Environmental Assessment/Regulatory Impact Review

Regarding

RESTRICTIONS TO LIMIT SALMON BYCATCH IN THE WHITING FISHERY

(REGULATORY AMENDMENT UNDER AMENDMENT 7, IF APPROVED,
TO THE PACIFIC COAST GROUNDFISH FISHERY MANAGEMENT PLAN)

Prepared by
the Pacific Fishery Management Council
and
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EXECUTIVE SUMMARY

To address concerns about the potential bycatch of salmon in the Pacific whiting fishery, several restrictions were imposed by emergency rule in 1992 (57 FR 14663, April 22, 1992). These restrictions prohibited: (1) fishing for whiting at night (midnight to 1/2 hour after official sunrise); (2) fishing for whiting shoreward of 100 fathoms in the Eureka area (43°-40°30' N. lat.), except for a small trip limit; (3) fishing for whiting in the Columbia River and Klamath River salmon conservation zones; and (4) at-sea processing of whiting south of 42° N. latitude (42°). Because emergency rules may remain in effect no longer than 180 days after initial publication in the Federal Register, these bycatch restrictions expire on October 19, 1992.

At its September 1992 meeting, the Pacific Fishery Management Council (Council) reviewed the first draft of this environmental assessment/regulatory impact review and selected its initial preferred management options, and deleted one option from further consideration at this time. The "no change" (status quo) alternative always is considered for reference. The Council also discussed if certain management measures are appropriate for "routine" implementation, which provides more responsive management but initially requires more analysis.

At its November 1992 meeting, the Council confirmed the preferred alternatives it had selected in September, with one exception. After reviewing information which had been updated after the September meeting, the Council agreed that there was an inadequate basis for prohibiting fishing for whiting at night north of 42° N. latitude. The Council therefore changed its preferred alternative to prohibit night fishing south of 42° N. latitude only, not coastwide as it had indicated in September.

Therefore, in conjunction with its recommendation to prohibit processing at sea south of 42° N. latitude, the Council's new preferred alternative for Issue IV.A. is Option 3B.

The final preferred options selected by the Council in November and analyses of these options are provided in this document, and are summarized below.

IV.A. DAY/NIGHT FISHING AND FISHING/PROCESSING NORTH AND SOUTH OF 42°:

Option 1. No restrictions (status quo)
Option 2A. No night fishing coastwide.
Option 2B. No night fishing coastwide; no at-sea processing south of 42° (same as 1992 emergency rule; this was the initial preferred option, selected at the September 1992 Council meeting, but was not selected as the final preferred option at the November 1992 meeting)
Option 3A. No night fishing south of 42° only; no restriction north.
Option 3B. No night fishing south of 42° only; no at-sea processing south of 42°; no restriction north of 42° **(PREFERRED - in conjunction with option 2A of Issue IV.D.; selected at Nov. 1992 Council meeting)**

At the time the Council selected its initial preferred alternative in September 1992, the draft analysis concluded that "A prohibition against fishing at night south of 42° decreases the bycatch of salmon, particularly in the Eureka area...[fishing at night south of 42°] may have been one of several factors contributing to the reduction in bycatch of yellowtail rockfish and widow rockfish in 1992." However, additional analysis was conducted since September, and presented at the November 1992 Council meeting, which weakened this rationale.

The new analysis supports the earlier conclusion that the highest bycatch rates for chinook salmon occurred at night south of 42°, whereas the lowest

rates occurred at night north of 42°. Data available to the Council in September suggested that the salmon bycatch rate was high at night south of 42° but not north of 42°. The analysis conducted since September indicates that, although the day/night difference south of 42° appears statistically significant, the high bycatch rates are associated with low precision, and there is no obvious biological explanation for the north/south difference. Consequently, extending the prohibition against night fishing to the northern area (options 2A or 2B) would not be expected to reduce the salmon bycatch and would preclude obtaining more data on this issue.

Similarly, data indicating high bycatch rates of yellowtail and widow rockfish at night are not statistically precise and therefore do not support a prohibition against fishing for whiting at night for the purpose of protecting widow or yellowtail rockfish. Factors other than the prohibition against night fishing probably explain the reduced bycatch of these species in the spring 1992 fishery.

A prohibition against fishing at night appears to have a disproportionate impact on processing vessels that make surimi (virtually all at-sea processors in 1992) because factory operations are less efficient if closed and cleaned each night. Shore-based fishers are not disadvantaged because this traditionally has been a daylight fishery for them. Also, the traditional shore-based processors south of 42° to date have not processed surimi and so may not have the same concerns regarding shut-down of the factory.

A prohibition against fishing at night might encourage some catcher/processors to hire catcher vessels to supply additional whiting to compensate for down-time.

At-sea processors were able to take their 98,900 mt allocation in only three weeks, in spite of the prohibitions against night fishing and operating south of 42°.

IV.B. RESTRICTING THE WHITING FISHERY IN NEARSHORE AREAS:

Option 1. Status quo - no restriction.
Option 2. **(PREFERRED)** No fishing for whiting within the 100-fm contour in the Eureka subarea (40°30'-43° N. lat.), except for small trip landing or frequency limits.

The highest catch and catch rates of salmon in the whiting fishery have consistently come from the Eureka area. Catches of salmon in the Eureka area are 9-16 times higher inside the 100-fm contour.

Klamath River fall chinook salmon, which are most likely to be caught in the Eureka area, have not met escapement goals for the last three years.

A prohibition against fishing inside of 100 fm in the Eureka area will not disadvantage most of the whiting industry. However, California shore-based processors may be disadvantaged in atypical El Nino years, like 1992, when whiting are more abundant inside the 100-fm contour.

The status quo is not a viable option because a condition of the Incidental Take Statement in the Biological Opinion for "Fishing Conducted Under the Pacific Coast Groundfish Fishery Management Plan for the California, Oregon, and Washington Groundfish Fisheries " (August 28, 1992) requires that the large-scale target fishery for whiting be restricted inside the 100-fm contour in the Eureka area.

Under option 2, the establishment or adjustment of trip, landing, or frequency limits in areas otherwise prohibited to the whiting fishery will be designated

as "routine." In this case, trip landing or frequency limits will be established for operations inside of 100 fathoms in the Eureka area. This will minimize discards and reduce disruption of small target fisheries supplying bait and fresh whiting markets. (The use of trip landing and frequency limits for whiting before and after the large-scale target fishery also are being proposed as routine actions through a separate rulemaking.)

The Council deleted an option (Option 2B) that would have prohibited target fishing for whiting within the 100-fm contour coastwide because the shelf is wider off Washington and Oregon and a such a restriction could force shore-based fishers beyond their normal operating range.

IV.C. Closure of Salmon Conservation Zones:

Option 1. Salmon conservation zones are not closed to the whiting fishery (status quo).
Option 2. **(PREFERRED)** Fishing for whiting is prohibited in the Klamath River and Columbia River salmon conservation zones surrounding the mouths of the Klamath and Columbia rivers.

Closure of the small Columbia River and Klamath River salmon conservation zones to the whiting fishery will not directly benefit the salmon resource because to date these areas have not been heavily exploited by the whiting fishery. However, these closures would minimize the potential increase in salmon bycatch due to the fishery shifting into these areas, and would address the perception that large-scale at-sea processors are harvesting returning, depressed salmon stocks. Therefore, these closures would have virtually no impact on normal operations of the whiting fishery.

The need for the closure of the Klamath Conservation Zone is less clear if at-sea processing is prohibited south of 42° or if large-scale target fishing for whiting is prohibited shoreward of 100 fathoms in the Eureka area. Even if at-sea processing were to be allowed south of 42°, or if target fishing were allowed inside of 100 fathoms, closure of the Klamath Conservation Zone would not affect operations of the at-sea processing fleet which has no compelling reason to search for whiting in this small area. Testimony at the September Council meeting indicated that this closure would not unduly disrupt the shore-based whiting fleet in the Crescent City/Eureka area that fishes for whiting near the Klamath Conservation Zone.

IV.D. Processing At-Sea South of 42°:

Option 1. At-sea processing is allowed coastwide (status quo).
Option 2A. **(PREFERRED)** At-sea processing is prohibited south of 42°.
Option 2B. At-sea processing is prohibited between 42° - 39° N. lat.

A prohibition against at-sea processing of whiting south of 42° clearly limits operational flexibility for that fleet. However, operations appear not to have been severely constrained in 1992 as demonstrated by record high catch rates of whiting. Record low bycatch rates of salmon also were observed in the spring 1992 fishery.

Closing only the area between 42° and 39° would protect the Eureka area, and particularly Klamath River stocks, but could result in high bycatch of chilipepper/bocaccio rockfish and could increase the likelihood of interception of Sacramento winter run chinook in the area south of 39°.

A prohibition against shore-based processing south of 42° is not considered because it would eliminate all shore-based processing of whiting in California. California shore-based whiting processors, who have traditionally

operated in this fishery, have taken less than 10,000 mt annually (less than 6 percent of the coastwide harvest guideline or quota).

This issue also is discussed in conjunction with the "no night fishing" issue in section IV.A. above.

IV.E. Whiting Season.

Option 1. April 15 opening for all users coastwide.
Option 2. (**PREFERRED**) March 1 opening for vessels delivering to shore-based processors in the Eureka area south of 42° (42°-40°30'). April 15 remains the opening date for shore-based operations north of 42°, south of 40°30', and all at-sea processing operations.

At its July 1992 meeting, the Council asked that January 1, March 1, and April 15 be reconsidered as opening dates with the possibility of a different opening for shore-based and at-sea processors, or a window with different dates north and south of 42°. In its analysis presented to the Council in July 1992, the Groundfish Management Team stated its belief that an opening for shore-based processing between March 1 and April 15 was supportable and within the scope of the EA/RIR previously prepared for setting the April 15 coastwide opening for all users. The EA/RIR used to establish the April 15 opening date, and the report titled "Groundfish Management Team Statement on the Pacific Whiting Season" (GMT Supplemental Report C.7., PFMC July 1992) are incorporated into this document in Appendix F.

At its September 1992 meeting, the Council selected March 1 as its preferred option for opening the whiting season for shore-based operations in the Eureka area between 42°-40°30'.

Shore-based processors in Eureka and Crescent City, California are the southernmost ports with a history of processing whiting. Whiting, which migrate from south to north in the spring, arrive early (sometimes in March) and leave early (often in August) in the Eureka area.

This pattern is more pronounced when ocean waters are atypically warm (El Nino), as occurred in 1992. A large portion of the whiting stock had already migrated north, out of fishing range, by the time the season opened on April 15 in 1992.

California processors have used less than 6 percent of the harvest guideline annually. The amount that they would take between March and April 15 might be substantially less.

In 1988 and 1991, California processors took more than 30 percent of their annual harvest in March and April (through April 30). Therefore, a substantial amount of their whiting production can depend on harvest before April 15.

Option 2 (March 1 opening) would restore the traditional season to these processors, more consistent with the length of season available to more northern processors in Oregon. However, it limits this early opening to the traditional area (42°-40°30') to avoid expansion into more southern areas.

V. Procedural Options. At its September meeting, the Council discussed whether the preferred alternative is of "longterm" effect, in which case a regulatory amendment is appropriate, or whether it is likely to be changed at least annually, in which case a "routine" designation may be more appropriate. The Council expressed its desire to maximize flexibility and efficiency in implementing regulations, but at the time, the criteria for making the options

routine were not adequately developed, with one exception. The exception is the small trip landing and frequency limits that could be applied in areas that are otherwise closed to the whiting fishery.

IV.F. SUMMARY OF COUNCIL'S FINAL PREFERRED ALTERNATIVES:

1. No fishing for whiting at night south of 42° N. latitude

2. No processing of whiting at-sea south of 42° N. latitude

3. No fishing for whiting within the 100-fm contour in the Eureka subarea (40°30'-43° N. lat.), except for small trip landing or frequency limits which are designated as "routine."

4. No fishing for whiting in the Klamath River and Columbia River salmon conservation zones surrounding the mouths of the Klamath and Columbia rivers.

5. March 1 opening for vessels delivering to shore-based processors in the Eureka area south of 42° (42°-40°30'). April 15 remains the opening date for shore-based operations north of 42°, south of 40°30', and all at-sea processing operations. Trip limits are designated as "routine" before and after these open seasons.

Environmental Assessment/Regulatory Impact Review
Regarding
RESTRICTIONS TO LIMIT SALMON BYCATCH IN THE WHITING FISHERY
(REGULATORY AMENDMENT TAKEN PURSUANT TO AMENDMENT 7)

I. Introduction. The bycatch of salmon in the Pacific whiting (whiting) fishery is of concern as salmon escapement goals have been more difficult to meet, and some salmon species become listed under the Endangered Species Act (ESA). With the full "Americanization" of the whiting fishery in 1991, regulations to minimize the bycatch of salmon in the foreign and joint venture fisheries do not apply to fully domestic operations. The large-scale target fisheries (particularly the at-sea processing fleet) is capable of more intense fishing (higher effort in more localized areas) than occurred in the past, raising questions about the bycatch of salmon in the whiting fishery.

To address these concerns, several restrictions were imposed by emergency rule in 1992 for the primary purpose of minimizing the bycatch of salmon in the whiting fishery (57 FR 14663, April 22, 1992). These restrictions prohibited: (1) fishing for whiting at night (midnight to 1/2 hour after official sunrise); (2) fishing for whiting shoreward of 100 fm in the Eureka area (except for a small trip limit); (3) fishing for whiting in the Columbia River and Klamath River salmon conservation zones; and (4) at-sea processing of whiting (and harvest by catcher vessels delivering to at-sea processors) south of 42°. Because emergency rules may remain in effect no longer than 180 days after initial publication in the Federal Register, these bycatch restrictions expired on October 19, 1992. An FMP amendment is necessary to provide the authority to take such actions in the future.

The Council developed Amendment 7 to the FMP which would authorize restricting the groundfish fishery for the purpose of addressing conservation concerns for non-groundfish species. Amendment 7 was adopted by the Council at its November 1992 meeting and submitted for review by the Secretary of Commerce (Secretary). Approval (or partial approval) of Amendment 7 is scheduled to occur by March 26, 1992 and final implementing regulations would not be effective before April 9, 1992. Implementation of the preferred alternatives in this EA/RIR to minimize the bycatch of salmon in the whiting fishery are contingent on Secretarial approval and implementation of Amendment 7. In order to implement these management measures in time for the spring 1993 fishery, review of this EA/RIR and proposed rule must occur concurrent with the review of Amendment 7, under the assumption that Amendment 7 will be approved. If Amendment 7 is approved, the final regulations may be implemented shortly thereafter, in time for the spring 1993 fishery.

As recommended by the Council in November 1992, if any action is selected to reduce the bycatch of salmon in the whiting fishery, it must be reasonably expected to minimize the bycatch of salmon and/or must not impose undue hardship on the whiting fishery. It also must conform with the overall provisions of Amendment 7, if approved, as follows:

> Where conservation problems have been identified for non-groundfish species and the best scientific information shows that the groundfish fishery has a direct impact on the ability of that species to maintain its long-term reproductive health, the Council may consider establishing management measures to control the impacts of groundfish fishing on those species. Management measures may be imposed on the groundfish fishery to reduce fishing mortality of a nongroundfish species for documented conservation reasons. The action will be designed to minimize disruption of the groundfish fishery, in so far as consistent with the goal to minimize the bycatch of nongroundfish species, and will not preclude achievement of a quota, harvest guideline, or allocation of groundfish, if any, unless such action is required by other applicable

law.

At its November 1992 meeting, the Council clarified that "the reference to maintaining the 'long-term reproductive health' of the non-groundfish species establishes a standard of proof that any management measures should have a measurable effect. However, the Council recognizes that in many (and perhaps most) cases, it will be impossible to quantitatively demonstrate such an effect, and in such cases a qualitative assessment will have to suffice. The Council does not intend that this objective be so narrowly defined that the Council and Secretary would be restrained from addressing mandates of the ESA and Marine Mammal Protection Act (MMPA), or from trying to rebuild non-groundfish stocks of concern. The Council also does not intend this objective to be interpreted as not supporting implementation of the proposed bycatch salmon regulations for the whiting fishery adopted at its November 1992 meeting" [which are the subject of this EA/RIR].

Amendment 7 authorizes (but is not limited to) the use of the following management measures:

- o mesh size;
- o landing limits and trip frequency limits;
- o escape panels or ports;
- o size limits;
- o bag limits;
- o quotas;
- o time/area closures; or
- o other forms of effort control including limited access and other types of input controls on fishing gear such as restrictions on trawl size or longline length or number of hooks or pots.

These management measures are the same as authorized in Section 6.1 of the FMP (Amendment 4) with one notable exception: allocations. Management actions taken under Amendment 7 may not be used for the primary purpose of allocating salmon between the salmon and groundfish fisheries.

Prohibited species quotas (which would prohibit further fishing for whiting if reached, are NOT proposed or analyzed in this EA/RIR. However, nothing precludes implementing a management measure (such as a closed area) when a certain level of salmon bycatch is reached.

Changes to this document. This document was first presented to the Council at its September 1992 meeting. Analysis for the season opening and routine trip limits before and after the regular season had been presented earlier, in December 1991 and July 1992, and the Council decided to combine these analyses with the other measures being considered to reduce bycatch in the whiting fishery. The Council selected its initial set of preferred alternatives in September 1992.

The analysis on fishing by time of day was refined before the November 1992 Council meeting. This new analysis was incorporated in the November draft of this document and was made available to the public and Council before that meeting. As a result, the Council changed its preferred alternative from prohibiting fishing for whiting at night coastwide to only south of 42° N. latitude. The final set of preferred alternatives recommended by the Council at its November 1992 meeting appear in this document.

This document also has been revised to incorporate changes to draft Amendment 7 as recommended at the November 1992 Council meeting, and language has been added in section VI to reflect consistency with Amendment 7. Minor editorial and format changes have been made and this introduction section has been enhanced. Otherwise, the document is substantively the same as reviewed and approved by the Council in November 1992.

Review of the 1992 fishery. The 1992 whiting season opened on April 15. The 208,800 metric ton (mt) was apportioned 98,800 mt for processing at sea, 80,000 mt for shoreside processing, and 30,000 mt was held in reserve for release to at-sea processing on September 1, if shoreside processors had not taken 60 percent (48,000 mt) of their allocation, or on October 1, if surplus to shoreside processing needs. The at-sea processing fleet (catcher/processors and motherships) took their 98,800 mt initial allocation in a record three weeks, and subsequently were closed before returning to the "B" season off Alaska.

