OREGON MARINE FISHERIES

1999 STATUS REPORT

Compiled by Oregon Department of Fish and Wildlife
Marine Resources Program
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CONTENTS

INTRODUCTION

In recent years change in Oregon's commercial fisheries and seafood industries has been rapid, with increasing uncertainty for nearly all participants and communities involved. Since the last fisheries review with users four years ago, the groundfish fishery was challenged with reduced harvest opportunities and new more conservative national standards under the revised Magnuson Stevens Sustainable Fisheries Act. Government and users are now challenged to work together to improve data, stock assessments, and confidence in decision making as we move into the next millennium.

New resource opportunities are appearing on the horizon, but have there own set of challenges as users and government seek to develop underutilized species, minimize waste, and open new markets. Pelagic species such as sardine, mackerel, and tuna may provide substantial new resource bases along with developmental species like box crab, squid, and snails.

In this document the Department has compiled basic resource information on most of Oregon's marine commercial and recreational fisheries. It includes an historical perspective on catch, management, and reviews emerging issues, resource assessment and data needs.

Of necessity, there are fisheries not reviewed - for instance, commercial halibut. This is not because these areas are not a priority. It is simply a matter of limited time and making the document one of reasonable length.

This Marine Resources Program document should be considered a preliminary edition. It will be revised and updated in the year 2,000 and then on even years in the future.

GROUNDFISH

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 manage-ment of west coast fisheries.

It is fortunate that this management process came about when it did, because the 1980s represented major changes in 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.

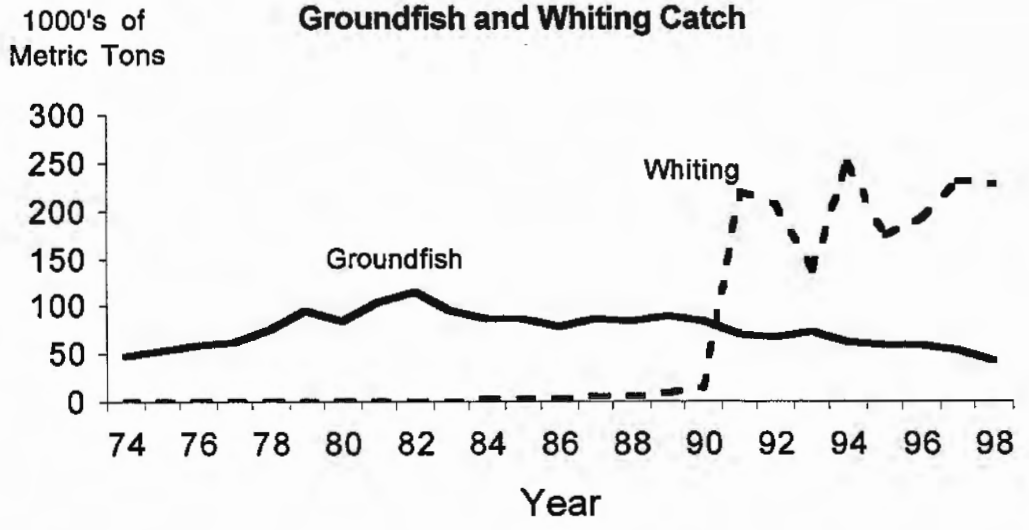


Figure A-1. West coast groundfish and whiting catch, 1974-1998.

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, the initial surplus of a largely virgin biomass is removed as expected. As this surplus biomass is removed, abundance of the stock declines, and the biomass available for fishing is reduced. This process is referred to as the fishing down period. The challenge to fisheries managers is to use appropriate management tools to prevent harvest of a species to drive the stock abundance down too low. Most Pacific coast groundfish species are managed at $F_{35\%}$ or $F_{40\%}$ which is the fishing induced mortality rate which will, over time, reduce the virgin stock spawning biomass to 35 percent or 40 percent of what it was initially. This level also closely estimates the MSY level which optimizes the harvest of a given species. As the fishing down period proceeds, managers need to ensure that stock will not be harvested below a fishery sustaining level. A stock not capable of supporting a fishery is described to be at a recruitment (new fish entering the fishery) overfishing level. This type of overfishing level is called $F_{20\%}$.

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 do not have 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 is initially harvested at a very high level. Management acts rapidly and constrains catch to a new, much lower, long-term production level. Recent abundance has been flat, and total catch has successfully been constrained to that level.

* 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 which 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.

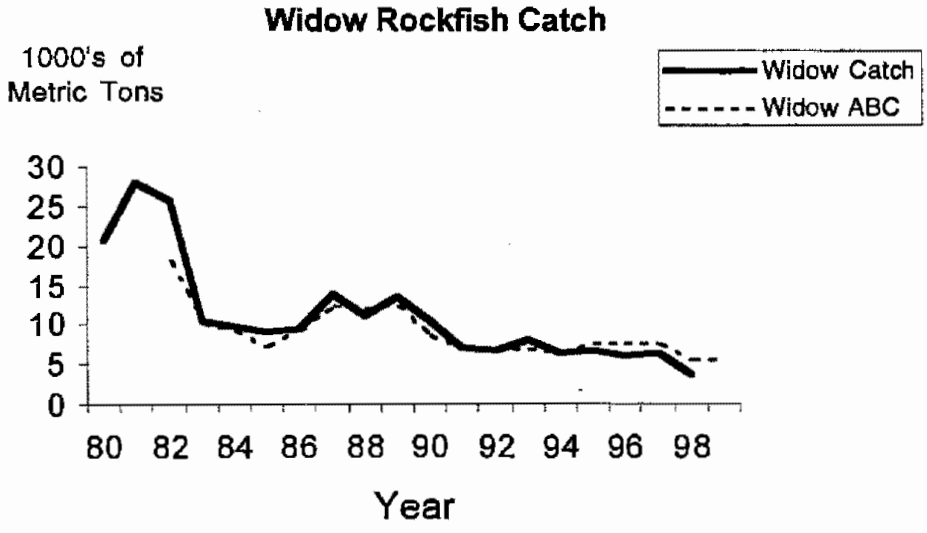


Figure A-2. West coast widow rockfish catch and annual acceptable biological harvest level, 1980-1998.

* 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.

Yellowtail Rockfish (Figure A-3)
This fish provides an example of a highly abundant species which 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.

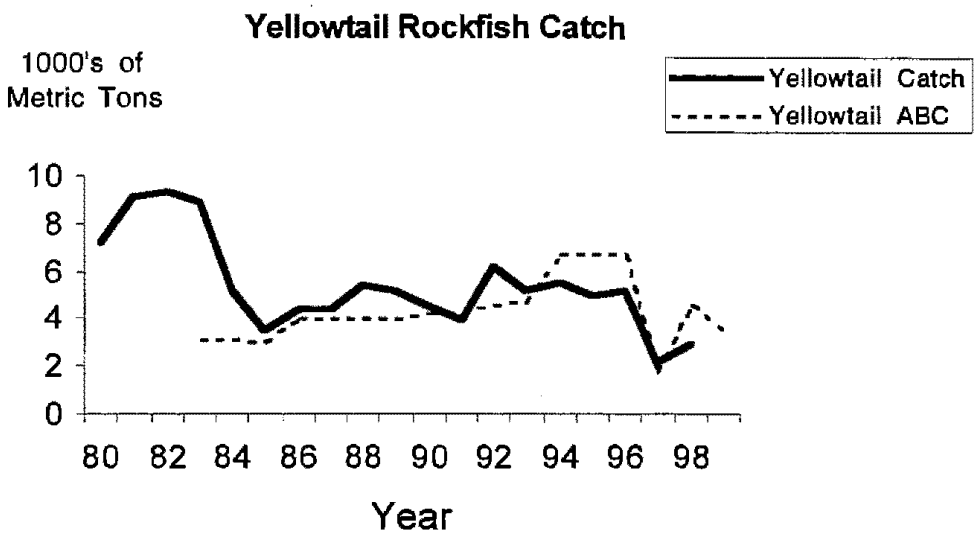


Figure A-3. West coast yellowtail rockfish catch and annual acceptable biological harvest level, 1980-1998.

* 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.

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.

* 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.

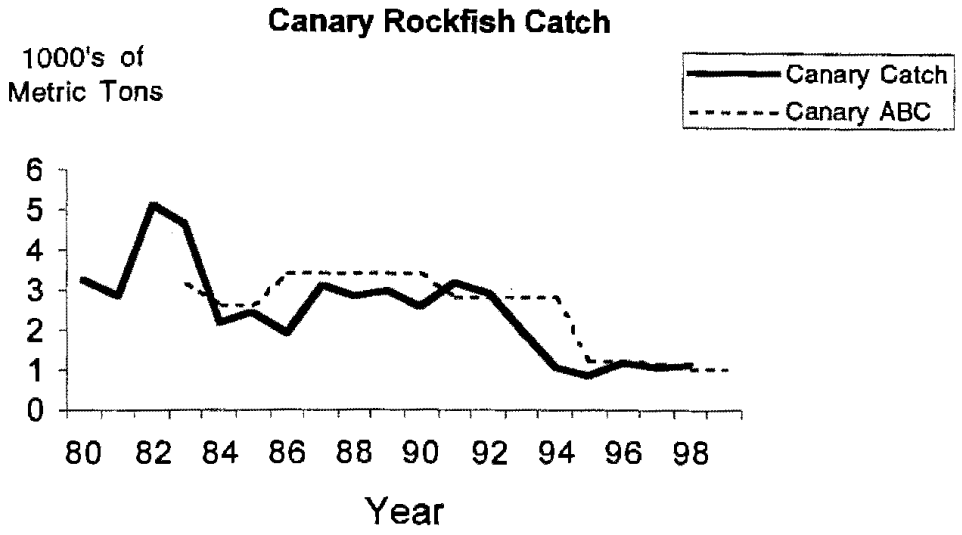


Figure A-4. West coast canary rockfish catch and annual acceptable biological harvest level, 1980-1998.

* 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 is 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.

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.

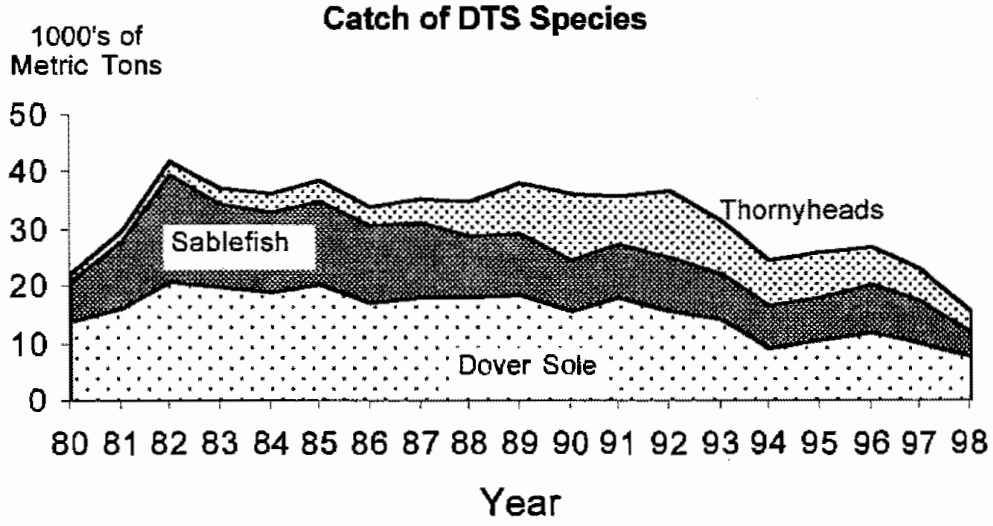


Figure A-5. Catch of DTS species, 1985-1998.

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.

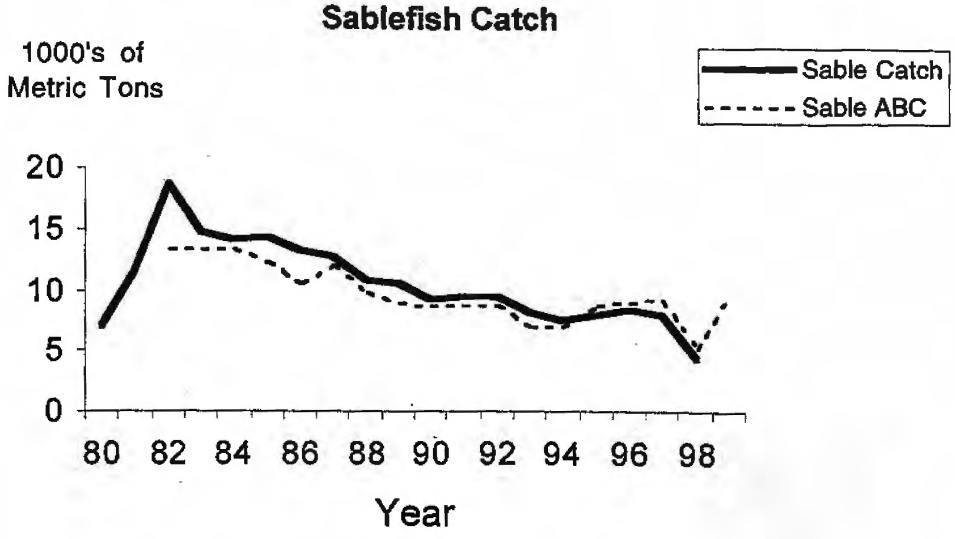


Figure A-6. West coast sablefish catch and annual acceptable biological harvest level, 1980-1998.

Thornyheads (Figure A-7)

* An initial stock assessment for thornyheads 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 with protection from the overfishing level.
* The same management approach was taken for thornyhead during 1983.

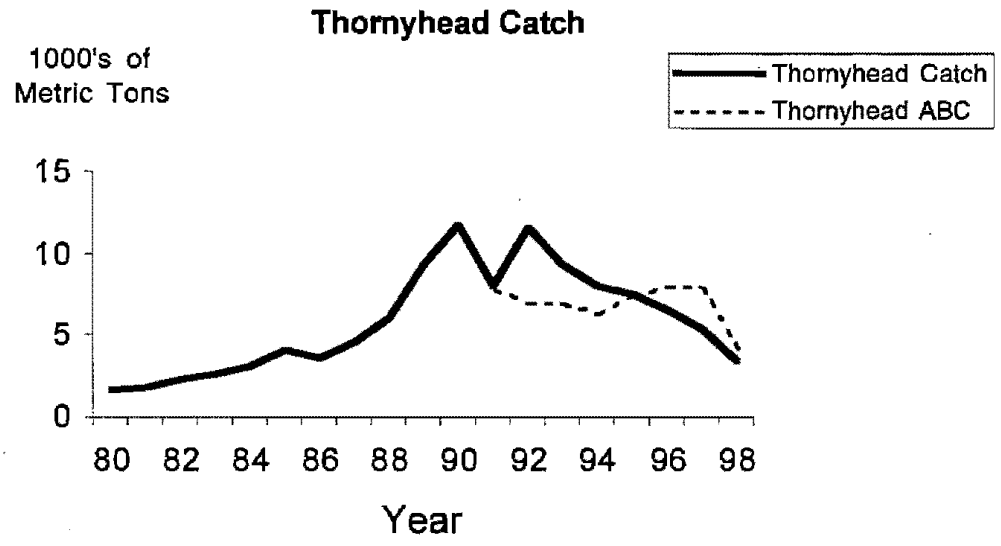


Figure A-7. West coast thornyhead catch and annual acceptable biological harvest level, 1980-1998.

* 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.
* During 1995, each species of thornyhead will be sorted to facilitate better monitoring 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 HG was 4,000 mt; the catch was approximately 3,300 mt.
* This 1994 catch level was well above the 2,850 mt HG set for 1995.
* Since 1996, the landed catch of Dover sole has been well below the ABC, due to relatively low trip limits designed to minimize the discard of sablefish and shortspine thornyhead.

