing back above the 10,000 boat day mark common in nearly all years from 1979 to 1992 (Figure J-2).

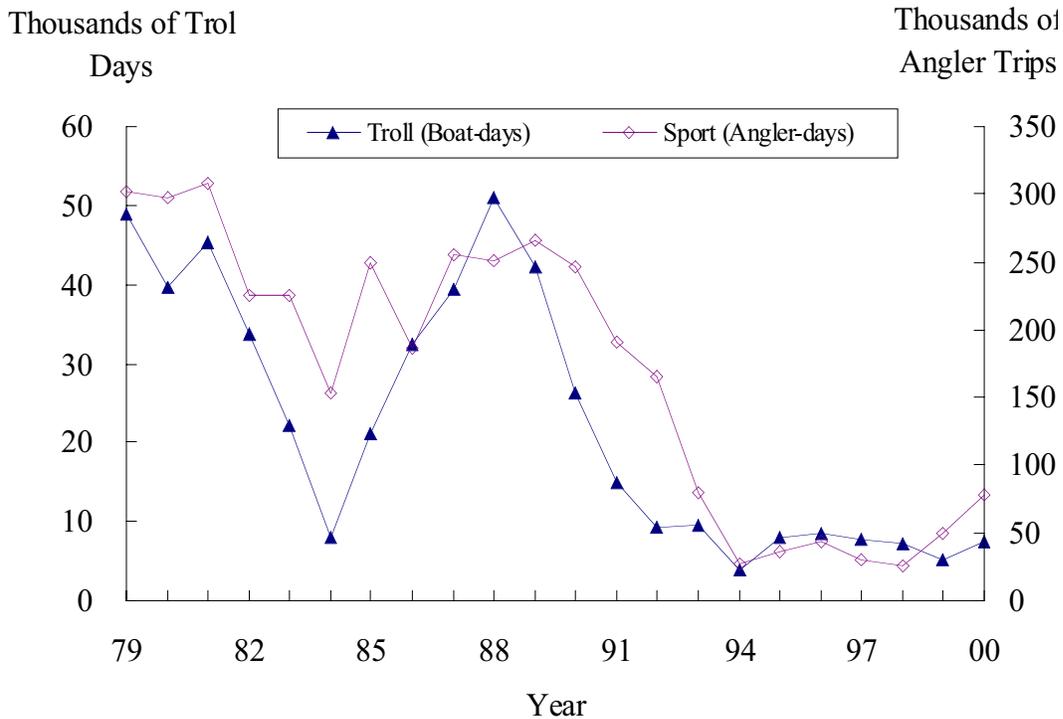


Figure J-2. Oregon ocean commercial troll and recreational salmon fishery effort, 1979-2000.

From 1994 through 1999 there were no commercial salmon seasons in Oregon waters that allowed the retention of coho salmon. In all recent years, chinook seasons had special limitations added to reduce coho hook and release impacts, and keep harvest within acceptable levels on a variety of chinook and coho stocks. These severe limitations are in large part a result of the continued poor production of Oregon Coastal Natural (OCN) coho, and management measures taken in an attempt to rebuild these stocks. The OCN coho was listed as a threatened species under the federal Endangered Species Act (ESA) in 1998.

The Oregon ocean troll catch has historically been characterized by various periods of high and low salmon abundance, most notably from the record high coho abundance from the mid 1960's through the mid 1970's, and the record chinook catch years of 1986-1989 (Figure J-3). Chinook landings have ranged from 25,000 to 530,000 (both record low and high), averaging 198,000 fish yearly from 1979-2000. Coho landings ranged from 50,000 to 715,000, averaging 358,000 during 1979-1992. In 2000 the first commercial troll selective fishery for adipose fin clipped coho was opened in northern Oregon and Washington, with landings of 12,000 coho into Oregon.

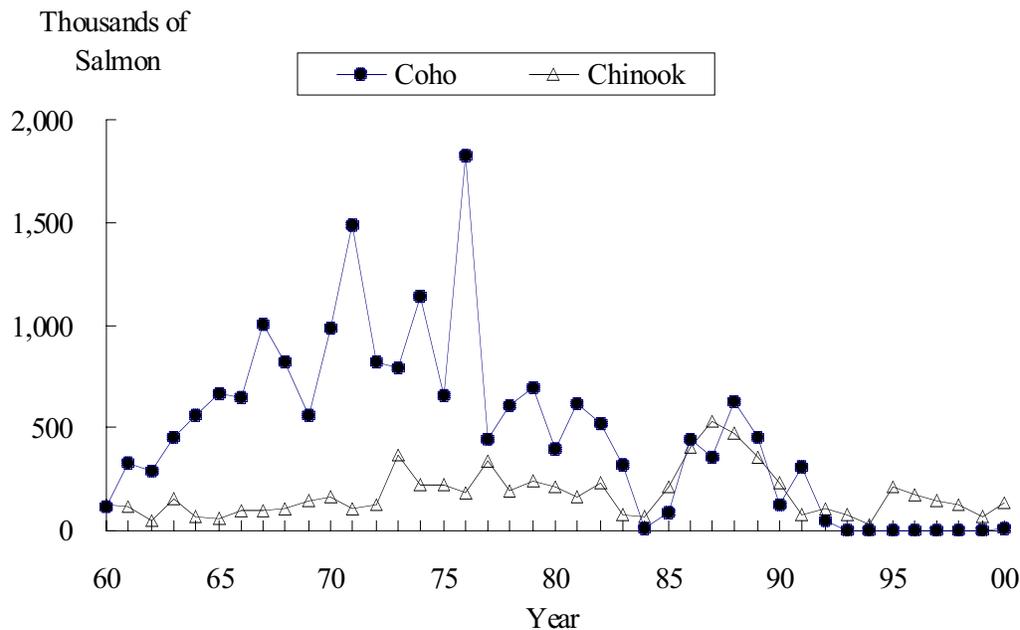


Figure J-3. Oregon ocean commercial troll fishery landings, 1960-2000. No commercial troll coho landings from 1994-1999.

Ocean Recreational Fishery

In the late 1940's and early 1950's, substantial numbers of recreational boats began to move into Oregon's nearshore ocean waters for salmon and bottom fish. Both private and charter boat effort increased. The availability of small boat moorage basins in coastal ports, launching ramps, charter businesses, better safety equipment, and vessel support facilities all contributed to this development.

The ocean recreational fleet historically targeted coho salmon, and, to a lesser degree, chinook (Figure J-4). This fishery was sampled prior to 1981 with estimates of catch made by a mix of direct ocean port sampling and returns recorded on Oregon's salmon/steelhead tag licenses. An enhanced port sampling program began in 1981 that estimated total landings by port, species, and user group (charter and private). The Oregon ocean recreational fishery is made up of private vessels and commercial charter vessels. Charter vessels have historically comprised about 25% of the total yearly effort and about one third of the total Oregon ocean recreational salmon landings (Figures J-5 and J-6).

Salmon trip effort (angler days) have been recorded since 1979, averaging about 250,000 angler days yearly through 1991. From 1992 to present, continued low coho abundance and restricted seasons have reduced effort to about 60,000 days, with a range of 165,000 (1992) to 26,000 (1998) angler days per year (Figure J-2). Charter vessel participation has ranged from about 125-150 boats annually from the mid-1980's through the early 1990's. Reductions in salmon fishing opportunities have currently reduced the active fleet to approximately 80-100 vessels.

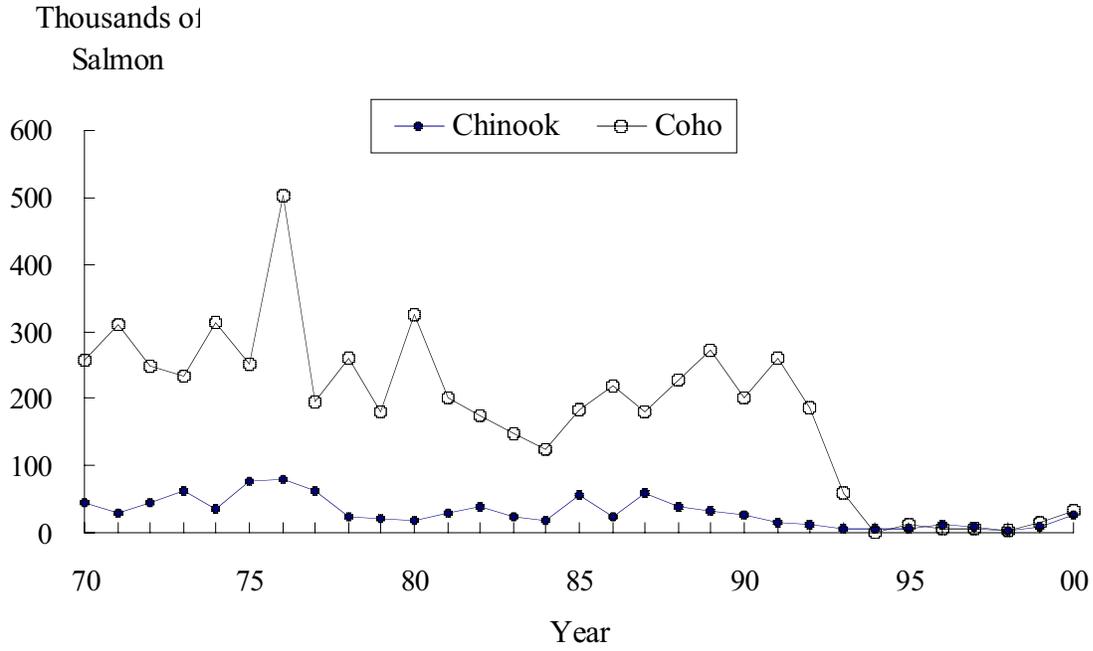


Figure J-4. Oregon ocean recreational salmon landings, 1970-2000.

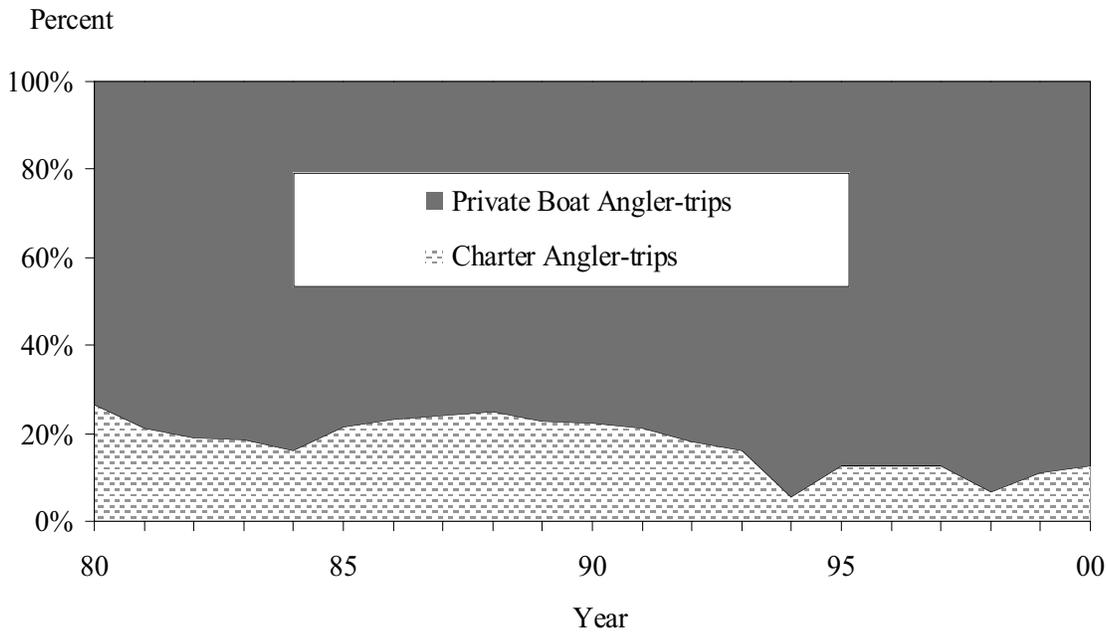


Figure J-5. Proportion of ocean salmon effort by private and charter vessels in Oregon's salmon fishery, 1980-2000.

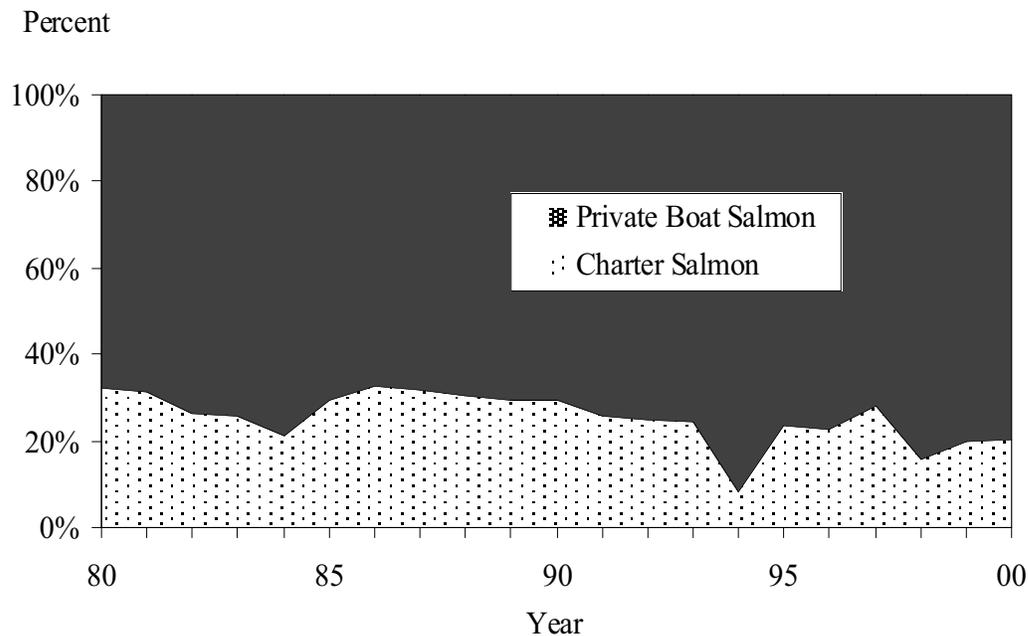


Figure J-6. Ocean salmon catch proportion by private and charter vessels participating in Oregon's ocean recreational salmon fishery, 1980-2000.

Recreational ocean salmon landings have averaged about 142,000 coho and 22,000 chinook coastwide during the period 1979-2000 (Figure J-4). The ocean recreational fishery reached its peak in 1976, a year of record coho abundance, and a catch of 501,000 coho and 79,000 chinook.

In comparing recreational salmon catch and effort data between years, it is important to note that beginning in 1982 catch quotas began to be applied to the recreational fishery. From 1982 to the present, quotas, bag limits, or season structure have been used to limit the catch of salmon within distinct management units, and keep the harvest within guidelines established by PFMC.

Management/Regulations

Pacific Salmon Commission (PSC)

Oregon is a signatory to the Pacific Salmon Treaty with Canada (PST 1985; PST “New Agreement”, 1999) that pledges all parties to manage the long-term health and /or rebuilding of their West Coast salmonid stocks contributing to PST area fisheries from SE Alaska to Oregon. Oregon coastal chinook stocks are a major contributor to both SE Alaska and Canadian ocean salmon fisheries as well as Oregon marine and estuary/freshwater fisheries. Since 1985, ODFW has built and coordinated a basic program, with PST federal funds, supporting activities including Oregon representation on the Pacific Salmon Commission (PSC), technical support on PSC committees, and small scale field studies that collect and assess stock information on Oregon chinook stock exploitation rates. The 1999 Agreement strengthened the Treaty based on an “abundance-based management” concept, requiring actual estimates of spawning escapements, yearly forecasts of ocean abundance, stock exploitation rates, and improved assessment modeling for contributing stocks.