Because shore-based processors had taken well less than 48,000 mt of whiting by September 1 (approximately 32,000 mt through August 29), the 30,000 mt reserve was released for at-sea processing on September 4, 1992. The reserve was projected to be reached, and at-sea processing closed, on September 12, 1992. An additional 24,000 mt of whiting surplus to shore-based processing needs was made available for at-sea processing on October 1, increasing the limit for at-sea processing to 152,800 mt. The fishery for the second release was closed on October 7. When the emergency rule allocations expired on October 15, two at-sea processors reentered the fishery to use approximately 2,000 mt of whiting of their allocation which had not been taken prior to October 7. Both vessels left the fishery on October 21 when 152,800 mt was projected to have been taken by at-sea processors for the year. The shore-based fishery continued operating, taking close to 56,000 mt for the year. A 3,000 pound trip limit was imposed on October 31 when the 208,800 mt harvest guideline for whiting was projected to be reached.

The incidence of salmon in the spring 1992 whiting fishery for at-sea processors was 0.0135 salmon per metric ton of whiting, compared with 0.0321 in 1991, both well within the goal of 0.05 (Appendix A). Data from the fall fisheries were not confirmed at the time this document was reviewed by the Council in September and November 1992. Bycatch of salmon by the at-sea processing operations appear to have been higher in the fall, but still below the 0.05 standard. Shoreside in the State of Oregon (through October 20), 238 salmon were observed in 23,651 mt of whiting, for an incidental rate of 0.0101 salmon per metric ton in observed trips.

The bycatch of salmon could have been low in 1992 for a number of reasons. Some salmon stocks were clearly less abundant, and atypically warm water ("El Nino") may have affected their availability. The cooperation of whiting fishermen in avoiding salmon also would have been a major factor. In addition, the restrictions imposed by emergency rule in 1992 are believed to have contributed to the lower bycatch rate.

II. Purpose of and Need for Action. An analysis of observer data between 1980 and 1991 revealed that, typically, 50 percent of the salmon bycatch occurred in 2 percent of the whiting tows, and that the bycatch rate was particularly variable by time and area. Between 1988 and 1991, salmon were encountered in 16 percent of all whiting tows (Appendix B). The Council's objective is to minimize the bycatch of salmon without causing undue hardship to the whiting fishery. The purpose of this document is to examine the need for implementing the same or similar regulations as implemented by emergency rule in 1992 to minimize the bycatch of salmon in the whiting fishery off Washington, Oregon, and California. In doing so, this document updates the Environmental Assessment (Appendix C) which supported the emergency rule in 1992. Much of the required analysis already has been conducted in support of the emergency rule and is referenced in this document and incorporated in the appendix.

The conditions that led to the emergency rule in the spring of 1992 persisted into late summer and provide no clear evidence of improvement. For the third year in a row, the Klamath River fall chinook salmon appears not to have reached its escapement goal. In response to this situation, the Council

allowed no commercial salmon fisheries between Florence, Oregon and Point Arena, California in 1992, and recreational fisheries in this same area were regulated under chinook quotas for the first time ever. The total 1992 chinook harvest in the recreational salmon fishery between Florence, Oregon and Point Arena, California is estimated at about 13,000 fish. A review of the Klamath River fall chinook stock will begin in 1993 to determine if the stock is overfished under the Council's definition of overfishing. The Council's Salmon Technical Team continues to believe that adult natural spawning escapements significantly below the escapement level (35,000 natural adult fish) will increase the danger of jeopardizing the long-term productivity of the Klamath fall chinook stock during this period of apparent low freshwater and marine survival.

Sacramento River winter run chinook continues to be listed as threatened, and has been proposed to be listed as endangered under the ESA. Additional salmon runs (Snake River sockeye and spring/summer chinook salmon) have been listed under the ESA and were the subject of a biological opinion dated August 28, 1992. The biological opinion finds that "operation of the fishery under the groundfish FMP is not likely to jeopardize the continued existence" of listed salmon species. Nonetheless, management measures may be appropriate to minimize interception of these and other salmon stocks, and particularly to assure that the magnitude of impact does not increase.

III. Affected Environment A complete description of the affected environment including a description of the user groups and their gear, biological information, and historical harvests of groundfish coastwide is found in Section 11 of amendment 4 to the FMP (PFMC 1990). Information on the performance of the whiting fishery in 1991 and 1992 is found in Appendix A. A description of the Pacific coast salmon stocks and their forecasted conditions for 1992 is included in "Preseason Report I: Stock Abundance Analysis for 1992 Ocean Salmon Fisheries" (PFMC 1992).

IV. Management Options. In general, each of the restrictions imposed by emergency rule in 1992 was analyzed as to the types of time, area, landing, and trip frequency provisions that may be implemented in 1993 and beyond. Alternatives to these restrictions also are provided, which are intended to accomplish the same purpose, to minimize the bycatch of salmon in the whiting fishery without imposing undue hardship on the whiting fleet.

The status quo also is included. For these analyses, the status quo is not the 1992 emergency rule, but rather what is in effect (in the codified regulations at 50 CFR part 663) immediately after the 1992 emergency rule lapses -- no restriction on U.S.-flag vessels to minimize the bycatch of salmon in the whiting fishery.

A set of "procedural options" (whether to impose each restriction by regulatory amendment or as a "routine" management action) also was included in Section 5 of the September 1992 draft. At its September meeting, the Council recommended that trip landing and frequency limits be designated as routine in areas where the whiting fishery is otherwise prohibited. The discussion on this issue has been incorporated directly into section IV.F. of this document (regarding fishing inside of 100 fathoms in the Eureka area) and also appears in the analyses for the season opening dates. A proposed rule already has been published in the Federal Register (57 FR 56897, December 1, 1992) that would designate trip landing and frequency limits as routine before and after the large-scale target season for whiting starts in the spring.

Summary of preferred options selected at the November 1992 Council meeting:

1. No fishing for whiting at night south of 42° N. latitude (revised since September 1992 which applied the prohibition coastwide);

2. No processing of whiting at-sea south of 42° N. latitude;

3. No fishing for whiting within the 100-fm contour in the Eureka subarea (40°30'-43° N. lat.), except for small trip landing or frequency limits which are designated as "routine";

4. No fishing for whiting in the Klamath River and Columbia River salmon conservation zones surrounding the mouths of the Klamath and Columbia rivers;

5. March 1 season opening for vessels delivering to shore-based processors in the Eureka area south of 42° (42°-40°30'). April 15 remains the opening date for shore-based operations north of 42°, south of 40°30', and all at-sea processing operations. Trip landing or frequency limits are designated as "routine" before and after these open seasons.

Specific management measures for minimizing the bycatch of salmon in the Pacific whiting fishery are analyzed in section IV of this document. The options considered herein include the status quo (no restriction), time, area, and trip landing and frequency restrictions. Most of the background information appeared as attachments to the September and November 1992 drafts of this EA/RIR, and are included at the end of this document for reference.

IV.A. DAY/NIGHT FISHING and FISHING/PROCESSING NORTH AND SOUTH OF 42°.

Background Data. In 1991, the rate of salmon bycatch in the whiting fishery (at-sea processing, predominantly) was evaluated north and south of 39° N. latitude and by time of day. The Council subsequently recommended prohibiting at-sea processing operations south of 42° in 1992. The data were reevaluated for the 1993 fishery. In the September 1992 draft of this EA/RIR, the 1991 data for at-sea processors operating in the Pacific whiting fishery was evaluated with respect to the rate of salmon interception north and south of 43° N. latitude and by time of day, assuming that the trend in bycatch rates between 42°-43° were not substantially different than those south of 42°. The analysis used 43° only because it represents the nearest statistical reporting area for which data are readily available; the preparers of the document were NOT suggesting that 43° N. latitude was a preferable management boundary.

Data for 1991 were used because this is the only year in which a large-scale fishery was conducted by at-sea processors without any restriction on area or time of day (until the fishery was closed). In 1992, processing occurred only north of 42° and during daylight hours; therefore, 1992 data, even if available, would not provide additional information for making these comparisons.

In 1991, virtually all harvest destined for at-sea processing occurred seaward of 100 fathoms in the Eureka area, so the observed trends were not influenced by fishing inside of 100 fm in this area.

A new analysis which relies on more rigorous scientific procedures has been conducted since the September (Appendix D), replacing the previous, obsolete analysis. This new analysis examined the unexpanded observer data from the 1991 fishery, north and south of 42°. (The data are analyzed in 3-hour increments, with the time measured at the midpoint of the tow.) After reviewing the revised analysis at its November 1992 meeting, the Council

changed its preferred alternative to prohibit night fishing south of 42° N. latitude only, not coastwide as it had indicated in September. Therefore, in conjunction with its recommendation to prohibit processing at sea south of 42° N. latitude (in section IV.D.), the Council's new preferred alternative for this issue (IV.A.) is Option 3B.

Management Options:

Management Option	N of 42° (Van+Col)		S of 42° (Eur+Mont+Conc)	
	SHORE	AT-SEA	SHORE	AT-SEA
	day nite	day nite	day nite	day nite
1 - No restrictions	○ ●	○ ●	○ ●	○ ●
2A- No night fishing coastwide	○ --	○ --	○ --	○ --
2B - No night fishing coastwide; no at-sea processing s. of 42°; same as 1992 emergency rule)	○ --	○ --	○ --	-- --
3A - No night fishing s of 42° only; no restriction north of 42°	○ ●	○ ●	○ --	○ --
3B - No night fishing s of 42° only; no at-sea processing s of 42°; no restriction n of 42° **(PREFERRED as of Nov. 92)**	○ ●	○ ●	○ --	-- --

○ means day fishing and/or at-sea processing operations are allowed
● means night fishing and/or at-sea processing operations are allowed
-- means fishing and/or at-sea processing is not allowed

A prohibition on day fishing by the shore-based fleet south of 42° was not considered a viable option for the same reasons presented in the 1992 emergency rule: shoreside whiting plants are at fixed locations and depend on whiting caught locally. To maintain quality, the fleet stays relatively near port and does not follow the whiting migration as at-sea processors do. Also, the amounts taken by the shoreside fleet south of 42° have been considerably smaller than the amounts that could be taken by high-capacity at-sea processors, and thus the localized impact by the shore-based fleet is expected to be considerably lower. A prohibition against day fishing in this area would close the California whiting processors, which is not warranted given the above information.

In 1992, "night" was used to mean the period between midnight and one-half hour after official sunrise. If better data become available and minor changes are proposed, the Council desires the flexibility to adjust the hours by administratively simple means. One way of providing that flexibility is to designate the establishment and adjustment of the exact hours of night closures as "routine."

The following data on bycatch and bycatch rates should be used with caution since they represent 1991 only, the only recent year with a large-scale whiting fishery that operated at night. Furthermore, the ability to identify the conditions that are important factors affecting bycatch is limited by the extremely random nature of bycatch. Typically, only a small proportion of the tows in a given year account for a large fraction of the total bycatch. A high bycatch rate for a given combination of conditions could be due to a handful of tows that may have occurred by chance. Furthermore, when a large

number of conditions are considered, the number of sampled tows in each cell can become too small to obtain meaningful estimates of the average bycatch in that cell. For these reasons, it is essential that decisions to control bycatch be based not only on point estimates of bycatch rates but also on an assessment of their precision.

Impacts of No Restriction (Option 1):
Biological --

Salmon. The highest bycatch rates for chinook salmon south of 42° in 1991 was observed between midnight and 6 am (Appendix C,D). North of 42° there is no indication that the chinook salmon bycatch rates are higher during the night.

If night fishing were allowed south of 42° (option 1, status quo), the likelihood is higher of encountering Sacramento winter run chinook salmon (which has been listed under the Endangered Species Act) and Klamath River fall chinook salmon, which also are severely depressed.

Whiting. No known impact.

Other species. In 1991, with no restrictions, more than 3 percent of each of the following species' ABC or harvest guideline was taken in the at-sea processing segment of the whiting fishery: chilipepper (14.5%), yellowtail rockfish (7%), widow rockfish (5.2%), Pacific ocean perch (3.8%) (Appendix A).

For yellowtail rockfish, the bycatch rates south of 42° are extremely low, due largely, no doubt, to the limited geographic range of yellowtail rockfish. North of latitude 42°, higher bycatch rates tended to occur during the daylight hours, 9:00 AM to 6:00 PM. The lowest bycatch rates occurred from 3:00 AM to 6:00 AM in the morning. For widow rockfish, the bycatch rates south of 42° are low in comparison to the bycatch rates north of 42°. There is some indication that the widow rockfish bycatch is higher between the hours of 9:00 PM and 3:00 AM. However the confidence intervals for these two time periods are extremely wide, indicating that these estimates are not precise (Appendix D).

Socio-Economic --

Salmon. The salmon industry is quite concerned over bycatch levels in the whiting fishery. Although the bycatch of salmon in the whiting fishery is not large coastwide, localized impacts are more noteworthy and may impact local fisheries, such as in the Eureka INPFC area. (Appendix A, C, E)

Whiting. The status quo maximizes operational opportunities for processing vessels; even though catch per unit of effort may be lower at night (when whiting are more dispersed), the factory can stay "primed" and operate more efficiently than if is must be shut down and cleaned each day.

Allowing at-sea processing to occur south of 42° might be a slight disadvantage to the shoreside fleet because the high-capacity at-sea processors, if in large force, may scatter the whiting. However, this is a relatively short-term impact as whiting tend to re-aggregate within a few weeks.

Other fisheries. The levels of bycatch of chilipepper, yellowtail rockfish, widow rockfish, Pacific ocean perch, and bocaccio in 1991 were not so high as to affect the inseason management of those species.

Impacts of no "night" fishing (Options 2A, 2B, 3A, 3B):

Biological --

Salmon. Data available to the Council in September suggested that the salmon bycatch rate was high at night south of 42° but not north of 42°. The analysis conducted since September indicates that, although the day/night difference south of 42° appears statistically significant, the high bycatch rates are associated with low precision, and there is no obvious biological explanation for the north/south difference. Consequently, extending the prohibition against night fishing to the northern area (options 2A and 2B) would not be expected to reduce the salmon bycatch and would preclude obtaining more data on this issue.

During the year of highest salmon interception (1986), the fishery was conducted entirely during daylight hours; the high catch rates seemed to be more closely associated with fishing depth than fishing at night (Appendix B).

Whiting. None of the options is expected to have a measurable biological impact on the whiting resource. Under all options, it is assumed that the whiting harvest guideline will be taken.

Other Species. The analyses presented at the September 1992 meeting indicated that the bycatch of widow and yellowtail rockfishes appeared to be correlated with fishing at night in the Columbia area, and that if night fishing is prohibited north of 42° (option 2A or 2B), the bycatch of widow and yellowtail rockfishes could be reduced. However, more rigorous statistical analysis has been conducted which weakens that conclusion.

A new analysis prepared after the September 1992 meeting indicated high variability in the bycatch rates for widow and yellowtail rockfishes, and no conclusive day/night pattern can be demonstrated (Appendix D).

Bycatch levels were much reduced in the spring 1992 fishery when night fishing was prohibited and at-sea processing was not allowed south of 42°. (Appendix A). However, this is not necessarily due to these restrictions. It should be noted that 1992 was an El Nino year that could result in anomalous conditions, and the spring 1992 fishery by at-sea processors was over in 3 weeks (April 15-May 5) compared with a slower and more extended season in 1991 (late March - early September). Consequently, the 1992 fishery did not occur when the bycatch rates were the highest for widow and yellowtail rockfishes in 1991 (June-July for widow and June for yellowtail) (Appendix F). Preliminary data indicate that the bycatch rates for widow and yellowtail rockfish were higher in the fall 1992 fishery, even though fishing at night was prohibited both north and south of 42°.

Socio-Economic --

Salmon fishery. The amount of chinook salmon that would be avoided in the near future under these options would not result in an immediate measurable economic benefit or opportunity to the commercial or recreational salmon fisheries as a whole; most chinook salmon taken in the whiting fishery are sublegal size and not available to the current year's salmon fishery. In conjunction with restrictions applied to the salmon fishery, escapement levels of salmon are expected to improve over time.

A prohibition against fishing at night south of 42° would not create a beneficial impact if at-sea processing is prohibited from operating south of 42° because the shore-based fleet traditionally has not fished at night.

These restrictions would help allay concerns of the salmon industry that the whiting fishery, in particular the at-sea processing fleet, is harvesting large amounts of salmon and contributing to heavy restrictions on the salmon

industry.

Whiting fishery. Under all options, it is assumed that the whiting harvest guideline, or any allocation, would be achieved, even if night fishing were prohibited coastwide and at-sea processing were prohibited south of 42°.

The at-sea processing industry reports that surimi product quality suffers onboard at-sea processing vessels because the factory must be closed and re-opened daily. Similarly, processing operations are less efficient if the factory must be idle for part of the day.

Six of the 21 catcher/processors operating in the spring of 1992 compensated for no fishing at night by accepting codends from 6 catcher vessels, which enabled the factories to operate longer or through the night. It is not known if these whiting caught during the day but delivered at night were of the same quality as those delivered immediately after capture. (Appendix G)

The prohibition against night fishing provided increased opportunities for catcher vessels delivering to catcher/processors. (Since haulback began within 3 hours of the closed period for 70% of the tows delivered by these catcher vessels, it is assumed that these vessels were hired in response to the nighttime prohibition against fishing for whiting.) Four of the 6 catcher vessels were "traditional" catchers that fished in the early years of the whiting joint venture (Appendix G).

Buying fish from catcher vessels is more expensive for catcher/processors than catching it themselves. It is not known if the cost of buying whiting was less of an expense than closing the factory for the six catcher/processors that accepted over-the-side deliveries.

A prohibition against night fishing has no direct impact on the shore-based whiting fleet or processors since they normally depend on whiting caught during the day.

If an explicit allocation is made to motherships, and catcher/processors accept over-the-side codends to compensate for no fishing at night, catcher/processors might be perceived as eroding the share for vessels operating only as motherships. However, if the allocation is for catcher vessels that do not process, there is no difference whether the delivery is made shoreside or at sea. (Nothing in the 1992 emergency rule prevented catcher/processors from also accepting codends.)

If an explicit allocation is made between shoreside and at-sea processors, the prohibition against fishing at night slows achievement of the at-sea allocation (compared to no restriction), prolonging their presence on the fishing grounds. Shore-based fishers traditionally have not fished for whiting at night and so this prohibition would not affect the time needed to take a shoreside allocation.

A prohibition against at-sea processing south of 42° (and from operating at night) limits operating flexibility. However, the at-sea processing fleet was able to take its allocation in record time in 1992, suggesting that these restrictions did not severely inhibit operations.

Other fisheries. The levels of bycatch of chilipepper, yellowtail rockfish, widow rockfish, Pacific ocean perch, and bocaccio did not affect the inseason management of those species under the status quo in 1991, and the same is likely under the alternate options.

Administrative impacts (Options 2A, 2B, 3A, 3C).

The cost to the government of implementing this action is slight because such actions would most likely be combined with other announcements in the Federal Register.

Enforcement and compliance would be somewhat more complicated because there is an extra factor to monitor, particularly if, as in 1992, fishing is prohibited during certain hours but the delivery of codends is not, and also because the closed period was tied to "official sunrise" which changes with time of year and latitude.