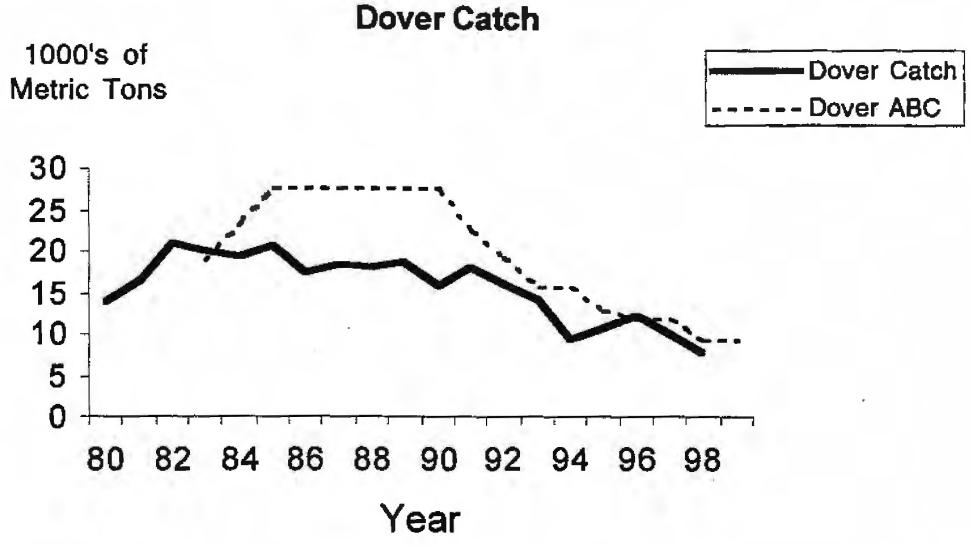


Figure A-8. West coast Dover sole catch and annual acceptable biological harvest level, 1980-1998.

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-ing 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 nontarget 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.

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.

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.

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). From 1984 to 1990, shore-based processing slowly rose 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.

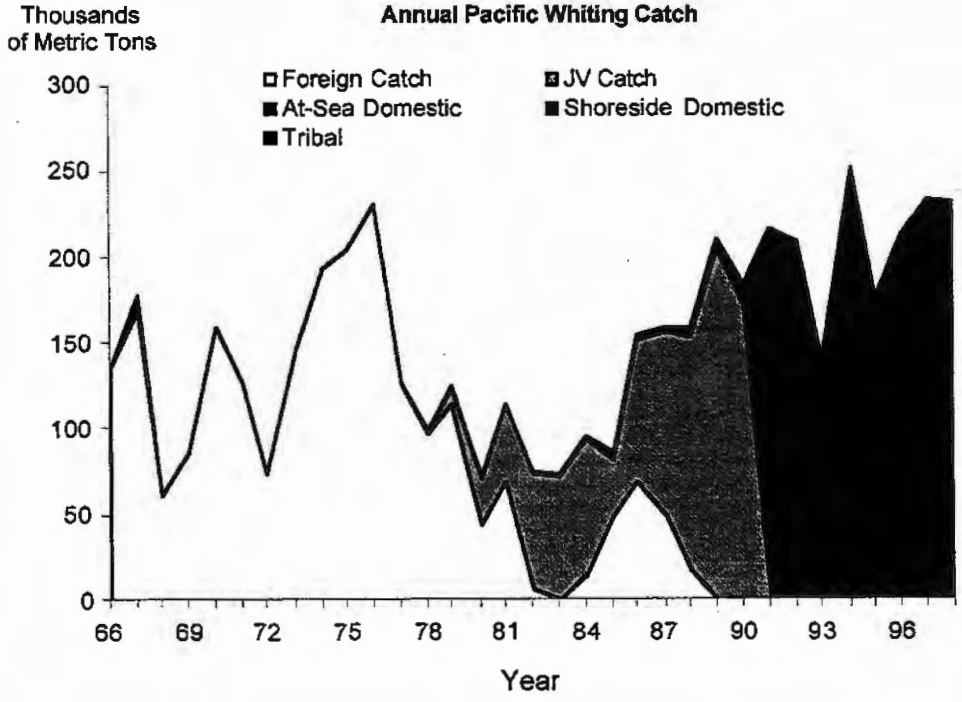


Figure B-1. Annual Pacific whiting catch, 1966-1998.

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.

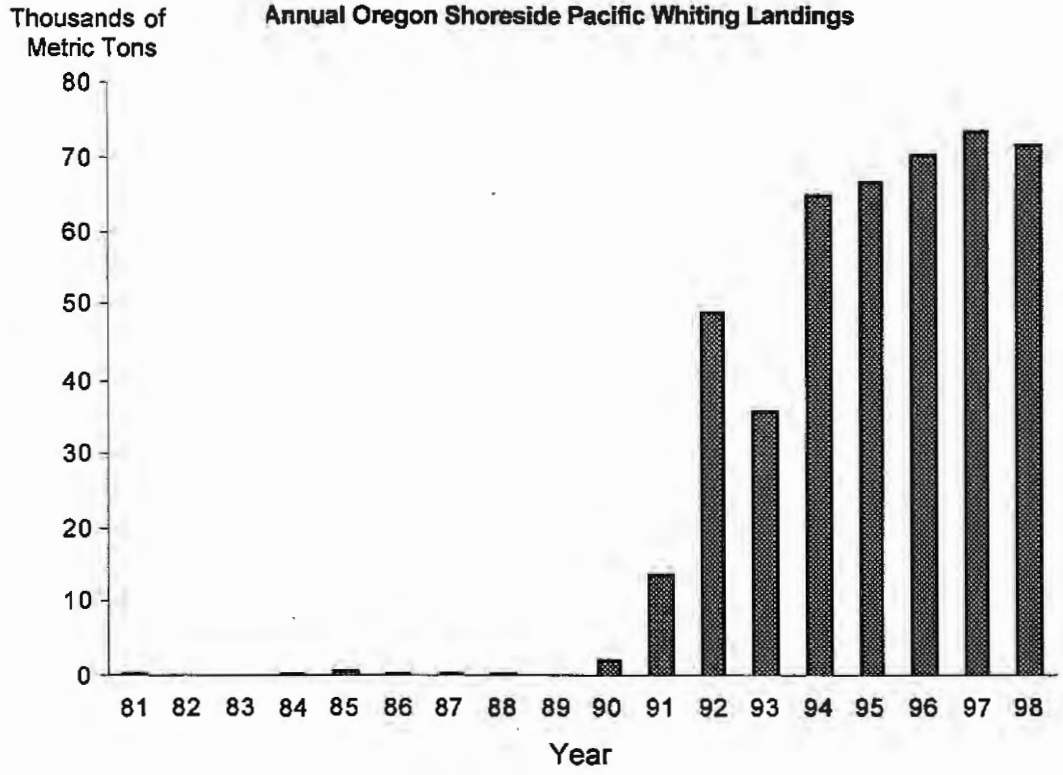


Figure B-2. Annual shoreside landings of Pacific whiting for Oregon ports, 1985-1998.

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 typically reject fish which are very large (over several pounds). The market requires whiting flesh of high quality, which means fish should be processed within a few hours of catch, and they must be handled carefully and maintained at a cold temperature. 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. In 1999, the bulk of the catch is expected to come from the moderately strong 1993 and 1995 year classes. 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 1999 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 pro-gram 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 (HG). 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.

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.

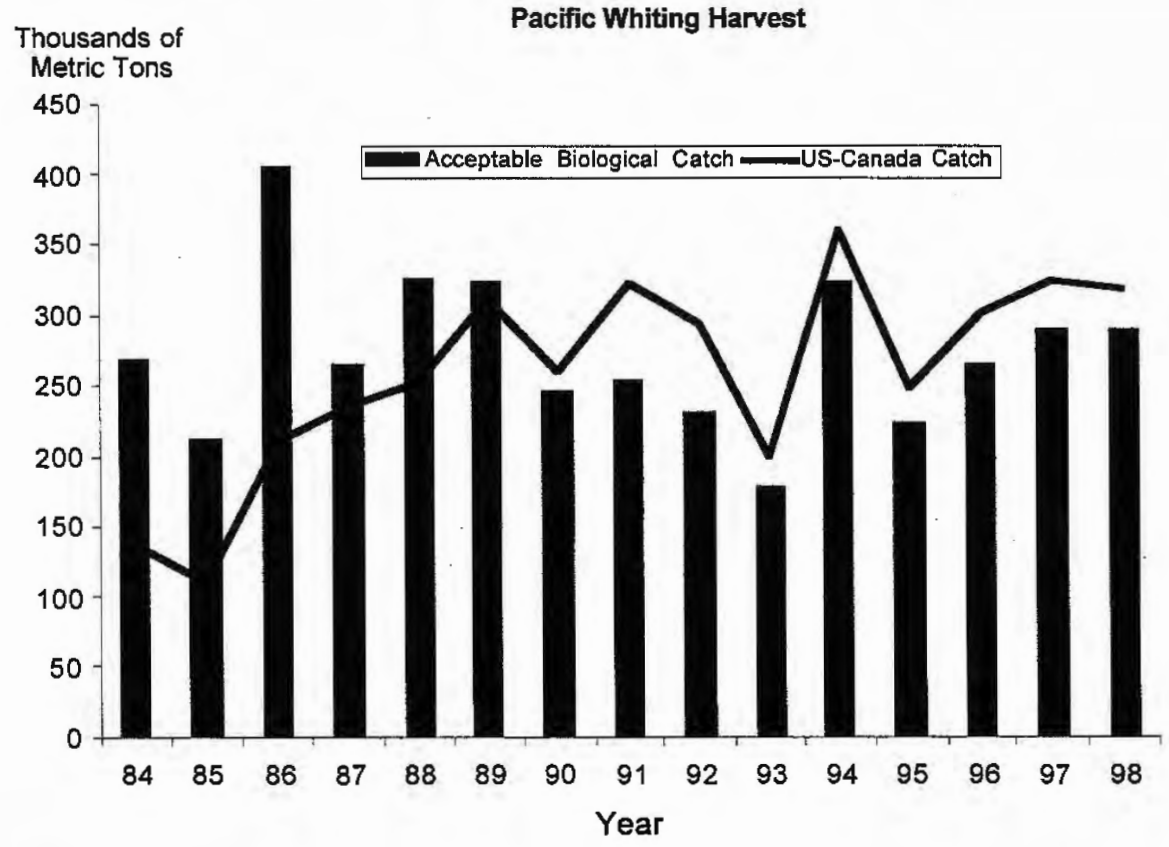


Figure B-3. HG and U.S.-Canada catch of Pacific whiting.

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 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 experimental fishing permit program is to survive.

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 forcast stock conditions. Currently, whiting surveys are only conducted every three years.

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 5 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.

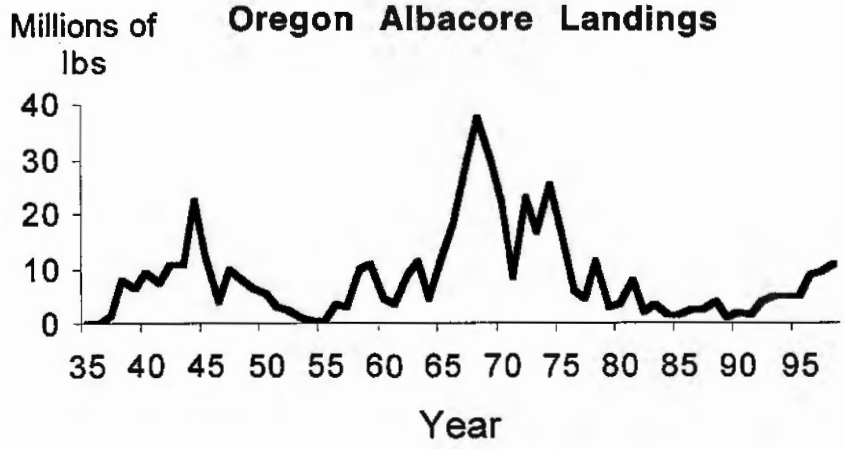


Figure C-1. Oregon albacore landings in pounds, 1936-1998.

Management/Regulations

There is presently no active management regime for the north Pacific albacore fishery. NMFS scientists believe that the MSY is between 80,000-110,000 mt. Since 1950, the fishery has operated at relatively high levels with periods when the stock was heavily exploited or over-exploited. Drift netting severely affected stocks prior to 1992, when removal of high seas drift nets reduced impacts on the stock by about 50 percent. Presently, with drift-netting gone, the north Pacific albacore stock is not expected to decline in the near future unless there is a major effort change in foreign fisheries. The U.S. albacore fishery has produced about 10-20 percent of the total north Pacific catch in recent years; expansion of U.S. effort and catch should not greatly affect the resource if environmental conditions remain favorable. Recent modeling shows the biomass is currently healthy and rebuilding to levels that could support MSY.

Presently, fishery managers from about 15 different nations, including the United States, Canada, Mexico, the South Pacific and Asian rim nations are meeting to form a management organization by the year 2,000. This organization will address the management needs of tunas and other highly pelagic species.

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. Possibilities include fresh or frozen vacuum-packed loins, smoked, oven-ready, quartered fish, and pre-cooked salad mix. Potential markets for these noncanned products include restaurant, ethnic, gift and super-market retail.

Product Quality

Another recent issue in the fishery concerns product safety and quality. Albacore belong to the family Scombridae which 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 which affect chilling rates, as well as gathering samples to be analyzed for presence of histamine toxin. This ongoing research will provide information to harvesters on steps needed to assure a safe product.

Because of competition and an excess of albacore supply, users unable to find place in traditional markets have turned to value added markets. In some cases fish are caught frozen at sea and prepared for a custom canned product. Others are bringing in fresh caught tuna and marketing off of fishing boats using a Limited Fish Sellers license. Recently, some selling this way have offered loining or filleting of tuna as a service to customers. Health concerns and lack of the application of consistent standards for handling fish have lead towards a public process and review of rules.

Currently the Oregon Department of Fish and Wildlife and the Oregon Department of Agriculture are developing rules and guidelines for Commission consideration. Options include 1) prohibiting preparation of fish for customers aboard fishing boats, and 2) allowing the practice as long as those preparing fish are inspected first by the ODA.

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).

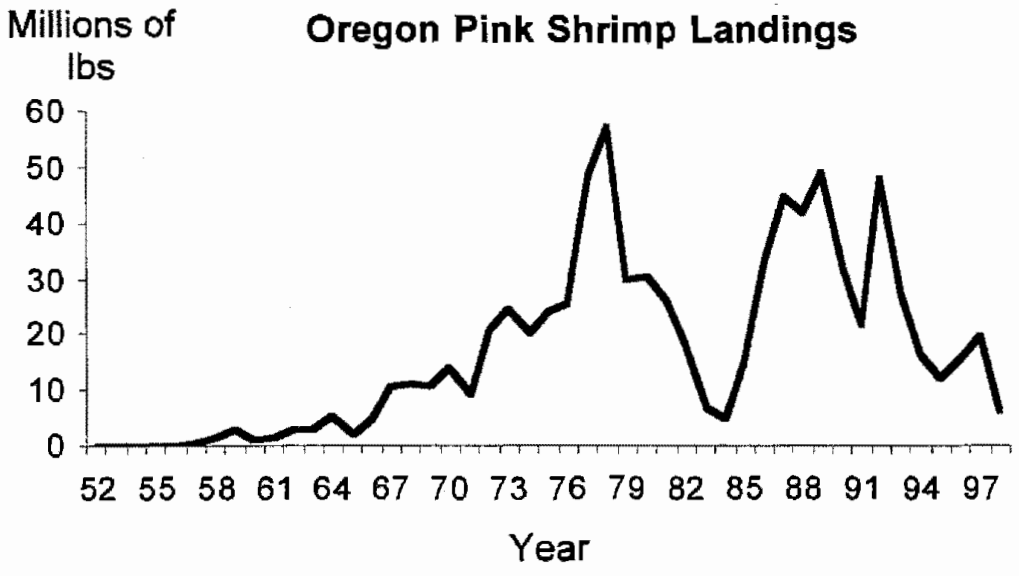


Figure D-1. Oregon shrimp landings, 1957-1998.

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.

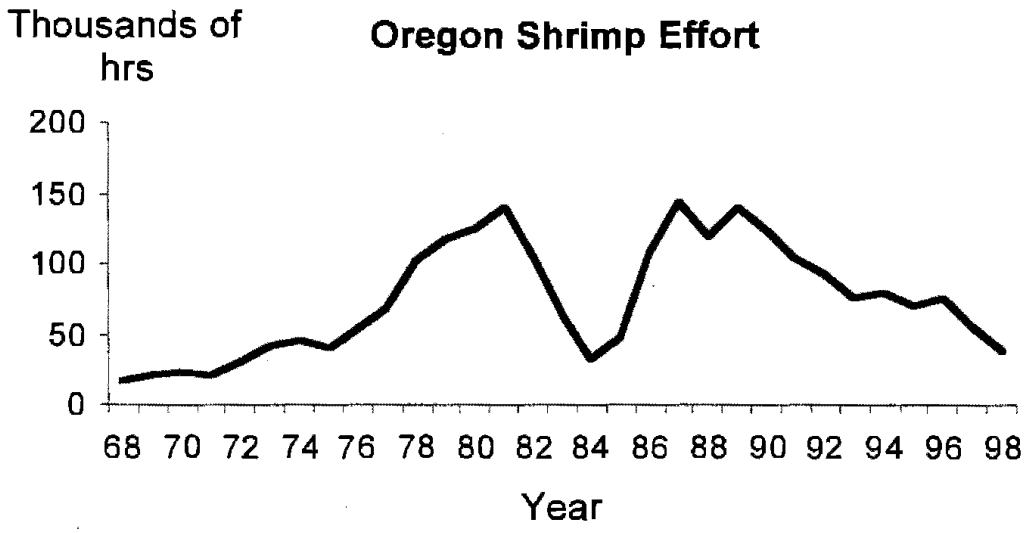


Figure D-2. Fishing effort expended to catch pink shrimp landed in Oregon, 1968-1998, in single-rig equivalent hours.