Pacific Fishery Management Council (PFMC)

Domestic ocean fisheries off the U.S. west coast of Washington, Oregon, and California (state and federal waters) have been managed since 1977 under requirements of the Magnuson Fishery Conservation and Management Act (MFCMA 1976). The PFMC (formed in 1976 under the MCFMA) works with the various coastal states to manage the multiple coho and chinook salmon stocks and fisheries within the 200 mile Exclusive Economic Zone (EEZ).

Federal regulations, proposed by PFMC and implemented through the Department of Commerce, adopted initial Salmon Management Plans (FMP) in 1977 and 1978 to govern ocean fisheries and management. Several amendments to the 1978 plan occurred through 1983 when a more manageable "framework amendment" approach to the 1978 plan was adopted (1984). This amendment incorporated a series of fixed principles that established a long-term management framework while more flexible elements allowed yearly preseason and in-season management measures without a revision of the entire FMP. The MFCMA (now known as the Stevens-Magnuson FCMA) amended in 1996 by the Sustainable Fisheries Act (SFA, 1996), contained comprehensive revisions to reflect ESA-listed species, added national standards, criteria to prevent overfishing, establish salmon bycatch reporting plans to minimize bycatch mortality, and description of essential fish habitat.

Generally, management has become progressively more complex and restrictive in response to increasingly depressed salmon populations, ESA listed stocks, meeting allowed exploitation rates, stock rebuilding goals, and harvest allocation requirements. An extensive PFMC preseason technical process is used to evaluate several preseason ocean fishery options. The resulting regulations adopted yearly by the PFMC, Oregon, and approved by the U.S. Department of Commerce attempt to balance conflicting goals of providing fishing opportunity while allowing for spawning escapement levels to sustain healthy stocks or rebuild depressed populations.

Historical *ocean* exploitation rates for combined OPI area coho (1970-2000) are shown in Figure J-7. This long term rate assessment is calculated based on the comparison of yearly ocean catch divided by the combined catch (ocean and freshwater and hatchery/spawning escapements). While this rate also indirectly tracks the OCN coho stock component within the OPI, it is not a direct measure of OCN exploitation. Revised OCN escapement estimation methodology and better spawning ground coverage have been combined with recently developed modeling techniques to provide a direct OCN coho stock exploitation rate assessment for fishery managers. This rate analysis (1994-2000) is also shown in Figure J-7. Oregon north/mid coast and south coast chinook stocks are shown in Figure J-8.

Oregon began managing for added selected terminal ocean area fisheries in the mid 1970's in coordination with the general ocean fishing seasons managed under PFMC regulations. These nearshore fisheries were designed to "target" specific local healthy salmon stocks returning to Oregon coastal streams. Various ocean terminal fisheries have continued for most years within state waters consistent with PFMC managed fisheries and goals.

In 1979, the Oregon legislature established a moratorium on entry into Oregon's historically "open entry" ocean commercial troll salmon fishery. Beginning in 1980, the legislature set a troll salmon permit cap at 2,400 vessels (Figure J-1). At that time 4,311 vessels already had permits, and permits were required to be renewed each year. If a permit was not renewed within the year it was lost. In 1993 and 1995, the Oregon legislature revised the permit cap and decreased it to 1,800 and 1,200, respectively. In 2000, 1,054 permits were issued, but only 399 vessels landed salmon.

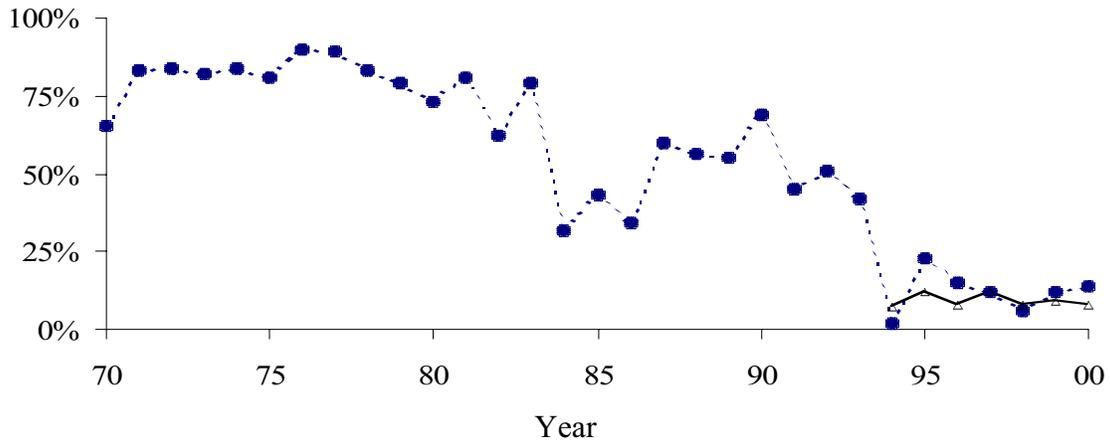


Figure J-7. Historical composite ocean exploitation rate for coho salmon in the Oregon Production Index (OPI) area (Leadbetter Point, WA. through California) by catch year based on post-season abundance (catch and escapement), 1970-2000 (dotted line). Overall Oregon Coastal Natural (OCN) coho exploitation rate (%) based on a post-season assessment using the PFMC-adapted Fishery Regulation Exploitation Model (FRAM), 1994-2000 (solid line).

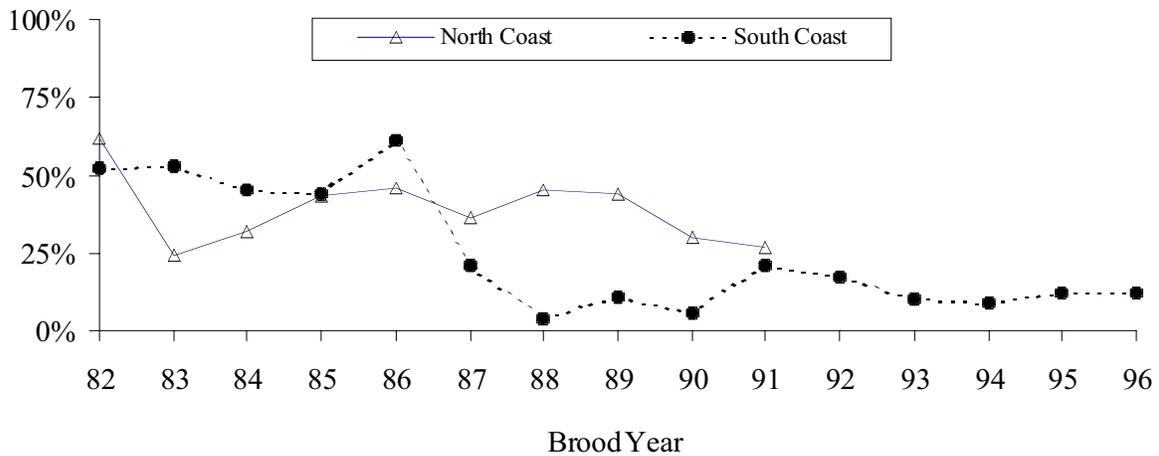


Figure J-8. Ocean exploitation rates for two major Oregon coastal fall chinook Aggregates. Rates for the two stock aggregates are not directly comparable to each other, but each separately, are indicative of ocean exploitation for the aggregate they represent. Ocean exploitation of southern Oregon coast (SOC) stocks (south of Cape Blanco) are represented by the exploitation on 4-year old Klamath River fall chinook. Both Rogue (the major south coast stock harvested) and Klamath Chinook are very similar in ocean distribution and catch impacts. The north Oregon coast (NOC) aggregate is represented as ocean exploitation for an entire brood (impacts for all ages resulting from a single spawning year; usually 3-5 year fish). Salmon River fall chinook are used as the “indicator stock” for the NOC aggregate of stocks (Nehalem through Siuslaw Rivers).

Troll regulations

Oregon's ocean commercial troll fishery has undergone a continuous management changes since mid century. The fishery was unrestricted prior to 1948. From 1948 through 1975, season length decreased slightly from a year-round fishery to a mid-spring through late-fall season. During this period the coho salmon opening was delayed until mid-June with the season ending in October. It was also during this period that minimum size limits were set for ocean caught salmon.

In 1976, under PFMC management, the Oregon Coast was split into two separate ocean management areas, with a boundary established at Tillamook Head. Different chinook length limits and season lengths were in effect north and south of this line. This split allowed specific regulations to manage Columbia River chinook stocks north of Tillamook Head; it was not established as a coho based management boundary. This was also the first year a barbless hook regulation appeared for a portion of the fishery and the first time that the early summer was closed to limit coho interceptions.

In 1978, the management line was moved from Tillamook Head to Cape Falcon. In 1980, an additional major management line was placed at Cape Blanco, creating three ocean salmon management zones off Oregon. By 1983, multiple time and area openings and closures were becoming the rule, and the "north" (i.e. north of Cape Falcon), "central" (i.e. Falcon to Blanco), and southern (i.e. south of Cape Blanco) management zones were becoming institutionalized to respond to stock abundance levels each year. In 1984, a conservation zone was established off the mouth of the Columbia River to minimize the catch and release of small "shaker" chinook and coho. South of Cape Falcon the troll coho fishery was prohibited for the first time following the devastating 1983 El Nino event.

Coho restrictions continued in 1985, with very limited opportunities south of Cape Falcon that primarily involved limited coho per chinook ratio fisheries, coho landing limits, and shortened seasons. This level of regulation was the rule rather than the exception into the early 1990's. From 1994 through 1999 no commercial coho harvest was allowed. In 2000, the first ocean commercial selective fishery for hatchery coho (fin-clipped) took place off the northern Oregon and southern Washington coast.

In the Southern management area (south of Cape Blanco), the troll chinook season was closed in 1985 due to limited availability of Klamath River fall chinook. Highly restricted time and area openings with modest quotas began in 1986 in the waters south of Cape Blanco. Many of the troll opportunities in this area since 1986 have focused on specific time/area fisheries to access healthy spring and fall chinook returning to the Rogue River. These micro seasons were in response to decreased abundance and allocation agreements for Klamath River fall chinook, which makes up a substantial portion of the chinook catch in this area.

The first late season fall terminal area "state waters" chinook fisheries that targeted local stocks began in 1974 off the mouths of the Elk and Chetco rivers. These fisheries have continued more or less regularly since that time. In recent years both fisheries have had limited openings. Added late season troll opportunities have also occurred off Tillamook Bay.

Coho salmon continued to decline in abundance, despite reductions in coho harvest rates and led to a "4 spread" (hook) limit per troll wire, based on research by ODFW. This study demonstrated coho interceptions could be reduced with little loss of chinook catch rates when fewer spread were used and directed at specific depths where chinook usually occurred.

The 4-spread rule was first used in 1991 for the Cape Falcon to Cape Blanco area for June only, but was expanded to include the entire season in 1993, and southern Oregon (south of Humbug Mountain) was added in 1994.

Recreational Regulations

Oregon enacted its first ocean recreational salmon fishing regulations in 1946 with daily and possession bag limits. From 1948 through 1964, the daily bag limit was 2 salmon with a possession limit of 4 salmon. This was increased to 3 salmon from 1965 through 1978, and then dropped back to 2 salmon per day in 1979. In 1984, 1988, and 1992-98 some openings have had daily limits of 1 salmon.

An annual salmon bag limit of 20 salmon was in effect from 1948 to 1969, and increased to 40 salmon per year from 1970 to 1995. In 1996, this was dropped back to 20 salmon per year. Since 1992, some seasons have had separate ocean annual salmon limits of 10 or 20 fish.

Length limits were first established for salmon in the recreational fishery in 1955. Length limits were dropped for the area south of Tillamook Head from 1970-77. Since 1978, length limits have been in effect in most seasons, except that from 1982-87 some seasons required anglers to keep the first two salmon caught. This “first two salmon” regulation was adopted in lieu of requiring barbless hooks, which also first went into effect in 1982.

Until 1976, the ocean salmon season had been open along the entire Oregon coast for the whole year. Beginning in 1976, seasonal fishing periods were adopted. The first season structure included a mid-April opening and a season that ran through the end of December. Season lengths and open areas have varied substantially each year since then.

Special state waters recreational fishing opportunities off the Elk and Chetco rivers were adopted in 1977 to target on returning fall chinook, concurrent with similar commercial troll regulations. These late fall seasons took place off the Elk in all years except 1990 and 1991; and off the Chetco in all years except 1983-85, 1988-91, and 1993. A state waters fall chinook target fishery was established off Tillamook Bay beginning in 1983, and has occurred in every year since that time.

Ocean fishery season closures first took place off Oregon in 1980 based on attainment of a PFMC managed coho catch quota. During the period of 1980-82 and 1984, the State of Oregon continued to allow ocean salmon fishing within state waters (0-3 miles) even after the federally managed waters had closed due to attainment of the coho quota. Oregon was pre-empted by the federal government from extending certain state water recreational fisheries in both 1982 and 1984.

Beginning in the mid-1980's, a multitude of ocean recreational fishery regulations have been used. Barbless hooks were required statewide for the first time in 1984, and from 1988 to the present have been required in all general ocean seasons. An ocean “conservation zone” was established off the mouth of the Columbia River in 1985, and in this same area the days of the week were limited for the first time to a Sunday through Thursday fishery each week. From 1988 to 1994, there was a spring salmon fishery in the Central coast management area that limited to the area inside of 27 fathoms (about 3 miles offshore). From 1995 to 2000, special lure size and other tackle limitations were in effect to help reduce the interception of prohibited coho while anglers are fished for chinook.

Beginning in 1986, the number of salmon allowed in Oregon ocean fisheries within a seven-day period began to be limited. The general rule has been not more than 6 salmon in 7 consecutive days, but in some seasons, the limit has been dropped to 4 or 2 salmon in 7 days.

Critical Issues/Research Needs

Issues related to salmonid research are extensive and represent some of the most difficult Northeastern Pacific ocean management assessment and fishery strategies. Salmon life history covers both freshwater and marine environments. Managers must account for and manage stocks during their extensive migration in the NE Pacific Ocean, and their interception and impacts by multiple users and jurisdictions. The PFMC issues a periodic “Research and Data Needs” document covering all species under Council fishery management plans. The current 2000-2002 publication introduces the salmon section with this overview:

“Salmon fishery management in the Pacific Northwest is undergoing a shift from mixed stock fisheries for hatchery stocks. Successful implementation of selective fisheries will require accurate estimates of nonretention mortalities and new, more detailed information on fishery stock contributions and migration patterns. Recent expansion of listings under the Endangered Species Act, and the new definition of EFH, expand the Council’s concerns with both freshwater and marine habitat in relation to harvest strategies and conservation. The revised Magnuson-Stevens Act requires better definitions of MSY and better understanding of population dynamics.”

The three highest priority research and data needs for salmon are:

- A more accurate assessment of total fishing related mortality of natural stocks of coho and chinook.
- Advances in genetic stock identification, otolith marking, and other techniques may make it feasible to use a variety of stock identification technologies to assess fishery impacts and migration patterns.
- Encourage development of probabilistic habitat-based models that incorporate environmental variation to establish harvest policies and enable risk assessment for fishing strategies.