SUMMARY. These conclusions are drawn with caution since they are based on only one year's data.

At-sea processors were able to take their 98,900 mt allocation in only three weeks, in spite of the prohibitions against night fishing coastwide and operating south of 42°, and therefore it was assumed that these restrictions did not cause undue hardship to the at-sea processing industry.

South of 42°, the higher rate of salmon bycatch at night appears to be statistically significant. However, the high bycatch rates are associated with low precision, and there is no obvious biological explanation for the difference in low bycatch rates at night north of 42° compared with south of 42°.

Extending the prohibition against night fishing to the northern area (options 2A and 2B) would not be expected to reduce the salmon bycatch and would preclude obtaining more data on this issue.

Similarly, data initially indicating a higher bycatch rate at night for widow and yellowtail rockfishes are inconclusive. The bycatch rate for these species is more likely to be influenced by other factors, such as time of year and geographical area.

A prohibition against fishing at night appears to have a disproportionate impact on processing vessels that make surimi (most did so in 1992) because factory operations are less efficient if closed and cleaned each night. Shore-based fishers are not disadvantaged because this traditionally has been a daylight fishery for them. Traditional shore-based processors south of 42° to date have not processed surimi and so may not have the same concerns regarding shut-down of the factory.

After selecting the preferred option to prohibit fishing at night south of 42° N. latitude (option 3A of this section IV.A.), the Council also recommended prohibiting at-sea processing operations south of 42° to protect chilipepper and bocaccio rockfishes and to minimize the likelihood of catching Sacramento winter run chinook salmon which are listed under the ESA (option 2 of section IV.D.). Option 3B of this section IV.A. combines these two preferred options.

A prohibition against fishing at night south of 42° would have a minimal but potential beneficial impact if at-sea processing is prohibited from operating south of 42° because the shore-based fleet traditionally has not fished at night.

TABLE IV.A. -- RELATIVE IMPACTS OF OPTIONS

Options	Whiting		Salmon		Other		Admin Costs
	biol	soc-econ	biol	soc-econ	biol	soc-econ	
Opt 1 - no restriction (status quo)	0	0	0	0	0	0	0
Opt 2A-no night fishing coastwide	0	-	0	0	0	0	+
Opt 2B - same as 2A and no at-sea processing s. of 42°	0	-	+	0	+	0	+
Opt 3A - night fishing prohibited s. of 42° only	0	-	+	0	0	0	+
Opt 3B - same as 3A and no at-sea processing s. of 42° **(PREFERRED)**	0	-	+	0	+	0	+

+ means "positive but slight"; ++ means very positive; - means slightly negative; -- means very negative; 0 means neutral or no difference

IV.B. RESTRICTING THE WHITING FISHERY IN NEARSHORE AREAS

The current depressed condition of certain salmon stocks along the Pacific coast has forced attention on the number of salmon taken incidentally in fisheries for other species, particularly in the Pacific whiting fishery. Although salmon taken in trawl fisheries cannot be retained legally, the additional mortality on stocks that are at critically low abundance levels is of concern. This concern is particularly urgent in the ocean area that is frequented by Klamath River fall chinook salmon. This is mainly the area off northern California, where whiting fishing effort and salmon bycatch have concentrated in recent years, particularly in 1991.

Analysis of historical salmon bycatch data indicates that bycatch rates of salmon tend to be higher in shallower, nearshore areas (Appendix B). The highest bycatch of salmon in the whiting fishery occurred in 1986 when whiting were not readily available and the joint venture fleet exploited more nearshore areas than normally was the case. The high bycatch was exacerbated by the fact that salmon were particularly abundant that year. An analysis of the bycatch rate inside and outside of the 100-fathom contour in the Eureka subarea (the area of highest salmon catches in the whiting fishery) indicated that salmon bycatch rates were 9 to 16 times higher shoreward of the 100-fathom contour.

Most, if not all, of the salmon bycatch in the 1991 fishery by the at-sea processing fleet occurred seaward of the 100-fathom contour. Concerned that a shift in the whiting fishery to more nearshore waters could increase the bycatch of Klamath River salmon and other stocks above 1991 levels, the 1992 emergency rule prohibited fishing for whiting inside of 100 fathoms in the Eureka area (by both the shore-based and at-sea fleets). However, recognizing that there are small bait fisheries and fresh-fish markets for whiting, and that bycatch of whiting taken while fishing for other species occurs inside of 100 fathoms in the Eureka area, an allowance was made for small incidental or target fisheries landing less than 2,000 pounds per trip. For the same reasons, a 3,000-pound trip limit was implemented when the whiting harvest guideline was reached on October 30, 1992, consistent with bycatch levels used in other groundfish fisheries.

A biological opinion required by the Endangered Species Act (ESA) for "Fishing Conducted under the Pacific Coast Groundfish Fishery Management Plan for the California, Oregon, and Washington Groundfish Fishery" (and approved by the National Marine Fisheries Service on August 28, 1992) states that: "...the only management action [of those implemented by emergency rule in 1992] that will be specified as a condition of the incidental take statement in this opinion is the restriction regarding targeted harvest inside of 100 fathoms in the Eureka area. This provision is specified because the available information indicates that bycatch rates area generally higher in nearshore areas. It is not applied to the rest of the coast because previous analyses of depth related effects in the whiting fishery were specific to the Eureka area." Consequently, this restriction will continue in effect as required under the "incidental take" provisions of the biological opinion. This provision may be changed in the future, but will require additional analysis supporting the change, and will require reconsultation under the ESA to assure compliance with that law and the biological opinion.

Option 1. Status quo - no restriction.

Option 2. **(PREFERRED)** No fishing for whiting within the 100-fm contour in the Eureka subarea (40°30' - 43° N. lat.), except for small trip landing or frequency limits, which would be designated as routine.

It is proposed under Option 2 that, trip, landing, or trip frequency limits for whiting may be imposed (modified, or removed) in areas that are otherwise

closed to the whiting fishery inside the 100-fm contour in the Eureka area. These trip limits would be based on the best information available, with the understanding that the total removals of whiting will be quite small relative to the annual harvest goal and that impacts on the salmon stock also will be minimal.

Whiting are ubiquitous and thus are caught incidentally in other fisheries conducted in areas closed to the whiting fishery. There is little market for this bycatch, if any, since whiting must be handled swiftly and carefully to maintain product quality. Therefore, there is little incentive to land whiting bycatch, and few are landed or recorded. The Council recognized that there is little reason to require a fisher to disrupt normal operations to sort and discard whiting caught unavoidably while fishing for other species. Consequently, the Council recommended implementation of a small trip limit (designated as "routine" under 50 CFR 663.23) to accommodate bycatch of whiting in other fisheries. Since whiting is not the target species in this case, there is no relevance to the bycatch of salmon in the whiting fishery, and there is no impact on the level of salmon taken incidentally in the whiting fishery.

The Council also acknowledged that small target trips are made to supply the fresh fish market in southern California (generally less than 500 pounds (0.23 mt) per trip, often on a daily basis), and that larger but less frequent trips are made to supply bait fisheries (as large as 50,000 pounds (23 mt) off Oregon). These small whiting fisheries have very little impact on the total landings of whiting (probably less than 1 percent of the total harvest guideline). The whiting from these fisheries that enter the fresh fish markets have a high unit value, and the income from whiting is important to these operations. Whiting taken in bait fisheries enables other fisheries (particularly for sablefish or hagfish) to be conducted. Shore-based processors have stated that there are few landings in the bait fishery in the Eureka area, but there are no data available to provide an exact amount. The impact of the small target fisheries on the salmon resource is believed to be negligible, if measurable.

Available data from the State of California do not differentiate between catches made shallower, or deeper than, 100 fathoms in the Eureka area, so the Council assumed similar patterns in this area as along the rest of the coast. It is critical that any trip limit which is intended to minimize the bycatch of salmon be designed so as not to encourage an increase the level of target fishing for whiting (generally more than 20 mt per trip shoreside and 40 mt at-sea) or in the bycatch of salmon. It also is critical that this trip limit be modified quickly if necessary to protect salmon stocks in the Eureka area. For these reasons, the Council recommended that the trip limit be designated as "routine," and initially set at 10,000 pounds, the same level and based on the same analysis as the initial 1993 trip limit for whiting caught before and after the regular season. This limit is expected to have no measurable impact on the salmon resource, is a compromise between the disparate needs of the fresh fish and bait fisheries, and should adequately accommodate the bycatch of whiting in non-whiting fisheries.

These routine trip landing or frequency limits would be imposed for some of the same reasons identified at 50 CFR 663.23(c)(1)(ii) for "routine" landing and trip frequency limits applied to other commercial groundfish fisheries: to minimize disruption of traditional fishing and marketing patterns; to reduce discards; to discourage target fishing while allowing small incidental catches to be landed; and to allow small fisheries to operate outside the normal season. Routine trip limits are announced in the Federal Register.

Impacts of No Restriction (Option 1-status quo):

Biological impacts --

Salmon. Although the bycatch of salmon in the whiting fishery was relatively low in the 1991 fishery (0.03 salmon per mt of whiting; or one salmon in about 30 mt of whiting), without restriction and voluntary efforts, the bycatch rate could reach levels achieved in earlier years. Of course, as salmon abundance remains low, bycatch levels also are expected to remain low; as salmon abundance improves, a higher bycatch rate could be expected.

The status quo was unacceptable under the Biological Opinion for the groundfish fishery (August 28, 1992).

Plots of salmon interception in the whiting fishery clearly indicate higher incidental catch rates shoreward of the 100-fathom (approximately 200 meter) contour. (Appendix B)

It should be noted that during the year of highest salmon interception (1986), the fishery was conducted entirely during daylight hours; the high catch rates seemed to be more closely associated with fishing depth. (Appendix B)

Whiting. No known impact.

Other species. No known impact.

Socio-economic impacts --

Salmon. If the salmon bycatch were large, there could be localized depletion and more severe restriction of the commercial and recreational salmon fisheries.

Salmon fishers are concerned about whiting vessels operating in times and areas where the salmon fishery is closed or severely restricted.

Whiting. the status quo maximizes operating opportunities for the whiting fishery, particularly in years when whiting is not available to the gear.

Other fisheries. Potential grounds preemption and fouling of the grounds could occur if large-scale whiting operations occurred in nearshore areas by vessels lacking or not using meal plants. Complaints have been received but not documented.

Impact of Restricting the Whiting Fishery in Nearshore Areas (Option 2):

Biological--

Salmon. The best available data suggest that the highest bycatch of salmon occurs in nearshore areas. As mentioned above, the bycatch of salmon in the whiting fishery was 9 to 16 times greater in the Eureka area at depths less than 100 fathoms. (Appendix B and the Biological Opinion (August 28, 1992). Adoption of option 2 would continue to minimize the potential bycatch of salmon relative to the status quo.

The level of fishing allowed under the "routine" trip limit would be designed to be quite small, and would not have a measurable impact on any salmon stock.

Whiting. No measurable impact.

Other species. No known impact.

Socio-economic --

Salmon. In so far as the bycatch of Klamath River salmon is reduced, it may be reflected in meeting escapement goals and stronger salmon stocks in the future. The short term gain is not expected to be noticeable, particularly since salmon caught in the whiting fishery tend not to be returning fish nor of a size legal in the salmon fishery (Appendix E).

Whiting. It is assumed that the whiting harvest guideline could be fully taken, and not significantly slowed, even with this restriction. Although some fishing for whiting has occurred shoreward of 100 fm in the past, the whiting fishery generally prefers operating close to the 100 fm contour (Appendix B). Therefore, this operation does not impede most normal whiting operations. However, in years of low whiting availability, fishermen have operated closer to shore, resulting in higher bycatch of salmon. This occurred in 1986 when the bycatch of salmon reached peak levels in the joint venture fishery. If large-scale target fishing is prohibited shoreward of a particular depth, the whiting fishery could be severely constrained in atypical years when whiting are not available near the 100-fm contour.

Testimony was received at the September Council meeting indicating that El Nino conditions in 1992 pushed whiting inside and salmon outside the 100-fathom contour near Crescent City, California. Because target fishing for whiting caught inside the 100-fathom contour was limited by a small trip limit in 1992, shore-based processors in the Eureka area felt constrained. California shore-based landings were unusually low in 1992, less than 5,000 mt, compared with over 8,000 mt in 1991. The early northward migration of whiting beyond the range of Eureka and Crescent City shore-based fleets, and the delayed whiting season (to April 15) also contributed to the poor shore-based performance in this area.

The routine trip limit would be intended to minimize discards of bycatch and to enable small target fisheries to continue their normal operations. Very little data currently are available to document incidental bycatch levels of whiting, or the needs of the small bait or fresh fish whiting markets.

Other fisheries. Grounds preemptions and fouling of the grounds could be lessened if at-sea processing occurs seaward of 100 fathoms, IF in fact these problems currently exist.

Administrative impacts -- Monitoring and enforcing fishing activities relative to a depth contour is more difficult than using geographic coordinates.

The cost to the Federal government of implementing this action is small since it most likely will be processed in combination with a number of other regulatory actions.

SUMMARY: Option 2 is preferred for the following reasons.

The highest catch and catch rates of salmon in the whiting fishery occurred in the Eureka area. Catches of salmon in the Eureka area are 9-16 times higher inside the 100-fm contour.

Klamath River fall chinook salmon, which are most likely to be caught in the Eureka area, have not met escapement goals for the last three years.

A prohibition against fishing inside of 100 fm in the Eureka area will not disadvantage most of the whiting industry, except for atypical years when whiting are not available near the 100-fm contour. Shore-based whiting processors in California would be most disadvantaged, particularly in El Nino years when whiting distribution does not follow normal patterns (which

reportedly occurred in 1992 when whiting were found mostly inside of 100 fm).

The status quo (Option 1) is not a viable option because the Biological Opinion requires that the target fishery for whiting be restricted inside the 100-fm contour in the Eureka area.

The Council decided not to consider further a coastwide prohibition against fishing for whiting within the 100-fm coastwide (option 2B in the September draft EA/RIR). If the 100-fm restriction were applied coastwide, it could force shore-based vessels in more northern areas beyond their normal fishing range, jeopardizing quality or increasing operating costs (Appendix C). The 100 fathom curve is generally substantially further offshore in the north than it is off California.

TABLE IV.B. RELATIVE IMPACTS OF OPTIONS

Options	Whiting		Salmon		Other spp.		Admin. Costs
	biol	soc-econ	biol	soc-econ	biol	soc-econ	
Opt 1 - status quo	0	0	0	0	0	0	0
Opt 2 - minimal fishing inside 100 fm in Eureka **(PREFERRED)**	0	-	++	+	0	0	+
[~~Opt 3 - no fishing inside 100 fm coastwide~~]	no further consideration after Sept. 92						

+ means "positive but slight"; ++ means very positive; - means slightly negative; -- means very negative; 0 means neutral or no difference

IV.C. Closure of Salmon Conservation Zones:

The Klamath River and Columbia River salmon conservation zones have been closed to commercial and recreational salmon fisheries for some years in order to conserve salmon stocks returning to these rivers. The Klamath River Salmon Conservation Zone extends approximately 6 nm north and 6 nm south of the Klamath River mouth and 12 nm seaward. The Columbia River Salmon Conservation Zone is roughly a square, 6 nm on each side, off the mouth of the Columbia River. Operators of whiting vessels voluntarily agreed not to operate in these relatively small areas in 1991. These zones are not areas where whiting are likely to be found, and therefore, their closure does not unduly burden the whiting fleet and allays the concerns of salmon fishermen.

Option 1. Salmon conservation zones are not closed to the whiting fishery (status quo).

Option 2. (**PREFERRED**) Fishing for whiting is prohibited in the Klamath River and Columbia River salmon conservation zones, described below. (These zones may be made smaller, removed, or closed for a shorter period, if consistent with the WOC salmon regulations at 50 CFR part 611, or if not providing a benefit to depressed salmon runs.)

> The Klamath River Salmon Conservation Zone is: The ocean area surrounding the Klamath River mouth bounded on the north by 41°38'48" N. latitude (approximately 6 nautical miles (nm) north of the Klamath River mouth), on the west by 124°23'00" W. longitude (approximately 12 nm from shore), and on the south by 41°26'48" N. latitude (approximately 6 nm south of the Klamath River mouth);
>
> The Columbia River Salmon Conservation Zone is: The ocean area surrounding the Columbia River mouth bounded by a line extending for 6 nm due west from North Head along 46°18'00" N. latitude to 124°13'18" W. longitude, then southerly along a line of 167 True to 46°11'06" N. latitude and 124°11'00" W. longitude (Columbia River Buoy), then northeast along Red Buoy Line to the tip of the south jetty.

Impact of No Restriction (Option 1):

Biological --

Salmon. There is a potential for significant bycatch of salmon in these areas IF the whiting fleet should concentrate near these river mouths; this has not yet occurred. If large-scale target fishing for whiting is prohibited shoreward of 100 fathoms in the Eureka area (as suggested under the August 28, 1992 Biological Opinion), OR if at-sea processing is prohibited south of 42° as in 1992, the potential benefit from closing the Klamath Salmon Conservation Zone (which is south of 42°) to whiting fishing is not as clear.

Whiting. No known impact.

Other species. No known impact; these areas are so small that operating in them, or avoiding them, would not impact any other resource.

Socio-economic--

Salmon. Although this has not yet been a problem, the concern that the whiting fleet will operate in these areas and take large quantities of salmon troubles many salmon fishers who believe it unfair that the whiting fishery is allowed to operate in areas closed to salmon fishing. These concerns could escalate under the status quo, particularly IF at-sea processing is allowed south of 42° or inside of 100-fm in the Eureka area.

Whiting. No known impact.

Other fisheries. No known impact.

Impact of Closing Salmon Conservation Zones (Option 2):

Biological --

Salmon. At this time, there are no quantifiable biological costs or benefits. These area closures avoid an unlikely, but potential problem.

Whiting. No known impact.

Other species. No known impact -- see discussion for status quo.

Socio-economic --

Salmon. At this time, there are no quantifiable costs or benefits resulting from this action. However, closing these small areas helps alleviate the concerns of salmon fishers who object when the whiting fishery is allowed to operate in areas closed to the salmon fishery.

Whiting. These areas are of no or little interest to the at-sea processing fleet (and their catcher boats). Some shore-based fishers in California may be required to fish farther from port than they would prefer, which would result in some economic cost (extra travel time, less fishing time). However, testimony at the September 1992 Council meeting indicated that California fishers are not concerned over this restriction.

Other fisheries. No known impact.

Administrative impacts: The cost to the Federal government of implementing this regulation is minimal because it will be combined with other bycatch provisions.

Enforcement: Area closures are relatively easy to enforce.