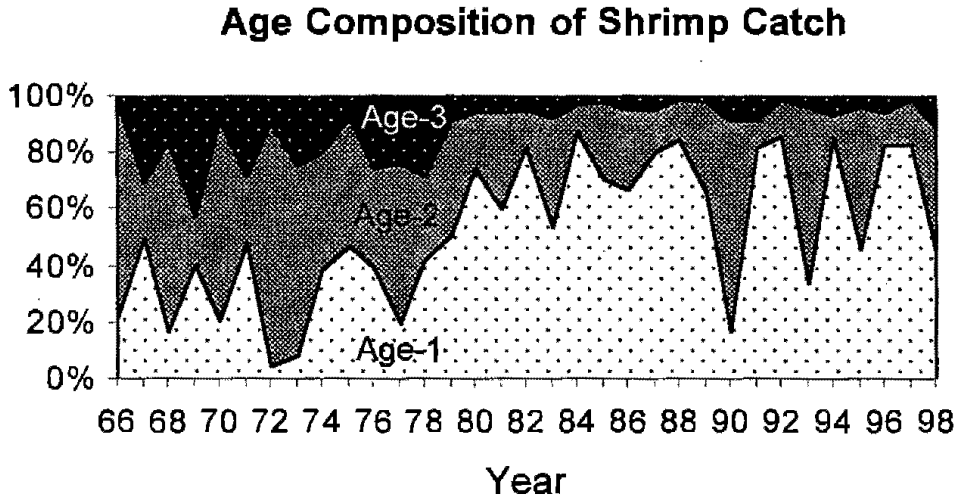


Figure D-3. Age composition of shrimp catch, 1966-98.

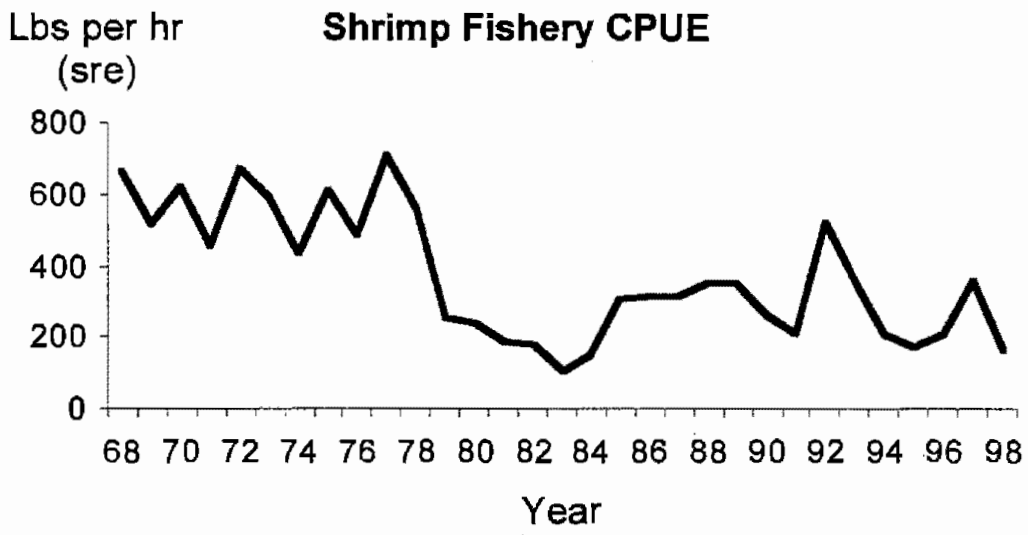


Figure D-4. Shrimp fishery catch-per-unit effort (lbs/single-rig hours) 1968-98.

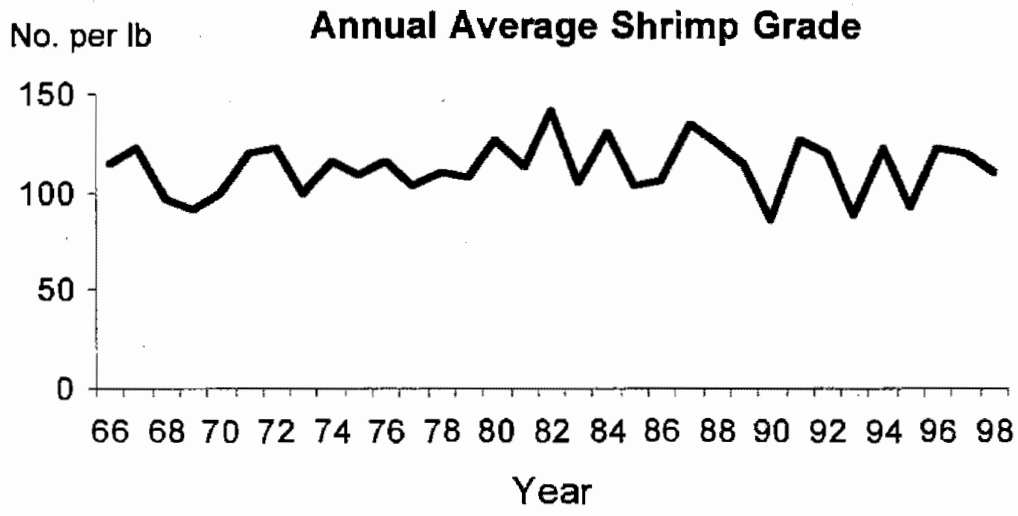


Figure D-5. Average count-per-pound (catch-weighted) of Oregon shrimp landings, 1966-1998.

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 which 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. ODFW is hoping to conduct a research using a staged plankton sampling device to sample in front of and above s shrimp trawl to try to measure net efficiency. Some initial work on this project may take place during the summer of 1999.

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.

For 1999, ODFW is planning to test some square mesh panels in the top forward section of shrimp codends to see if some bycatch reduction is possible without shrimp loss. The species most likely to be excluded include smaller whiting, smelt, and herring, and possibly smaller rockfish. This work is timely as National Marine Fisheries Service is considering listing smelt under the Endangered Species Act.

ODFW is also involved in another project which bridges the gap between bycatch and economic research. This is another cooperative project with OSU that is also Sea Grant funded. In this project, we are trying to measure how bycatch influences the economics of the shrimp fishery. To date, the economic data on bycatch has been limited to the value of fish landed and shrimp loss caused by excluders. In the new study we focus on how bycatch affects fishing decisions as well as shrimp product quality. So far, we have determined that high bycatch levels cause a small but statitstically significant increase in breakage of shrimp.

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 multispecies 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.

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 9.4 million pounds (Figure E-1).

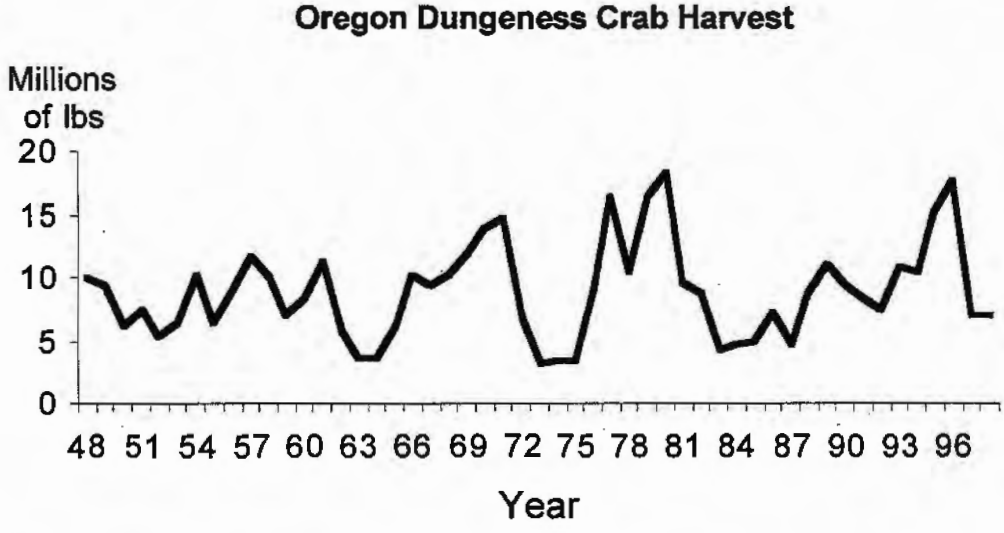


Figure E-1. Oregon ocean Dungeness crab harvest, 1948-1998.

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 has been landed by the end of January.

Effort

Effort can be measured by the number of boats, pots, or 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.

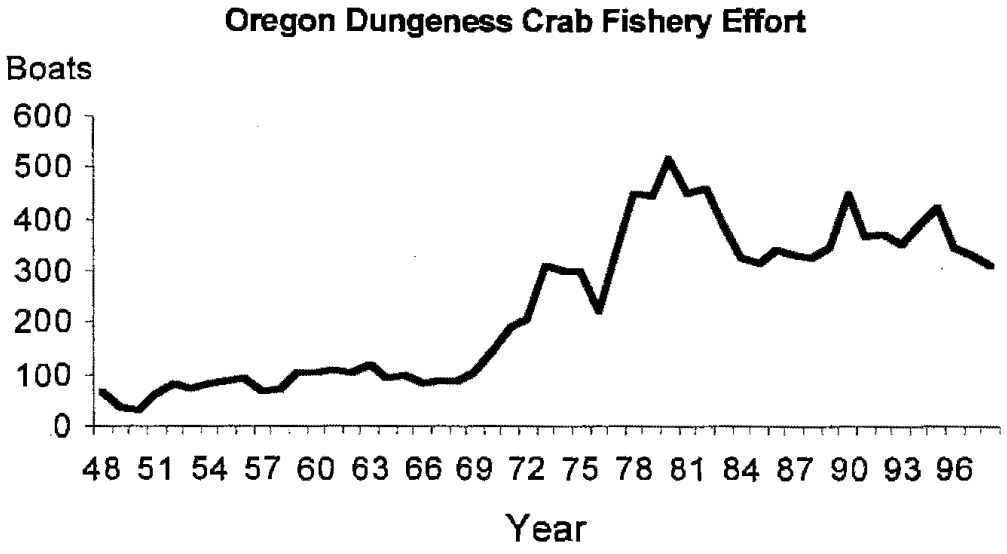


Figure E-2. Oregon ocean Dungeness crab fishery effort; number of boats, 1948-1998.

The number of pots fished has also shown a marked increase from 20,000 in 1960 to 126,000 in 1980. In recent years 70,000 to 151,000 pots were fished annually with an average of about 250-300 pots per boat, increasing to over 400 pots per vessel during the last three years (Figure E-3).

Although some boats have landed large quantities of crabs, the average annual pounds landed per boat has 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 boats were fairly small, but over the years that has changed. In recent years most boats range from 35-50 feet in length. About 20 percent range from 65-160 feet and have the capacity to transport hundreds of pots at one time, can fish in marginal weather and sea conditions, and can fish a much larger piece of the ocean. With the influx of larger vessels, efficiency increased. The larger vessels make multi-day trips, and with the advent of deck lights, crabbing for many vessels has become a 24-hour-a-day operation.

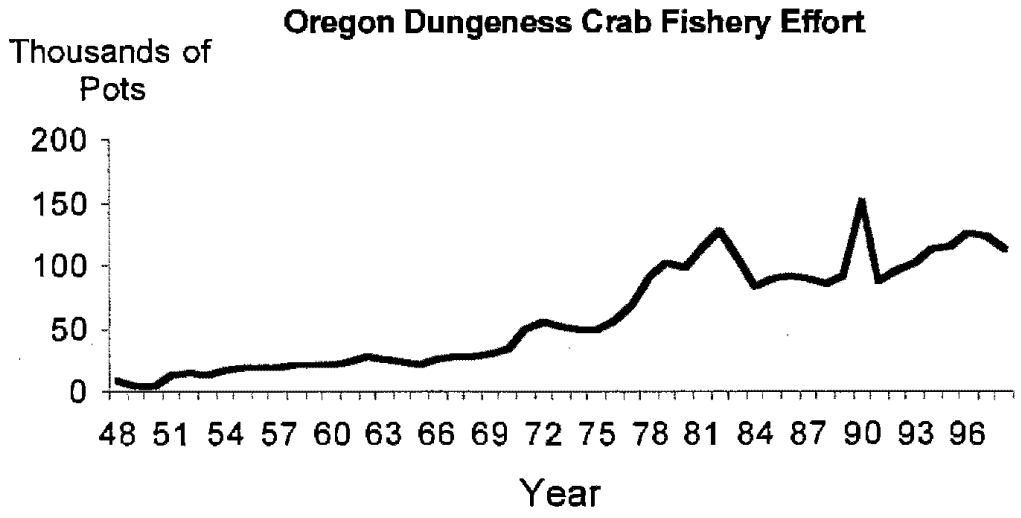


Figure E-3. Oregon ocean Dungeness crab fishery effort; number of pots, 1948-1998.

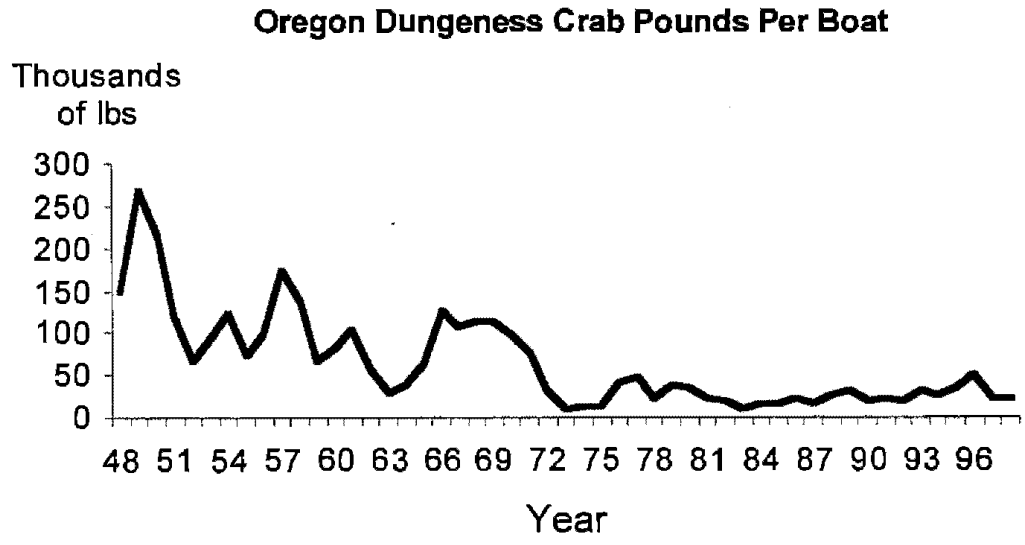


Figure E-4. Oregon ocean Dungeness crab fishery pounds per boat, 1948-1998.

Price
The price for crab at the end of January 1999 was $2.00 per pound. 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 a low price early in the season with an increase as the season progresses and crab volume decreases. The high prices at the end of the season reflect small specialty markets that individual crabbers have developed. Low prices late in the season usually reflect a high volume of poor quality crab as was the case in 1982-1984.

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 were 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. The ocean Dungeness crab season was delayed again December of 1995 due to softshell crab. The season opened north of Cape Falcon December 16. The season has opened coastide on December 1 in the three most recent seasons, after test fishing confirmed crab were of acceptable quality.

Fishing Gear
Longline gear was prohibited in the ocean Dungeness fishery after August 15, 1997.

Harvest Guidelines
In 1992, a HG of ten percent of the December through May harvest was adopted to prevent high fishing effort on soft-shell crabs in the summer. Since implementation, the summer fishery has not attained the harvest guideline.

Soak Times
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 Tri-State Crab Committee was formed in 1990, through the PSMFC, to assist the states of Washington, Oregon, and California in achieving consensus on several issues related to crab management. Consistency in seasons, limited entry programs 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 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. In some years the industry has shown an inability to control the soft crab problem; and management agencies have been reluctant to change regulations to help resolve the problem without an industry consensus.