The PFMC also amends its salmon Fishery Management Plan (FMP) periodically. A 1999 amendment (13) was designed to insure that fishery related impacts do not act as a significant impediment to the recovery of depressed Oregon Coastal Natural (OCN) coho stocks. When the PFMC adopted the amendment, they stipulated that it should be reviewed and updated on a periodic basis.

Research and management needs are also defined under the Oregon Plan for Salmon and Watersheds (The Oregon Plan) and direct considerable resources towards watershed health via habitat rebuilding, water quality, and Implementation/monitoring activities to measure results.

The issues described below represent only a limited overview of research and data needs that relate directly to the PFMC’s salmon FMP and its recent amendments, and Oregon’s, ocean salmon fisheries. The reader should review the Oregon Plan in its entirety and annual reports, published since 1998 (internet at <http://www.oregon-plan.org>), to review the entire scope of watershed risk management and salmonid needs and efforts to restore them.

Mass Marking

Many regional (Oregon and Washington) hatchery stocks of coho salmon were first mass marked (fin-clipped) beginning with the 1995 brood; additional stocks and broods were added in later

years. Selective Chinook stocks are also being mass marked. Selective identification for many groups of marked (hatchery) and non marked (mostly wild) open up several opportunities for life history studies (freshwater and oceanic), ecological investigations, predation, migration, and survival to name a few. The potential now exists to study several aspects of estuarine ecological relationships between smolts and their environment and hatchery/wild smolt interactions.

Selective Fisheries

Selective salmon fisheries, that is, fisheries directed towards hatchery mass-marked (fin-clipped) salmon stocks (or a single specie fishery) for selected times and areas, are now becoming the common denominator for marine and terminal area fisheries while minimizing impacts on critical wild stocks. Both the PFMC and PSC are working on developing harvest model applications to assess such fisheries. To support these efforts we are addressing:

- Encounter levels of Oregon coastal wild coho stocks in PFMC area ocean selective fisheries for hatchery coho and their impact rate by direct at-sea observations.
- Time and area distribution factors for wild/hatchery stocks to give the greatest potential for accessing hatchery stocks.
- Improvement in current harvest modeling for both marked and unmarked stock catch and “catch and release” impacts applicable in selective fisheries.

Selective fisheries for coho have now been in effect since 1998. In all ocean selective seasons, we have staffed observers on board charters, private vessels, and commercial trollers to observe the ratio of marked to unmarked coho, number of lost fish, and other data elements to assist in the evaluation of the fishery and associated impacts. In 2000, we made observer trips on 121 recreational trips and 5 commercial troll vessel trips. We observed coho marked to unmarked ratios of 69% to 76% in the Cape Falcon to Humbug Mountain recreational fishery, and ratios of 85% and 74% in the recreational and commercial troll coho seasons north of Cape Falcon.

Hooking Mortality and Bycatch

Total fishery related impacts in chinook and coho fisheries need further evaluation, including measurement of mortality associated with catch-and-release fishing and with selecting different types of fishing gear.

Fishery Management Strategies

The initiation of ocean and select area fishing strategies require added evaluation and updating of current harvest assessment models as a basic tool to adequately assess stock impacts. New techniques for genetically determining stocks of chinook and coho need to be evaluated for application in managing fisheries in the PFMC area.

Escapements and Assessment

Accounting for actual coho adult escapement to the Oregon coast and most Columbia River stocks are well developed as part of yearly accounting and determining management strategies. Oregon coastal chinook stocks, however, most of which are wild stocks, need much additional work to develop the necessary methodologies to effectively determine actual escapement (in numbers of fish, not just trends in abundance), recruitment estimates to regional fisheries and exploitation rates in both Pacific Salmon Treaty (PSC) areas and PFMC fisheries off the West Coast. Currently, coastal fall chinook escapement is accurately enumerated in “indicator stock”

programs only in the Salmon River (representing north Oregon coast stocks) and Elk River (representing central/south central Oregon coast stocks) accurately measure actual escapement and ocean and freshwater exploitation rates. New coastal chinook salmon field studies, started in 1998, are exploring techniques and methodologies to better assess escapement, run forecasting of abundance, and exploitation factors.

MARINE RECREATIONAL FINFISH

Background/History

Recreational fisheries along the Oregon coast have occurred for decades. ODFW's monitoring of the summer ocean boat fishery began in the late 1970's, and was initiated to monitor the ocean salmon fishery. Because the program targeted salmon, our early records of catch cover the mid-June through August months. Substantial catch of fish other than salmon also occurs in the boat fishery outside of this period. In addition, minor catches of most marine recreational finfish species occur in shore and estuary fisheries. ODFW is presently expanding its ocean boat-sampling program. Year round sampling in the major ports indicates little activity during the November through February period due to weather and adverse ocean conditions. Thus, ODFW plans to sample ocean boats during the March through October period. The national Marine Recreational Fishery Statistics Survey staff will sample the shore and estuary fisheries.

Fishery Trends

Annual angler ocean boat trips targeting finfish species other than salmon have more than doubled since 1980 (Figure K-1), as has catch (Figure K-2). This occurred during a period when salmon opportunity decreased dramatically. In recent years, the bottomfish directed effort has exceeded salmon directed effort (Figure K-3).

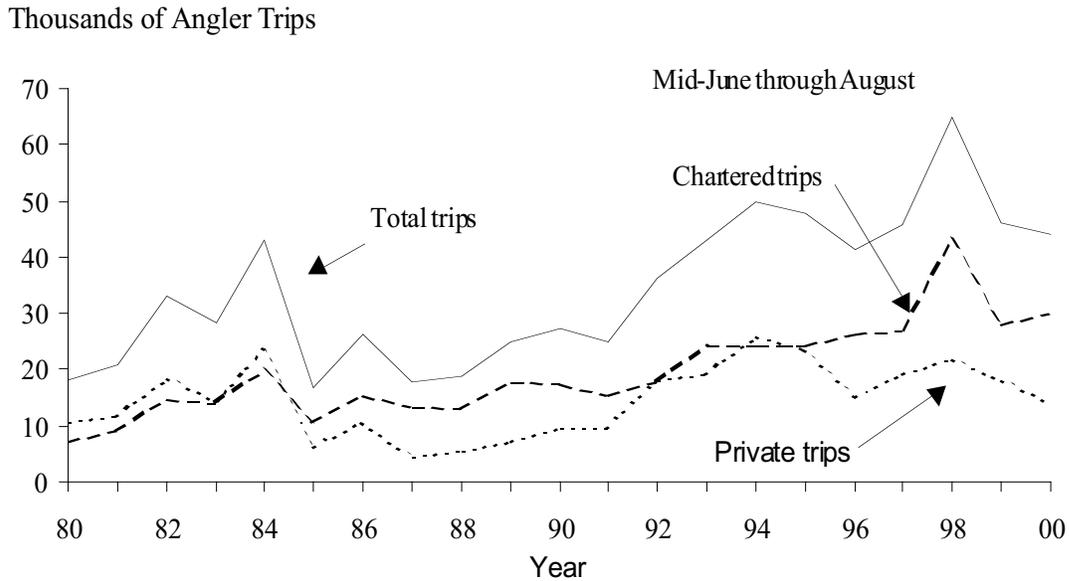


Figure K-1. Estimated number of Oregon ocean trips targeting non-salmonid fish species From mid-June through August, 1980-2000.

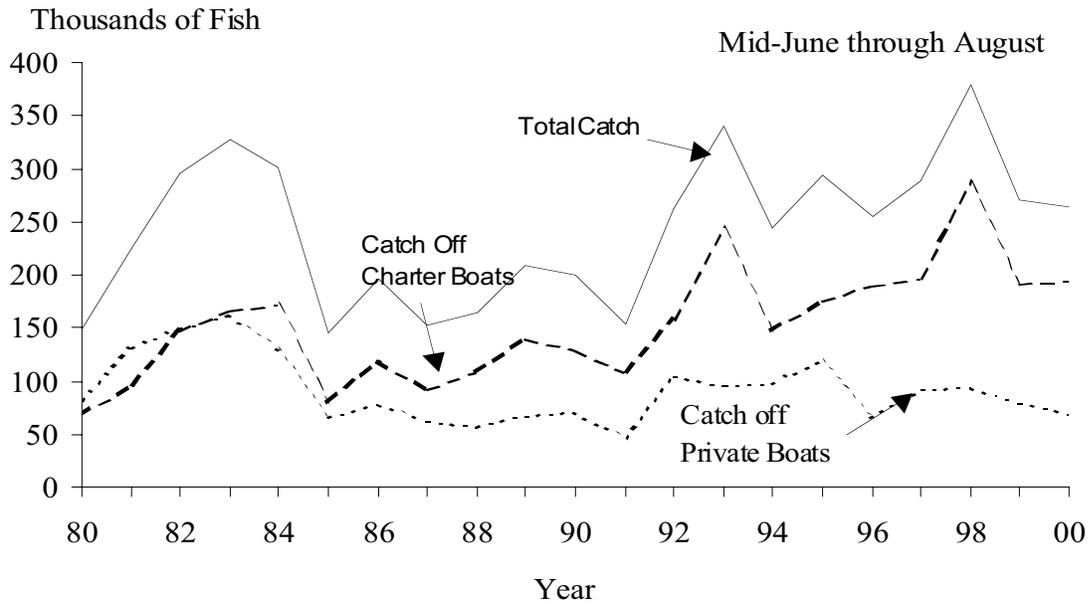


Figure K-2. Estimated number of fish (excluding salmon) caught from mid-June through August, 1980-2000.

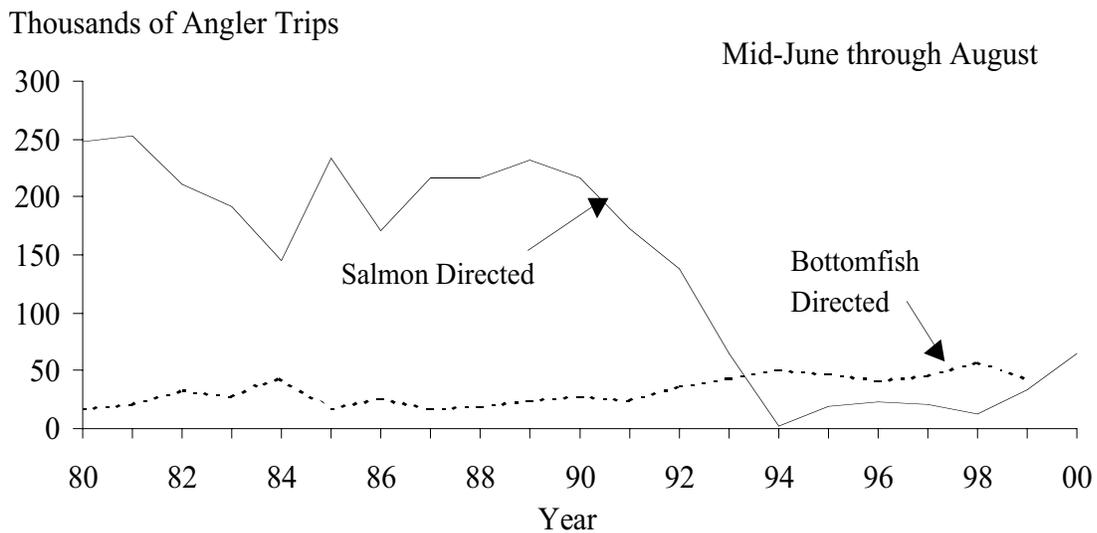


Figure K-3. Comparison of salmon vs. non-salmon angling effort from mid-June through August, 1980-2000.

Species Composition

A variety of species are caught in marine fisheries. Black rockfish, lingcod and Pacific halibut are some of the most frequently caught fish in ocean boat fisheries. Bank anglers commonly catch surfperch species, while estuary anglers harvest a variety of species including sturgeon and Pacific herring.

Management/Regulations

The first sport fishery bag limit of 25 fish (with no more than five lingcod) was adopted in 1976. In 1978, the bag limit was changed to stipulate no more than three lingcod, and 15 rockfish, cabezon and greenling in the 25-fish bag. In 1986, these regulations were liberalized to 25 other fish in addition to the 15 rockfish/cabezon/greenling and 3 lingcod to allow development of target fisheries for nearshore flatfish and other species. In 1994, a limit of 10 black rockfish within the rockfish bag was imposed to conserve black rockfish stocks. In 2000, the rockfish aggregate daily limit was reduced to 10 fish, with a three canary rockfish limit. Since 1995 several regulation changes were made for lingcod. A minimum length limit was adopted and then increased to 24 inches, while the bag limit was reduced to two fish.

The fishery is open year round for most species. This is likely to change in the near future. In 1998, the Pacific Fishery Management Council considered winter closures for lingcod. In recent years the season for directed halibut fishing has been drastically reduced and was only open for five days in 2000.

Critical Issues/Research Needs

Stock Condition

Stock conditions are unknown for the majority of species harvested by anglers. Prior to 1999, biological sampling occurred only for black rockfish and surfperch species. Starting in 1999, length and weight data was gathered from most species, and age structures were taken from black, blue, yellowtail and canary rockfish and lingcod. Stock assessments have been conducted for a few species also harvested in commercial fisheries, such as lingcod, Pacific halibut, and black, canary and yellowtail rockfish. Recent assessments of black rockfish and lingcod, two of the more frequent species taken in sport fisheries, indicate substantial reductions in recent years resulting in restrictions placed on sport and commercial fisheries. We need to both continue and improve our assessments of these two important species.

With so few species being assessed, staff is working in cooperation with other projects within Marine Resources Program, and with other interstate and federal projects to gather needed biological data on a reef specific basis. This new habitat based approach may be used to develop non-traditional stock assessments on groups of species.

A developing commercial “live fish” fishery may compete with the sport fishery for the resource where resource use overlaps. Due to the nature of this fishery in keeping fish alive, harvest occurs nearshore on the same fish harvested by sport anglers. Presently this new commercial fishery is focused on the southern Oregon coast, but is likely to expand coastwide.

New solutions are needed for new problems. For example, safety is becoming an issue in our directed Pacific halibut fishery. This fishery went from a year round season in the mid-1980’s to five days in 2000. The fishery has become a derby fishery and as the number of days decreases the safety concern increases

STATE LIMITED ENTRY PROGRAMS

Background/History

In the past, fishery resources were thought to have unlimited potential as renewable food resources for the planet's growing human population. Limits on technology and marketability were viewed as the only barriers to exploitation of these resources. History has shown that as fishing and distribution technologies improved, acceptance and demand for more fish and shellfish increased. At the same time, many stocks were discovered to be finite, and renewability was not certain. Stock declines of many fisheries resources have occurred on a global scale. Some of these declines reflected limited recruitment of young and reduced production associated with environmental variability. In some cases habitat degradation has had negative impacts. In other cases, declines have been linked to excessive fishing effort.

Modern fisheries management methods attempt to determine stock size and productivity as well as fishing effort required to harvest the available sustainable yield. Restrictions on effective fishing effort may result from seasons, size limits, quotas, trip limits, limits on gear, or limiting the numbers of participants.

Harvesters, challenged with changes in abundance, increased restrictions, or changes in market demand and price, have adapted by increasing vessel efficiency and by developing innovative multi-species and multi-gear strategies. This flexibility allows rapid shifting of fleets to alternative fishery resources to take advantage of seasonal and annual variations in abundance and markets. Investment into increased flexibility and harvest capacity, as well as unrestricted access to fisheries, has led to excess harvest capacity in many sectors.