SUMMARY: Option 2 is preferred because these closures would minimize the likelihood of a potential biological problem and would help address the perception that large-scale at-sea processors are harvesting returning, depressed salmon stocks. It is acknowledged that closure of these small areas to the whiting fishery will not directly benefit the salmon resource because to date these areas have not been heavily exploited by the whiting fishery. However, these closures also pose no hardship on the whiting fleet. Even if at-sea processing were to be allowed south of 42° or target fishing were allowed inside of 100 fathoms, closure of the Klamath Conservation Zone would not affect operations of the at-sea processing fleet which has no compelling reason to search for whiting in these small areas. This closure is not expected to be troublesome for the shore-based whiting fleet in the Crescent City/Eureka area, even though they sometimes fish near the outer boundary of the Klamath Conservation Zone.

TABLE IV.C. -- RELATIVE IMPACTS OF OPTIONS

Options	Whiting		Salmon		Other spp.		Admin. Costs
	biol	soc-econ	biol	soc-econ	biol	soc-econ	
Opt 1 - no closed areas (status quo)	0	0	0	0	0	0	0
Opt 2 - closure of salmon conservation zones **(PREFERRED)**	0	0	+	0	0	0	+

+ means "positive but slight"; ++ means very positive; - means slightly negative; -- means very negative; 0 means neutral or no difference

IV.D. Processing At-Sea South of 42°. This issue is considered separately here, and in conjunction with the "no night fishing" issue (section IV.A.), to cover all possible combinations of options.

The 1992 emergency rule prohibited processing at sea south of 42°. The primary reason was to protect the southern part of the Eureka area, the area of highest salmon bycatch. This shifted the high-capacity at-sea processing fleet, which was capable of taking more than 30,000 mt of whiting in a single week in 1992, to more northerly fishing areas where salmon interception historically has been lower. It also shifted operations away from Cordell Banks and the Gulf of Farrallones, areas of high bycatch of rockfish (over 500 mt of chilipepper in 1991, and which could result in high bycatch of bocaccio in years of high recruitment).

Because of the mobility of these vessels, a shift to more northern waters is not expected to limit the at-sea processing fleet's ability to catch whiting, although it may slow their initial operations somewhat if whiting are not fully dispersed along the coast. However, whiting are expected to be migrating into the more northerly areas by the time the season opens (currently April 15), and effort by the at-sea fleet is expected to be sufficient to harvest any amount of whiting that is available to them.

The Council did not consider prohibiting catcher vessels that deliver whiting to shoreside processors south of 42°. The shore-based fleet cannot follow whiting as freely because vessels need to stay within approximately 12 hours of the processing plants to maintain quality of the fish. Unlike the at-sea processing fleet, shoreside processing plants are at fixed locations and depend on whiting caught locally instead of being able to follow the whiting as they migrate north. In addition, the amount of whiting expected to be delivered to shoreside processing plants is considerably less than the at-sea processing fleet would harvest in the area and the potential salmon bycatch is expected to be small. Thus, extending the prohibition against catchers that deliver to shoreside processors south of 42° would unduly impact their ability to participate in the fishery, but would protect only a relatively small amount of salmon and rockfish.

A prohibition against processing at sea south of 42° already has been analyzed in this document in conjunction with Day/Night Fishing (Section IV.A). The discussion regarding closure within the 100-fm contour in the Eureka area (43°-40°30') (Section IV.B.) is relevant whether or not at-sea processing is prohibited south of 42°.

Option 1. At-sea processing is allowed coastwide (status quo).

Option 2. (**PREFERRED**) At-sea processing is prohibited south of 42°.
Option 3. At-sea processing is prohibited between 42°-39° N. lat.

Impacts of No Restriction (Option 1): The status quo was analyzed in the EA/RIR for the 1992 emergency rule which provides a more complete discussion of impacts (Appendix C). A large-scale at-sea processing fleet operating south of 42° could have the following impacts:

Biological --

Salmon. Klamath River fall chinook and Sacramento winter run chinook, which are depressed, both occur south of 42°.

Whiting. No measurable impact. Although there were initial concerns that a large-scale fishery south of 39° (or 42°) would result in a disproportionate catch of juvenile whiting, this proved not to be the case in the spring 1991

fishery. Older fish were mixed with younger fish in March-April, before the northern migration was well underway, and young year classes were not taken in alarming numbers.

Other species. Bycatch of chilipepper rockfish (14% ABC) was particularly high in the Cordell Banks/Gulf of Farallones area (south of 39°) in 1991. Although the bycatch of bocaccio was negligible in 1991, this might not always be the case. Bocaccio, which were thought to be close to the "overfishing" level in 1991, are caught coincidentally with chilipepper. Year classes of bocaccio fluctuate widely; the bycatch of bocaccio in the whiting fishery could be high in years of strong recruitment.

Socio-economic --

Salmon. As mentioned in other discussions, moving the at-sea processing fishery north of 42° will not result in an immediate, if even measurable, benefit to the salmon industry in the short term, but it will avoid potential negative impacts in the future and may contribute to rebuilding depressed Klamath River fall chinook and Sacramento winter run chinook salmon.

Whiting. Maximum operational flexibility is maintained if the at-sea processing fleet is not prohibited from operating south of 42°. However, this argument is less compelling since, by the time the season opens on April 15, whiting are expected to be well into their northward migration and available to the fishery north of 42°.

Other species. Potential disruption of the bocaccio fishery if this species exceeds its level of overfishing.

Impacts of Prohibiting At-Sea Processing South of 42° (Options 2, 3):

Biological --

Salmon. This restriction would move the largest part of the whiting fleet (the at-sea catcher/processors, motherships and their catcher vessels) northward, out of the southern Eureka area with high bycatch rates of salmon, and providing the greater potential benefit for Klamath River fall chinook. Although the bycatch rate for chinook salmon south of 39° is quite low, this also is the area most likely to contain Sacramento winter run chinook, which are listed under the ESA.

Whiting. No measurable impact -- see impacts for option 1.

Other species. Although the bycatch of chilipepper and bocaccio would be lessened, the bycatch of widow rockfish and yellowtail rockfish could increase because they are more prevalent in the Columbia area. However, this was not seen in the spring 1992 fishery, possibly due to atypical El Nino conditions, careful fishing practices, and the short 3-week spring fishery for at-sea processing which was over in early May, before the summer months when bycatch rates for these species tend to be higher. Data for the 1992 fall fishery by at-sea processors were very preliminary at the time this document was prepared, but it appears that the rate of bycatch of widow and yellowtail rockfishes is higher than in the spring fishery, making the total rates for 1992 higher than for 1991 (particularly yellowtail rockfish) but not a great deal higher than the 1986-1990 joint venture average.

Socio-economic --

Salmon. No measurable economic impact in the short term; potential benefit in the longterm if pressure on depressed stocks is reduced. The perception of wide-spread removals of salmon is reduced.

Whiting. No measurable economic impact. Although the whiting fishery would not have full operating flexibility, it appears not to have been seriously constrained in 1992, when the 98,900 mt allocation for at-sea processing was taken in a record three weeks. However, whiting may have been more available north of 42° due to El Nino conditions. The delay in the whiting season until April 15 (when whiting are more dispersed along their northward migration) lessens the argument for restricting at-sea processing south of 42° but does not provide as much protection. Similarly, if at sea processing is restricted south of 42°, the need for an April 15 opening is less compelling for purposes of reducing the bycatch of salmon, but may provide for a more orderly fishery.

Other species. This provision provides potential for increasing the bycatch rate of other rockfish species, most notably widow and yellowtail rockfishes, but this did not occur in 1992. (See discussion of biological impacts.)

SUMMARY: Option 2 was selected as the preferred option to protect Klamath River fall chinook salmon, Sacramento winter run chinook salmon, and to discourage high bycatch of chilipepper (and potentially bocaccio) rockfish. A prohibition against at-sea processing south of 42° clearly limits operational flexibility for that fleet. However, operations appear not to have been constrained in 1992 as demonstrated by record high catch rates of whiting and record low bycatch rates of salmon in the spring 1992 fishery.

Closing only the area between 42° and 39° (Option 3) and allowing at-sea processors to operate south of 39°, in an area with a low bycatch rate of salmon in 1991, would protect the Eureka area, particularly Klamath River stocks. However, it could result in high bycatch of chilipepper/bocaccio rockfish. It also could increase the likelihood of intercepting of Sacramento winter run chinook which are listed under the ESA.

This Option 2, prohibiting at-sea processing south of 42°, combined with the preferred option to prohibit fishing at night coastwide (Option 2A in section IV.A.), is discussed as Option 2B in Section IV.A.

TABLE IV.D. RELATIVE IMPACTS OF OPTIONS

Options	Whiting		Salmon		Other spp.		Admin. Costs
	biol	soc-econ	biol	soc-econ	biol	soc-econ	
Opt 1 - at-sea processing ok coastwide (status quo)	0	0	0	0	0	0	0
Opt 2 - no at-sea proc. operations south of 42° **(PREFERRED)**	0	0	+	0	+	0	+
Opt 3 - no at-sea proc. between 42°-39°	0	0	+	0	-	0	+

+ means "positive but slight"; ++ means very positive; - means slightly negative; -- means very negative; 0 means neutral or no difference

IV.E. Whiting Season.

The opening date for the whiting season, for all U.S. participants, was changed from January 1 (no restriction) to April 15 in 1992 (57 FR 2851, January 24, 1992). One of the major reasons for this action was to reduce the bycatch of salmon. The analysis relevant to this action appeared in the "Final Environmental Assessment and Regulatory Impact Review (EA/RIR) for the Season Opening Date for Pacific Whiting," December 1991 (Appendix F).

At its July 1992 meeting, the Council asked that January 1, March 1, and April 15 be reconsidered as opening dates with the possibility of a different opening for shore-based and at-sea processors, or a window with different dates north and south of 42°. In its analysis presented to the Council in July 1992, the Groundfish Management Team (GMT) stated its belief that an opening for shore-based processing (in California) between March 1 and April 15 was feasible and within the scope of the impacts analyzed in the EA/RIR previously prepared when setting the April 15 coastwide opening for all users. That EA/RIR and the GMT report from the July 1992 meeting are incorporated into this document as Appendix F.

At its September 1992 meeting, in response to testimony from California processors who were disadvantaged when the season opening date was changed (from January 1) to April 15 in 1992, the Council decided to combine the previous discussions and analyses regarding the season opening date with the other actions under consideration in this document to minimize bycatch in the whiting fishery.

The impact of the April 15 opening date in 1992 was substantially greater than expected in the northern California ports of Crescent City and Eureka. These two ports are the furthest south on the coast to have established, shore-based whiting processors. The pattern of migration of the whiting stock generally brings the stock within reach of the southern ports early in the season. As was recognized in the December 1991 EA/RIR, the early months of the season produce substantial portions of the whiting catch for Eureka and Crescent City in some years. Between 1988 and 1991, the portion of the total annual landings of whiting in these two ports during March and April has ranged from 5 percent to 33 percent. In years when warm water extends further north, as influenced by the El Niño conditions that existed in 1992, the major part of the whiting stock moves north earlier in the year and beyond the range of shore-based whiting operations in northern California very early in the fishing season. Although some fish still may be available, the ability of the fleet to take normal levels can be severely curtailed. This problem is exacerbated by the fact that, even in typical years, whiting are totally out of fishing range by late summer, much earlier than for the more northern ports that can continue into September and October. In 1991 and 1992, the whiting fishery in California was virtually over in August. As a result, the April 15 opening date constrains the opportunity for the southern-most ports to catch whiting in some years. These California processors, who are the traditional shore-based processors in the whiting industry, believe they have lost their opportunity to compete equitably for the resource due to these constraints on the length of their season.

Option 1. Status quo. April 15 opening date coastwide for all whiting fisheries.

Option 2. (**PREFERRED**) March 1 opening for vessels delivering to shore-based processors in the Eureka area south of 42° (42°-40°30′). April 15 remains the opening date for shore-based operations north of 42°, south of 40°30′, and for all at-sea processing operations.

Impacts of the April 15 opening date coastwide (Option 1 - status quo): The impacts of the April 15 opening date were analyzed in the EA/RIR and GMT statement (Appendix F), which should be referenced for a more thorough discussion. The EA/RIR for the season opening date supported April 15 as the preferred date if both at-sea and shore-based operations were to begin at the same time, as the Council had requested. "The Council selected this option because it seemed to balance the needs of all sector of the industry while maintaining traditional fishing patterns. In doing so, the fishery and its impacts will be spread along the coast and operations in new areas (south of 39° N. latitude) will be minimized" (p. 21 of the Dec. 1991 EA/RIR).

Impacts of a March 1 opening date for the shore-based whiting fishery in the Eureka Area South of 42° (Option 2): The December 1991 EA/RIR indicated (in table 4.2.c.) that there was not a great deal of difference in the impacts of a single opening date, for all sectors of the whiting fishery, any time in April (April 1 to May 1). In its July statement, the GMT concluded that, if the Council prefers different opening dates for shore-based and at-sea processors, shore-based operations could begin as early as March 1. "Because an April-May window (for all sectors of the whiting fishery) was supported by the previous EA/RIR, a one-month earlier opening for the relatively small shore-based operations in California is not expected to have a significant biological impact."

The impacts of this option differ from the impacts described in the December 1991 EA/RIR in that the opening date is intermediate to the January 1 and the April 15 alternatives and only applies to a small part of the coast (42°-40°30'). Based on the data and analyses presented in the December 1991 EA/RIR, a March 1 opening date for the main whiting fishery in the Eureka area south of 42° would have the following impacts:

Biological --

Salmon. Although the highest bycatch rate for salmon in the joint venture and domestic at-sea processing fisheries have been observed in the Eureka area, bycatch rate in the month of March is generally the lowest during the year. Therefore, allowing an early whiting fishery in the Eureka area between March 1 and April 15 is not expected to increase the salmon bycatch rate for that area during the year or to increase the total salmon bycatch in the whiting fishery.

Whiting. No measurable impact on the resource is expected. The greatest landings of whiting in the Eureka area ports during the months of March and April totaled 2240 mt in 1991 (PacFIN report #184) which was approximately one percent of the harvest guideline. Unless the fishery in this area grows substantially and unexpectedly, early harvest of this small percentage of the total whiting annual harvest will not measurably effect the yield per recruit for the whiting stock. There is no evidence that fishing this early in the year will result in large catches of predominantly young fish; in fact, the year classes are more likely to be well mixed in the Eureka area in March-April if the northward migration is not yet completely underway.

Other species. Based on data from observers aboard processing vessels in both the domestic and joint venture fisheries bycatch rates for chilipepper, widow and yellowtail rockfish and bocaccio are the lowest in the whiting fishery within the Eureka area. The proposed season opening change is not expected to impact those low bycatch rates.

Socio-economic --

Salmon. No socio-economic impacts are expected within the salmon fishing community as a result of this proposed action because the whiting fishery in

the area will remain a relatively low volume fishery. If the other preferred alternatives are approved which would prohibit fishing in the Klamath Conservation Zone and allow only small trip limits for whiting caught shallower than 100 fathoms in the Eureka area, the March opening should not result in a measurable impact on any salmon fishery in the area.

Whiting. The whiting industry in Crescent City and Eureka, California will benefit from the season opening date of March 1. Based on the landings records for these ports from 1988 through 1991 in only one year of the four were substantial landings of whiting made during March. In March 1988, approximately 500 mt of whiting were landed. Anecdotal evidence from the spring of 1992 indicates that, if the April 15 opening date were not in force, substantial landings would have occurred once again in March. If this pattern were to hold, then the earlier season opening date would benefit the Eureka area ports in two of five years.

The amounts of whiting that would be landed in those ports during the March 1 to April 15 period are small relative to the total fishery, but significant to those processors. In 1988, 30 percent of the landings in the Eureka area (43°-40°30') were made in March and April. The average for 1986-1990 was 20 percent for those two months. In 1991, about 2,200 mt were landed in the Eureka area in March and April, over 30 percent of the whiting landed in those ports, 11 percent of all shore-based landings of whiting, and about 1 percent of all whiting taken (shoreside and at-sea) (PacFIN report #184). These percents are somewhat high because they include landings in all of April, not just the two weeks before the current season opens on April 15. The proportion of shore-based landings taken between March 1-April 15 would be even lower in the future due to the significant expansion by Oregon shore-based processors after 1991.

Option 2, if approved, would not preclude opportunities by the other fleets, but would clearly provide a more equitable opportunity by reinstating the more traditional season for these relatively small shore-based processors.

If whiting is allocated to shore-based processors or fishermen, landings in the Eureka area ports would count against the allocation. Therefore, in two of five years the Eureka area ports may experience a slight advantage over the whiting fishing industry located further north. However, this is in part compensated for by the fact that whiting migrate north out of the Eureka area late in the summer, and still is available to the more northern processors. The upper end of the range of the landings that are expected to be made in the Eureka area ports before the coastwide April 15 opening is less than three percent of the 80,000 mt initial shore-based allocation in 1992. Consequently, no measurable disadvantage is expected for the whiting industry operating outside of the Eureka area.

Although the at-sea processing fleet may feel disadvantaged not to have an earlier opening, this opening occurs in an area that may not be available to them if at-sea processing operations are prohibited south of 42° (see sections IV.A. and IV.D.). Landings would be included in the shore-based allocation, if any. If allocations were based on shore-based capacity and intent, which is not necessarily the case, this earlier opening for the Eureka processors could account for as much as 2,000 mt of the shore-based capacity. To the extent that shore-based allocations are not based entirely on shore-based capacity and intent, there would be less or no impact on the at-sea processing segment of the whiting fishery.

Other species. As indicated in the December EA/RIR and the GMT's July statement, a March 1 opening would not result in increased bycatch of widow or yellowtail rockfishes; in fact, the bycatch rates for these species in the Eureka area are comparatively low.

SUMMARY. Option 2 was selected as the preferred option for the following reasons.

The impact of the April 15 opening date in 1992 was substantially greater than expected in the northern California ports of Crescent City and Eureka, the southernmost ports on the coast to have established, shore-based whiting processors. Whiting, which migrates north early in the year, generally becomes available to these ports early in the season (March-April) and leaves early (sometimes in August) compared with more northerly ports. This trend is more pronounced in atypical El Niño years such as 1992 when the water is warmer. As a result, the April 15 opening date constrains the opportunity for the southern-most ports to catch whiting in some years. There appears to be no biological impact, and a very minimal economic impact in simply restoring the normal season to the traditional, small-scale whiting processors off California.

Option 2 is within the scope of analysis conducted for the April 15 whiting season opening date (Appendix F). The major reasons for the April 15 opening were to minimize the bycatch of salmon and bocaccio/chilipepper rockfish and to select a single date for both at-sea and shore-based processors. The Council subsequently decided to look at different opening dates for these processing sectors. Even though a shift to a March 1 opening for this small segment of the whiting fishery would in itself have an inconsequential impact on the level of salmon bycatch, it is appropriately taken under Amendment 7 (to minimize the bycatch of nongroundfish species) because it is within the scope of the analysis previously conducted to achieve that purpose.