Finally, under the revised Magnuson/Stevens Sustainable Fishery Act, authority was given to the states to enforce ocean Dungeness crab regulations outside of state territorial waters, within the Fisheries Conservation Zone (FCZ). Recent court decisions entitled 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.

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 452 vessels make up the current Oregon limited entry fleet.

Critical Issues/Research Needs

Soft Crab
One matter related to resource risk, increased effort, and intense competition, is the handling and landing of large numbers of soft crab. Late in the season from 1982-1984, a major fishing effort resulted when the season was extended. Up to 20 legal size, soft crab were being sorted at sea for every crab kept. Upon landing, processors sorted out an additional 70 percent because crabs were not full enough. Soft crab are easily injured and a high percentage most likely will not survive handling. A portion of those crab would have mated again. The economic loss can be estimated, but the significance of the biological risk is unknown.

Progress has been made on this issue regarding the beginning of the season, but apparently the summer fishery has soft-shell problems too. The Department has made a commitment to address these issues in 1999. Proposals considered so far include shortening the crab season by 30 to 60 days, closing the season when crab tests show an abundance of softshell crab, and applying gear restrictions or trip limits during the summer fishery.

The crab industry has also had a long-standing concern over possible impacts of the trawl fishery on the crab resource, particularly when crab are soft. Crabbers have been reluctant to support handling mortality research in their fishery without a commitment to investigate trawl fishery impacts.

Pot Limits
Limited entry programs currently do not place limits on the amount of crab gear fished. This limits the ability of a vessel permit limited entry program to effectively cap fishing effort. Petitions have been presented to the 70th Legislative Assembly by the fishing industry requesting a cap be placed on the amount of pots owned by vessel permit holders.

Marketing
Many individuals in the crab industry would like to spread out the catch of crab over time to improve marketing prospects. This must be balanced by the fact that crab are in the best condition in the winter months. While the summer fishery limit (ten percent of December through May harvest) is a step towards discouraging summer soft-shell crab landings, there is no definite mechanism in place to insure some production level through the end of the season.

Bay Crab Fisheries
Another area of concern is the potential for effort to continue to increase in the commercial bay crab fishery. Even though there is coastwide limited entry for the ocean fleet, we have not seen 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 the open access fishery. Because the bay crab resource is shared with sport fishers, potential for user group concerns is also high. An additional user group, guides and charter boats for hire may add to the 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.

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, subsequently declining to a low of 345,000 pounds in 1998. Catch per day and per hour statistics show a similar sharp decline followed by a leveling off in most harvest areas (Figures F-1 and 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. At least two major recruitment events have occurred in recent times, so stocks appear to be healthy and not overfished in a recruitment sense. Fishery yield appears to be reduced significantly but stable at present.

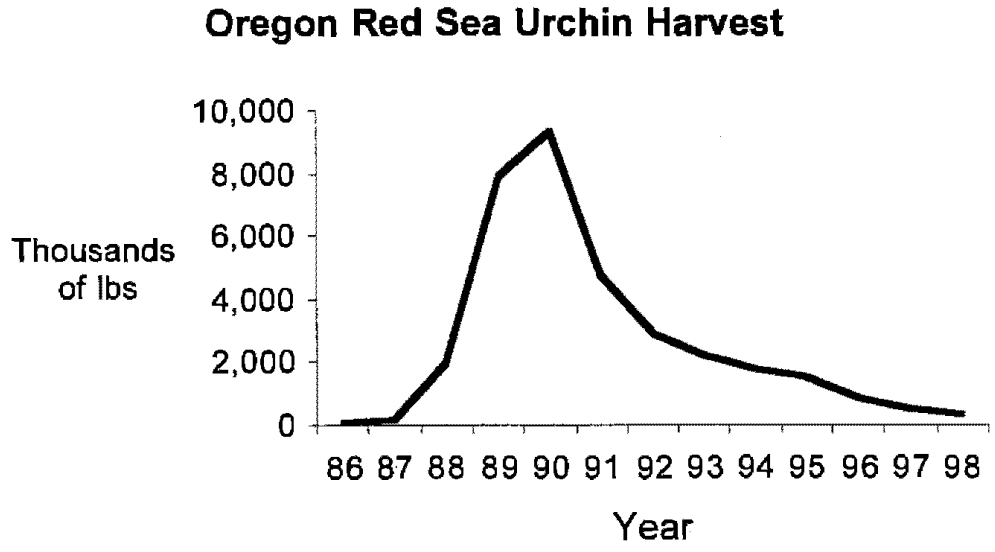


Figure F-1. Oregon red sea urchin harvest, 1986-1998.

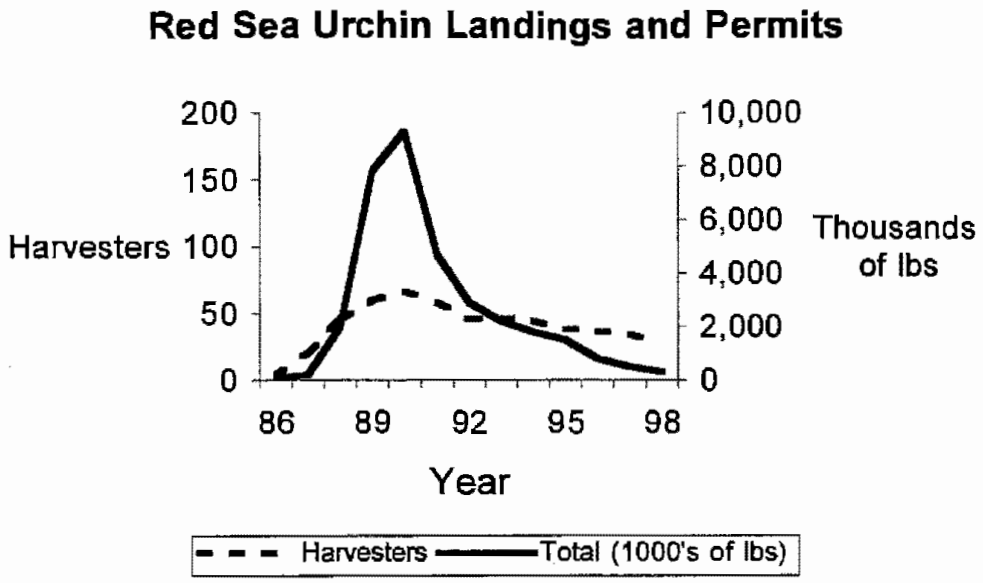


Figure F-2. Oregon red sea urchin average daily landings and number of permits, 1986-1994.

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.

Critical Issues/Research Needs

Markets
Market conditions 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 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 factor in key areas along the coast. Current efforts include urchin population surveys conducted biennially at Orford Reef and Depoe Bay. 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 REEFS AND FISHERY ISSUES

Background/History

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).

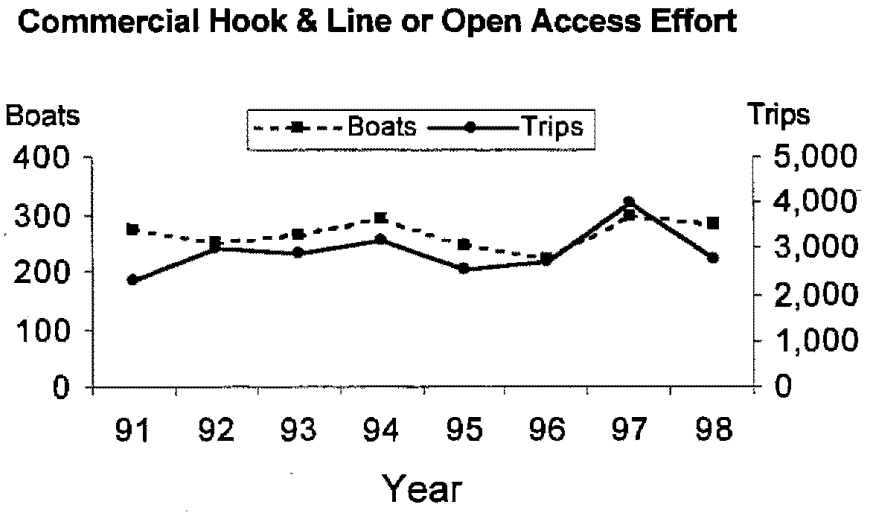


Figure G-1. Increase in fishing trips by hook-and-line harvesters. The open access fleet was defined in 1994. Effort beginning in 1994 does not include a few trips made using open access pot or bottom-longline gear types.

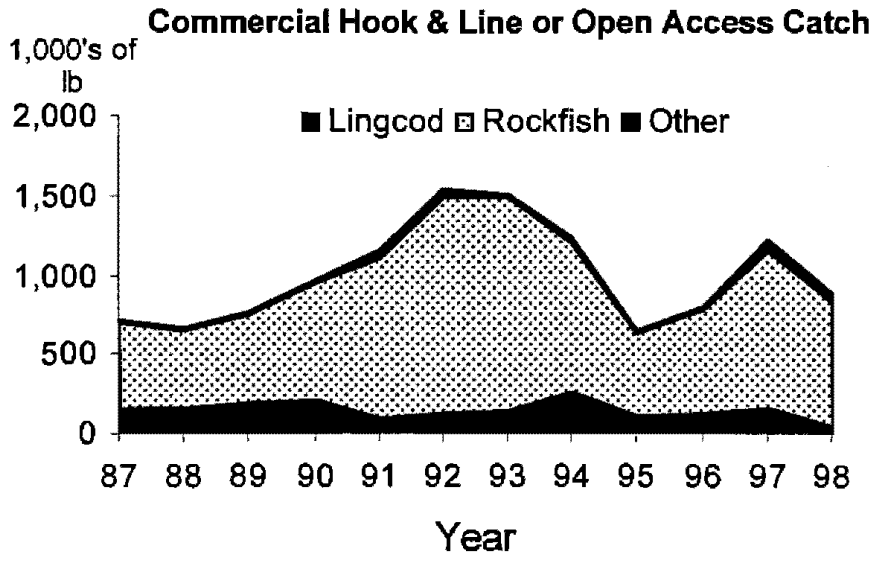


Figure G-2. Landings of rockfish from open access fishery. The open access fleet was defined in 1994. Catch beginning in 1994 does not include a few trips made using open access pot or bottom-longline gear types.

Table G-1 Oregon landings of live fish in pounds, number of boats, dealers and deliveries, 1997-1998.

	1997	1998
Species		
Cabezon	23,807	49,519
Greenling	19,396	19,371
Lingcod	39,061	21,527
Other Rockfish	7,679	34,832
Other Species[2]	65	1,167
Total	90,008	126,416
Live Fish Boats	44	67
Live Fish Dealers	5	14
Live Fish Deliveries	647	1039

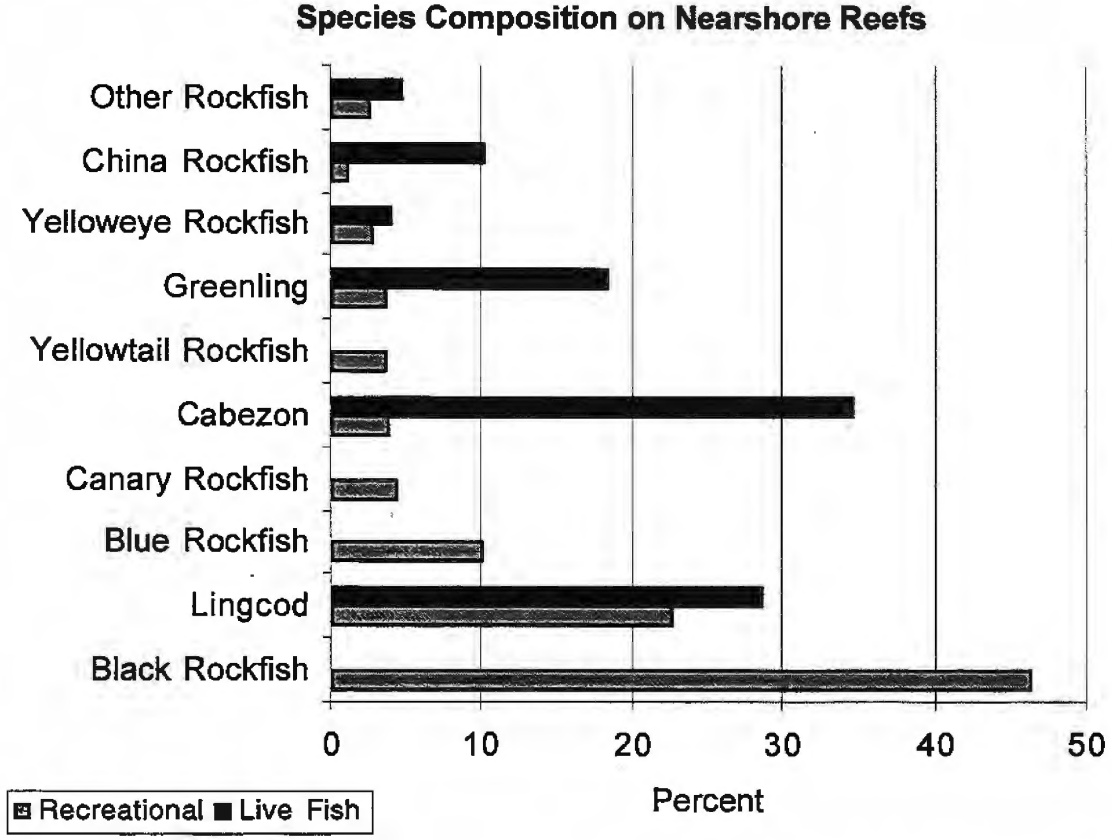


Figure G-3. Species composition of recreational fishery compared to commercial live fish fishery on Oregon's nearshore reefs. Adapted from RecFin data, 1980-1998, and ODFW landing data, 1997-1998.

Kelp Harvest

Kelp has been harvested commercially along the West Coast throughout this century. The two primary species harvested include giant kelp (*Macrocystis pyrifera*) and bull kelp (*Nereocystis luetkeana*). Uses of kelp have included food products, pharmaceutical products, chemical stabilizers and emulsifiers, animal feed, and fertilizers. The vast majority of kelp harvest on the West Coast occurs on the extensive giant kelp beds of southern California. Bull kelp, the more prevalent species in northern California, Oregon, Washington, and British Columbia, is currently harvested primarily in British Columbia. West Coast states have approached bull kelp harvest cautiously due to lack of information with which to manage harvest. California and Washington currently have moratoria on issuing commercial bull kelp harvest permits, and Oregon is evaluating impacts of small-scale harvest leases on an experimental basis.

Although markets are potentially available to allow development of a kelp industry in Oregon, the nature of the bull kelp plant and the size of Oregon's beds will limit any commercial kelp industry. Bull kelp biomass is highly variable from year to year, making it difficult to establish a predictable supply. Since bull kelp is an annual species, the plant can only be harvested during a relatively short season, making it impossible to provide year-round supplies to the market. Finally, bull kelp beds in Oregon are relatively small compared with other parts of the West Coast, limiting the size of the market potentially available to the industry. Oregon's total bull

kelp bed area is about one-tenth the size of British Columbia's and about one-twentieth the size of giant kelp beds in southern California.

The only recent documented commercial bull kelp harvest in Oregon occurred from 1988 though 1992, when a firm obtained a harvest lease on the southern Oregon coast. They harvested a total of about 70 tons during that time. Some of the proposed uses for bull kelp included meat filler and binder products, cultured abalone feed, and liquid fertilizer products, but markets for Oregon kelp were not fully developed. The state terminated the firm's lease in 1992 and re-issued an experimental harvest lease in 1996.

There is currently continuing interest in harvesting kelp among some of the public and the fishing community on the south coast, although Much of the current interest stems from reduced salmon fishing opportunities and a shift toward non-traditional fisheries to replace lost income. Kelp harvest, like sea urchin harvest and nearshore rockfish fisheries, occurs on nearshore reef environments where much of the effort shift is focused. Kelp harvest has some potential for replacing some of the lost income due to reduction in other fisheries. At the same time, some ocean users, resource agencies, and the public have expressed concern about possible adverse effects of harvest on existing fisheries and reef habitats. If kelp harvest adversely affects existing fisheries and other natural resources, potential for income lost in these fisheries as well as other impacts need to be seriously considered in balancing decisions about kelp harvest.

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 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 have 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 30 and users are limited to 250 pounds per month. Recreational users experienced a bag limit reduction for 3 to two fish and both sport and commercial users must release fish less than 24 inches long.

Kelp Harvest

The Division of State Lands (DSL) regulates kelp harvest under statutory authority to lease 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. This section presents a brief summary of DSL regulations on kelp harvest.