Commercial fisheries management in Oregon has followed patterns observed globally. Increased fishing effort on limited resources has resulted in the need to limit the number of participants, because other management measures have failed to provide adequate protection for the resource and equitable distribution among users. Oregon's state-managed fisheries have seven limited entry systems. Most of these systems were developed in the 1980's after a period of sustained growth and development of fisheries during the 1970's. When effort limitation programs were implemented, the number of fishermen issued permits generally exceeded the level needed to harvest the resource surplus. Attrition of participants in Oregon's state limited entry programs has reduced the number of permits to one-half or less in most fisheries since inception of each program (Figure L-1).

Management/Regulations

State limited entry programs are managed through a combination of Oregon Revised Statutes and Oregon Administrative Rules. All have target levels of permits and provisions for a lottery if the number of permits falls below a threshold level. Reduction in permits is by attrition. The only exception has been a federally financed buy-back program for the Columbia River gillnet fishery. Permit holders must renew their permits annually, and some fisheries have a landing requirement for renewal or transfer of permits. Additional restrictions are required on permit transfers in some fisheries. A boat license is required to purchase a limited entry permit in all fisheries except the Yaquina Bay roe herring fishery and the sea urchin dive fishery.

SB 938 established a Limited Entry Advisory Committee, which examined state limited entry programs. The committee recommended several changes in regulations including reducing the target level of permits for most fisheries, adding restrictions on vessel size for permit transfers, allowing lotteries to be suspended for two years, and other modifications to these programs. These changes were implemented in 1996. Individual summaries for each fishery follow.

Pink Shrimp

A total of 373 permits were issued for the ocean shrimp fishery when a vessel moratorium program was implemented in 1980. An annual landing of 5,000 pounds of pink shrimp was required to renew the limited entry permit from 1980 through 1998. The landing requirement was removed in 1999 via Oregon House Bill #2334. Five thousand pounds of shrimp must be landed in Oregon, California, or Washington for three or more calendar years in order to transfer a permit to another vessel. Currently, when the number of permits falls below 150, a lottery must be held to select new permit holders. The total number of permits may not exceed 150. However, an introduced 2001 Oregon House Bill (#2455) would require counting permits that were purchased by or otherwise transferred to the federal government toward the 150-permit limit. It would also give preference in any permit lottery to vessels that had made single deliveries. From 1980 through 1998, up to six single deliveries were allowed by vessels without Oregon shrimp permits providing those vessels held California or Washington shrimp permits. The number of single deliveries allowed was reduced to one (1) per year in 1999 via Oregon House Bill #2333.

Scallops

The vessel moratorium permit system was implemented in 1981 for scallops with an initial issuance of 196 permits. An annual landing of ten pounds of foodfish was initially required to renew the limited entry permit. Permits were initially transferred without restriction on length of a vessel. Single delivery licenses are restricted to vessels holding a California or Washington scallop permit. In 1996, a five-foot maximum length increase restriction was applied when a permit is transferred to a new vessel, combining of permits is not allowed. In order to transfer a permit, the permitted vessel must land 5,000 pounds of foodfish annually and must have participated in three or more consecutive years in the scallop fishery. For this fishery, the Oregon Fish and Wildlife Commission has been delegated authority to set the number of permits by rule, below which a lottery will be held to issue new permits.

Troll Salmon

The vessel moratorium permit system for troll salmon was implemented in 1980. Although 4,331 vessels already had Oregon troll permits, a goal of 2,400 vessels licensed to troll for salmon in Oregon was established. The Oregon legislature lowered the troll permit ceiling to 1,800 vessels in 1993 and to 1,200 in 1995. In 1998 only 1,194 vessels held permits. ORS 508.819 requires a lottery system of permit issuance if the number of permits falls below 1,200. However, the State Fish and Wildlife Commission may suspend the lottery for two years as it did in 1999 and 2000. In the year 2000, there were 1,111 permits and 611 boats landing salmon. There are no landing requirements for renewal of permits, but 100 pounds of salmon must be landed in Oregon, Washington, California, or Alaska in each of two calendar years prior to transferring a permit. There is a five-foot maximum size increase allowed for transfer of a permit with size groups for vessels less than 30 feet, between 30-42 feet, and over 42 feet. Combining of permits to achieve a larger size is not allowed, and transfers are restricted to one per year. Single delivery permits are available to vessels with ODFW approval and only in the case of an emergency.

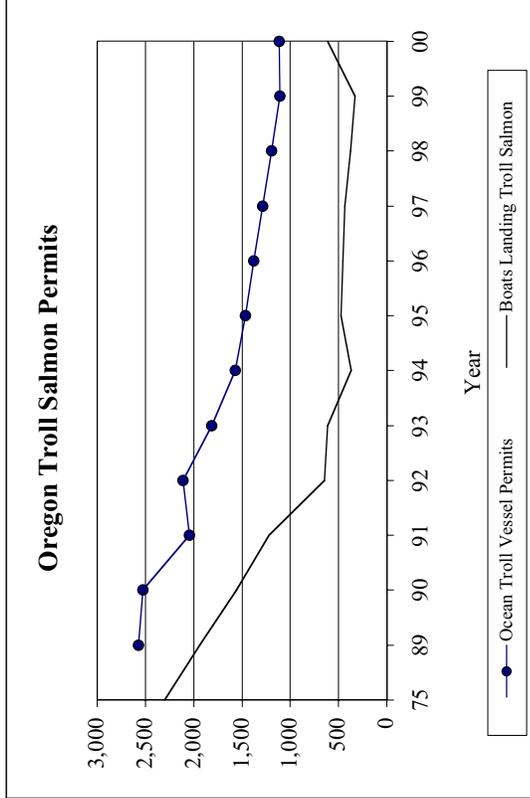
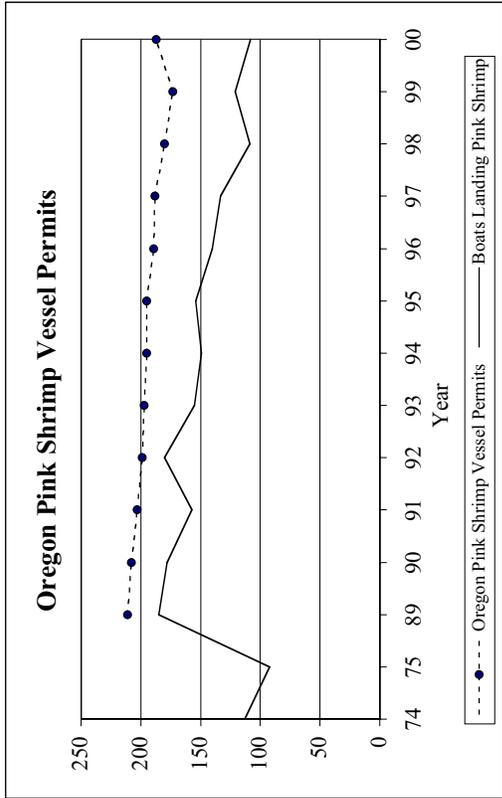
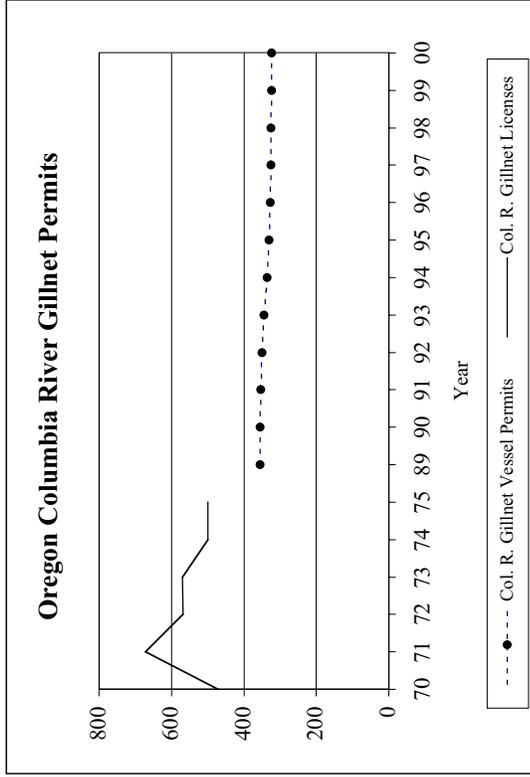
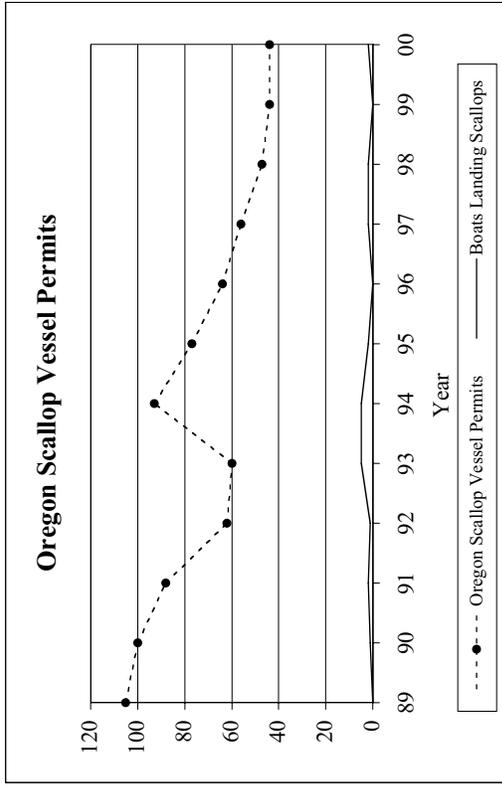


Figure L-1. State limited entry programs.

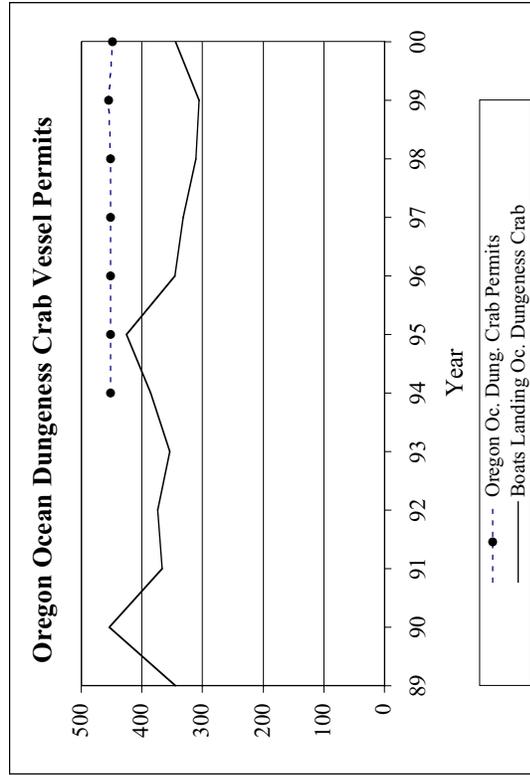
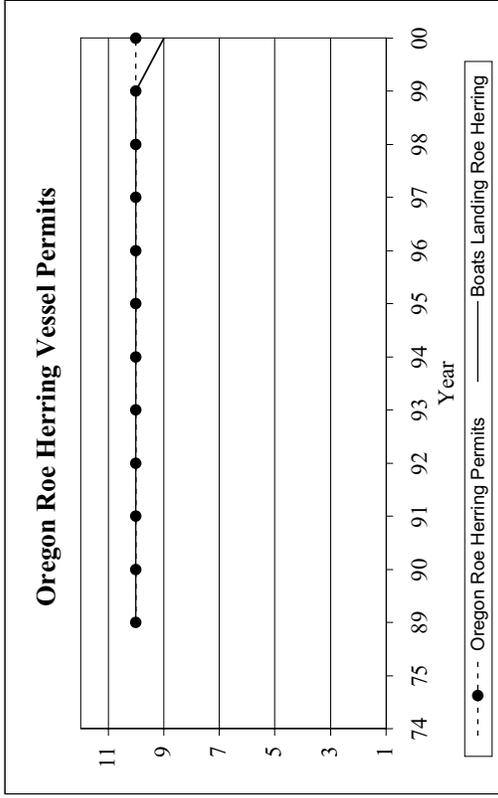
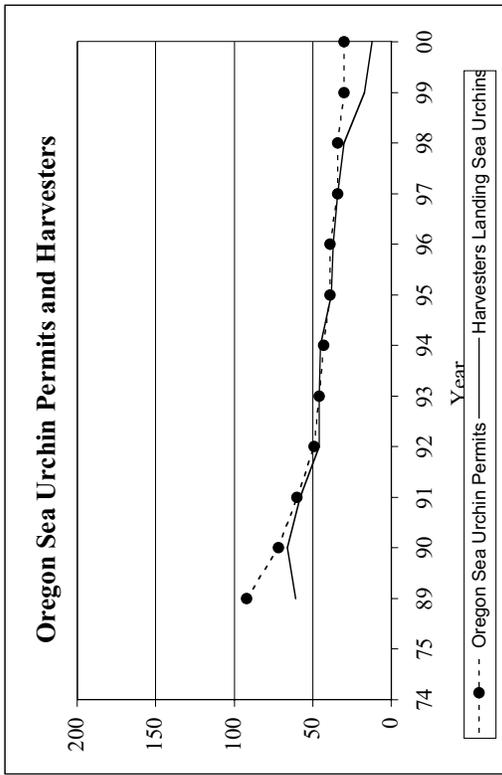


Figure L-1, continued. State limited entry programs.

Gillnet Salmon

The gillnet salmon limited entry system was implemented in 1980 when 571 permits were issued. A total of 133 out of 511 Oregon gillnet permits was purchased and retired by the state between 1982 and 1986 resulting in a 31 percent reduction in the number of permits. The landing requirement of one salmon for renewal of a permit was dropped in 1996. One Columbia River gillnet salmon must be landed per year for two or more calendar years in either Washington or Oregon in order to transfer a permit. There are no restrictions on vessel length for permit transfers. A lottery is held once the number of permits falls below 200. There are no provisions for single delivery licenses.

Yaquina Bay Roe Herring

The Yaquina Bay roe herring fishery limited entry system was implemented in 1984. Only ten permits were issued. Permit holders are required to land 500 pounds of roe herring each year in order to renew their permit. There are no requirements for transferring permits. By administrative rule, ODFW may issue up to six permits by lottery if the number of permits falls below six. The landing requirement to renew permits was dropped.

Sea Urchin

The sea urchin limited entry program was adopted in 1988 with 92 permits issued. Through administrative rule changes, the number of permits was reduced to 46 in 1989 and then to 33 in 1994. A lottery system was suspended indefinitely effective January 1, 1995. Beginning in 1996, the Commission set the permit numbers to 30 and instituted a system whereby permits could be purchased and combined on a 3 to 1 basis to encourage reduction of permits. Permits would become freely transferable once the target level of 30 permits was achieved. The permit renewal requirement was reduced to 5,000 pounds of urchin landings. In 1999, the number of permits reached 30 and became freely transferable.

Ocean Dungeness Crab

The ocean Dungeness crab fishery was the latest addition to Oregon's limited entry program. Established during the 68th session of the Legislature, Oregon's crab limited entry program became effective at the beginning of the 1995-96 crab season, December 1, 1995. Approximately 452 vessels make up the current Oregon limited entry fleet.

Critical Issues/Research Needs

Periodic review of state limited entry systems was recommended by the Limited Entry Advisory Committee. Industry and government were encouraged to review performance of fisheries under restricted access programs and to determine if recommended numbers of boats and fleet profile were still appropriate for the amount of resource available.

Optimizing effort is a complex process that seeks to balance exploitation or harvest against available surplus while meeting social and economic objectives such as fleet and harvest stability, profit, steady supply to markets, and minimal dislocations to harvesting and processing labor. Management strategies that successfully balance these interests result in optimum sustainable yield from the resource.