TABLE IV.E. -- RELATIVE IMPACTS OF OPTIONS

Options	Whiting		Salmon		Other SPP.		Admin. Costs
	biol	soc-econ	biol	soc-econ	biol	soc-econ	
Opt 1 - April 15 for all (status quo)	0	0	0	0	0	0	0
Opt 2 - March 1 for shore-based processors between 42°-40°30' **(PREFERRED)**	0	+	0	0	0	0	+

+ means "positive but slight"; ++ means very positive; - means slightly negative; -- means very negative; 0 means neutral or no difference

V. PROCEDURAL OPTIONS

The management options presented herein potentially could be implemented two ways, as a regulatory amendment or as a routine management measure.

A "regulatory amendment" is appropriate for restrictions that are expected to remain in effect indefinitely and/or for which it is unlikely there will be frequent information available to support a change. This procedure means the management measure may be substantively modified only by another regulatory amendment and full analysis.

A "routine" management measure is one that the Council determines is of the type normally used to address the issue at hand and which may require further adjustment to achieve its purpose with accuracy. It is expected to be adjusted on an annual (or more frequent) basis. Routine management actions must first be designated as "routine" by the regulatory amendment process. Subsequent changes may be accomplished by a single notice in the Federal Register as long as the change is for the same purpose, and within the range of impacts, analyzed when the routine designation was made.

At its September 1992 meeting, the Council was interested in maximizing the flexibility and efficiency of its management actions, and therefore would have preferred designating most as "routine." It acknowledged, however, that inadequate information was available at that time, and recommended the routine designation only for trip landing and frequency limits in areas that are otherwise closed to the whiting fishery.

VI. CONSISTENCY WITH FMP GOALS AND OBJECTIVES

The preferred alternatives are intended to be consistent with Conservation Objective 4 which the Council has initially recommended for incorporation into the FMP by Amendment 7. Amendment 7, and Objective 4, which were available for public review at the time this EA/RIR was written, therefore were not approved by the Secretary of Commerce at the time this EA/RIR was prepared.

With respect to non-groundfish species, Amendment 7 states: "Where conservation problems have been identified for non-groundfish species and the best scientific information shows that the groundfish fishery has a direct impact on the ability of that species to maintain its long-term reproductive health, the Council may consider establishing management measures to control the impacts of groundfish fishing on those species. Management measures may be imposed on the groundfish fishery to reduce fishing mortality of a non-groundfish species for documented conservation reasons." The Council clarified that "reference to maintaining the 'long-term reproductive health' of the non-groundfish species establishes a standard of proof that any management measures should [emphasis added] have a measurable effect, but acknowledged that in many (and perhaps most) cases, it will be impossible to quantitatively demonstrate such an effect, and in such cases a qualitative assessment will have to suffice. The Council does not intend that this objective be so narrowly defined that the Council and Secretary would be restrained from addressing mandates of the ESA and MMPA, or from trying to rebuild non-groundfish stocks of concern. The Council also felt that the analysis leading to the choice of preferred alternatives in this EA/RIR, although qualitative in many areas, is consistent with Amendment 7.

Salmon Conservation Problems. Severe conservation problems have been documented for Sacramento River winter-run chinook salmon, Snake River fall and spring/summer chinook and Snake River sockeye salmon. Snake River sockeye are currently listed as endangered and the other stocks as threatened under the ESA. The status of these stocks required formal biological consultation under the ESA to assess the impacts of the groundfish fishery on their

continued survival (Section 7 Consultation - Biological Opinion "Fishing Conducted under the Pacific Coast Groundfish Fishery Management Plan for the California, Oregon, and Washington Groundfish Fishery", National Marine Fisheries Service, August 28, 1992).

In addition to addressing concerns for salmon stocks listed under the ESA, the Council's proposed measures in this regulatory amendment also respond to a need to maintain the long-term reproductive health of the Klamath River fall chinook salmon stock. In each of the past three years, the escapement of naturally produced Klamath River fall chinook has failed to meet the spawning escapement goal floor (35,000 natural adults) specified in the salmon FMP. The natural spawning escapement was only 13,100 adults in 1990 and 11,100 adults in 1991. For 1992, it was projected that the stock would not meet the spawning escapement floor even with no ocean salmon fisheries. The Council's preseason deliberations, the Salmon Technical Team (STT) stated: "Although questions have been raised about the appropriateness of the 35,000 floor, the STT continues to believe that adult natural spawning escapements significantly below this level will increase the danger of jeopardizing the long-term productivity of the Klamath fall chinook stock during this period of apparent low freshwater and marine survival." ("Preseason report III analysis of Council-adopted management measures for 1992 ocean salmon fisheries." Council, 1992.)

In response to this situation, the Council allowed no commercial salmon fisheries between Florence, Oregon and Point Arena, California in 1992, and recreational fisheries in this same area were regulated under chinook quotas for the first time ever. The total 1992 chinook harvest in the recreational salmon fishery between Florence, Oregon and Point Arena, California is estimated at about 13,000 fish. A review of the Klamath River fall chinook stock will begin in 1993 to determine if the stock is overfished under the Council's definition of overfishing. The impact of the preferred alternatives in addressing these salmon conservation problems are summarized below.

Prohibition of Whiting Fishing in the Klamath and Columbia River Salmon Conservation Zones: Immature and mature salmon of a particular stock of concern are generally widely dispersed in the ocean. However, they may at times be found in relatively heavier concentrations near the mouths of major rivers or their river of origin. For this reason, the ocean areas immediate to the mouths of the Klamath and Columbia Rivers have generally been closed to commercial and recreational salmon fishing. Maintaining these same closures for the whiting fishery could help protect against the potential for any unusually high occurrence of salmon bycatch of a particular stock of concern (in this case, Snake River fall and spring/summer chinook and Klamath River fall chinook).

Prohibition of At-sea Whiting Processing Operations South of 42°N Latitude: Impacts on Sacramento River winter-run chinook occur primarily south of Point Arena, California (39° N. latitude). Shore-side processors south of 42°N latitude and the areas used by their catcher boats are currently found only well north of Point Arena. Therefore, shore-side operations are unlikely to have any significant impacts on Sacramento River winter-run chinook as determined in NMFS biological opinion (NMFS 1992). If allowed by regulation, it is possible that the at-sea processors could pursue whiting in areas south of Point Arena if whiting were concentrated in that area. This could result in impacts on Sacramento River winter-run chinook which are greater than anticipated under the biological opinion.

Klamath River fall chinook are of primary concern in managing salmon fisheries in the area between Horse Mountain, California and Humbug Mountain, Oregon. Salmon and whiting fisheries in this area have the greatest chance of making significant impacts on the Klamath River fall chinook stock. Limiting the

whiting fishery south of 42°N latitude to the shore-side industry protects against a situation in which the at-sea whiting fleet might take its entire allowable whiting harvest in the northern California area where impacts on Klamath River fall chinook could be most significant. Given the present low state of the population and commercial fishery closures from Point Arena to Florence, Oregon, it is possible that the salmon bycatch in the whiting fishery could be a significant portion of the total salmon harvest between Humbug and Horse mountains (the Klamath management zone). In 1992, only about 5,200 chinook salmon were harvested in the recreational fishery (the only salmon fishery) in this area. This is about the same as the total salmon bycatch of the whiting fishery in 1992. Had most of the whiting fishery occurred between Humbug Mountain and Horse Mountain, it is possible that the whiting fishery impacts on Klamath River fall chinook could have been a very significant part of the total 1992 fishery impacts.

Prohibition against Taking Large Amounts of Whiting Per Trip Inside 100 Fathoms in the Eureka Area: This restriction is mandated by the incidental take statement of the NMFS biological opinion on the impacts of the groundfish fishery on listed salmon species. Available data indicates that salmon bycatch rates in the Eureka area are generally highest in the nearshore area.

Prohibition Against Fishing for Whiting at Night South of 42°N Latitude: The highest bycatch rates observed for chinook salmon in the whiting fishery in 1991 occurred south of 42°N Latitude during the hours of midnight to 6 a.m. North of 42° there was no statistically significant indication that bycatch rates were higher during the night than in daylight hours. The bycatch of salmon in the whiting fishery is an extremely variable and random event which makes it hard to statistically evaluate the significance of the observations in 1991. However, given the extremely low numbers of Klamath River fall chinook and Sacramento River winter-run chinook at this time and the increased likelihood of impacting both stocks in areas south of 42°, it seems prudent to avoid night-time fishing in this area. Shore-based catcher boats have not generally fished during hours of darkness. Only if at-sea processing is allowed south of 42° does it appear likely that night-time fishing would occur absent any prohibition.

Minimizing Disruption in the Groundfish Fishery. With respect to the groundfish fishery, Amendment 7 also states: "The action will be designed to minimize disruption of the groundfish fishery, in so far as consistent with the goal to minimize the bycatch of non-groundfish species and will not preclude achievement of a quota, harvest guideline, or allocation of groundfish, if any, unless such action is required by other applicable law." The management measures recommended by the Council are intended to minimize the bycatch of salmon with minimum impact on the Pacific whiting fishery. The preferred alternatives are less restrictive than those imposed in 1992 (because night fishing was prohibited north of 42° N. latitude in 1992 but would be allowed under this EA/RIR). Yet, even under the more restrictive 1992 regulations, no component of the whiting fishery was precluded from achieving its allocation. Therefore, it is assumed that none of the preferred options will preclude achievement of a harvest goal in the whiting fishery in the future.

VII. OTHER APPLICABLE LAW

A. Endangered Species Act. In November 1991, NMFS completed a biological opinion under Section 7 of the Endangered Species Act (ESA) that considered the impacts of the Pacific whiting fishery on Sacramento River winter chinook salmon, which are listed as threatened under the ESA. The biological opinion considered recent changes in the character of the whiting fishery brought on by the displacement of foreign processing vessels by U.S. processing vessels.

Foreign processing vessels were prohibited from operating south of 39° while domestic processors were not prohibited from any areas. The impacts of the all of the alternatives considered in this proposal fall within the scope of the November, 1991 biological opinion. None of the proposed actions will either increase the magnitude of the whiting fishery or result in a fishery earlier in the year in the area south of 39° N. latitude, which is the area of concern for Sacramento River winter chinook salmon.

In regards to the impacts on other species listed under the ESA, the impacts of all of the proposed alternatives fall within the scope of previous consultations under Section 7 of the ESA (August 10, 1990 and August 28, 1992) which concluded that the Pacific groundfish fishery would not jeopardize the continued existence of any of the listed species.

B. National Environmental Policy Act (NEPA). The Council initially has determined that implementation of the preferred alternatives would not significantly affect the quality of the human environment, and therefore preparation of an environmental impact statement is not required by Section 102(C) of NEPA or its implementing regulations.

Finding of no Significant Impact (FONSI)

For the reasons discussed in this document, neither implementation of the proposed actions nor the status quo would significantly affect the quality of the human environment, and the preparation of an environmental impact statement on the final action is not required by Section 102 (2)(C) of the National Environmental Policy Act or its implementing regulations.

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Assistant Administrator for Fisheries Date

C. Executive Order 12291. These actions, if implemented, will not have a cumulative effect on the economy of $100 million or more nor will they result in a major increase in costs to consumers, industries, government agencies, or geographical regions. No significant adverse impacts are anticipated on competition, employment, investments, productivity, innovation, or competitiveness of U.S.-based enterprises. The gross revenues generated from the whiting fishery are not expected to differ substantially as a result of these proposed actions. Clearly, some operating flexibility is lost by restrictions against operating in certain areas or at certain times. However, these actions are not intended or expected to severely constrain any user group from achieving any designated allocation, if any. The net effect of these actions will be to minimize the bycatch of salmon in the whiting fishery without causing undue hardship to the whiting industry. These actions do not guarantee shares to any particular user group.

D. Regulatory Flexibility Act. The prohibition against fishing at night, if applied coastwide as originally recommended in September 1992, would have affected mostly large-capacity at-sea processors; the shore-based fishing fleet traditionally has not operated at night to any great extent. Since the Council changed its preferred alternative in November 1992 so that night fishing is prohibited only south of 42° N. latitude, the same area where at-sea processing is prohibited, there is no additional impact on at-sea processors. Consequently, the prohibition against fishing at night south of 42° N. latitude will have a neglible impact on either the shore-based or at-sea fishing or processing sectors.

Although the prohibition against processing at sea south of 42° impacts the large at-sea processing fleet, it also greatly reduces the potential bycatch of salmon. Even though this restriction limits operational flexibility, the

large at-sea processors were able to harvest their allocation in 1992 in record time, and therefore appear not to have been unreasonably constrained. (This restriction was imposed by emergency rule in 1992.) Large at-sea processors are not considered small businesses based on NMFS survey information indicating average annual gross revenues in the range of $8,000,000. Restrictions against fishing inside of 100 fathoms in the Eureka area affects operations of all categories of vessels, mostly the shore-based fleet in the Eureka area, but also is expected to minimize interception of depressed Klamath River salmon stocks. An early opening (March 1) for these shore-based processors will somewhat mitigate the impact of the 100-fathom restriction. Closure of the Klamath River and Columbia River salmon conservation zones will have little impact on the whiting fleets. Consequently, these proposed actions will not have a significant economic impact on a substantial number of small entities under the Regulatory Flexibility Act, 5 U.S.C. 603 et seq., and a regulatory flexibility analysis was not prepared.

E. Paperwork Reduction Act (PRA). There is no collection of information requirement subject to the Paperwork Reduction Act, 44 U.S.C. 3501 et seq.

F. Coastal Zone Management Act. These actions are consistent to the maximum extent practicable with applicable State coastal zone management programs. NMFS will correspond with the responsible state agencies under Section 307 of the Coastal Zone Management Act to obtain their concurrence in this finding.

G. Executive Order 12612. This rule does not contain policies with federalism implications sufficient to warrant preparation of a federalism assessment under Executive Order 12612.

VIII. COORDINATION AND CONSULTATION

Development of the proposed action and the analyses incorporated in this EA were coordinated with the Council's Groundfish Team members, Council staff, NMFS scientists and managers, and NOAA General Counsel. The details of the proposed action were developed and discussed by the Council at its July and September public meetings and thereby included comments and input by the affected industry and the public.

IX. LIST OF PREPARERS

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X. APPENDICES AND REFERENCES

Appendix A. "Catch Reports for Motherships and Catcher/Processors in the Pacific Whiting Fishery", preliminary data April 15-May 5, 1992, Attachment C.3.d, July 1992. National Marine Fisheries Service, Northwest Region.

Appendix B. "Patterns of Bycatch in the Pacific Whiting Fishery" and "A Spatial analysis of Salmon Bycatch in the Pacific Whiting Fishery 1980-1991", Methot and Dorn, March 9, 1992.

Appendix C. "Environmental Assessment: Measures for Reducing Bycatch in the Pacific Whiting Fishery off California, Oregon, and Washington in 1992," Pacific Fishery Management Council and National Marine Fisheries Service, March 1992.

Appendix D. Additional supplemental information on day/night differences in bycatch rates in the 1991 offshore fishery for Pacific whiting. [**Revised since September 1992**] National Marine Fisheries Service, Northwest Fisheries Science Center.

Appendix E. "1991 Pacific Coast Whiting Fishery Catch Summary," Supplemental Attachment C.3.a. March 1992. National Marine Fisheries Service, Northwest Region.

Appendix F. (1) "Final Environmental Assessment and Regulatory Impact Review (EA/RIR) for the Season Opening Date for Pacific Whiting", Pacific fishery Management Council, December 1991; (*The discussion regarding day/night fishing is no longer appropriate. It is replaced by the more recent analysis at Appendix D.*)

and (2) "Groundfish Management Team Statement on the Pacific Whiting Season," GMT Supplemental Report C.7., Pacific Fishery Management Council, July 1992

Appendix G. Supplemental Deliveries of Whiting by Catcher Boats to Catcher/Processors in the 1992 spring fishery.

OTHER RELEVANT REFERENCES:

Emergency Interim Rule to minimize the impact of the Pacific whiting fishery on Pacific salmon stocks, 57 FR 14663, National Marine Fisheries Service, April 22, 1992.

Endangered Species Act - Section 7 Consultation - Biological Opinion for "Pacific Coast Whiting fishery and Modifications in Structure of the Fishery", National Marine Fisheries Service, November 26, 1991

Endangered Species Act - Section 7 Consultation - Biological Opinion "Fishing Conducted under the Pacific Coast Groundfish Fishery Management Plan for the California, Oregon, and Washington Groundfish Fishery", National Marine Fisheries Service, August 28, 1992.

"Environmental Assessment for a Proposed Emergency Rule to Manage the 1992 Fishery for Pacific Whiting", National Marine Fisheries Service, March 1992

"Preseason report III analysis of Council-adopted management measures for 1992 ocean salmon fisheries." Pacific Fishery Management Council, 1992.

Appendix A. "Catch Reports for Motherships and Catcher/Processors in the Pacific Whiting Fishery", preliminary data April 15-May 5, 1992, Attachment C.3.d, July 1992.

PRELIMINARY DATA APRIL 15 -MAY 5, 1992

CATCH REPORTS FOR MOTHERSHIPS AND CATCHER/PROCESSORS IN THE PACIFIC WHITING FISHERY
(Based on Observer Data)

TABLE 1. SUMMARY - CUMULATIVE CATCH OF ALL SPECIES

GROUNDFISH	Retention (mt)	Discard (mt)	Total (mt)
Pacific whiting	94,941	4,038	98,979
Rockfish	30	310	340
Flatfish	0	2	2
Pacific cod	0	trace	trace
Ling cod	trace	trace	trace
Jack mackerel	trace	3	3
Sablefish	3	49	52
Other groundfish*	0	12	12
TOTAL	94,974	4,414	99,388
PROHIBITED SPECIES		Number fish	
Halibut		9	
Salmon		1,337	

* Other groundfish = all other miscellaneous species of fish and invertebrates.