Prior to 1993
Oregon Revised Statutes (ORS) Chapter 274 has governed kelp harvest. Existing law enables DSL to lease submerged lands for kelp harvest, requires payment for harvest rights, and contains a few other requirements of the lessee. Existing law was enacted in the early 1900s and does not address a number of issues that have recently arisen concerning kelp harvest.

1993
In March of 1993, DSL convened a Kelp Advisory Committee to examine kelp harvest issues and provide recommendations to guide future actions on kelp harvest leasing. The committee found there was significant interest in commercial kelp harvest, and identified several significant unknowns regarding potential harvest impacts to kelp communities and existing fisheries. The committee recommended DSL develop a small scale kelp leasing program primarily intended to gather information needed for proper management of harvest. As a consequence of Committee recommendations, potential leases were structured as follows:

- issue five-year leases for kelp harvest study plots at Cape Blanco, Orford Reef, Rocky Point, and Rogue Reef

- attempt to lease to more than one harvester

- conduct research to determine potential harvest impacts and to determine options for future kelp leasing

- require that harvesters be performance bonded to ensure that research harvest is carried out pursuant to a study plan

- enter into a five-year contract for aerial surveys needed to determine available kelp biomass, and determine an equitable method of cost-sharing these surveys between the state and all lessees

- work with harvesters and ODFW to prepare an annual study plan before harvest season to respond to updated information, as well as projections of kelp densities from aerial surveys

- create an operations committee to oversee the project

1994-1999
DSL has implemented many of the recommendations of the Kelp Advisory Committee. In 1994, DSL issued a request for lease bids for four experimental kelp harvest sites. Nobody filed a bid. Prospective bidders informed DSL that some of the lease conditions were either too restrictive or too expensive to allow development of an adequate business proposition. Of particular concern was the size of the performance bond required, amount of liability insurance required, and potential cost of conducting impact assessments.

DSL revised bid specifications to address industry concerns and re-issues request for bids in spring of 1995. As a part of the management process, annual kelp surveys have been conducted by ODFW since 1996 to determine available biomass for harvest. Bluewater Harvesters was the successful bidder, however no kelp harvest has occurred under the permit due to poor kelp abundance to date. Any harvest that may occur must be conducted according to a research harvest plan to gather impact information as well as document logistical issues associated with harvest.

Critical Issues/Research Needs

Fishery Information Needed

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?

The Fish and Wildlife Commission will consider rule changes May of 1999 affecting Oregon's nearshore fisheries. Modifications to our rules are needed to properly track landings, importation, and shipment of live fish, and to prevent inadvertent introductions of exotic species or fish disease.

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.

Stock Assessment

In 1998, field staff began ride-along trips with open access/live fish fishers out of Port Orford, and developed methods for sampling the live fish fishery for biological data. Biological research being conducted on selected nearshore reefs was initiated in 1998. Seal Rock, Waldport and Cape Perpetua reef areas off the central Oregon coast were sampled for species composition, age, length, and maturity using a charter boat. Additional work is planned in 1999 at reef sites between Depoe Bay and Cannon Beach.

ODFW Marine Resources Program staff used side scan sonar to map selected areas of southern Oregon coast reef habitats in 1995 and surveyed different habitats within and between reefs to determine fish and habitat associations in 1996-97. (Miller et. al, 1997; Fox, et. al, 1998). In coordination with the biological sampling mentioned above, staff mapped the same three reefs off of the central Oregon coast during the summer of 1998 using a different acoustical sampling method.

Study results show that certain habitats can be identified and measured, and that particular bottom habitats within a reef demonstrate strong fish associations with these habitats. Ongoing studies seek to develop efficient methods of mapping important reef structures in the nearshore and to determine the best methods for indexing abundance of fish and invertebrate populations associated with reef habitats. In the near future, we hope to use this information to develop a new stock assessment tool which addresses both the need to protect essential fish habitat, determine nearshore reef fisheries resource health, and appropriate harvest levels of all living resources to ensure sustainability.

Kelp Inventory

Kelp harvest may give south coast communities the ability to replace some of the lost income due to declining salmon fisheries. The prospect of commercial kelp harvest is being approached cautiously because of significant unanswered questions regarding:

- the annual abundance and distribution of kelp,
- factors affecting kelp growth, and
- the role of kelp in nearshore reef ecology and fisheries.

Kelp harvest cannot be effectively managed until we begin to answer these questions. Incorrect decisions now could lead to ultimate loss of fishing income if kelp harvest negatively impacts existing fisheries. The experimental kelp harvest lease was set up for a five-year period during which harvesters and resource agencies will collect necessary information for managing harvest. ODFW began receiving grants in 1995 to begin conducting research designed to answer some of the outstanding questions. These grants permitted ODFW to work in partnership with harvesters significantly reducing private investment needed by harvesters to meet impact assessment requirements of the lease.

Since 1996, ODFW Marine Resources Program has estimated kelp abundance in key areas off the southern Oregon coast which encompass potential harvest sites. Kelp abundance has been too low to support experimental harvest to date, although the 1998 survey indicates an increase in biomass (Figure G-4 adapted from Fox et. al., 1998).

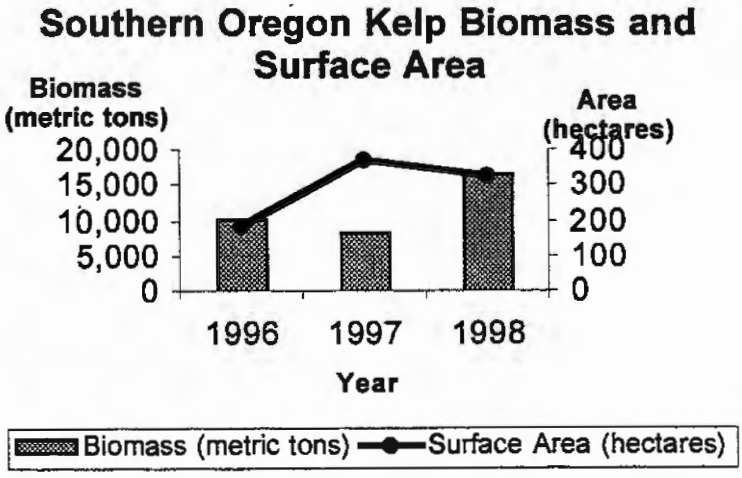


Figure G-4. Kelp biomass in metric tons and kelp bed surface area in hectares off of the southern Oregon coast at Blanco, Orford, Redfish, Humbug and Rogue reefs.

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 1993 were 38 diggers and 127,730 pounds. The ten-year average (1984-1993) is 80,426 pounds annually. The value of bay clams to the harvesters in 1993 was approximately $100,000. 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.

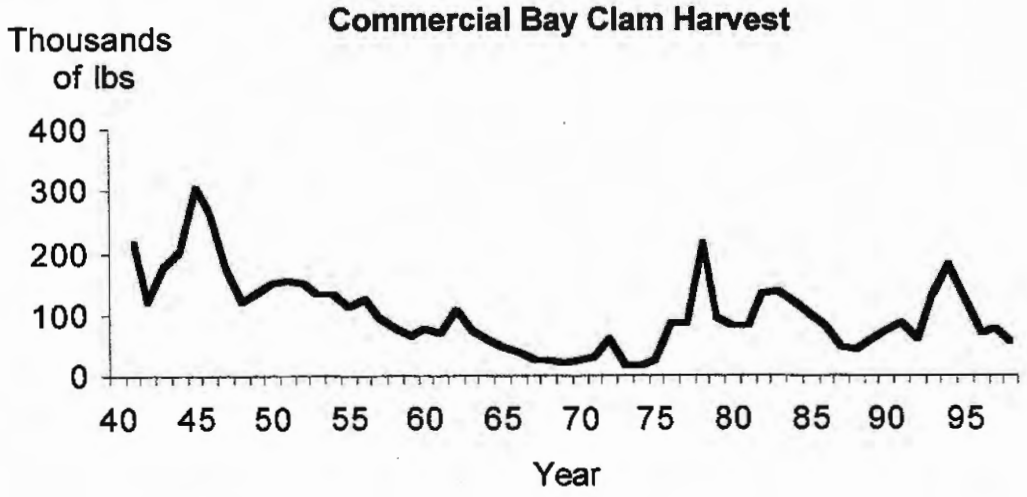


Figure H-1. Commercial harvest of bay clams, 1941-1998.

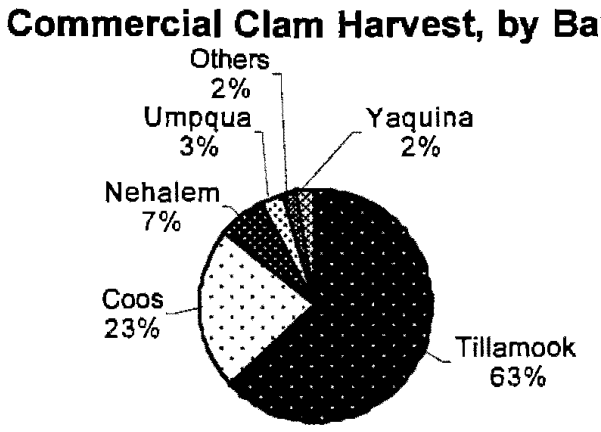


Figure H-2. Commercial clam harvest, percent by bay, 1989-1998.

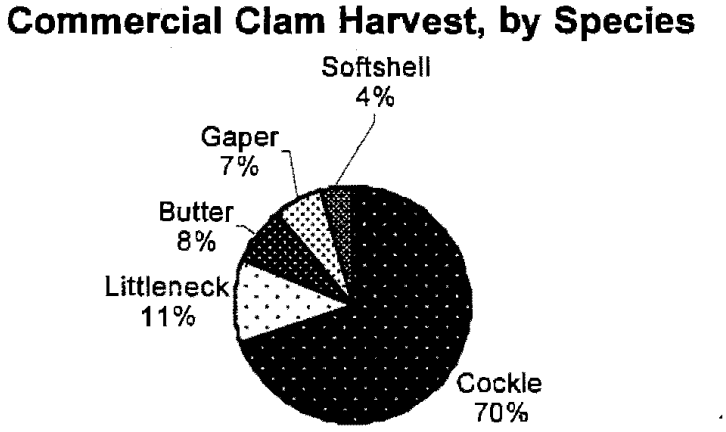


Figure H-3. Commercial clam harvest, percent by species, 1989-1998.

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 softshell 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.

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, the bulk of the harvest is taken by sport diggers. The ten-year average (1982-1991) indicates an annual average of 150 commercial diggers participating in the fishery that harvested 14.7 percent of the total catch. Recreational razor clammers have averaged 85.3 percent of the total annual take and have taken about 64,000 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 in 1990 was nearly $40,000.

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 parallitic 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.

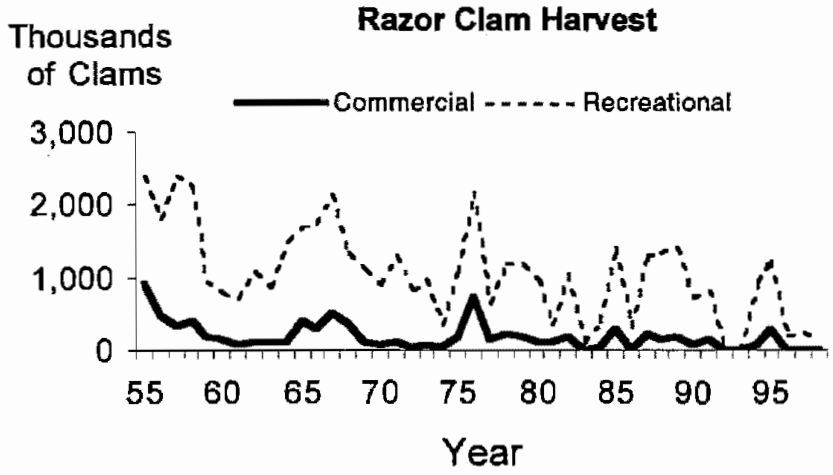


Figure H-4. Commercial and recreational harvest of razor clams, 1955-1998.

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.

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 permits to disabled clam diggers in 1997 and 1998, 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 (*Crassotrea 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 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		Agency	
Gerald Gunnari -	Charleston	Jim Golden -	OR Dept. Fish & Wildlife
Jerome Grant -	Siletz	Dalton Hobbs -	OR Dept. Agriculture
Linda Brown -	Brookings		
Stan Schones -	Siletz		
Leonard VanCurler - (chair)	Florence	Ex Officio	
		Frank Dulcich (The Pacific Group)	
Processors		Joe Easley (OR Trawl Commission)	
Bill Schriber - (vice-chair)	Garibaldi	Paul Heikkila (Sea Grant Extension)	
Scott Adams -	Charleston	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 fisheries, 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
Pacific hagfish	25	14	12	12	8
blue shark	10	6	2	4	
swordfish	10 other gear 20 longline	10 9	10 1	10 2	10 3
northern anchovy & Pacific herring	15	7	5	4	10
Pacific sardine & Pacific saury	15				12
Pacific sandfish	10				
smelt spp.	20	1			
Pacific pomfret	10	2			
slender sole	10				
INVERTEBRATES					
box crab	25	18	8	25	14
Oregon hair crab & scarlet king crab & grooved tanner crab	10	10	10	10	4
spot prawns	6 trawl 10 other gear	6 10	6 10	6 10	6 10
coonstriped shrimp &	10 pot gear	(b)	(b)	(b)	10

sidestriped shrimp					
cockle clams (ocean)	5	5	1	1	1
bay clams	10 coast wide	(a)	20(c)	10	10
giant octopus	10	10	1	10	9
squid	30 trawl 30 other gear	22 10	14 2	9 17	34(d) 39(d)
fragile urchin	6 trawl 6 other gear	1			
sea cucumber	6 trawl 10 dive 10 other gear	6 9	3	1 6	6 3
snails	10	3	2	3	2
brine shrimp	3 adults 1 cysts	(a)	(a)	3 1	3 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.

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

Category C species - under other management plan

Fish

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	

Invertebrates

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 highly 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 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 fishery highly structured, limited to entry, and with fewer and fewer opportunities for fishers at the end of the twentieth century. 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 future "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 adapted for ocean troll fishing. 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 out river gillnet from ocean catch and landing information.

After 1920, vessels specifically designed for ocean troll fishing began exploring further offshore with larger, more powerful, and efficient vessels. Troll fishers expanded their territory south along the Oregon coast as larger vessels became capable of fishing at sea for several days at a time. 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, and by late in the decade trollers were actively fishing for a combination of salmon, albacore tuna, and Dungeness crab. 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 fleet further expanded and were the dominant sector of the fleet. By the mid 1960's, development of a substantial "dory" and day boat fleet was well underway. Growth in the small boat fleet was 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 and the onset of highly restrictive troll fisheries, participation of these smaller vessels dropped to about one third of the total fleet and landing about the same proportion of the catch. By 1997, the "day boat" fleet represented less than 25% of the fleet and only 6% of the targeted Chinook catch. Historically, about 10% of the fleet harvests 50% of the salmon and about 50% of the fleet harvest 90%. Despite recent changes in fleet composition, this relationship still holds true.

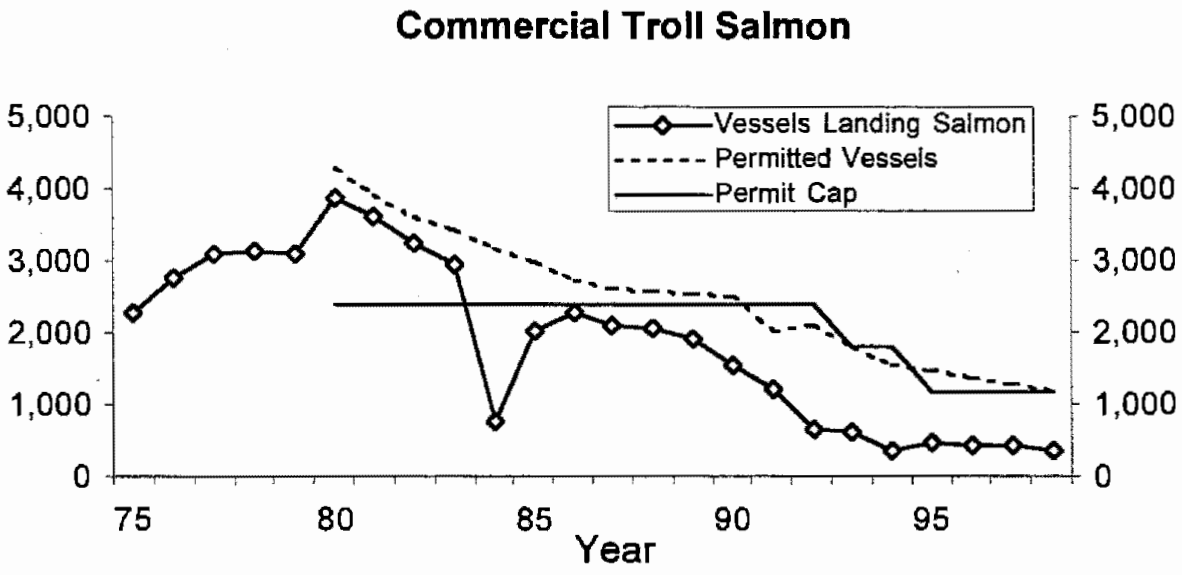


Figure J-1. Number of commercial troll vessels permitted, landing salmon, and legal permit cap in Oregon's commercial troll salmon fishery, 1979-1998.