Effort limitation, when employed, usually captures effort well in excess of what is needed to harvest any available surplus. Optimizing fleet size can take place through a vessel permit buy-back system, or through slow attrition due to renewal requirements linked to fishery performance. For most of Oregon's limited entry programs, the latter method has been employed since our ability to reduce fleet size through buyback programs is constrained by statute (ORS 506.241).

In spite of the reductions in permits in Oregon's limited entry fisheries, there are still concerns that effort is still in excess of current available resources for most of these fisheries. Fortunately, those fisheries where permit attrition has slowed, as in the shrimp and sea urchin fisheries, harvest appears to be approaching sustainable and stable levels for the level of effort expended for those resources. In those fisheries with resources in decline, the number of permits continued to decline. The role of industry and government should be to develop a system to determine target numbers of participants and to review these targets periodically to see if they are still appropriate. Given the nature and performance of Oregon's limited entry systems, the following guidelines were recommended by the Limited Entry Advisory Committee for optimizing fleet or participant numbers:

1. The fishing industry, with assistance from state government, should review performance of Oregon's limited entry programs every five years to see if target numbers of permits or participants are appropriately scaled to the resource and needs of industry.
2. Target numbers of participants should be based on potential harvest capacity, past fishery performance, resource variability, and number and kinds of additional management measures needed to maintain fisheries resources and resource allocation. For instance, the recommended number of participants might be the number of participants in a set of base years where resource availability was stable and few additional management measures were needed to maintain the resource base.
3. Effects of increasing or decreasing recommended numbers of participants in a limited entry system should take into account potential effects on other fisheries and fisheries resources.
4. Attrition of permits through retirement or through restrictions on renewal or transfer requirements is the preferred method of reducing numbers of participants in a limited entry program.

Currently the fishing industry and Oregon Legislature are exploring legislation to limit the total number of pots used by fishers in the Dungeness crab fishery. In addition, Pacific Fishery Management Council's Groundfish Strategic Plan Committee recommended a 50% reduction in fleet size through a buy-back program or through permit stacking. Such efforts need to be coordinated with state permitted limited entry systems, because many groundfish federal permit holders also hold state permits. Some state limited entry permit holders expressed concern a buy-back program that eliminated groundfish permits but not state permits would activate 'latent' state permits and cause an excess of effort in state limited entry fisheries. Current proposals for a groundfish capacity reduction program include retiring of all permits, federal and state. A bill was introduced in Oregon's 2001 legislative session to allow changes in permit numbers if such a buy-back program is developed.

BYCATCH & DISCARD ISSUES

Background/History

Oregon's groundfish, pelagic and shellfish fishery industry dominates all Oregon commercial fisheries. In 1998, these fisheries comprised 99 percent of the landings and 94 percent of the value to the industry with a statewide income contribution of almost \$47 million. Coastal communities receive substantial direct and indirect employment opportunities as a result of year-round fishing and processing activities.

The state's key commercial fisheries are developing potentially serious problems that could affect the health of fish stocks and fishing communities. Every fishery has a varying level of bycatch or species caught incidentally while fishing for other targeted species. There are three types of bycatch: 1) unmarketable fish, 2) marketable fish caught accidentally that have low market value, and 3) marketable fish caught accidentally after a season has closed, or a trip limit has been reached, or with prohibited gear (bycatch resulting from regulations). Bycatch is normally discarded and the fishing industry and public are growing increasingly concerned over mortality of discarded fish and waste of harvest. Bycatch mortality affects fish populations and is one reason scientists are concerned about the status of long-lived species and their productivity.

Management is becoming increasingly difficult and complicated as there are more species being fished, more and different types of gear being used and more fishery interactions. Many of these interactions can impact fish stocks and unintentionally increase bycatch.

Among the most difficult aspects of bycatch is that it must be accounted for because it affects stock abundance estimates. However, the fishing industry is concerned about the quality of information and methods used to include bycatch in setting allowable harvest. Areas of concern include the NMFS trawl surveys of fish populations, the mathematical model used to assess fish stock status, and estimates used to compute fish loss due to bycatch and subsequent discards.

The magnitude of this loss is unknown for most species, and only estimated for several primary species, but management agencies currently reduce allowable harvest as much as 20 percent to compensate for anticipated discards. These loss estimates raise three important issues:

If accurate, fishing practices and efficiency need improvement to reduce waste.

If overestimated, allowable harvest and subsequent economic yields from fisheries could be increased.

If underestimated, fish stocks face a greater risk of depletion than believed, and conservation efforts need improvement.

Research was conducted in the 1980s to help evaluate at-sea discard from trawls. This work was valuable and provided important information on utilization and discard occurring at that time. However, management and market changes since have resulted in changed fisheries and fishing strategies; newer, more relevant information is needed. An example is the relatively new shoreside processing fishery for Pacific whiting, discussed in an earlier section. Unique aspects of this fishery led to the need for a specialized observation program to determine the extent to which bycatch occurred. The resulting program has been ongoing since 1992 and is presented here as an example of a study designed to provide needed information and yet accommodate the specific needs of a particular fishery. A second example is the urgent need for increased data on trawl discard in the groundfish fishery, which led to the cooperative Enhanced Groundfish Data Collection Project (EDCP). This three-year project has produced a better understanding of

discard rates, and how they occur within the fishery. It also serves to demonstrate that industry and government can work together to produce applicable results.

Pacific Whiting Shoreside Observation Program

The Pacific whiting shoreside observation program has shown the salmon bycatch rate is very low, no higher than 0.01 salmon per mt of whiting. Total bycatch rate was also small, and was highest for Pacific and jack mackerel at between nine and 59 pounds per mt of whiting. Bycatch rate was modest for yellowtail and widow rockfish at two to twelve pounds and one to fifteen pounds per mt of whiting, respectively (Figures M-1 and M-2).

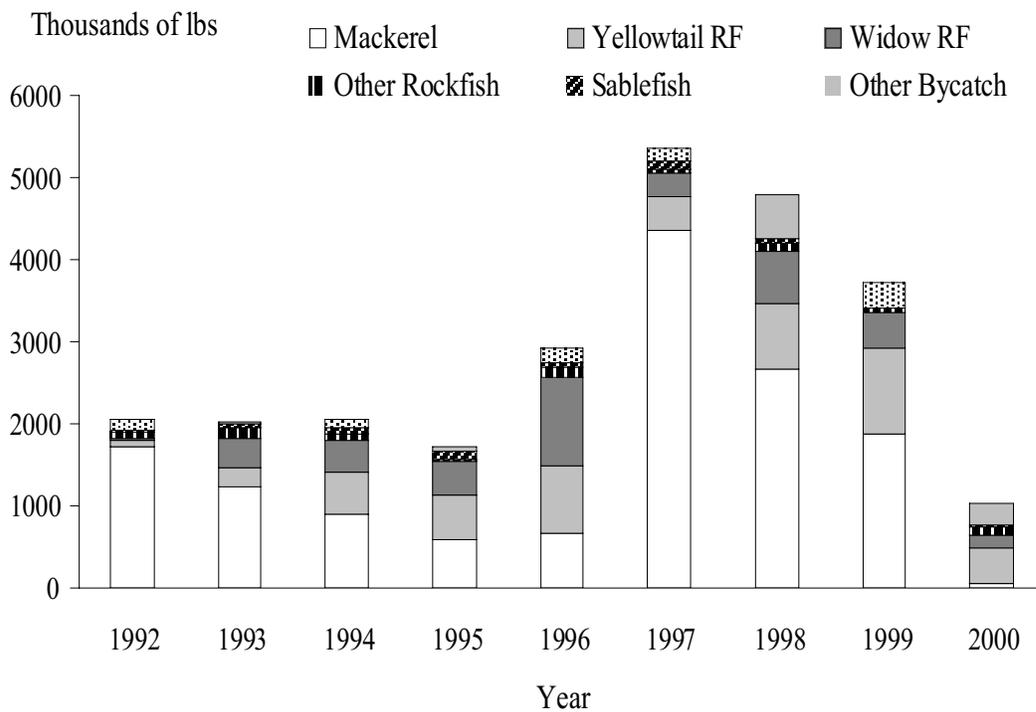


Figure M-1. Bycatch from Oregon Pacific whiting fishery, 1992-2000.

Although the rockfish bycatch rate is modest in the whiting fishery for catches delivered shoreside, it is of concern when combined with the bycatch delivered to or caught by at-sea processors. During the years 1991-1998, yellowtail and widow rockfish bycatch from the combined whiting fisheries was eight percent to 39 percent and five percent to 16 percent of the respective harvest guidelines for those species (Figure M-3).

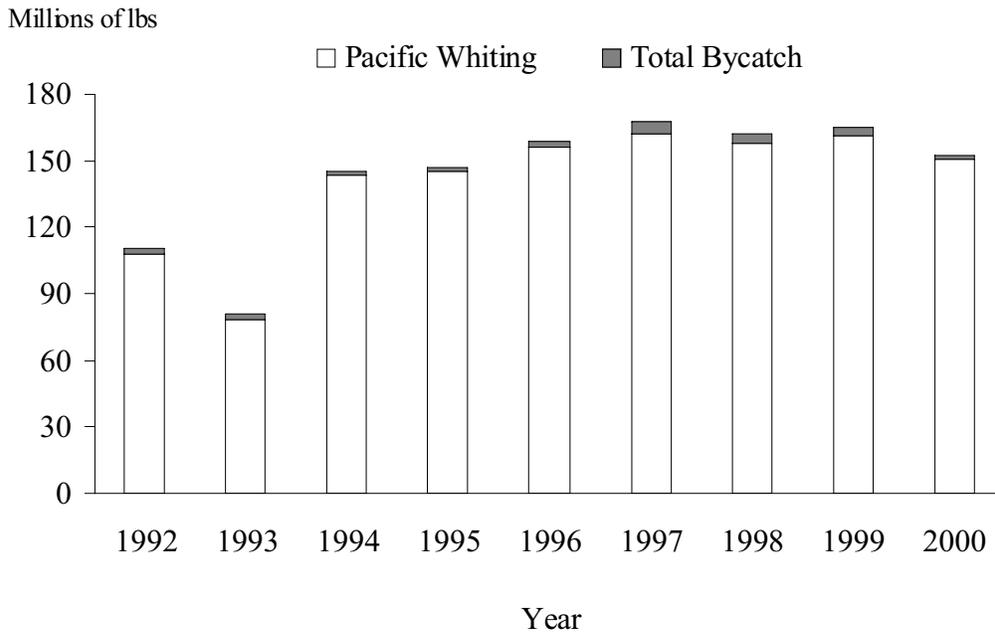


Figure M-2. Oregon landings from Pacific whiting fishery.

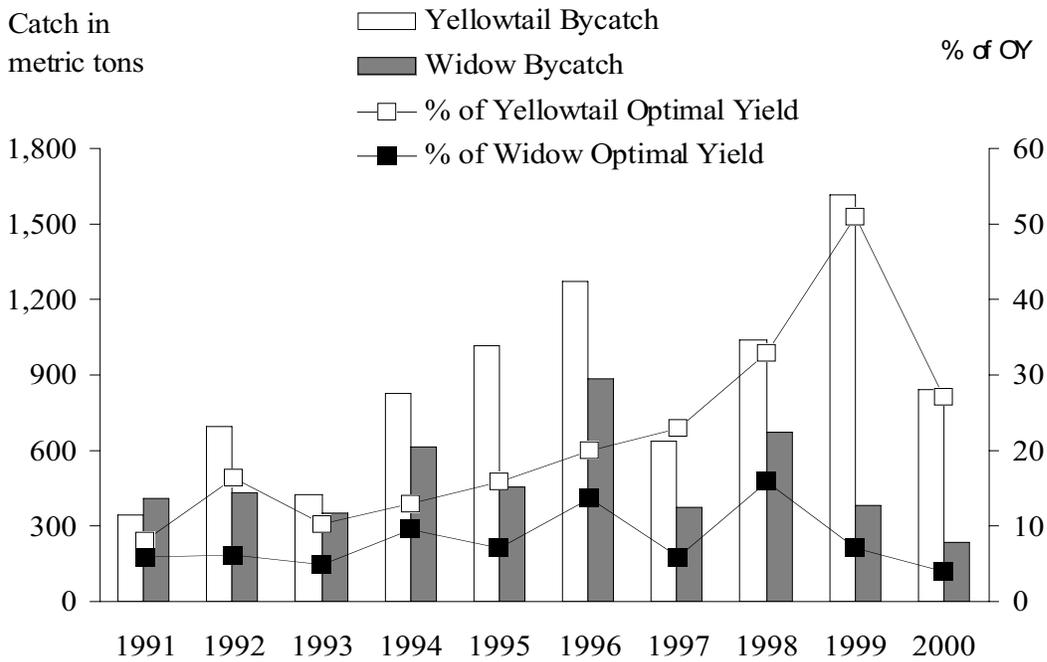


Figure M-3. Bycatch of yellowtail and widow rockfish from whiting fishery.

Management/Regulations

The principal management measures to reduce bycatch and discard are gear restrictions, seasons, and limited entry. Regulations may also result in discard, such as quotas, limits, and gear that are legal for some species and prohibited for others. A summary of recent management measures addressing bycatch is as follows:

- 1982 Implementation of the Pacific coast groundfish FMP.
- 1985 Prohibition of tickler chains ahead of rollers on roller and bobbin trawls.
- 1992 Increased the minimum legal codend mesh size from three to 4 1/2 inches and prohibited double-walled codends. Prohibited night fishing in the directed Pacific whiting midwater trawl fishery, and fishing in the Columbia River Conservation Zone to reduce catch of sensitive species in the directed midwater trawl whiting fishery. The Council approved a cooperative program between industry and fishery managers which allowed landing of unsorted whiting catches by midwater trawlers and established the bycatch observation program in that fishery.
- 1995 Trawl minimum mesh size applies throughout the net. Removed the legal distinction between bottom and pelagic (midwater) trawls. Modified chafing gear requirements.
- 1996 For limited entry fishery, established cumulative vessel limits for specified 2-month periods with the target harvest level per month being 50% of the 2-month limit. However, vessels able to land up to 60% of the 2-month limit during either of the two months, as long as the total does not exceed the specified 2-month limit.
- 1998 Limited entry trip limited periods redefined into seven periods of varying length, those being 1) January – March; 2) April - May; 3) June – July; 4) August – September; 5) October; 6) November; and 7) December.
- 1999 Council closes limited entry trawl fishery for last quarter of 1999 because of excessive bycatch of yellowtail rockfish (>50% of total OY) by the whiting fishery.
- 2000 Shoreside fishery implements cooperative plan with industry to educate fishers and processors, track and monitor bycatch levels of yellowtail rockfish, and enforce “tie-up” penalties for vessels with high bycatch rates.

New limited entry trawl gear restrictions were imposed based on footrope size (diameter). Large footrope is defined as having a diameter greater than 8 inches (including rollers, bobbins, etc.), small is any diameter less than 8 inches. Possession of any species of shelf or nearshore rockfish and certain flatfish from a fishing trip using large footrope trawl is prohibited.

Critical Issues/Research Needs

Marine finfish are a public resource, and there is a growing belief they should not be wasted. Discard is becoming less acceptable to the general public as well as the fishing industry.

Research

Research is needed to determine the extent of bycatch and discard from many of the traditional commercial and sport fisheries. Research on bycatch in the whiting fishery has provided good results; this work will serve as a model for additional studies. The recent research on bycatch in the limited entry groundfish fishery obtained by the Enhanced Groundfish Data Collection Project will shed further light on important bycatch issues. This work will also provide important insight into the development of additional studies as the need for this type of research continues to increase.