TABLE 2. ROCKFISH CATCH AND RATIO BY AREA (in metric tons)

ROCKFISH	VANCOUVER 670	COLUMBIA 710	EUREKA 720	MONTEREY 730	TOTAL WOC
Bocaccio	trace	3	0	0	3
Other rockfish	6	17	trace	0	23
POP	10	11	trace	0	21
Thornyheads	0	9	trace	0	9
Canary	0	trace	0	0	trace
Yellowtail	34	105	0	0	139
Widow	29	95	trace	0	124
Chilipepper	trace	trace	0	0	1
Shortbelly	0	20	0	0	20
TOTAL ROCKFISH	79	260	trace	0	340
Whiting	11,780	69,548	17,650	0	98,979
Rockfish (mt)/ Whiting (mt)	0.0067	0.0037	0.0001	0	0.0034**

* *Rockfish weights include retained and discarded catch.*
** *Joint venture 11-year average coastwide was 0.007.*

TABLE 3. SALMON AND CATCH AND RATIO BY AREA

	VANCOUVER 670	COLUMBIA 710	EUREKA 720	MONTEREY 730	TOTAL
Chinook (no.)	187	938	107	0	1,232
Other salmon (no.)	0	102	4	0	106
TOTAL Salmon (no.)	187	1,040	111	0	1,337
Whiting (mt)	11,780	69,548	17,650	0	98,979
No. salmon/ mt whiting	0.0158	0.0150	0.0063	0	0.0135*
Mt whiting/ no. salmon	63	67	159	0	74

* *Joint venture 10-year average coastwide was 0.109.*

TABLE 4. CATCH BY MOTHERSHIPS AND CATCHER/PROCESSORS (in metric tons)

GROUNDFISH	MOTHERSHIP		CATCHER/ PROCESSOR		TOTAL
	(mt)	(%)	(mt)	(%)	(mt)
Whiting	24,375	25	74,603	75	98,979
Rockfish	204	60	136	40	340
Flatfish	1	50	1	50	2
Other fish	27	40	40	60	67*
TOTAL	24,607	25	74,781	75	99,388
Salmon (number fish)	201	15	1,137	85	1,337

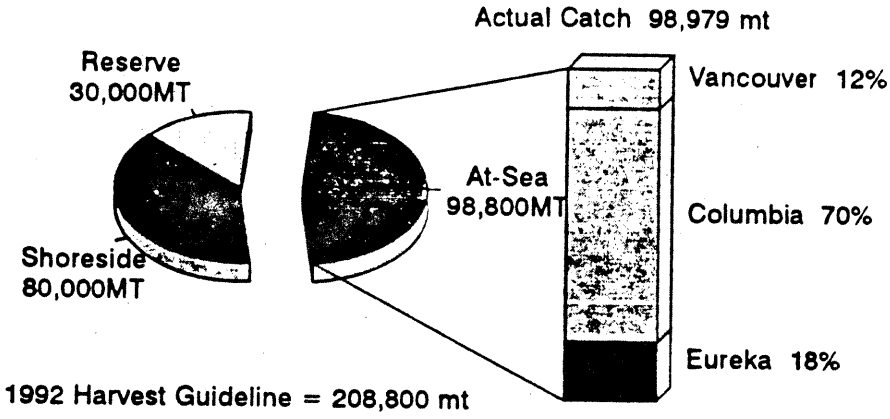
* *Other fish total includes approximately 52 mt sablefish.*

TABLE 5. CATCH OF ROCKFISH BY MOTHERSHIPS AND CATCHER/PROCESSORS (in metric tons)

	MOTHERSHIP	CATCHER/ PROCESSOR	TOTAL
Bocaccio	3	trace	3
Other rockfish	12	11	23
POP	13	8	21
Thornyheads	2	7	9
Canary	trace	trace	trace
Yellowtail	81	57	138
Widow	73	52	125
Chilipepper	0	1	1
Shortbelly	19	trace	20
TOTAL ROCKFISH	204	136	340
Mt whiting	24,375	74,603	98,979
Mt rockfish/ mt whiting	0.0084	0.0018	0.0034*

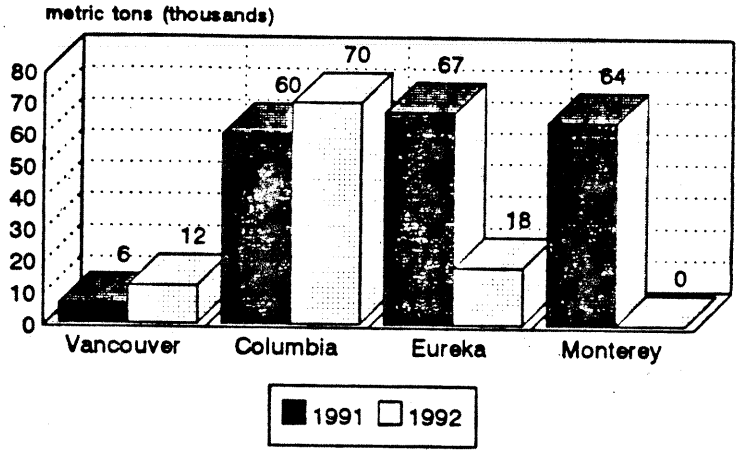
* *Joint venture 11-year average coastwide = 0.007*
Trace means less than 0.5 mt (or 1,102 pounds). There may be slight discrepancies due to rounding.

Pacific Whiting Fishery
1992 Allocation and Catch



Based on 57 FR 19061, April 17, 1992.
At-Sea data through May 5, 1992.

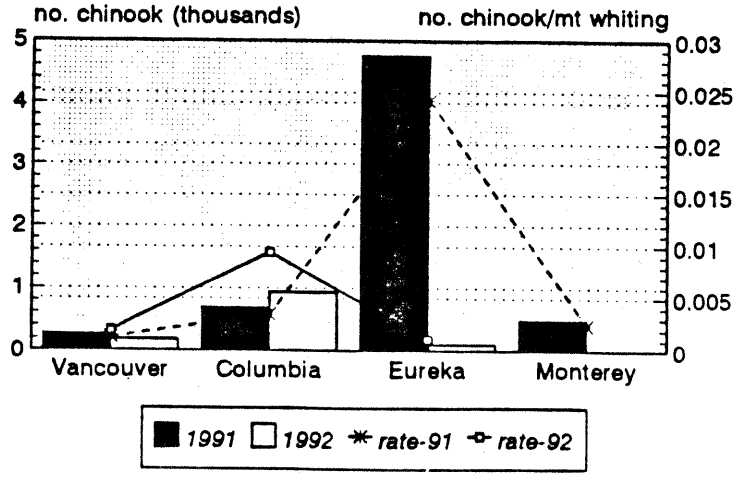
Comparison of 1991-1992 Whiting Fishery
By Area - At-Sea Processing Only



1991 Total = 196,711mt 1992 Total = 98,979mt

Based on preliminary NMFS Observer data.
Compares 1991 and April 15 - May 5, 1992.

Bycatch of Chinook in the 1991-92 Whiting Fishery
Catch and Catch Rate by Area - At-sea processing only.



1991 Total Chinook = 6,165 1992 Total Chinook = 1,232

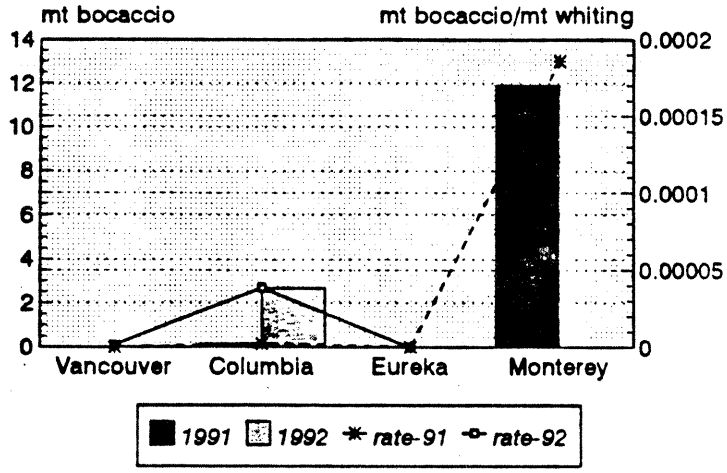
Preliminary data from NMFS Observers.
Compares 1991 and April 15 - May 5, 1992.

BYCATCH IN THE WHITING FISHERY
EXCEEDING 1% ABC or HG
1991 and 1992 At-sea Processing

SPECIES	% ABC or HG 1991	1992
BOCACCIO	1.1	0.3
CHILIPEPPER	14.5	0.01
POP	3.8	1.4
WIDOW	5.2	1.8
YELLOWTAIL	7.0	2.6

Preliminary NMFS Observer data.
Compares 1991 with Apr 15-May 5, 1992.
Percent may be high since may compare coastwide catch to ABC/HG for a smaller area.

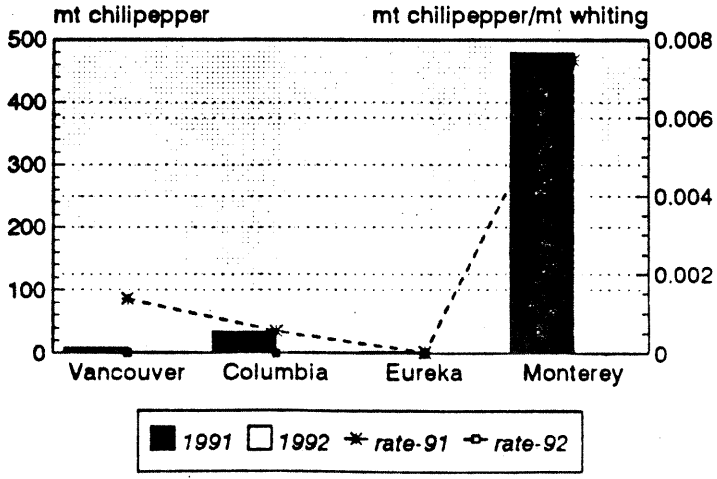
Bycatch of Bocaccio in the 1991-92 Whiting Fishery
Catch and Catch Rate by Area - At-sea processing only.



1991 Total = 12.1mt 1992 Total = 2.7mt

Preliminary data from NMFS Observers.
Compares 1991 and April 15 - May 5, 1992.

Bycatch of Chilipepper in the 1991-92 Whiting Fishery
Catch and Catch Rate by Area - At-sea processing only.

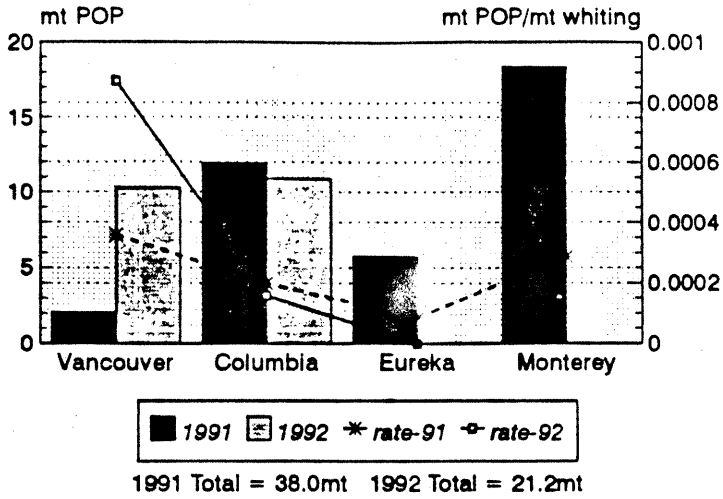


1991 Total = 522.4mt 1992 Total = 0.5mt

Preliminary data from NMFS Observers.
Compares 1991 and April 15 - May 5, 1992.

Bycatch of POP in the 1991-92 Whiting Fishery

Catch and Catch Rate by Area - At-sea processing only.

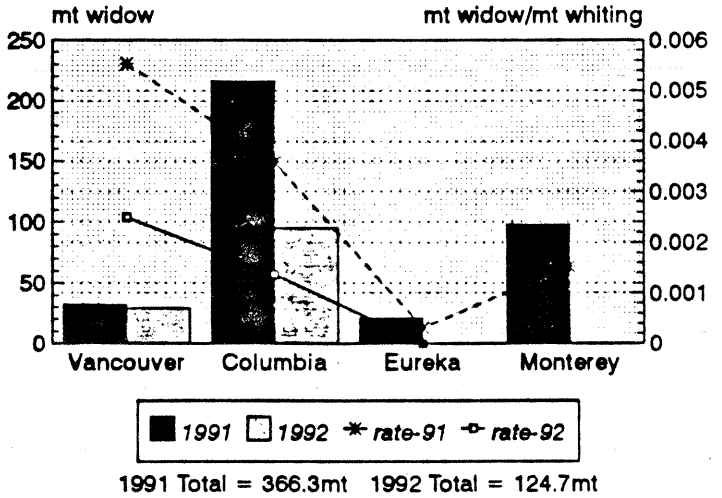


1991 Total = 38.0mt 1992 Total = 21.2mt

Preliminary data from NMFS Observers.
Compares 1991 and April 15 - May 5, 1992.

Bycatch of Widow in the 1991-92 Whiting Fishery

Catch and Catch Rate by Area - At-sea processing only.

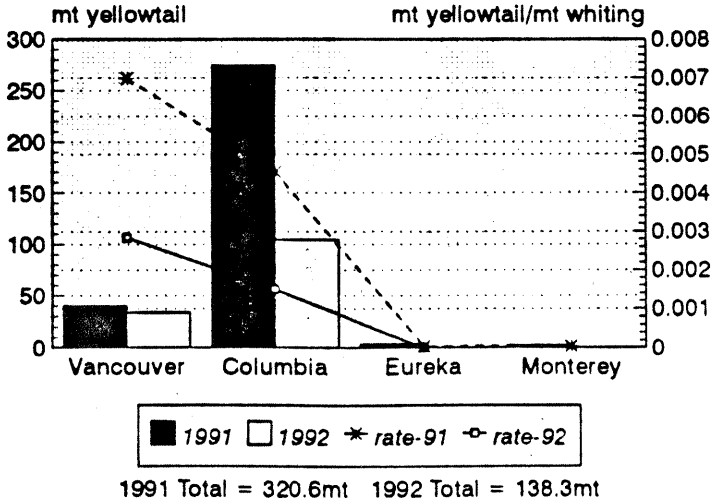


1991 Total = 366.3mt 1992 Total = 124.7mt

Preliminary data from NMFS Observers.
Compares 1991 and April 15 - May 5, 1992.

Bycatch of Yellowtail in the 1991-92 Whiting Fishery

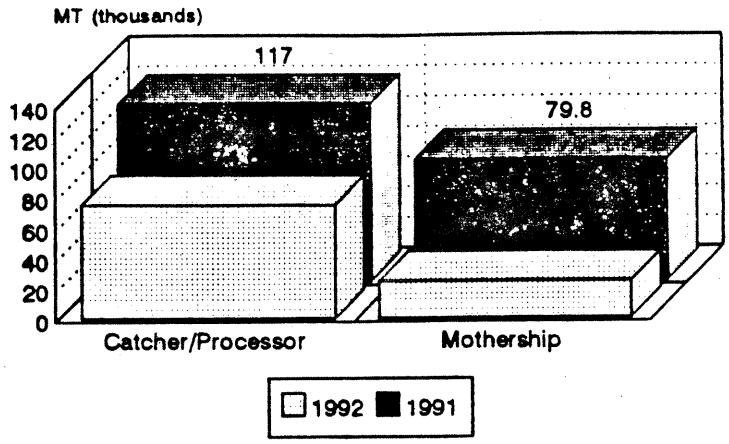
Catch and Catch Rate by Area - At-sea processing only.



1991 Total = 320.6mt 1992 Total = 138.3mt

Preliminary data from NMFS Observers.992.
Compares 1991 and April 15 - May 5, 1992

1991 - 1992 WHITING FISHERY
CATCH BY AT-SEA PROCESSOR TYPE



Reduction from 1991 to 1992: C/P = - 36% M/S = - 69%

Based on preliminary NMFS Observer data.
Compares 1991 and April 15 - May 5, 1992.

CATCH BY PROCESSOR TYPE IN THE WHITING FISHERY
At-Sea Processors Only, April 15 - May 5, 1992

SPECIES	MOTHERSHP amount	%	CATCHER/PROC amount	%	TOTAL amount	%
WHITING (mt)	24,375	25	74,603	75	98,979	100
BOCACCIO (mt)	2.6	96	0.1	4	2.7	100
CHILIPEPPER (mt)	0.0	tr	0.5	100	0.5	100
POP (mt)	13.3	63	7.8	37	21.2	100
YELLOWTAIL (mt)	81.2	59	57.1	41	138.3	100
WIDOW (mt)	73.1	59	51.6	41	124.7	100
ALL SALMON (no.)	201	15	1,137	85	1,337	100
CHINOOK ONLY (no.)	187	15	1,045	85	1,232	100

Based on preliminary NMFS observer data.

Comparison of 1991 and 1992 Pacific whiting at-sea processing operations.

	COMMON NAME	WEIGHT Metric tons (mt)			CATCH RATE	
		1991	Spring 1992	Difference	1991	Spring 199
ROUND	Pacific whiting	196,770.628	98,978.910	-97,791.718	1.0000	1.000
	Pacific cod	0.338	0.058	-0.280	0.0000	0.000
	Lingcod	0.442	0.379	-0.063	0.0000	0.000
	Jack mackerel	228.714	3.109	-225.605	0.0012	0.000
	Sablefish	27.484	51.735	24.251	0.0001	0.000
FLATFISH	Arrowtooth flounder	0.256	1.422	1.166	0.0000	0.000
	Dover sole	0.034	0.009	-0.025	0.0000	0.000
	English sole	0.001	0.002	0.001	0.0000	0.000
	Petrale sole	0	0	0.000	0.0000	0.000
	Rex sole	0.312	0.972	0.660	0.0000	0.000
	Rock sole	0	0	0.000	0.0000	0.000
	Starry flounder	0	0	0.000	0.0000	0.000
	All other flatfish spp (except halibut)	0.832	0	-0.832	0.0000	0.000
ROCKFISH	Bocaccio	12.072	2.712	-9.360	0.0001	0.000
	Canary rockfish	5.055	0.341	-4.714	0.0000	0.000
	Chilipepper rockfish	522.438	0.511	-521.927	0.0027	0.000
	Pacific ocean perch	38.046	21.187	-16.859	0.0002	0.000
	Shortbelly rockfish	6.934	19.638	12.704	0.0000	0.000
	Thornyhead	0.560	9.356	8.796	0.0000	0.000
	Widow rockfish	366.326	124.698	-241.628	0.0019	0.001
	Yellowtail rockfish	320.556	138.311	-182.245	0.0016	0.001
	All other rockfish spp	256.399	22.905	-233.494	0.0013	0.000
All other groundfish*		261.349	11.639	-249.710	0.0013	0.000
TOTAL GROUNDFISH		200,809.776	101,379.894	-99,429.882	n/a	n/a
NON	Pacific mackerel **	0.001	40.243	40.242	0.0000	0.000
	Pacific sardine **	0	1.373	1.373	0.0000	0.000

PROHIBITED SPECIES	Number of fish incidentally caught			Catch Rate (No. fish/mt whiting	
	1991	Spring 1992	Difference	1991	Spring 19
Chinook Salmon	6,165	1,232	-4,933	0.03113	0.012
Other Salmon	165	105	-60	0.00083	0.001
TOTAL SALMON	6,330	1,337	-4,993	0.03217	0.013
Pacific Halibut	29	9	-20	0.00015	0.000

In the 1991 at-sea whiting fishery, chinook salmon comprise 97.4% of all incidentally caught salmon.
In the spring 1992 at-sea whiting fishery, chinook salmon comprise 92.1% of all incidentally caught salmon.