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 the fleet to 373 active boats in 1998. 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 have been kept. Since 1992, troll effort has averaged only 7,700 boat days per year, never climbing back above the 10,000 boat day mark common in nearly all years prior to 1992 (Figure J-2).

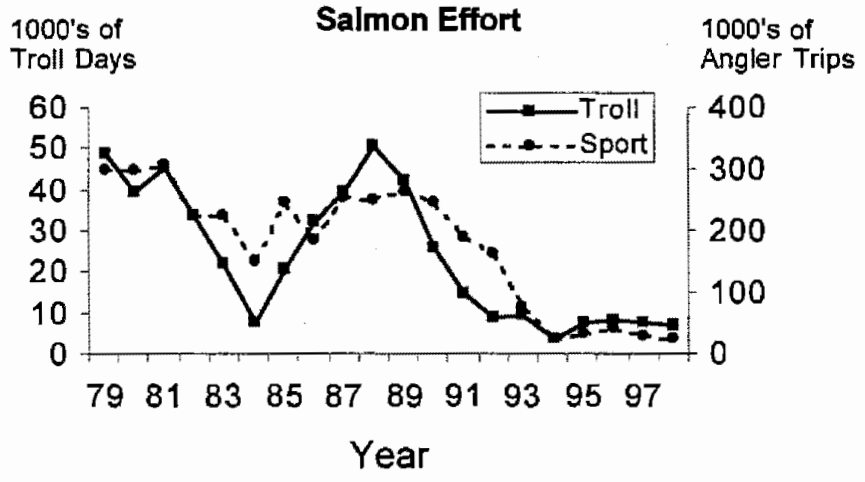


Figure J-2. Oregon ocean commercial troll and recreational salmon fishery effort, 1979-1998.

The Oregon ocean troll fishery has not had a coho salmon season since 1993, and has operated under severely reduced chinook fishing opportunities since that time. Fishery limitations are largely a result of extremely poor ocean survival of Oregon hatchery and wild Oregon coastal natural (OCN) coho, depressed abundance of other regional stocks of coho and chinook, and new listings under the Endangered Species Act. Oregon's OCN stocks were also listed as threatened species under the ESA in 1998.

The Oregon ocean troll catch has 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 208,000 fish yearly from 1979-1998. Coho landings ranged from 50,000 to 715,000, averaging 358,000 during 1979-92. The troll coho season was open only for a small quota north of Cape Falcon in 1993 and has been completely closed since.

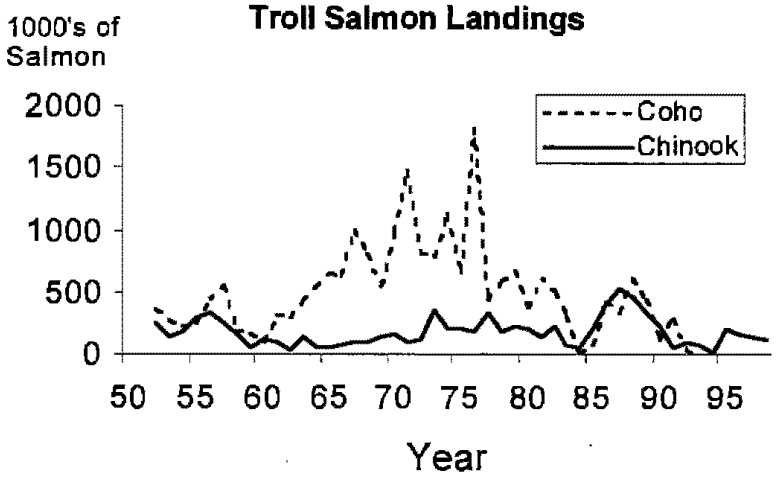


Figure J-3. Oregon ocean commercial troll fishery landings, 1952-1998.

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 lessor 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. The Oregon ocean recreational fishery is made up of private vessels and a large group of 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 58,000 days, and ranging from 165,000 (1992) to 26,000 (1998) angler days per year (Figure J-2). Charter vessel participation ranged from about 125-150 boats annually from the mid-1980's through the early 1990's. The loss of large scale coho fisheries and reduced chinook opportunities reduced the active fleet to a range of 80-100 vessels.

Recreational ocean salmon landings have averaged about 148,000 coho and 23,000 chinook coastwide during the period 1979-1998 (Figure J-4). The ocean recreational fishery reached its peak in 1976, a year of record coho abundance , with a catch of 501,000 coho and 79,000 chinook.

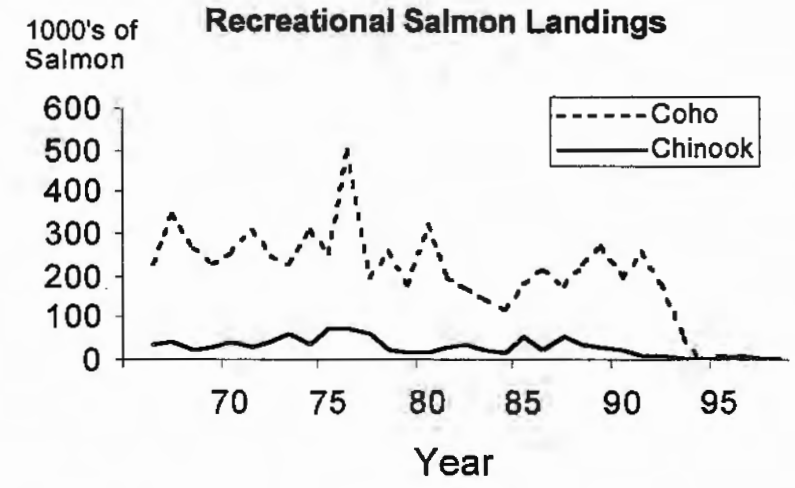


Figure J-4. Oregon ocean recreational salmon landings, 1966-1998.

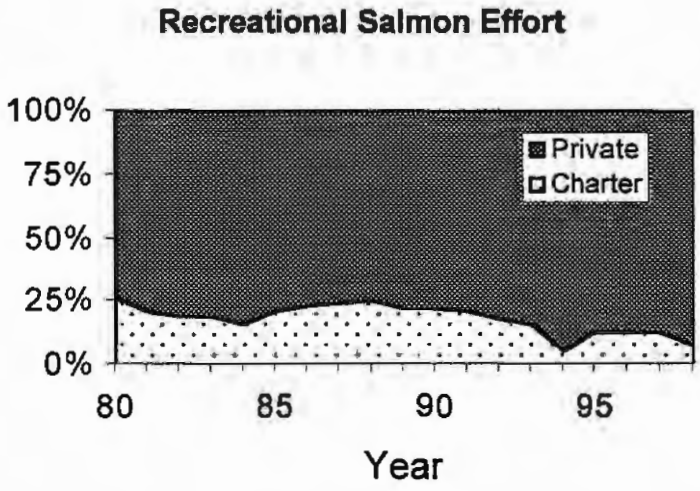


Figure J-5. Proportion of ocean salmon effort by private and charter vessels in Oregon's salmon fishery, 1980-1998.

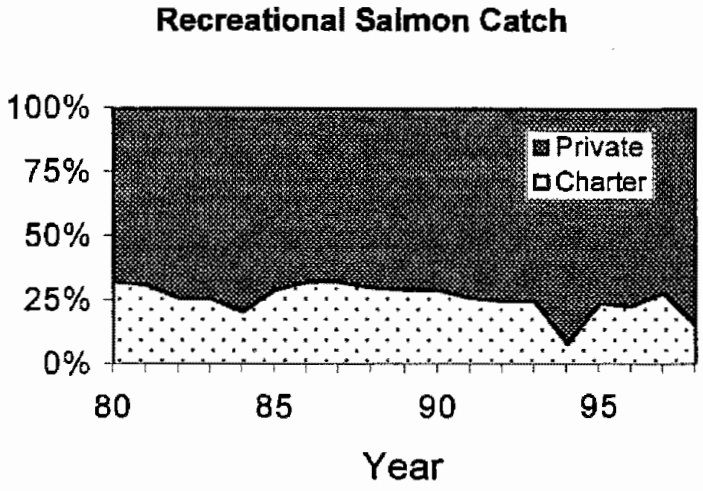


Figure J-6. Ocean salmon catch proportion by private and charter vessels participating in Oregon's ocean recreational salmon fishery, 1980-1998.

It's important to note that Oregon's ocean recreational coho fishery has been closed from 1994 through 1998. The only exceptions being very limited ocean seasons north of Cape Falcon (Columbia River area) in 1995, 1996, 1997, and a new, but very restricted, coho "selective" test fishery for hatchery fin-clipped fish for the same area in 1998.

Management/Regulations

Pacific Salmon Commission (PSC)
Oregon's coastal chinook salmon migrate extensively along the west coast of North America and are significant contributing stocks in both sport and commercial fisheries within the harvest management framework of the PSC and the implementing Pacific Salmon Treaty (PST, 1985) off Canada and Southeast Alaska. Under the PST, both the United States and Canada agreed to prevent overfishing on various stocks and halt the decline in natural chinook salmon escapements, and provide for their rebuilding. Harvest limits were structured to provide "pass through" of larger numbers of fish for critical stocks and deliver them to spawning escapement. The treaty requires "pass through" for any fish saved from curtailed PST fisheries. A significant portion of Oregon's Columbia River and central and north coast chinook stocks are managed through the PST and benefit from the resulting PSC fishery management agreements. Although the PST provides a management framework for all salmon species intercepted between the two countries, Oregon is most concerned about impact and management of its multiple chinook stocks moving through treaty area fisheries.

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), in cooperation with the various coastal states, manages the various 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" 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. This planning arrangement has continued until the present, although the MFCMA (now known as the Stevens-Magnuson FCMA) most recently amended by the sustainable Fisheries Act (SFA, 1996), required a comprehensive revision to reflect the ESA, added national standards, criteria to prevent overfishing, establish salmon bycatch reporting and plans to minimize bycatch mortality, and describing essential fish habitat.

Under the PFMC's salmon FMP and Oregon's adoption of yearly ocean fishery regulations through the Oregon Fish and Wildlife Commission, Oregon coho and chinook stocks are assessed and goals for both spawning escapements and fishery quotas established. Generally, management has become progressively more complex and restrictive in response to increasingly depressed salmon populations, conservation concerns, meeting spawning escapement goals, and harvest allocation requirements. An extensive series of preseason technical analyses are 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 providing for specific spawning escapement goals for the various stocks in Oregon and the other states.

Exploitation rates for OPI area coho (and that generally track impacts on OCN coho) and for Oregon north/mid coast and south coast chinook stocks are shown in Figures J-7 and J-8, respectively.

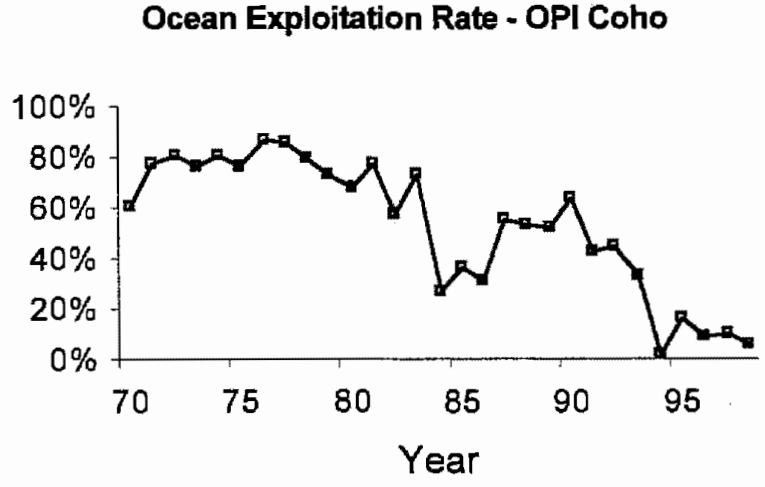


Figure J-7. Composite exploitation rate for coho salmon in the Oregon Production Index (OPI) area (Leadbetter Point, WA. through California) by catch year. Data shown is representative of Oregon coastal natural (OCN) wild coho exploitation rates.

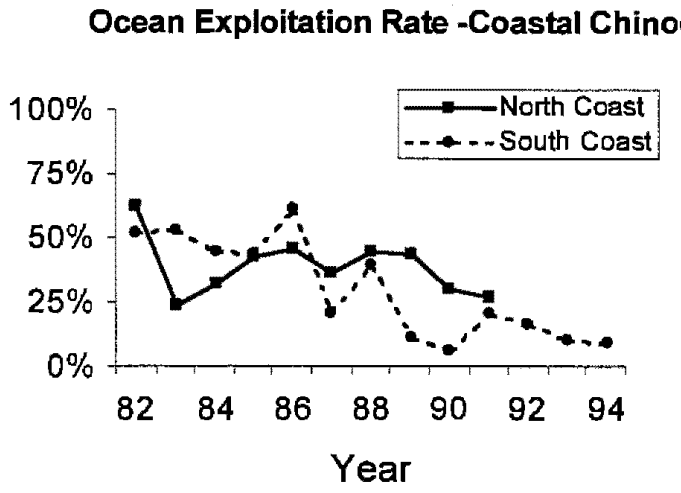


Figure J-8. Ocean exploitation rates for two major Oregon coastal fall chinook stock aggregates on the Oregon Coast are shown. Rates for the two stock aggregates are not directly comparable to each other, but each separately, are indicative of ocean exploitation for the aggregate they represent. Ocean exploitation of southern Oregon coast (SOC) stocks (south of Cape Blanco) are represented by the exploitation on 4-year old Klamath River fall chinook, as 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).

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 all permits would be renewed unless the permit lapsed for a year. In 1993 and 1995, the Oregon legislature revised the permit cap and decreased it to 1,800 and 1,200, respectively. In 1998, a total of 1,200 permits were issued, however, only 433 vessels actually fished.

Troll regulations

Oregon's ocean commercial troll fishery has undergone a continuing series of 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.

The first late season fall terminal area target chinook fisheries began in 1974 off the mouths of the Elk and Chetco rivers. These fisheries continued yearly for both areas through 1982 and off the Elk through 1989. In recent years both fisheries have had limited openings, with added opportunities off Tillamook Bay as well.

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.

The 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. Since 1994, there have been no commercial troll coho opportunities off Oregon.

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; a stock harvested in substantial amounts in this southern Oregon area.

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 expanded to southern Oregon areas (south of Humbug Mountain) in 1994.

Recreational Regulations

Oregon enacted ocean recreational salmon fishing regulations in 1946. Daily and possession bag limits were established for the recreational fishery. 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 ocean 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.

In 1955, length limits were first established for salmon in the recreational fishery. 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 coast for the whole year. Beginning in 1976, seasonal fishing period 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 opportunity 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 been a spring salmon fishery in the Central coast management area that has been limited to the area inside of 27 fathoms (about 3 miles offshore). From 1995 to 1998, special lure size and other tackle limitations have been in effect to help reduce the interception of prohibited coho while anglers are fishing for legal 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 issues and research. Salmon life history cover 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 1998-2000 publication introduces the salmon section as follows:

"The single most important data need for the Council in the short term is a more accurate assessment of total fishing related mortality of natural stocks of coho and chinook. Management methods designed to reduce impacts through non-retention or selective fishing require unbiased estimates of hook and release mortality in order to be successful. The increasing necessity for weak-stock management puts a premium on the ability to identify naturally reproducing stocks and stocks that contribute to fisheries at low rates. The coded-wire-tag (CWT) marking system is not suitable for these needs. 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. The Council should encourage efforts to apply these techniques to management.