Sensitive Issues

There are several bycatch/discard issues that are sensitive:

- Trawl bycatch and discard of Dungeness crab (trawl vs. pot issue)
- Bycatch and discard of prohibited species, especially salmon and halibut in trawls (trawl vs. longline and sport issue)
- Discard of rockfish; these species usually die and are seen floating at sea (commercial vs. sport)

Sensitive Species

Bycatch and discard, especially of sensitive species, are becoming subjects of interest for environmentally active groups. Some groups will seek to eliminate the catch of fish by nets as they classify trawls in the same category as high sea gillnets.

Allocation

Bycatch and discard are subjects of interest when considering allocation of limited stocks among user groups. Some groups will use the bycatch issue as a tool to reduce the allocation of competitors.

New Opportunities

Harvesters and processors are looking for new opportunities from a limited fishery resource as most traditional market species are fully utilized. Research is needed to find ways to best utilize or reduce bycatch and discard. Gear research to reduce these is desirable. Research to increase recovery and better utilize discards is also needed.

Regulations

Additional regulations may be necessary to reduce bycatch and discard. Some issues may include: increase in trawl minimum mesh size, requirement of fish excluders in shrimp trawls, exclusion of fishing in juvenile rearing areas, elimination of some fishing gears, time/area closures.

SUMMARY OF MARINE FISHERY RESEARCH

Groundfish – Shellfish - Habitat

The Oregon Department of Fish and Wildlife has been building a marine nearshore and at-sea research and management assessment program since early 1999. The program identified the need to expand sampling dockside, improve groundfish stock assessments and initiate new stock surveys for species in nearshore areas not covered by federal continental shelf and slope surveys. The research utilizes existing ODFW scientific staff and relies on chartering under-utilized local fishing vessels for at-sea research.

Goals and Objectives

It is ODFW's goal to increase the quality and quantity of groundfish stock assessments and biological information through improved at-sea and dockside sampling programs and through carefully designed research projects. The ODFW State General Funds have been and will continue to be used to develop a research program to address emerging fisheries concerns. We have used industry input and cooperation to design and implement projects that will:

- Evaluate changes in regulations and their impact on fishery dependent information used in stock assessments.
- Conduct new groundfish inventories.
- Develop alternative survey methods.
- Improve stock assessments by improving biological data.
- Supplement observer coverage in smaller nearshore fisheries.
- Develop alternative gears to minimize bycatch of critical groundfish species.

SUMMARY OF CALENDAR YEAR 2000 RESEARCH PROJECTS

Research Objectives

- Improving groundfish stock assessment surveys and fishery monitoring.
- Reduction of bycatch (non-target species) in commercial and recreational fisheries.
- Nearshore fisheries research directed at developing techniques to conduct habitat based inventory and juvenile recruitment surveys.

Projects

While the projects spanned a wide range of topics, several were focused on developing methods to assess nearshore groundfish stocks. It is ODFW's goal to increase the quality and quantity of groundfish stock assessments and biological information. We have used commercial and recreational fishing industry input and cooperation to design and implement projects that will:

- Evaluate changes in regulations and their impact on fishery dependent information used in stock assessments.
- Conduct new groundfish inventories.
- Develop alternative survey methods.

- Improve stock assessments by improving biological data.
- Supplement observer coverage in smaller nearshore fisheries.
- Develop alternative gears to minimize bycatch of critical groundfish species.

Nearshore Fixed Gear Survey

This project tested two gear types for surveying nearshore rocky reefs, cable gear and short bottom longline, on Orford Reef. The project also utilized side-scan sonar mapping of Orford Reef completed in 1999 to test whether high relief and low relief rocky habitat yielded different fish densities.

Improving Maturity Data

New maturity data was collected for female yellowtail, canary, yelloweye, black, vermilion, quillback and yellowmouth rockfish, Pacific ocean perch and petrale sole. Histology was used to evaluate maturity more accurately and did suggest some significant problems in visual staging at some times of the year. Petrale sole data was successfully collected prior to spawning aggregation, directly addressing a Stock Assessment Review (STAR) Panel concern with the petrale sole assessment. Difficulty in determining maturity for some rockfish species, even histologically, suggests more work is needed in this area.

Juvenile Rockfish Sampling

This project tested seining in estuaries and protected nearshore open ocean sites as a tool to collect recruitment information for black rockfish and other nearshore groundfish species. Results were promising. If this project is extended it will take 5-10 years to see if seine catches accurately reflect variation in new recruits to nearshore groundfish populations.

Lingcod Discard Mortality

One of the most difficult aspects of estimating fishing mortality is to measure the mortality induced by capture and subsequent discard of non-target or non-marketable fish in a given fishery. This project will develop and test methodologies to measure discard mortality rates in Lingcod, a species important to both commercial and recreational fisheries and currently designated as overfished. Early research on this project tested an at-sea cage for holding captured Lingcod. This method failed due to predators (sand fleas) entering the cages and consuming the fish.

Later research utilized a tank/transport holding method. Survival using this method was excellent, regardless of tow duration, providing time on deck was short. The study was small scale, but confirms what many fishermen have contended for lingcod: if you get them back in the water quickly, they do pretty well.

Bottom Escapement Panels in Trawls

This project tested escapement panels in the bottom (just behind the footrope) of shrimp and bottom trawls. In general, this project had a number of technical difficulties. There was some indication that lingcod utilize bottom escapement panels in shrimp trawls, but a better mechanism needs to be developed to measure the footrope height above bottom before the panels can be tested further. For bottom trawls, the “capture bag” approach did not work; fish exited the panel, but jumped back up into the trawl when they encountered the capture bag.

Sablefish Behavior Towards a Baited Pot

This project was the third in a series of projects designed to test the feasibility of using tow or longline gear as an additional survey tool for sablefish (blackcod). This project used visible light and infrared light with video equipment to view the behavior of sablefish around and inside a baited sablefish pot. Video observations are hard to quantify, however it appeared that sablefish avoided the pot with the visible light source, but approached the pot with infra-red light quite readily. Sablefish were seen both entering and leaving the pot. Although sablefish can swim rapidly, their swimming behavior approaching a baited pot is a slow, side to side swimming and looks like olfactory search behavior.

Rocky Reef Mapping

This project used multi-beam bathymetry to map small patches of rocky habitat off Cape Perpetua and a Remote Operated Vehicle to examine which types of fish were living in what type of small rocky habitat. The findings show that patches larger than 5X5 meters tend to hold rockfish and suggest that only surveying large rocky reef might underestimate rockfish population size.

Biological Characteristics of Nearshore Rockfish

Information on nearshore bottomfish species in large areas between ports (inter-port areas) is not available. The amount of interaction between populations in port and inter-port areas is unknown. It is possible that lightly fished populations in areas between ports are providing recruitment supporting fisheries in “local” port fishing areas. A new and growing commercial “live fish” fishery is developing in these inter-port areas. Consequently, it is important to gather biological information for both “local” and inter-port populations for effective management of these stocks and fisheries. Since 1998, we have collected biological samples of nearshore fish species to determine general population characteristics at several sites along the Oregon coast. Using recreational charter vessels and volunteer anglers, project staff record length, weight and sex and collect age structures, and genetic samples of fish landed. Also, species composition and reef location have been recorded for future habitat mapping. We have aged the black rockfish collected on the Oregon north coast in 1998 and 1999 and, in general, have not found older aged fish in the inter-port areas as was speculated. For 2000 and 2001, we are continuing the work on the southern Oregon coast.

Growth Data Analysis – Dr. Sampson

This project, being funded by ODFW and conducted by Dr. David Sampson and Yong-Woo Lee of OSU, is an attempt to develop methods to use commercial fishery samples to examine long-term changes in fish growth and condition. Progress to date includes development and testing of a technique to derive a length-weight relation from individual lengths and an aggregate weight.

CALENDAR YEAR 2001 RESEARCH PROJECTS

Already Planned Projects:

- Continuation of the maturity study.
- Completion of the lingcod discard mortality study.
- Development and testing of a remote device to measure footrope height above the bottom in shrimp trawls.
- Testing of 1 or 2 variations on existing finfish excluder designs for shrimp trawls.

- Design and initial testing of a selective flatfish trawl.
- Determine stock structure of black rockfish and other nearshore rockfish.
- Conduct at-sea observations on-board sport bottomfish charter vessels to evaluate the discard of canary rockfish and gather biological data and age structures on several species of marine bottomfish about which little information is known.

Other Ideas That We're Working On:

- Testing of a larger shrimp fly to decrease canary rockfish bycatch in the nearshore recreational fishery.
- Testing Passive Integrated Transponder (PIT) tag retention in black rockfish.
- Telemetry work on rockfish and lingcod movements.
- Roundfish excluder for shelf flatfish trawls.
- Developing tagging and recapture methods for deepwater rockfish.
- Re-test of at-sea cage holding methodology used for lingcod in 2000.
- Expanded petrale sole maturity sampling.

Salmon

Since 1998, the Department's Marine Resources (MRP) and Interjurisdictional Fisheries (IJ) Programs have been working jointly to develop and coordinate at-sea salmonid fishery assessments off Oregon related to evaluating at-sea impacts on OCN coho and to develop chinook research and stock assessment methodologies for Oregon coastal wild chinook stocks managed under the Pacific Salmon Treaty (PST) with Canada.

Goals and Objectives

It is ODFW's goal to conduct biological research, stock assessments, and ocean fishery impact evaluations on its salmonid stocks to provide the necessary technical information and develop effective management strategies for Oregon's stocks in state, regional, and international management forums. The Marine Program objectives under this overall goal are to: 1) conduct Oregon's marine salmonid fisheries evaluations and impact studies through shore-side sampling and at-sea observer programs, and 2) conduct chinook research on wild coastal populations to develop methodologies that will determine adult spawning escapements, forecast future abundance, and stock exploitation rates. The Program relies heavily on state general and license fund revenue as matching dollars to access available federal funding for this work.

Oregon is a signatory to the Pacific Salmon Treaty with Canada (PST 1985; PST "New Agreement", 1999) that pledges all parties to manage the long-term health and /or rebuilding of their West Coast salmonid stocks contributing to PST area fisheries from SE Alaska to Oregon. Oregon coastal chinook stocks are a major contributor to both SE Alaska and Canadian ocean salmon fisheries as well as Oregon marine and estuary/freshwater fisheries. Since 1985, ODFW has built and coordinated a basic program, with PST federal funds, supporting activities including Oregon representation on the Pacific Salmon Commission (PSC), technical support on PSC committees, and small scale field studies that collect and assess stock information on Oregon chinook stock exploitation rates. The 1999 Agreement strengthened the Treaty based on an "abundance-based management" concept, requiring actual estimates of spawning escapements, yearly forecasts of ocean abundance, stock exploitation rates, and improved assessment modeling for contributing stocks.

It is ODFW's goal to meet Oregon's stock assessment and technical data obligations for its coastal chinook stocks required for managing stocks under the PST. Present and future field research and assessment studies are specifically designed to meet these needs. We coordinate

work with all levels of department staffs and have implemented an internal “chinook working group” as a forum to discuss and develop coordinated PST-related coastal chinook field studies. We work with several coastal Watershed Councils to introduce them to these new studies, and seek their opinions and comments on the objectives and direction of the work. These efforts are collectively intended to:

- Meet Oregon’s obligations under the Pacific Salmon Treaty.
- Meet the goals of the Oregon Plan for Salmon and Watershed.
- Meet the goals of the ODFW “Comprehensive Plan for Production and Management of Oregon’s Anadromous Salmon and Trout-Coastal Chinook Salmon Plan (1991).
- Evaluate and implement field assessment methods and evaluation techniques that will, for the first time, allow Oregon to define coastal chinook adult spawning escapement, forecast ocean adult abundance, and develop overall exploitation rates for north migrating stocks from the Elk River to the Nehalem River.
- Maintain long term healthy wild coastal chinook stocks.
- Monitor appropriate ocean, estuary, and freshwater fisheries that target Oregon coastal chinook stocks.
- Create a coordinated working framework within ODFW, with other agencies, and in public forums to ensure proper management on these stocks in their health.

Projects

Oregon Marine Salmonid Fisheries Assessment Program

This project collects and evaluates basic fishery ocean catch, effort and landing information. It assesses stock-related impacts in Oregon’s marine salmonid fisheries through evaluation of coded-wire tagged fish. This project monitors in-season catch quotas and maintains contacts with a wide membership of the fishing industry and individual fishers. One important project development is the implementation of the “Ocean Recreational Boat Survey” (ORBS). The ORBS combines elements of the sport groundfish and salmon sampling projects, creating more efficiency and the opportunity to tackle sampling and data-gathering needs in either salmonid or non-salmonid sport fisheries. It conducts both shore side-sampling studies and an at-sea observer programs (on sport charter vessels) to assess ocean fishery exploitation for Oregon Coastal Natural (OCN) coho stocks, a federally listed stock under the Endangered Species Act, and impacts associated with the development of ocean “selective coho fisheries.” These fisheries allow only fin-clipped hatchery coho salmon to be retained. Such fishery impacts on OCN coho are highly restricted under a federal fishery management plan (FMP) adopted through the Pacific Fishery Management Council (PFMC), the National Marine Fisheries Service (NMFS), and under the Oregon Plan. Quotas and overall exploitation rates control fisheries. Selective fisheries occur only for limited times and areas where the potential for fin-clipped hatchery coho is high and OCN interceptions are lower. Through the at-sea observer program the project: 1) estimates the proportions of marked (fin-clipped) and unmarked coho encountered by time and area, 2) estimates the encounter, drop-off (fish lost) and retention rates for coho, 3) evaluates angler compliance with finclip retention regulations, 4) evaluates gear type and use, and 6) evaluates hook wounds that occur on landed coho by gear and hook type. Selective coho fisheries have occurred for the recreational fishery (1998, 1999, and 2000) and experimentally for the troll salmon fishery (2000).

PST Project-Nehalem River Indicator Stock Monitoring and Spawner Survey Methodology

The Nehalem River chinook stock has been designated as an “escapement indicator ” for the North Oregon Coast (NOC) in the 1999 Pacific Salmon Treaty, Chinook Chapter. For a river to be designated as an indicator stock for the NOC aggregate of stocks, three components are

necessary: 1) an existing or newly developed biologically-based escapement goal, 2) a precise annual estimate of the total freshwater escapement (including freshwater harvest), and 3) a less precise annual spawner estimate from a random survey design that can be correlated to the more precise estimate.

The goals of the Nehalem project are: 1) to precisely estimate the annual escapement, by age, of adult chinook and annually update a brood-year run reconstruction for the stock, 2) use this data and stock recruitment analysis to estimate the biologically based escapement goal for the basin and post season assessment of managing for the escapement goal, and 3) determine the appropriate spawner survey methodology that will enable managers to calibrate estimates in the Nehalem and other NOC basins that are based on less precise random survey methodologies..

PST Project-Umpqua River Indicator Stock Monitoring and Spawner Survey Methodology

The Umpqua River Chinook stock is a candidate for an “escapement indicator” stock for the Mid Oregon Coast (MOC). The same three components listed above for the Nehalem River apply here.

The goals of the Umpqua project are the same as those listed for the Nehalem River project.