* Defined as sharks, skates, kelp greenling, cabezon, ratfish, morids, and grenadiers.
** Defined as non-groundfish species that are incidental to the whiting fishery.

Appendix B. "Patterns of Bycatch in the Pacific Whiting Fishery" and "A Spatial analysis of Salmon Bycatch in the Pacific Whiting Fishery 1980-1991", Methot and Dorn, March 9, 1992.

PATTERNS OF BYCATCH IN THE PACIFIC WHITING FISHERY

RICHARD METHOT and MARTIN DORN
ALASKA FISHERIES SCIENCE CENTER
MARCH 9, 1992

1. **SEASON COMPRESSION:** Season has compressed from a May-October fishery in 1986, to a April-June fishery in 1989 and 1990. In 1990, 59% of the annual total was caught by the end of May. In 1991, 70% (147,700 mt: shoreside and at-sea) of the annual total was caught by the end of May. In 1990, catch in the Eureka area had approximately 25% age 10 fish, 40% age 6 and 35% age 3, so an early, southern fishery will not necessarily impact only young fish.

2. **SALMON BYCATCH:** Salmon bycatch in recent years has ranged from 9,200 fish in 1989 to (27),000 fish in 1986. The bycatch rate has been greater in waters shallower than 100 fathoms. The JV fishery had a higher rate than the foreign fishery, presumably because the foreign fishery operated outside 12 miles.

3. **SALMON COMPOSITION:** The salmon bycatch is composed primarily of chinook (82% chinook in 1988 to 98% chinook in 1989 and 1990). Sockeye are not encountered. The mean size of chinook is typically about 55 cm, but the mean size tended to be smaller in years with higher bycatch rates.

4. **ROCKFISH BYCATCH:** During 1986-1990, rockfish bycatch has ranged from 429 mt in 1989 to 998 mt in 1986. The most common rockfish species is yellowtail rockfish, which is caught mostly north of Cape Lookout, with a secondary concentration near Hecate Bank off central Oregon. Widow rockfish is the second most common species. Its bycatch is distributed over a broader range of the coast.

5. **PATCHY DISTRIBUTION:** High bycatch occurs infrequently: 1.5% of the tows account for 50% of the yellowtail rockfish and 0.5% of the tows account for 50% of the widow rockfish.

6. **ROCKFISH BYCATCH IN 1991:** In 1991 the total rockfish catch increased to 1688 mt. Because of a southward displacement of the hake fishery in 1991, the bycatch of yellowtail rockfish was relatively low, but the bycatch of widow rockfish increased and bycatch of chilipepper increased to over 500 mt. Most chilipepper were caught close to Cordell Bank.

7. **ROCKFISH DIEL PATTERNS:** The extreme variability in rockfish bycatch causes difficulty in interpreting diel patterns in the data. There was a tendency for chilipepper bycatch to be greatest during midday, widow to be greatest in late evening, and yellowtail did not have an obvious pattern. These data have not been subjected to a statistical analysis, but seems obvious that area is more important than time of day in predicting rockfish bycatch.

Figures and Tables

HAKE (MT)

YEAR	AREA	OP	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	TOTAL
86	VAN	FOR									0
86	COL	FOR			1972	2382	12973	12124	11701	377	41529
86	EUR	FOR			8344	14433	5555				28332
86	MON	FOR									0
86	ALL	FOR	0	0	10316	16815	18528	12124	11701	377	69861
86	VAN	JV			3581	3616	2543	1606			11346
86	COL	JV	359	11931	16276	10253	17840	6686	3554	115	67014
86	EUR	JV			181	2803	181				3165
86	MON	JV					92				92
86	ALL	JV	359	11931	20038	16672	20656	8292	3554	115	81617
87	VAN	FOR									0
87	COL	FOR			1505	5071	9471	10145	23319		49511
87	EUR	FOR			12	128	4				144
87	MON	FOR									0
87	ALL	FOR	0	0	1517	5199	9475	10145	23319	0	49655
87	VAN	JV		128	3677	2209	799	146	15		6974
87	COL	JV	302	13344	17935	19695	33169	10855	3693		98993
87	EUR	JV									0
87	MON	JV									0
87	ALL	JV	302	13472	21612	21904	33968	11001	3708	0	105967
88	VAN	FOR									0
88	COL	FOR			874	1422	0	1631	12308	627	16862
88	EUR	FOR				1179					1179
88	MON	FOR									0
88	ALL	FOR	0	0	874	2601	0	1631	12308	627	18041
88	VAN	JV		579	3626	427	5745	1277	829		12483
88	COL	JV	3595	12844	15886	22887	20364	19765	2114		97455
88	EUR	JV				20476	4236	410			25122
88	MON	JV				722					722
88	ALL	JV	3595	13423	19512	44512	30345	21452	2943	0	135782
89	VAN	JV									0
89	COL	JV	4907	53991	33877	1061					93836
89	EUR	JV	19307	34860	44311	1516					99994
89	MON	JV	11	349	1394	50					1804
89	ALL	JV	24225	89200	79582	2627	0	0	0	0	195634
90	VAN	JV	1664	4215	0	0	509	85			6473
90	COL	JV	14456	42594	31443	122	5090	5896	1631		101232
90	EUR	JV	8793	30840	21803						61436
90	MON	JV	1830								1830
90	ALL	JV	26743	77649	53246	122	5599	5981	1631	0	170971

SALMON NUMBERS

YEAR	AREA	OP	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	TOTAL
86	VAN	FOR									0
86	COL	FOR			179	942	704	3786	2735		8346
86	EUR	FOR			45	1103	684				1832
86	MON	FOR									0
86	ALL	FOR	0	0	224	2045	1388	3786	2735	0	10178
86	VAN	JV			754	2339	1313	514	0		4920
86	COL	JV	52	1885	1834	10096	2166	1683	1310		19026
86	EUR	JV			0	3035	0				3035
86	MON	JV					18				18
86	ALL	JV	52	1885	2588	15470	3497	2197	1310	0	26999
87	VAN	FOR									0
87	COL	FOR			82	485	291	741	3050		4649
87	EUR	FOR									0
87	MON	FOR									0
87	ALL	FOR	0	0	82	485	291	741	3050	0	4649
87	VAN	JV			284	706	409				1399
87	COL	JV	2	1211	1305	2201	1536	696	286		7237
87	EUR	JV									0
87	MON	JV									0
87	ALL	JV	2	1211	1589	2907	1945	696	286	0	8636
88	VAN	FOR									0
88	COL	FOR			17	136	0	173	1797		2123
88	EUR	FOR				62					62
88	MON	FOR									0
88	ALL	FOR	0	0	17	198	0	173	1797	0	2185
88	VAN	JV		20	107	0	2762	57	23		2969
88	COL	JV	373	764	803	1055	4402	869	64		8330
88	EUR	JV				2271	411				2682
88	MON	JV				2					2
88	ALL	JV	373	784	910	3328	7575	926	87	0	13983
89	VAN	JV		5	30						35
89	COL	JV	169	4049	1246						5464
89	EUR	JV	253	1590	1783						3626
89	MON	JV		19	55						74
89	ALL	JV	422	5663	3114	0	0	0	0	0	9199
90	VAN	JV		325	0	1					326
90	COL	JV	205	1590	1060	0	13	77	0		2945
90	EUR	JV	190	1593	4212						5995
90	MON	JV	42								42
90	ALL	JV	437	3508	5272	1	13	77	0	0	9308

SALMON/MT

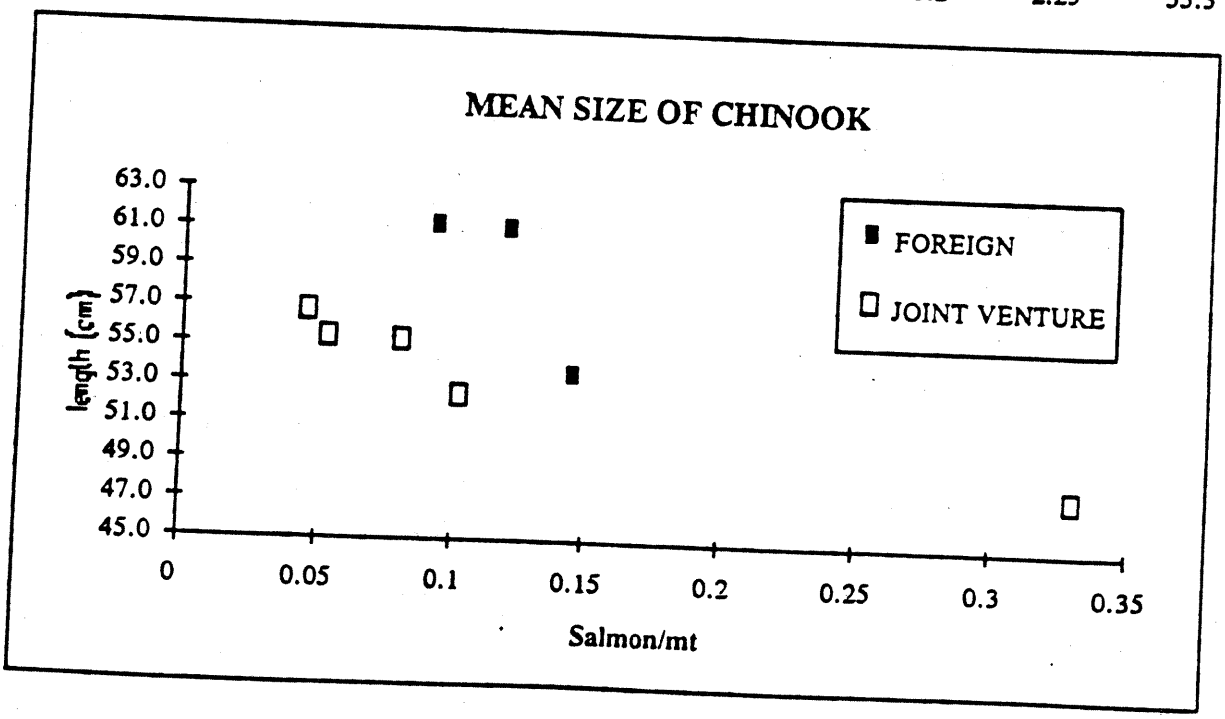
YEAR	AREA	OP	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	TOTAL
86	VAN	FOR									
86	COL	FOR			0.091	0.395	0.054	0.312	0.234	0.000	0.201
86	EUR	FOR			0.005	0.076	0.123				0.065
86	MON	FOR									
86	ALL	FOR			0.022	0.122	0.075	0.312	0.234	0.000	0.146
86	VAN	JV			0.211	0.647	0.516	0.320			0.434
86	COL	JV	0.145	0.158	0.113	0.985	0.121	0.252	0.369	0.000	0.284
86	EUR	JV			0.000	1.083	0.000				0.959
86	MON	JV					0.196				0.196
86	ALL	JV	0.145	0.158	0.129	0.928	0.169	0.265	0.369	0.000	0.331
87	VAN	FOR									
87	COL	FOR			0.054	0.096	0.031	0.073	0.131		0.094
87	EUR	FOR			0.000	0.000	0.000				0.000
87	MON	FOR									
87	ALL	FOR			0.054	0.093	0.031	0.073	0.131		0.094
87											
87	VAN	JV		0.000	0.077	0.320	0.512	0.000	0.000		0.201
87	COL	JV	0.007	0.091	0.073	0.112	0.046	0.064	0.077		0.073
87	EUR	JV									
87	MON	JV									
87	ALL	JV	0.007	0.090	0.074	0.133	0.057	0.063	0.077		0.081
88	VAN	FOR									
88	COL	FOR			0.019	0.096		0.106	0.146	0.000	0.126
88	EUR	FOR				0.053					0.053
88	MON	FOR									
88	ALL	FOR			0.019	0.076		0.106	0.146	0.000	0.121
88											
88	VAN	JV		0.035	0.030	0.000	0.481	0.045	0.028		0.238
88	COL	JV	0.104	0.059	0.051	0.046	0.216	0.044	0.030		0.085
88	EUR	JV				0.111	0.097	0.000			0.107
88	MON	JV				0.003					0.003
88	ALL	JV	0.104	0.058	0.047	0.075	0.250	0.043	0.030		0.103
89	VAN	JV									
89	COL	JV	0.034	0.075	0.037	0.000					0.058
89	EUR	JV	0.013	0.046	0.040	0.000					0.036
89	MON	JV	0.000	0.054	0.039	0.000					0.041
89	ALL	JV	0.017	0.063	0.039	0.000					0.047
90	VAN	JV	0.000	0.077			0.000	0.000			0.050
90	COL	JV	0.014	0.037	0.034	0.000	0.003	0.013	0.000		0.029
90	EUR	JV	0.022	0.052	0.193						0.098
90	MON	JV	0.023								0.023
90	ALL	JV	0.016	0.045	0.099	0.008	0.002	0.013	0.000		0.054

FOREIGN

YEAR	RATE	%CHNK	WEIGHT	LENGTH
86	0.146	75.9	2.28	53.5
87	0.094	90.1	3.27	61.1
88	0.121	89.4	3.22	61.0
89				
90				

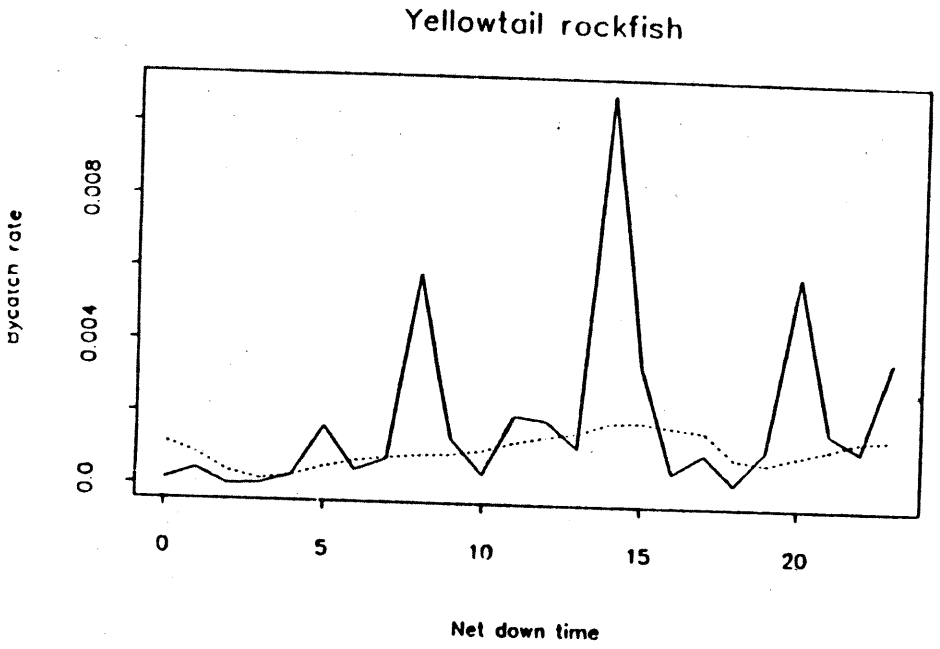
JOINT VENTURE

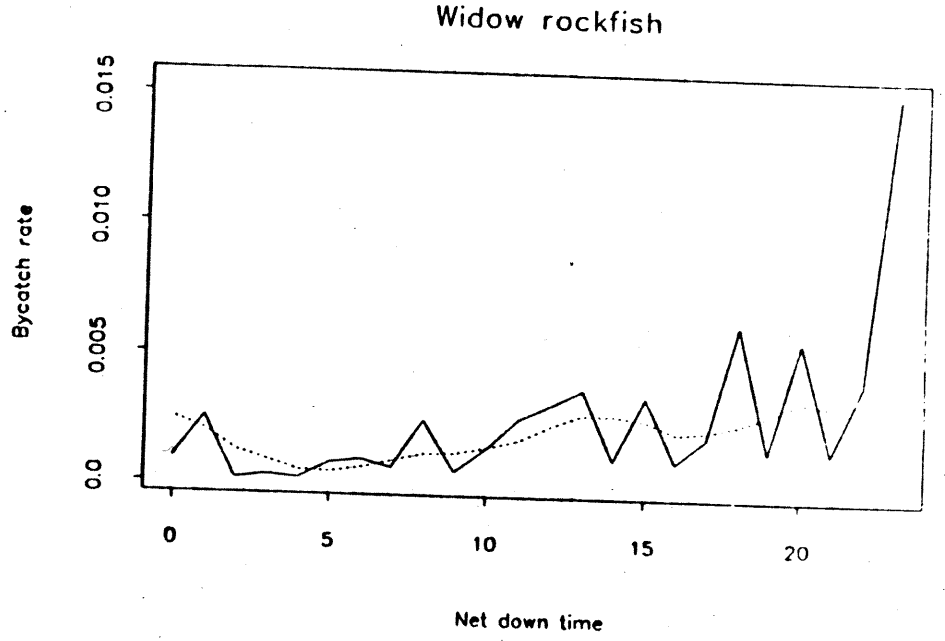
RATE	%CHNK	WEIGHT	LENGTH
0.331	94.1	1.56	47.7
0.081	92.4	2.32	55.1
0.103	81.6	2.16	52.4
0.047	98.3	2.67	56.6
0.054	98.2	2.23	55.3