Overfishing definitions are required to relate to a measure of MSY. MSY for salmon is related to productivity, which varies annually in freshwater and the marine environment. Techniques for evaluating productivity, or survival, in freshwater and marine habitats are needed to set appropriate harvest targets and associated conservation guidelines such as escapement floors and overfishing definitions. The Council should encourage development of probabilistic habitat-based models that incorporate environmental variation to establish harvest policies and enable fish assessment for fishing strategies."

Research and management needs defined under the Oregon Plan for Salmon and Watersheds (The Oregon Plan) encompass these same elements 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 Oregon's, ocean salmon fisheries. The reader should review the Oregon Plan in its entirety and first year 1998 annual report (internet at http://www.oregon-plan.org), to review the entire scope of watershed and salmonid needs and efforts to restore them.

Mass Marking

Many regional stocks of coho salmon were first mass marked (fin-clipped) beginning with the 1995 brood; additional stocks were added in later broods. 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), are rapidly 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 need to address:

- potential encounter levels of Oregon coastal wild coho stocks in selective fisheries for hatchery coho and their impact rate.
- time and area factors for wild/hatchery stocks to give the greatest potential for accessing hatchery stocks
- possible differential hooking mortality impacts of bay selective fisheries versus similar fisheries in an ocean environment
- improve current harvest modeling for both marked and unmarked stock catch and catch and release impacts applicable in selective fisheries

Hooking Mortality and Bycatch
Total fishery related impacts in chinook and coho fisheries need evaluation, including measurement of mortality associated with catch-and-release fishing and with selecting different types of fishing gear. The factor of "drop-off," fish hooked but lost prior to being boated, needs further investigation also.

Fishery Management Strategies
The initiation of ocean and terminal area selective 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 Assessments
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, 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) and recruitment to regional fisheries. Currently, coastal fall chinook escapement is accurately enumerated in "indicator stock" programs in the Salmon River (representing north Oregon coast stocks) and Elk River (representing central/south central Oregon coast stocks) are accurately measure actual escapement and ocean and freshwater exploitation rates.

MARINE RECREATIONAL FINFISH

Background/History

Recreational fisheries along the Oregon coast have probably existed since humans first settled the area. ODFW's monitoring of the summer ocean bottomfish fishery began in the late 1970's, in cooperation with ocean salmon fishery monitoring. Because the program targeted salmon, our early records of catch cover the mid-June through August months. The harvest of marine recreational finfish also occurs from shore and in estuaries for which ODFW does not have a sampling program. Bottomfish catch from ocean boat anglers during the September through early-June period, combined with catch by shore and estuary anglers, is commonly thought to exceed the catch sampled from ocean boats during the mid-June through August period. ODFW is presently expanding its ocean boat-sampling program with intent to include the March through October period.

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).

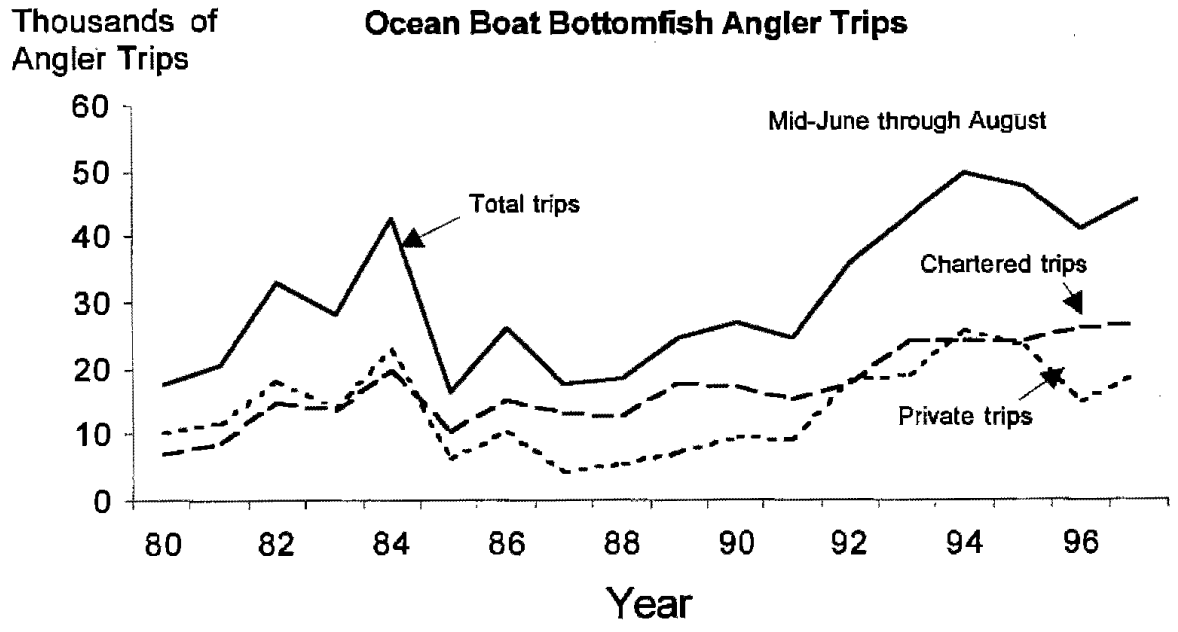


Figure K-1. Estimated number of Oregon ocean trips from mid-June through August, 1980-97.

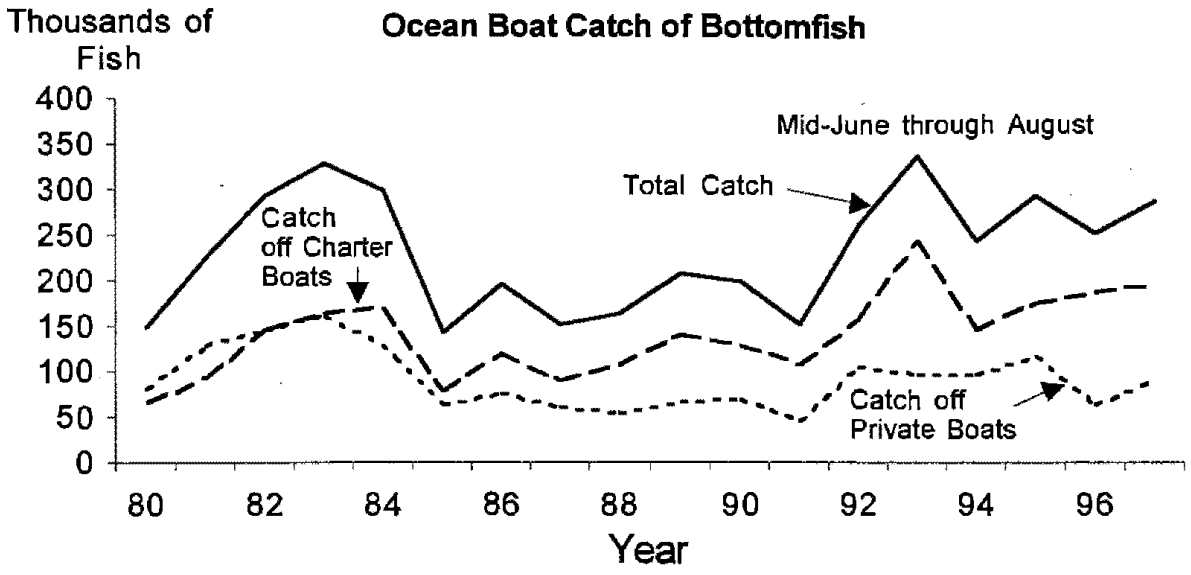


Figure K-2. Estimated number of fish (excluding salmon) caught from mid-June through August, 1980-97

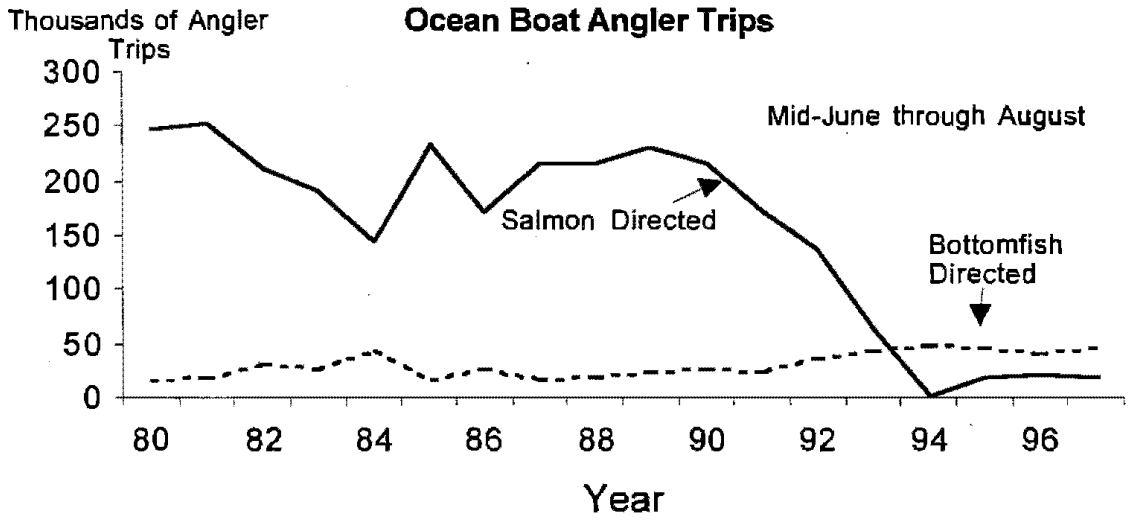


Figure K-3. Comparison of salmon vs. non-salmon angling effort from mid-June through August, 1980-97.

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. 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 nine days in 1998.

Critical Issues/Research Needs

Stock Conditions

Stock conditions are unknown for the majority of species harvested by anglers. Biological sampling is conducted only for black rockfish and redtail surfperch, although we plan to implement sampling of lingcod in 1999. We do not know the abundance trend for surfperch, greenling, and several other species. 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 nine days in both 1997 and 1998. Projections are for a seven to eight day season in 1998. 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.

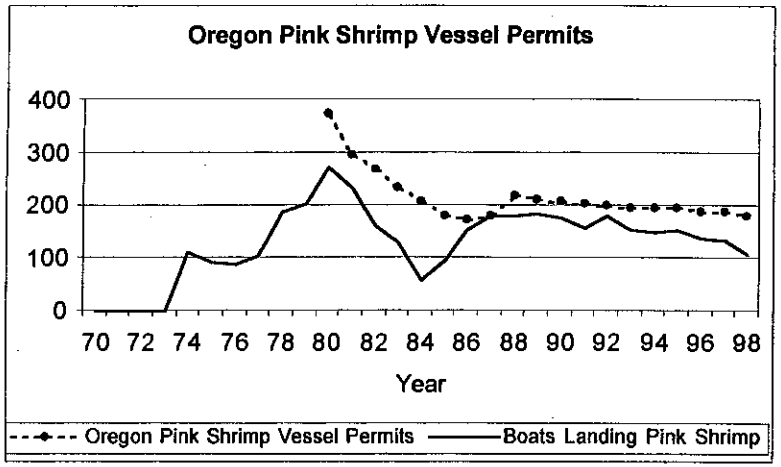
Modern fisheries management methods attempt to determine stock size and productivity as well as fishing effort required to harvest the available sustainable yield. Restrictions on effective fishing effort may result from seasons, size limits, quotas, trip limits, limits on gear, or limiting the numbers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

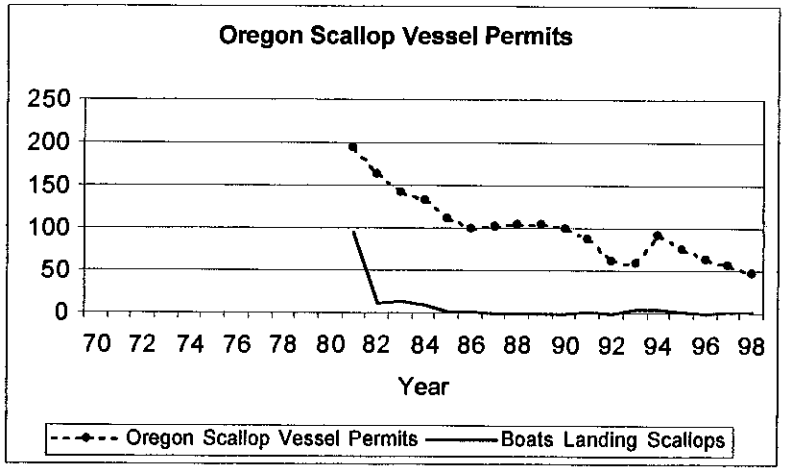
Harvesters, challenged with changes in abundance, increased restrictions, or changes in market demand and price, have adapted by increasing vessel efficiency and by developing innovative multi-species and multi-gear strategies. This flexibility allows rapid shifting of fleets to alternative fishery resources 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.

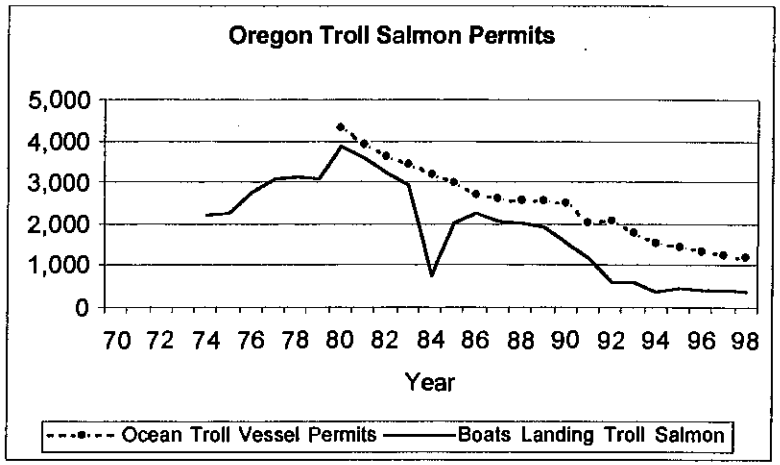
Commercial fisheries management in Oregon has followed patterns observed globally. Increased fishing effort on limited resources has resulted in the need to limit the number of participants, because other management measures have failed to provide adequate protection for the resource and equitable distribution 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 buyback 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.







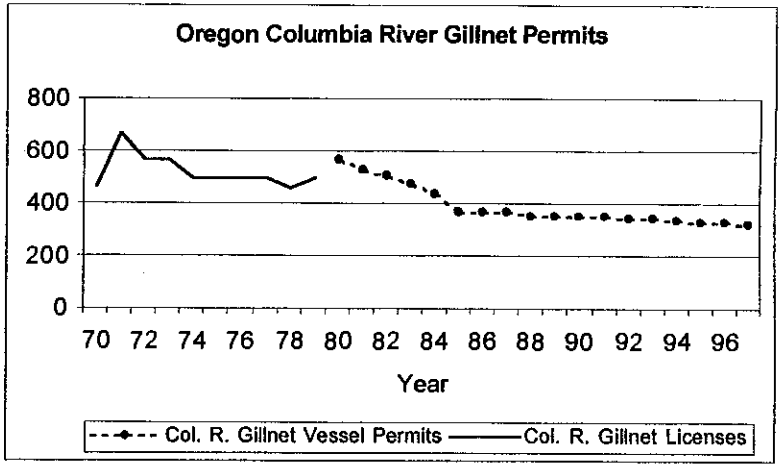
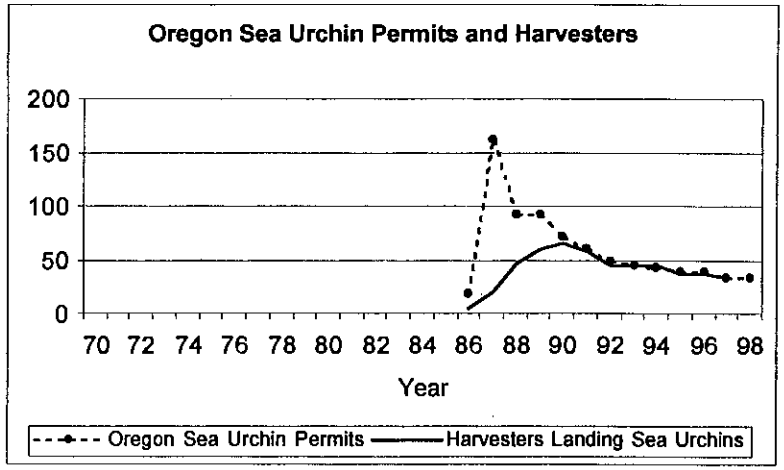
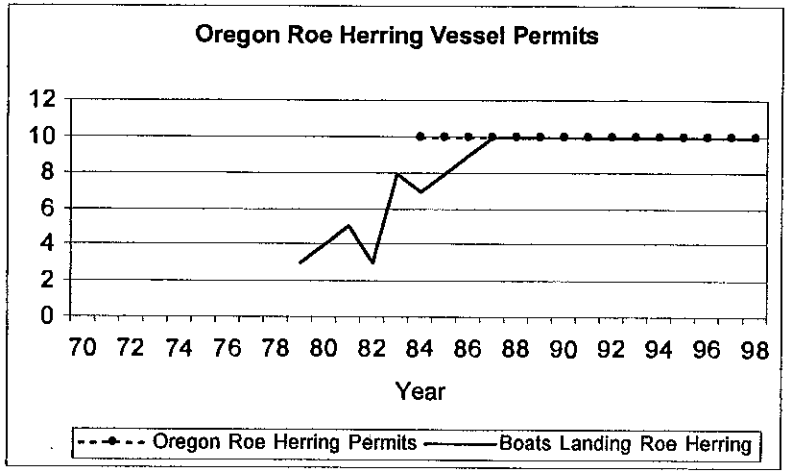


Figure L-1. State limited entry programs.