PST Project-Coquille River Indicator Stock Feasibility Study

The Coquille River is also a candidate as an “escapement indicator” for the Mid-Oregon Coast (MOC) aggregate under the PST. The same components listed for the Nehalem stock to become an escapement indicator stock apply here. This project is a new feasibility study to develop methods for estimating age-specific escapement of adult chinook for the Coquille basin, develop stock recruitment analysis to estimate a biologically based escapement goal, and complete a post season assessment of management strategies to evaluate the attainment of meeting the escapement goal. Determining the most accurate spawner survey methodology will enable managers to calibrate estimates in the Coquille and other MOC basins that are based on the less precise random survey methodologies.

The goals of the Coquille project are to: 1) estimate the total escapement of adult chinook in the Coquille River such that the estimate is within +/- 50% of the true value 95% of the time and 2) estimate the age and sex composition of Chinook spawning in 2001 such that all estimated fractions are within +/- 0.05 of their true values 95% of the time.

PST Project-Estimate Age and Sex Composition of Oregon Coastal Wild Fall Chinook in NOC and MOC Stock Aggregates

The project’s focus is to enhance the scale collection sampling of Oregon coastal chinook stocks. Historically, scale sampling of dead fish was done in six key rivers. However, the number of collected dead fish has been found to be insufficient to provide a reliable estimate of the age composition of the runs. This project will employ more samples to increase the collection of scales for age analysis. Age analysis is necessary to provide accurate stock assessment data for the Abundance Based Management regimes negotiated in the 1999 Pacific Salmon Treaty. These river basins are included in the North Oregon Coast (NOC) and Mid Oregon Coast (MOC) chinook salmon aggregates. Both the NOC and MOC stock aggregates are north-migrating and subjected to Pacific Salmon Commission chinook Technical Committee’s (CTC) abundance based management programs.

SUMMARY OF FISHERY ECONOMICS

Preliminary Review of Oregon's Onshore Landings in 2000

The information, analysis, tables and graphs contained in this section were obtained from a memorandum written by Dr. Hans D. Radtke, and Shannon W. Davis, of The Research Group, Corvallis, Oregon.

The Oregon commercial fishing industry had a good year in 2000, but it was not because of the groundfish fishery. While the Oregon fishing industry enjoyed one of its better years this decade, groundfish harvest revenues were still 30% below the early 1990's levels.

The overall fishing industry good news is mostly due to some higher prices and record level volume landings in other than groundfish fisheries. Total onshore landed volume for the Year 2000 is estimated to be 262 million pounds valued \$81 million at the harvester level. The volume about equals 1997, which was the highest year on record. The value is 19% greater than last year and would be the second highest amount in today's dollars since 1988.

Ocean salmon landings represented less than 5% of total value, but they were the highest since 1992. Columbia River gillnet landings were more than double than last year thanks to strong coho salmon hatchery returns. Crab and shrimp were in the apex of their cyclical abundance trends and prices were strong. Sardine landings, fetching approximately 5 cents per pound, explains most of the overall landing volume increase. Landings last year were over 21 million pounds compared to less than 2 million pounds in recent previous years. The growth from the new sardine fishery in Oregon is expected to stabilize this year.

Overall groundfish landing volume declined in 2000 from what was landed in 1999, but the total value was about the same. This was mostly due to the highest prices ever received for some species such as blackcod. Severe trip and cumulative limits used to manage groundfish fisheries have had the beneficial results of spreading out deliveries and keeping consumer demand high throughout the year. Pacific whiting onshore prices increased from \$.037 to \$.041. Both onshore and offshore delivered harvests have been constant during the late 1990's.

The total economic impact from the onshore landings in Oregon will be around \$165 million in household personal income. Revenues returned from distant water fisheries will add another \$59 million in income to households.

A decrease in groundfish landings is expected in the year 2001 as the rebuilding plans decrease allowable catch for several groundfish species. Five species (lingcod, bocaccio, Pacific ocean perch, cowcod, and canary) are declared overfished now and two more (darkblotched and widow) will be added soon. The rebuilding plans for these species will also affect other fisheries that catch rockfish as a bycatch when other species are targeted like shrimp. Management measures to protect the overfished and depleted stocks will affect communities differently. Communities where vessels depend on the species that have lower quotas will be hard hit. Recreational fisheries also have restrictions that may reduce angler days, hence spending in coastal communities.

Oregon's commercial groundfish landings contributed \$59 million (2000 dollars) in personal income to the economy in 1995, but this decreased to \$38 million in 1998 and has only slightly increased to about \$41 since then. The groundfish fishery has comprised about 1/3 of total economic contribution from the fishing industry in recent years and about 3/5 on the total economic contribution when Pacific whiting is included. The projected economic contribution to Oregon's economy from the adopted groundfish fishery management measures will cause further reductions for the Year 2001 season.

The concern for the Year 2001 management measures is from the multi-species nature of the fishery. In-season review of harvest rates may result in more drastic economic impacts than estimated if fishing has to be curtailed to protect the stocks in an over fished and depleted status. The restrictions on certain species of concern may cause other healthy species harvests to be less than their quota levels.

Table 1
Oregon Onshore Volume Trends by Species Groups in 1970 to 2000

<u>Year</u>	<u>Salmon</u>	<u>Crab</u>	<u>Shrimp</u>	<u>Tuna</u>	<u>Groundfish</u>	<u>Whiting</u>	<u>Other</u>	<u>Total</u>
1970	19,628	14,929	13,572	26,937	21,392	0	1,200	97,659
1971	17,268	14,876	9,075	13,092	22,040	0	1,036	77,387
1972	12,189	6,762	20,731	29,234	22,801	0	1,170	92,888
1973	17,385	2,350	24,517	24,425	21,944	0	917	91,538
1974	15,099	3,918	20,314	33,040	22,098	0	1,137	95,605
1975	12,390	4,027	24,084	23,584	21,024	0	937	86,046
1976	16,278	8,134	25,456	17,349	26,930	0	1,313	95,460
1977	10,774	19,902	48,580	9,899	23,366	0	1,835	114,357
1978	8,780	12,502	56,666	18,398	37,056	0	1,385	134,787
1979	11,129	15,634	29,587	8,821	64,430	0	2,267	131,868
1980	7,243	18,652	30,152	3,506	63,661	0	1,293	124,507
1981	7,041	6,984	25,924	7,727	82,502	0	18,047	148,224
1982	8,638	7,036	18,462	1,914	90,690	0	2,944	129,683
1983	2,673	5,368	6,547	3,411	78,152	0	4,211	100,361
1984	3,598	5,286	4,844	1,631	63,245	0	5,567	84,171
1985	6,577	7,518	14,855	1,525	64,694	0	4,435	99,603
1986	13,797	4,661	33,884	2,461	56,202	0	2,818	113,822
1987	15,092	5,991	44,589	2,288	68,409	0	2,243	138,612
1988	17,786	9,414	41,846	3,967	71,559	0	3,734	148,306
1989	11,724	11,676	49,129	1,080	82,510	0	9,504	165,623
1990	5,412	9,510	31,883	2,079	74,119	5,058	11,011	139,072
1991	5,344	4,924	21,711	1,259	81,711	29,109	5,976	150,033
1992	2,364	11,908	48,033	3,889	78,393	107,939	4,456	256,982
1993	1,848	10,456	26,923	4,754	83,523	78,970	3,941	210,415
1994	1,285	10,638	16,386	4,698	65,813	143,563	3,349	245,732
1995	2,860	11,954	12,106	5,034	56,335	147,355	3,047	238,692
1996	2,840	19,302	15,727	8,948	58,044	155,588	2,049	262,497
1997	2,245	7,777	19,560	9,170	57,475	162,782	1,947	260,955
1998	1,978	7,410	6,096	10,607	44,781	157,895	1,709	230,476
1999	1,560	12,347	20,451	4,564	46,804	160,965	2,828	249,520
2000	3,121	10,314	25,455	8,764	38,787	151,451	24,146	262,038

- Notes:
1. Landings are reported in thousands of round pounds.
 2. Salmon includes landings of steelhead, which have come exclusively from the treaty Indian fisheries since 1975.
 3. Crab includes only Dungeness crab.
 4. Tuna includes landings of albacore, yellowfin and skipjack tuna for 1970 - 1979. Essentially all tuna landings from 1980 on are albacore.
 5. Groundfish includes landings of cods, rockfish (snapper), sablefish, soles, flounders, halibut, and Pacific whiting (until 1990).
 6. Pacific whiting (also known as hake) did not emerge as a major fishery species until after 1990. Landings are included in groundfish until 1990.
 7. Other includes landings of sea urchins, sturgeon, shad, smelt, clams, scallops, squid, crayfish and other species.
 8. Years 1998 and 1999 are preliminary.

Source: Oregon Department of Fish and Wildlife (2000).

Table 2
Oregon Onshore Landed Value Trends by Species Groups in 1970 to 2000

Year	Index	Salmon		Dungeness Crab		Pink Shrimp		Albacore Tuna		Groundfish		Pacific Whiting		Other		Total	
		Real	Nominal	Real	Nominal	Real	Nominal	Real	Nominal	Real	Nominal	Real	Nominal	Real	Nominal	Real	Nominal
1970	27	33,653	9,144	13,735	3,732	5,995	1,629	25,482	6,924	5,907	1,605	--	--	751	204	85,523	23,238
1971	29	20,132	5,745	14,875	4,245	3,890	1,110	12,713	3,628	6,350	1,812	--	--	722	206	58,682	16,746
1972	30	21,553	6,412	9,634	2,866	9,647	2,870	30,709	9,136	7,281	2,166	--	--	699	208	79,522	23,658
1973	31	45,036	14,150	4,265	1,340	17,168	5,394	27,683	8,698	8,348	2,623	--	--	726	228	103,226	32,433
1974	34	30,747	10,531	8,061	2,761	12,905	4,420	36,703	12,571	9,442	3,234	--	--	575	197	98,434	33,714
1975	37	26,322	9,851	8,607	3,221	8,649	3,237	20,040	7,500	7,947	2,974	--	--	647	242	72,211	27,025
1976	40	48,942	19,358	13,370	5,288	12,871	5,091	14,313	5,661	10,877	4,302	--	--	1,183	468	101,556	40,168
1977	42	37,233	15,672	25,896	10,900	26,609	11,200	6,092	2,564	11,641	4,900	--	--	1,404	591	108,875	45,827
1978	45	25,980	11,711	21,295	9,599	33,064	14,904	22,894	10,320	17,805	8,026	--	--	923	416	121,961	54,976
1979	49	42,878	20,947	23,800	11,627	23,213	11,340	9,531	4,656	35,628	17,405	--	--	1,881	919	136,932	66,894
1980	53	19,746	10,533	23,199	12,375	31,275	16,683	5,148	2,746	21,748	11,601	--	--	1,166	622	102,281	54,560
1981	58	19,024	11,095	11,509	6,712	22,365	13,043	11,451	6,678	25,235	14,717	--	--	9,108	5,312	98,692	57,557
1982	62	20,039	12,415	12,188	7,551	14,993	9,289	2,043	1,266	32,793	20,317	--	--	2,214	1,372	84,270	52,210
1983	64	4,721	3,040	12,342	7,947	7,231	4,656	2,921	1,881	29,453	18,965	--	--	2,576	1,659	59,244	38,148
1984	67	7,677	5,128	11,848	7,914	3,216	2,148	1,325	885	24,005	16,034	--	--	3,378	2,256	51,449	34,365
1985	69	13,161	9,068	15,658	10,789	7,606	5,241	1,181	814	25,752	17,744	--	--	3,133	2,159	66,492	45,815
1986	70	21,570	15,191	9,355	6,588	25,708	18,105	1,306	920	26,412	18,601	--	--	3,296	2,322	87,649	61,727
1987	73	37,254	27,022	11,514	8,352	41,735	30,272	2,310	1,675	35,023	25,404	--	--	2,726	1,977	130,563	94,702
1988	75	52,099	39,073	15,036	11,277	22,867	17,150	4,437	3,327	33,130	24,846	--	--	2,885	2,163	130,454	97,837
1989	78	18,322	14,266	17,421	13,564	22,997	17,906	1,139	887	34,198	26,628	--	--	5,363	4,176	99,439	77,427
1990	81	11,847	9,585	17,991	14,555	19,318	15,629	2,064	1,670	29,791	24,102	271	220	7,089	5,735	88,370	71,494
1991	84	6,957	5,832	8,901	7,462	14,396	12,069	1,164	976	35,677	29,910	1,666	1,397	5,380	4,511	74,141	62,158
1992	86	4,294	3,688	15,589	13,388	20,013	17,187	4,611	3,960	32,305	27,742	5,901	5,067	3,752	3,222	86,465	74,254
1993	88	2,759	2,426	13,416	11,798	10,134	8,912	4,414	3,881	32,506	28,586	2,591	2,279	3,388	2,979	69,208	60,861
1994	90	1,626	1,460	16,110	14,463	10,723	9,626	4,176	3,749	33,199	29,803	4,777	4,289	2,653	2,382	73,264	65,771
1995	92	3,897	3,575	21,852	20,045	9,375	8,599	4,088	3,750	34,801	31,924	7,631	7,000	2,634	2,416	84,277	77,308
1996	94	3,518	3,289	27,998	26,180	10,012	9,362	7,946	7,430	32,834	30,702	4,435	4,147	1,396	1,305	88,138	82,414
1997	95	2,909	2,773	15,354	14,637	8,298	7,911	6,867	6,546	30,107	28,700	7,157	6,823	1,575	1,501	72,267	68,890
1998	97	2,684	2,591	12,971	12,520	3,304	3,189	6,374	6,152	20,563	19,848	3,892	3,756	1,692	1,633	51,480	49,690
1999	98	2,085	2,043	23,383	22,908	9,769	9,571	3,900	3,820	23,434	22,958	6,040	5,917	1,114	1,092	69,726	68,309
2000	100	4,022	4,022	24,387	24,387	10,189	10,189	7,487	7,487	24,020	24,020	6,254	6,254	4,591	4,591	80,950	80,950

Notes: 1. Value is in thousands of real 2000 dollars. Adjustment used GDP implicit price deflator developed by U.S. Bureau of Economic Analysis.
2. Ex-vessel value is the value or revenue received by fishermen/harvesters.
3. Notes from Table 1 concerning species composition also apply to this table.

Source: Oregon Department of Fish and Wildlife (2000).

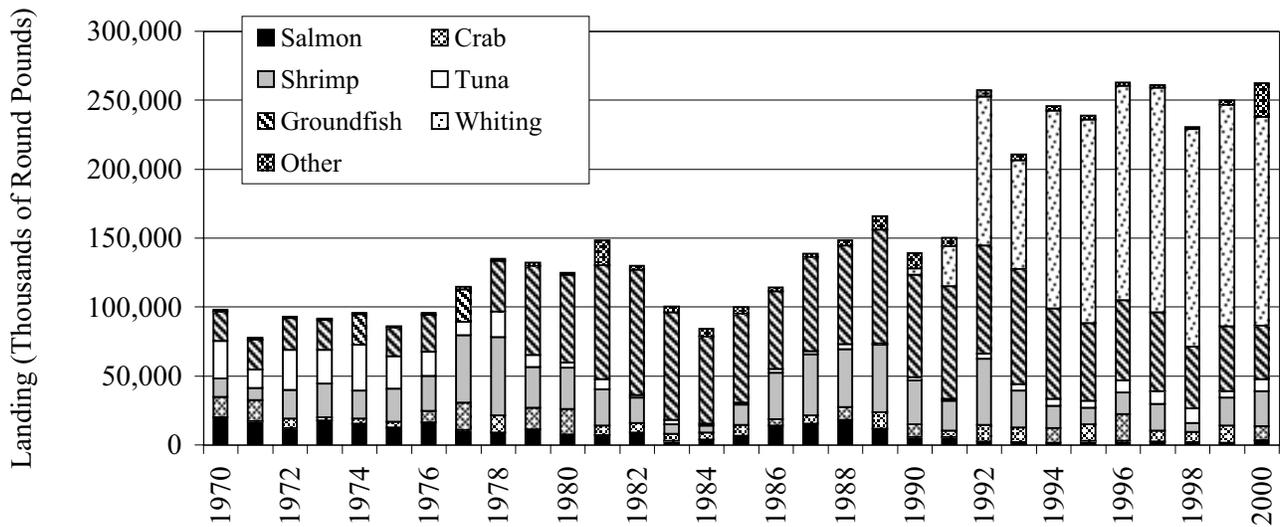


Figure 1. Oregon landing trends, 1970 through 2000.

- Notes: 1. Landings are in thousands of round pounds.
- 2. Notes in Table 1 also apply to this figure.

Source: Oregon Department of Fish and Wildlife.

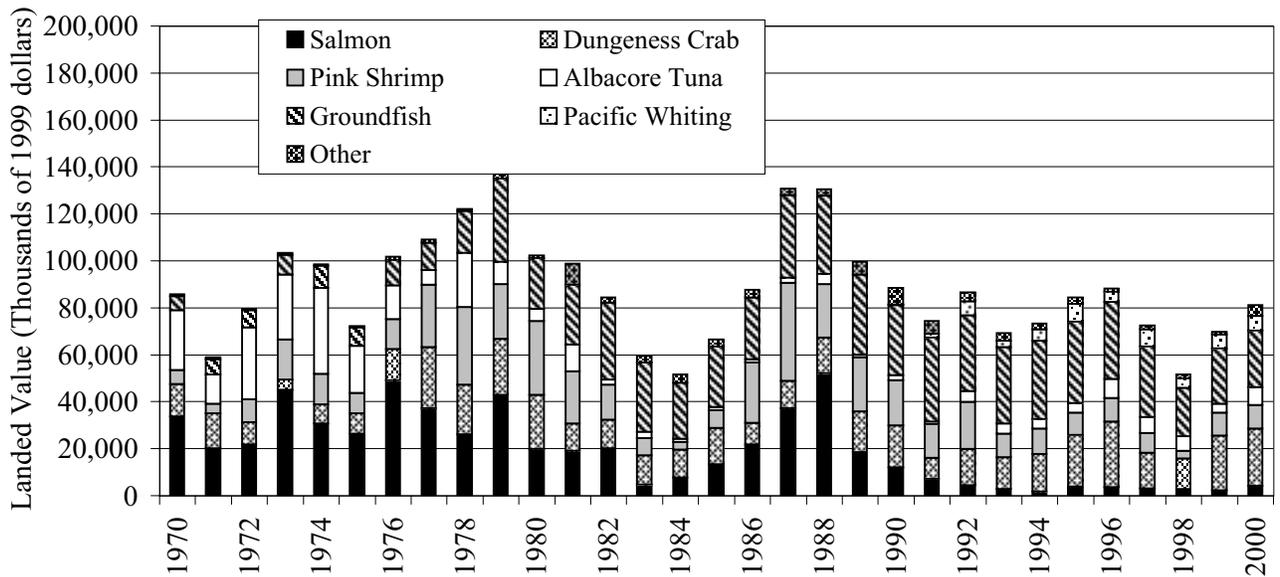


Figure 2. Oregon landing trends in 1970 through 2000.

- Notes: 1. Value is in thousands of real 2000 dollars. Adjustment used GDP implicit price deflator developed by U.S. Bureau of Economic Analysis.
- 2. Notes for Table 2 also apply to this figure.

Source: Oregon Department of Fish and Wildlife.

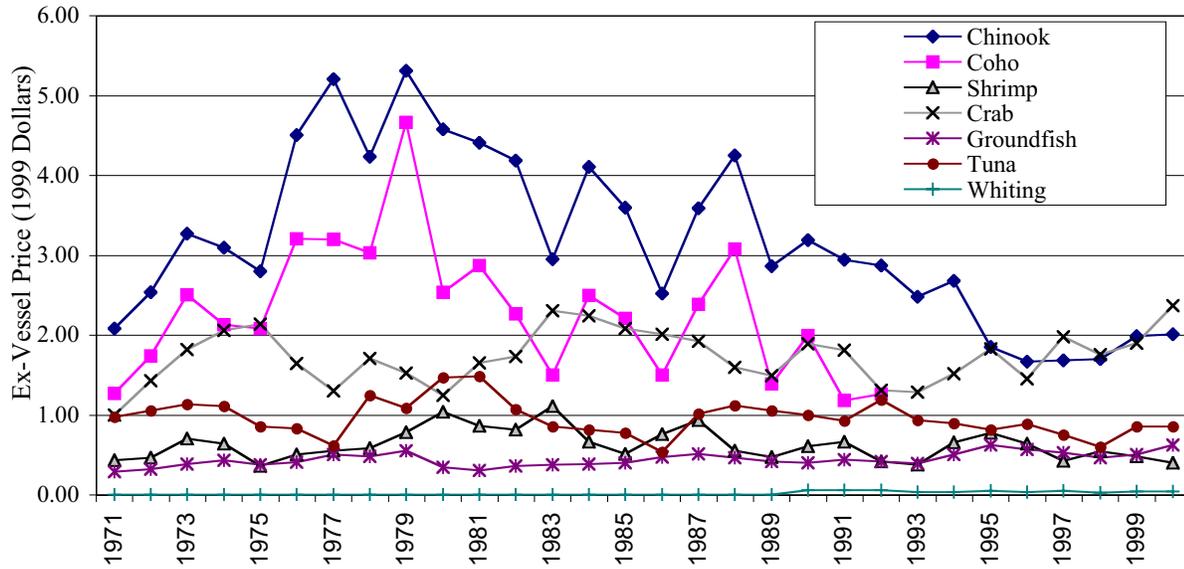


Figure 3. Species group annual ex-vessel price trends, 1971 through 2000.

- Notes: 1. Prices adjusted to real 2000 dollars using the GDP implicit price deflator developed by the U.S. Bureau of Economic Analysis.
- 2. Groundfish price calculation does not include Pacific whiting.
- 3. Prices are annual and species averaged and are for onshore landings only.
- 4. Average prices for salmon include seasonal and size considerations.
- 5. Ex-vessel price is the amount paid to fishers at the time of fish delivery.

Source: Oregon Department of Fish and Wildlife.

Table 4
Statewide Economic Impacts by Species Group in 1973 to 2000

Years	Pacific Whiting	Groundfish	Salmon	Pink Shrimp	D. Crab	Other Landed Finfish and Shellfish	Distant Water Fisheries	Total Landed Fish	Total
1973	--	16.6	75.7	18.6	4.7	51.1	--	166.7	--
1974	--	18.5	60.8	11.8	9.0	65.9	--	165.8	--
1975	--	16.6	51.7	15.9	9.0	41.4	--	134.6	--
1976	--	21.4	89.2	15.6	14.2	41.5	--	181.9	--
1977	--	21.5	63.5	33.3	28.8	31.9	--	179.0	--
1978	--	33.0	47.0	40.5	22.2	63.2	--	205.9	--
1979	--	60.3	68.9	24.7	26.0	41.0	--	220.8	--
1980	--	46.4	33.1	32.2	26.7	28.2	--	166.6	--
1981	--	58.9	32.3	23.0	12.4	42.5	--	169.1	--
1982	--	67.5	39.0	12.4	12.6	22.7	--	154.2	--
1983	--	60.9	9.5	7.0	12.3	15.0	--	104.8	--
1984	--	49.7	15.3	3.6	11.7	15.0	--	95.4	--
1985	--	52.0	26.9	10.2	16.0	18.3	--	123.5	--
1986	--	50.3	45.4	27.1	10.2	24.6	96.9	157.7	254.6
1987	--	64.0	61.1	38.5	12.6	31.0	89.6	207.1	296.7
1988	--	64.2	96.5	28.3	16.4	35.4	84.5	240.7	325.2
1989	--	68.6	35.2	33.0	18.5	41.9	80.5	197.2	277.7
1990	1.0	61.0	23.7	23.6	18.6	36.7	104.2	164.6	268.8
1991	7.9	69.0	15.8	16.3	9.6	21.2	70.5	139.9	210.3
1992	20.3	58.3	6.8	36.4	23.0	16.6	68.3	161.3	229.6
1993	11.0	59.2	4.5	19.1	19.9	14.8	66.9	128.4	195.3
1994	23.3	55.2	2.6	16.5	23.0	11.3	70.9	131.9	202.8
1995	35.2	59.7	6.7	14.9	32.3	12.3	73.9	161.2	235.1
1996	32.2	57.7	6.4	16.7	45.1	17.7	60.0	175.9	236.0
1997	39.3	52.3	5.3	15.5	23.9	21.0	55.1	157.3	212.3
1998	27.7	38.2	4.3	6.2	22.3	18.2	57.8	116.9	174.7
1999	34.0	43.1	3.6	17.3	40.4	11.7	73.0	150.2	223.2
2000	28.7	40.5	6.6	18.6	40.2	31.1	58.5	165.7	224.2

Notes: Economic impacts are expressed as personal income in millions of 2000 dollars. Adjustments are made to real 1999 dollars using the GDP implicit price deflator developed by the U.S. Bureau of Economic Analysis.

The economic impact estimates for 1998 and 1999 were calculated using the most up-to-date version of the FEAM. This version uses 1997 IMPLAN coefficients. Because the induced impacts are calculated more precisely based on earnings per industry groups, instead of averages for the state, the estimates for years prior to 1998 are about 15 percent lower when compared to using an earlier version of the FEAM.

The economic impacts from salmon fisheries includes ocean troll and Columbia River gillnet fisheries, so the estimates will be greater than reported by the PFMC. Also, the PFMC uses the FEAM model with 1994 IMPLAN coefficients. The output from the PFMC modeling for the ocean fisheries will vary slightly from this table's estimates.

Source: Study.

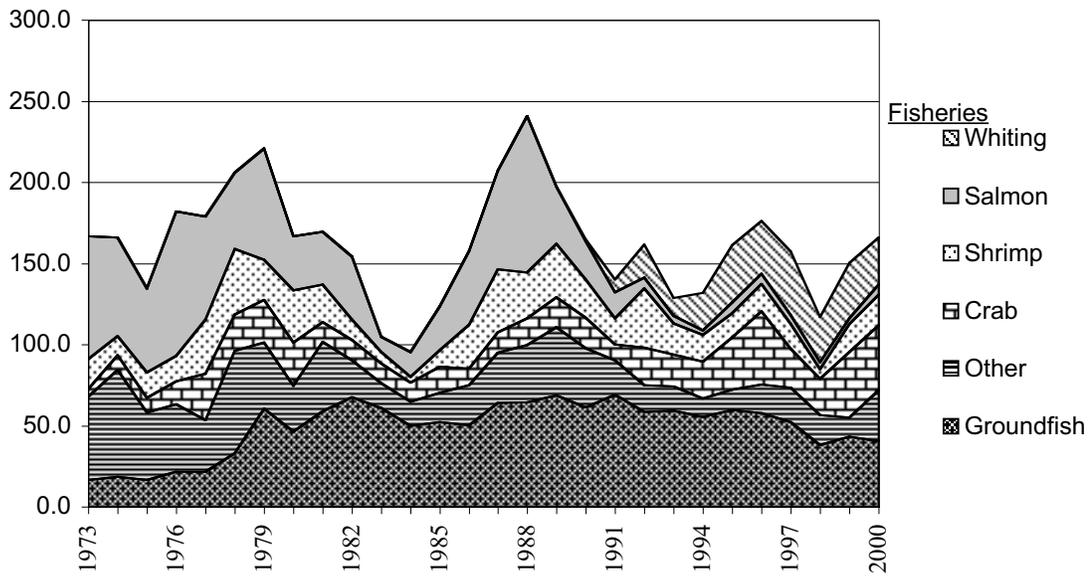


Figure 4. Economic impacts of onshore landings in Oregon, 1973 through 2000.

- Notes:
1. Economic impacts are expressed as total personal income in millions of 2000 dollars. Dollar adjustment uses the GDP implicit price deflator developed by the U.S. Bureau of Economic Analysis.
 2. Economic impacts from distant water fisheries are not included.
 3. The economic impacts for years before 1986 are rough estimates based on the level of

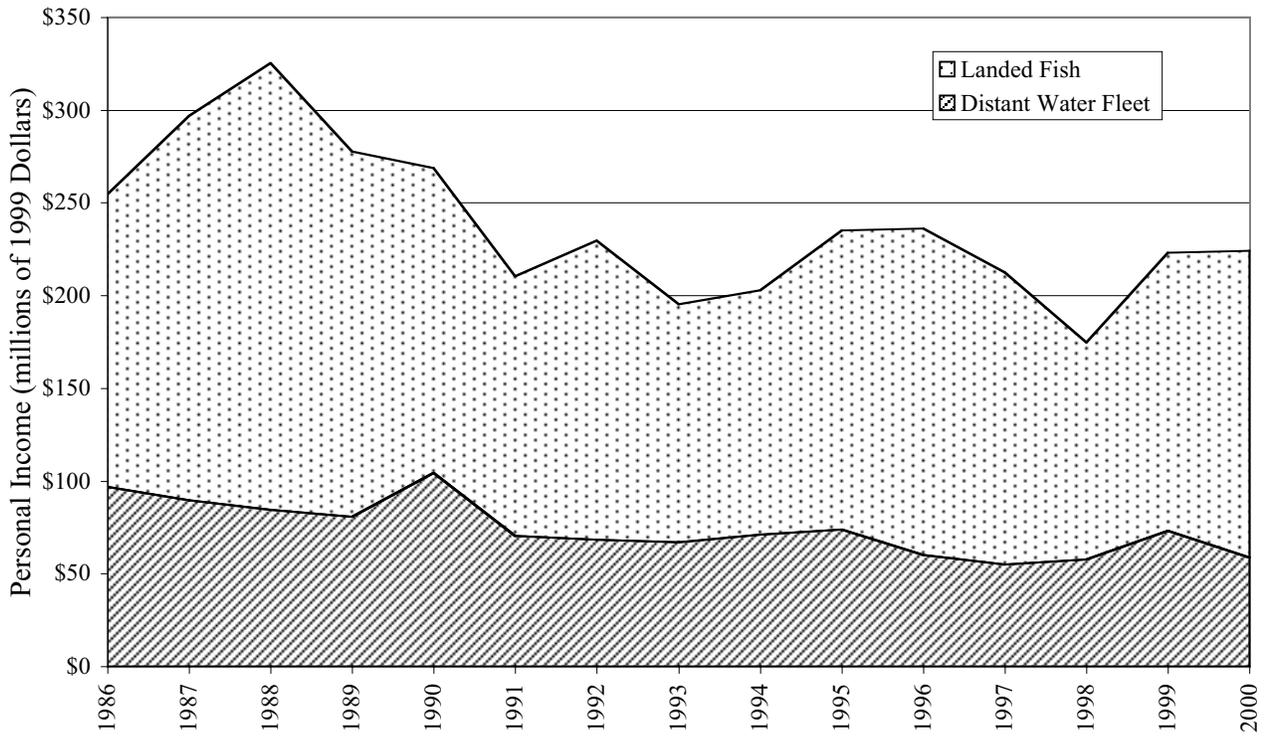


Figure 5. Personal income contribution of the Oregon commercial fishing and processing industry to coastal communities and to Oregon, 1986 through 2000.