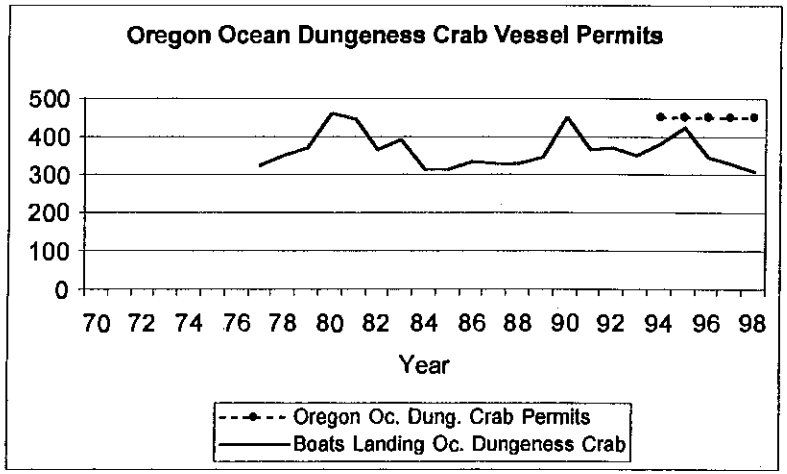


Figure L-1, continued. State limited entry programs. Note that in recent years roe herring vessel participation has been less than the number of permits-catch sales by harvesting vessels are shared.

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 was 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 is required to renew the limited entry permit. There is legislation pending which may remove this requirement. Vessel length is limited to a five-foot maximum length increase when transferring a permit to a new vessel unless the new vessel is owned by the same individual - no combining of permits. 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. Up to six single deliveries may be made by vessels without an Oregon license or shrimp permit providing those vessels hold California or Washington shrimp permits. There is legislation proposed to reduce the number of single delivery permits to 1 per year.

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. Originally, 4,314 permits were issued. 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 under 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. A lottery is required if the number of permits falls below 1,200 permits. Single delivery permits are available to vessels with ODFW approval and only in the case of an emergency.

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 sesson, 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 govemment 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 which 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 or vessel permit buyback 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 govemment

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. 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.

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.

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 determine 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 bycatch occurring. 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).

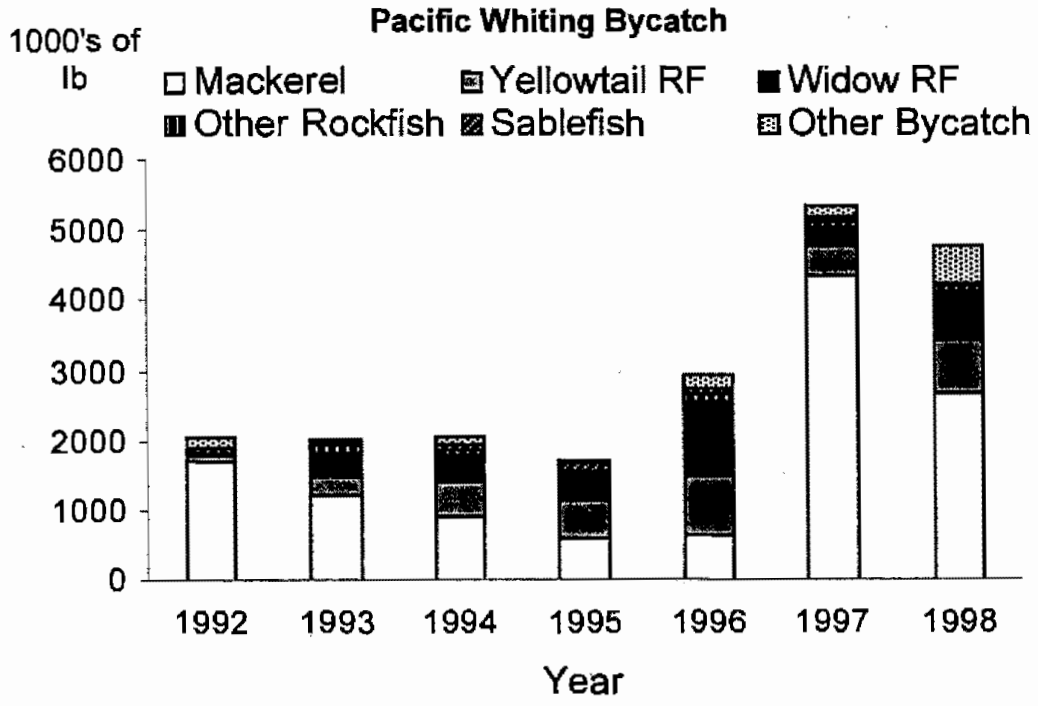


Figure M-1. Bycatch from Oregon Pacific whiting fishery. (In 1992, observed bycatch rates considerably higher than reported rates)

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).

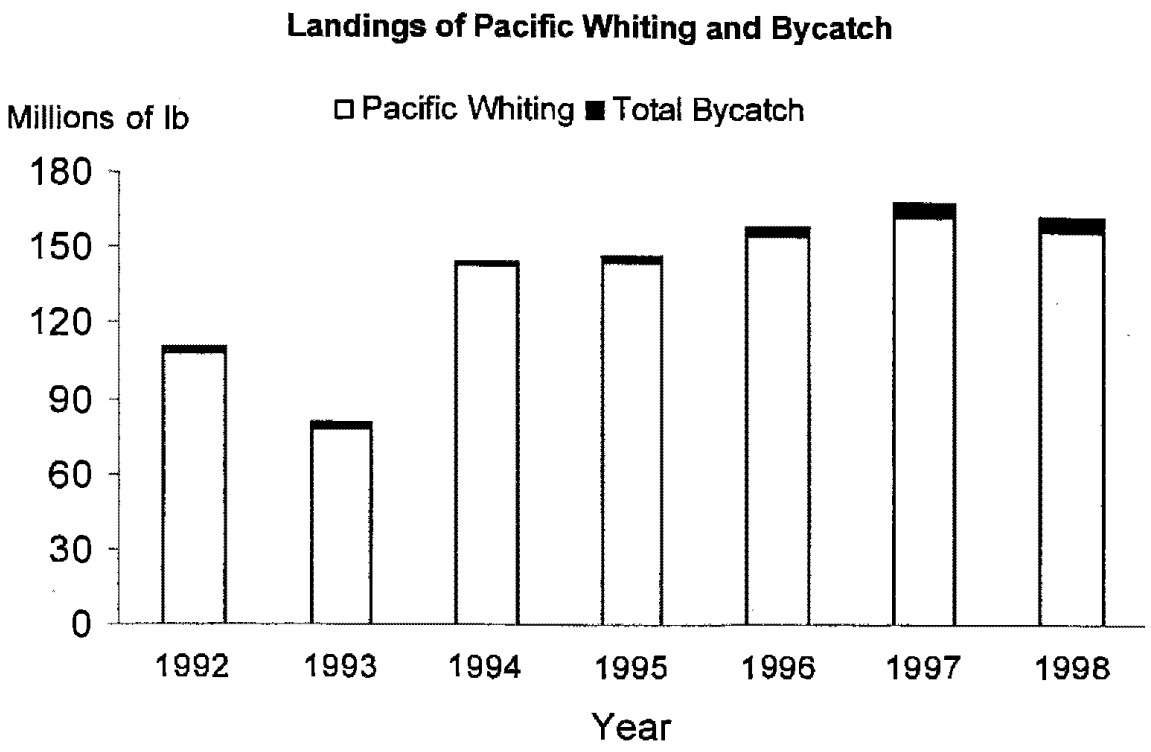


Figure M-2. Oregon landings from Pacific whiting fishery.

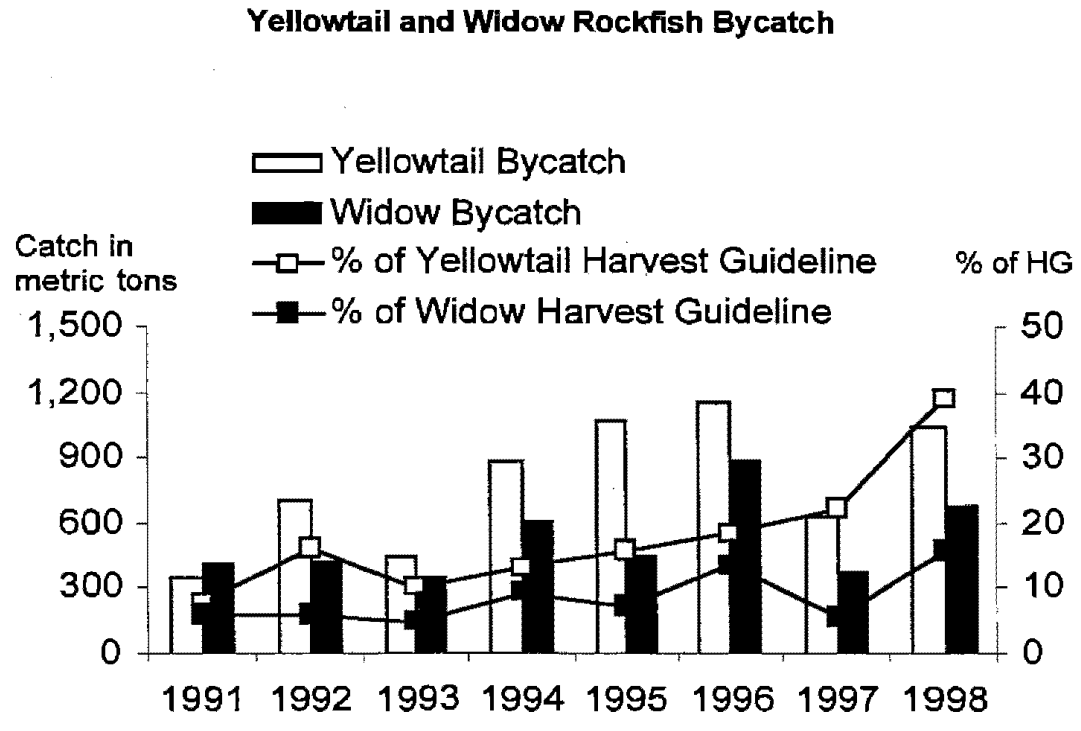


Figure M-3. Bycatch of yellowtail and widow rockfish from whiting fishery.

Gear modifications and restrictions may have some potential to reduce bycatch in this fishery. Some bycatch is probably unavoidable in a fishery of this magnitude.

Enhanced Groundfish Data Collection Project

The accuracy of stock assessments has been compromised by inadequate knowledge of discard levels occurring within the groundfish trawl industry. During a time of steadily lowering trip limits, previously accepted discard rates have become obsolete. Members of the industry had floated the idea of a limited observer project to sample a portion of the fleet. By June of 1995, a proposal by ODFW to the Oregon Trawl Commission had been accepted marking the beginning of a project to regularly sample discard activity aboard trawl vessels in Oregon. The project was scheduled to run through December 31, 1998.

This program was highlighted by the number of participants:

- Oregon Department of Fish & Wildlife (ODFW)
- Oregon Trawl Commission (OTC)
- National Marine Fisheries Service (NMFS)
- Northwest Food Strategies
- Pacific States Marine Fisheries Commission (PSMFC)
- Participating Vessels and Crews
- West Coast Seafood Processors Association
- Washington Department of Fish & Wildlife
- California Department of Fish & Game

The goals of the project included discard information by target strategy, area, depth, and time of year. Survival rates of halibut were to be investigated, and salmon were to be retained for distribution to hunger-relief organizations. Observers and volunteer vessels were to collect biological samples of specific species within the discard, also from the retained catch.

Personnel hiring and programming of the initial databases was begun in July of 1995. The first observer "shakedown" trip was taken in November 1995, with regular observer assignments to vessels beginning in December of that year and continuing through the end of the year 1998.

Observers were hired by PSMFC and trained at the ODFW office in Newport. The data collected while aboard trawl vessels included:

- Date, time, and location
- Net type, depth, and target strategy
- Discard amounts and species composition
- Halibut viability
- Collection of biological samples

Vessels participated on a voluntary basis, and there were several ways to contribute. The simplest way was for a vessel to maintain an "enhanced" logbook provided by the project, recording discard information for each tow. If a boat was large enough, it could carry an observer aboard to sample the discard in detail for up to four months. Vessels carrying an observer also kept an enhanced logbook, so that the data recorded by the vessel could be compared to the data recorded by the observer. Establishment of a relationship between the two data sources may enable the use of logbooks to augment the

observer data. This also might point the way toward the most efficient and reliable method of collecting discard information on a long-term basis.

Regular observer coverage of trawl vessels ran from December of 1995 through to the end of the project in 1998, a total of 37 months (Table M-1).

Table M-1. Summary of observer coverage for EDCP, November 1995 through December 31, 1998.

	1995-96	1997	1998	Total
Ports	5	7	7	10
Vessels	10	13	11	25
Trips	92	70	63	225
Tows	837	671	574	2,082

Data collected on discard can be combined with logbook and fish ticket information to give information on discard rates and total catch. Coverage of a broad area and percentage of the fleet allows the development of discard rates representative of the fishing fleet.

The discard rates presented should not be viewed as representative of the entire fleet, but only as the cumulative of all observations collected during the project. These rates may approximate what we expect to discover following a robust statistical examination of the data collected, or they may be very high or low. Stratifying the information by appropriate fishing strategies, area, depth, and other significant factors and applying statistical tests and techniques will likely result in a range of discard rates for each stratification. The expansion of each "sample" up to a total estimate for each strata will the be summed together to provide the best estimate for discard by species in the groundfish fishery. Since the work will take a large amount of time, the provided simple discard estimates can only fairly be used as "ballpark" estimates.

Presented in Table M-2 are preliminary discard rates calculated by dividing the discard poundage by the retained plus the discard poundage. Total tows and observed tows are not equal, as it was not always possible to sample a tow due to weather or safety factors, equipment failure, etc. This has not been factored into the calculations of discard rates.

Pacific whiting *(Merluccius productus)* is typically not retained except by vessels specifically fishing for whiting, because of the very low price and because of the rapid deterioration of whiting flesh (see previous section).

Table M-2. Observed tows, poundages, and discard rates for selected species and groups from EDCP observations November 1995 through December 31, 1997.

1995 - 1997 EDCP Totals as of March 4, 1999

Species	Total Tows	Observed Tows	Retained Pounds	Discard Pounds	Percent Discard
English Sole	1,440	1,185	41,276	5,116	11.0
Petrale	1,440	1,185	165,691	3,238	1.9
Dover Sole	1,440	1,185	569,370	58,514	9.3
Shortspine thornyhead	1,440	1,185	80,153	35,821	30.9
Longspine thornyhead	1,440	1,185	304,405	25,926	7.8
Sablefish	1,440	1,186	256,098	134,614	34.5
Canary Rockfish	1,440	1,185	70,584	8,943	11.2
Yelloweye Rockfish	1,440	1,185	404,156	78,481	16.3
Other Rockfish	1,440	1,185	254,527	149,554	37.0
Sebastes Complex	1,440	1,185	729,267	236,978	24.5
Widow Rockfish	1,440	1,185	501,529	9,615	1.9
Pacific Ocean Perch	1,440	1,185	90,831	11,056	10.9
Lingcod	1,440	1,185	177,565	6,669	3.6
Whiting	1,440	1,185	0	259,797	100.0
All Cards	1,440	1,403	3,573,215	2,076,313	36.8

In January 1999, trip limit periods were changed from six two-month periods to seven periods of varying length. How this will affect discard rates is unknown, and continuation of some level of observer coverage to document the affect on discard rates is imperative.

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:

1982 Implementation of the Pacific coast groundfish FMP.

1985 Prohibited 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.

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.