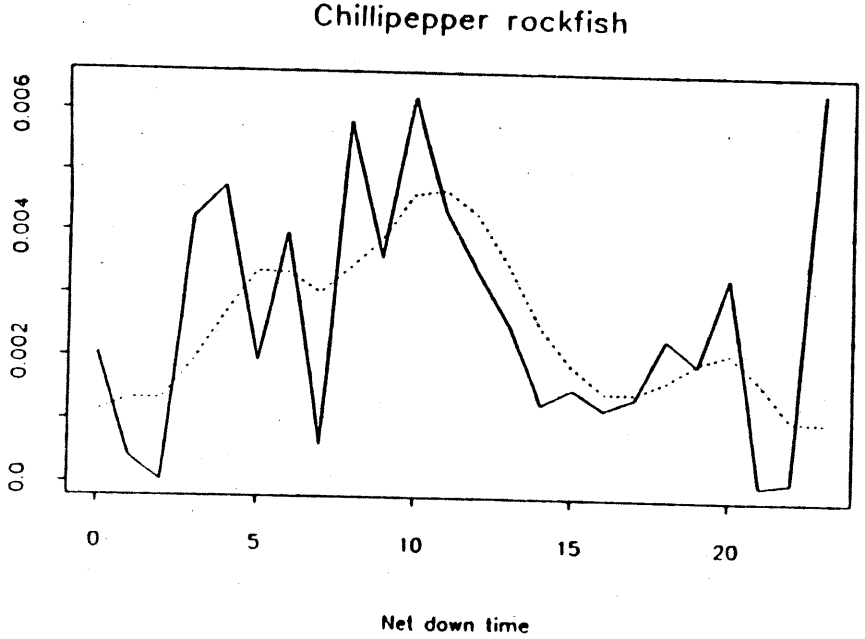


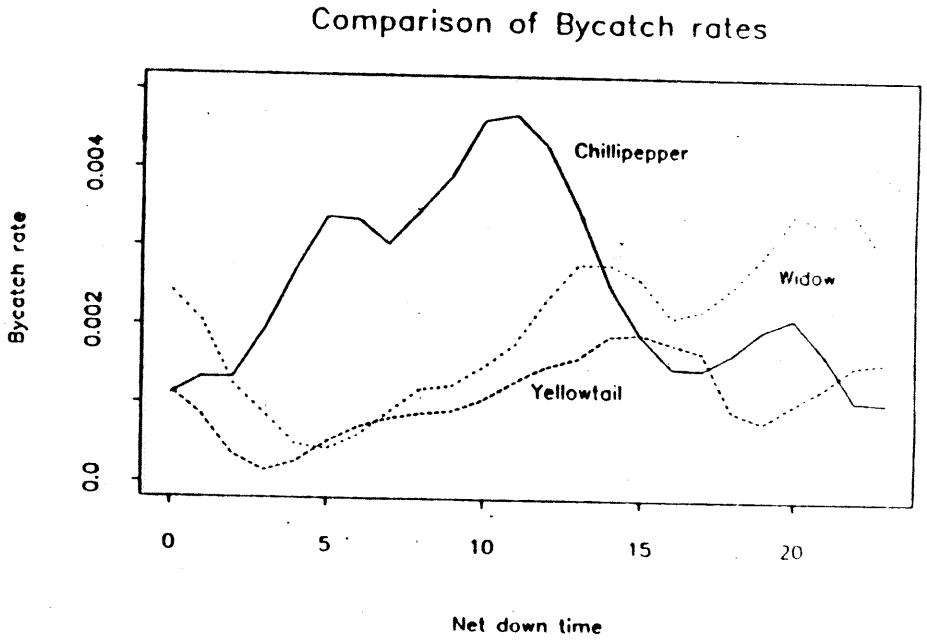
ROCKFISH BYCATCH IN OFFSHORE WHITING FISHERY

Year	Source	Retain	Discard	Total	Other	Bocaccio	Chili	P.O.P.	Shortbelly	Widow	Yellowtail	Sum
1986	foreign	195		195	22	1	0	1	20	71	80	173
	J.V.	165	628	793	65	4	2	20	2	194	508	728
1987	foreign	222		222	46	3	1	3	9	78	81	176
	J.V.	76	570	646	32	2	0	3	14	110	484	614
1988	foreign	152		152	59	1	0	2	9	61	19	93
	J.V.	122	539	661	44	2	2	2	10	167	436	617
1989	J.V.	170	259	429	8	1	4	3	4	228	181	420
1990	J.V.	268	409	677	28	1	48	1	40	258	299	648
1991	retain	386		1688	68	0	63	23	0	150	82	319
	discard		1301		221	18	459	34	7	263	300	1081


Yellowtail rockfish
Bycatch rate
0.0
0.004
0.008
0
5
10
15
20
Net down time


Widow rockfish
Bycatch rate
0.0
0.005
0.010
0.015
0
5
10
15
20
Net down time


Chillipepper rockfish
0.0
0.002
0.004
0.006
0
5
10
15
20
Net down time


Comparison of Bycatch rates
Bycatch rate
0.0
0.002
0.004
Chillipepper
Widow
Yellowtail
0
5
10
15
20
Net down time

A spatial analysis of salmon bycatch in the Pacific whiting fishery 1980-1991

The data presented in the attached table and figures are from the observer data base for the Pacific whiting fishery from 1980 to 1991. The unit of analysis is the catch of all species of salmon in numbers per tow. Both tows made by foreign vessels and tows by joint venture boats were grouped together for this analysis. The distributional characteristics of salmon bycatch are presented in Table 1. In a typical year, 50% of the total bycatch comes from approximately 2% of the total number of tows. These high bycatch tows are tows with greater than about 20 salmon, though there is much variation from year to year. Salmon are present in approximately 27 percent of all tows. In recent years (1988-91), salmon have been present in 16 percent of all tows. Changes in salmon bycatch may be associated with 1) changes in fishing operations (location, depth, time of day, etc.), 2) changes in salmon abundance, 3) luck (i.e. stochastic variability). This analysis addresses only the first and, indirectly, the third of these possible factors.

To identify high bycatch regions, all the sampled tows for a year were ranked by salmon bycatch. Tows where salmon were present and tows that accounted for 50% of the total salmon bycatch for a given year were plotted with a offset on a figure showing the position of all tows for that year. The figures show the coast, the 200 meter depth contour (roughly corresponding to 100 fathoms), and the boundaries between the INPFC regions. A figure was prepared for each year from 1980 to 1991. The first panel shows the location of all sampled tows. The next panel shows the location of all those tows where salmon were caught, and the final panel shows the location of those tows where 50% of the total salmon bycatch occurred.

Tows with high salmon bycatch can occur throughout the historical fishing grounds of Pacific whiting. Our analysis did find several locations where high salmon bycatch occurred fairly predictably over the period 1980-91. The first of these areas generally corresponds to the Eureka INPFC region. Although this area was not fished every year, when fishing did take place there, tows with high salmon bycatch occurred. The salmon bycatch is not uniformly high throughout the Eureka region. The southern part of the Eureka region, from 42^{0} N to Cape Mendocino, tended to record the highest salmon bycatch. In 1991, the tows south of Cape Mendocino tended to have low salmon bycatch, indicating that the southern limit of the high bycatch area is approximately at Cape Mendocino.

The other pattern that was fairly regular was a tendency for the salmon bycatch to decrease as the depth increases. This pattern suggests that there is a greater habitat overlap between salmon and Pacific whiting in the shallow water. One factor that may help account for this pattern would be that in shallow water the midwater schools of Pacific whiting would tend to be closer to the bottom.

Tows with high salmon bycatch also occurred irregularly from the Columbia River mouth north to Cape Flattery. No particular location in this large area regularly produced tows with high bycatch. Fishing for Pacific whiting in this area tends to occur on the shelf in shallower water than is typically fished further south. The higher salmon bycatch in this area may simply be due to the shallower mean depth of fishing in this area.

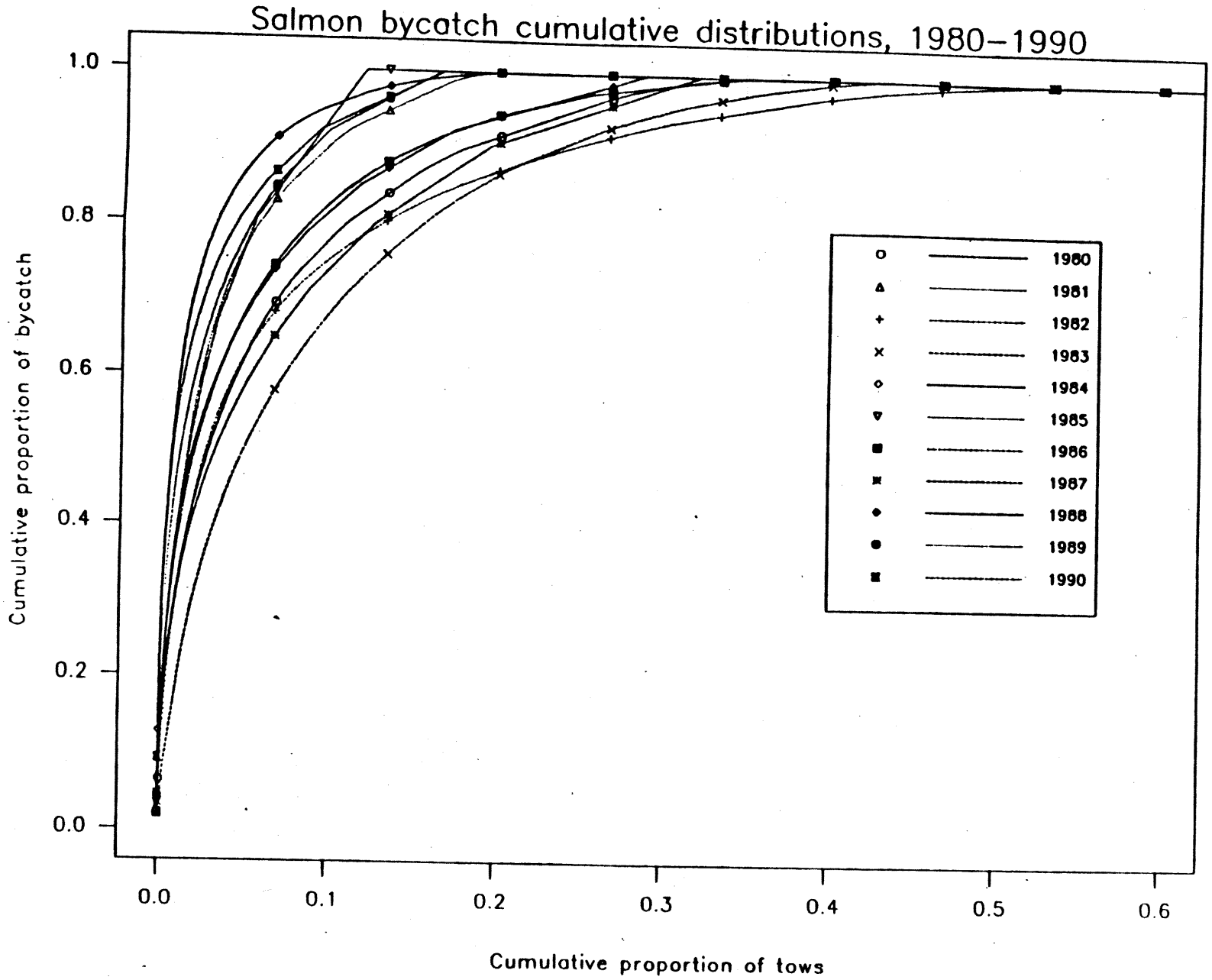
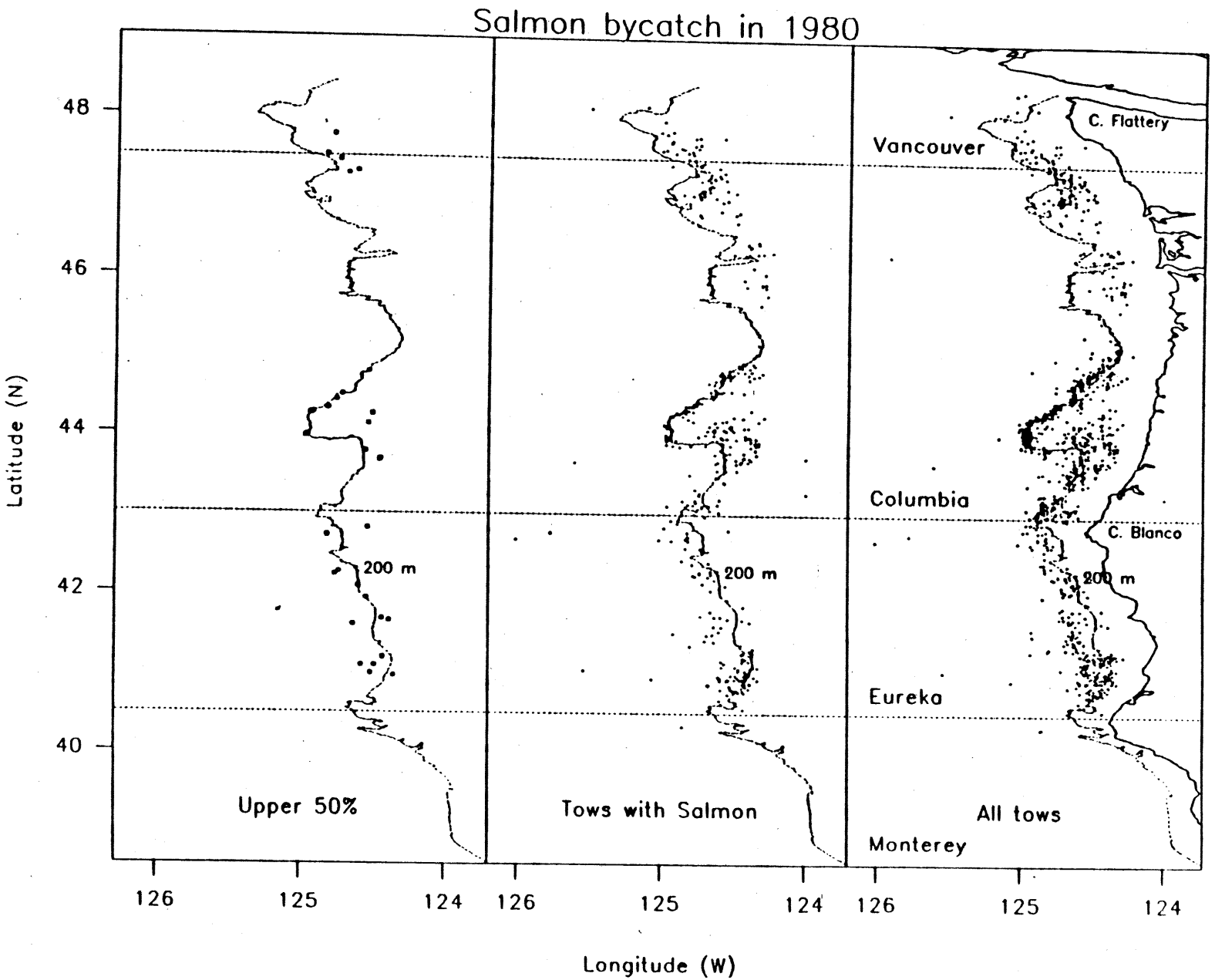
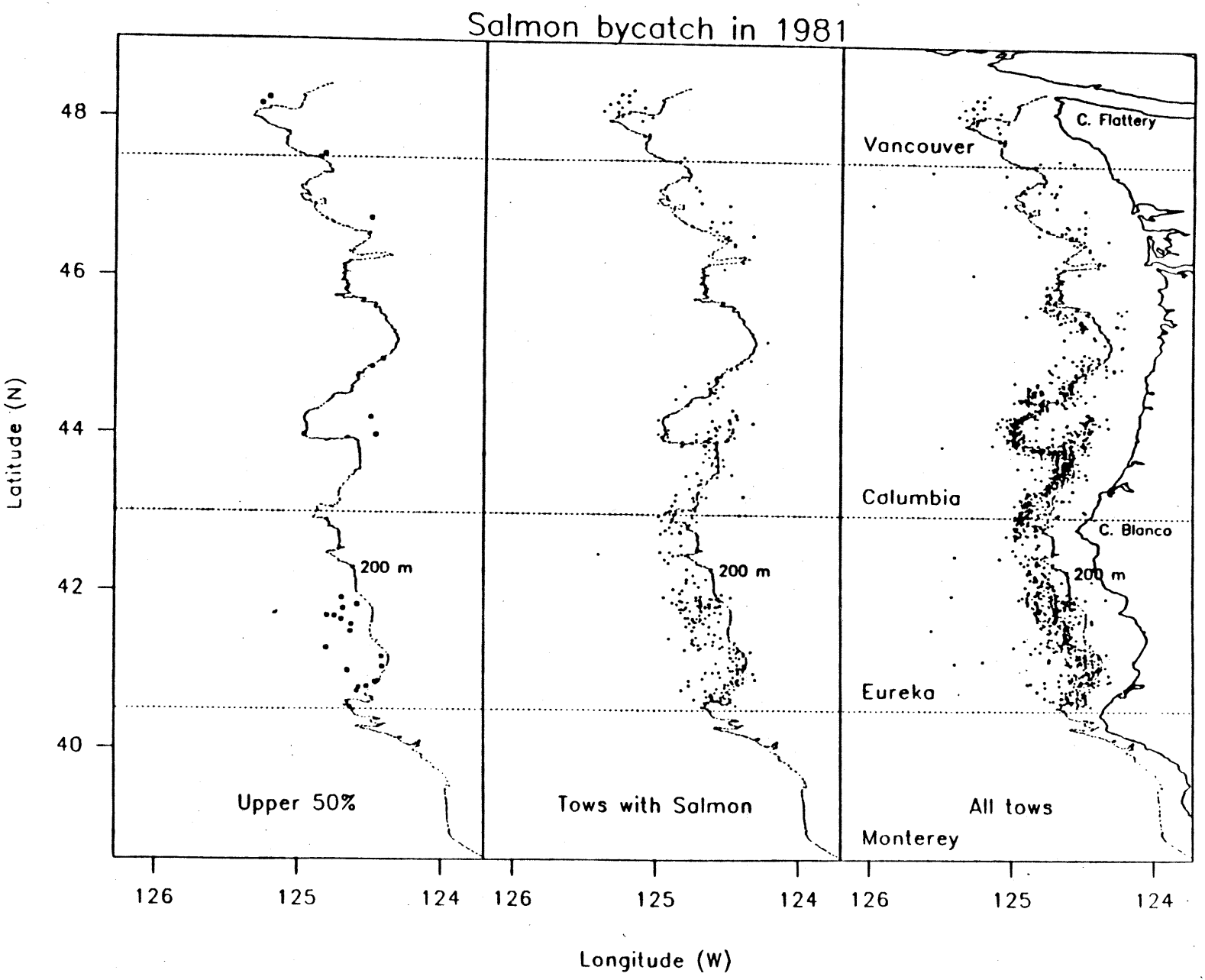

Salmon bycatch cumulative distributions, 1980–1990
Cumulative proportion of bycatch
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Cumulative proportion of tows
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990

Table 1. Distributional characteristics of salmon bycatch (all species including steelhead trout) in the Pacific whiting fishery, 1980-91. Salmon bycatch is defined as the catch of all species of salmon in numbers per tow.

Year	50% of total bycatch		Presence/Absence
	Tows with bycatch greater than (nos)	Percent of all tows	Percent of tows with at least one salmon
1980	9.8	2.89	35.0
1981	14.4	1.66	19.8
1982	20.5	2.74	53.4
1983	5.3	5.04	42.9
1984	31.0	0.74	20.2
1985	5.0	1.73	12.0
1986	34.0	2.07	35.0
1987	8.0	3.29	32.1
1988	14.0	1.93	28.8
1989	12.0	1.22	16.5
1990	20.0	0.76	16.6
1991	59.0	0.58	16.0


Salmon bycatch in 1980
48
46
44
42
40
Latitude (N)
Vancouver
C. Flattery
Columbia
C. Blanco
Eureka
Monterey
200 m
200 m
200 m
Upper 50%
Tows with Salmon
All tows
126
125
124
126
125
124
126
125
124
Longitude (W)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48
46
44
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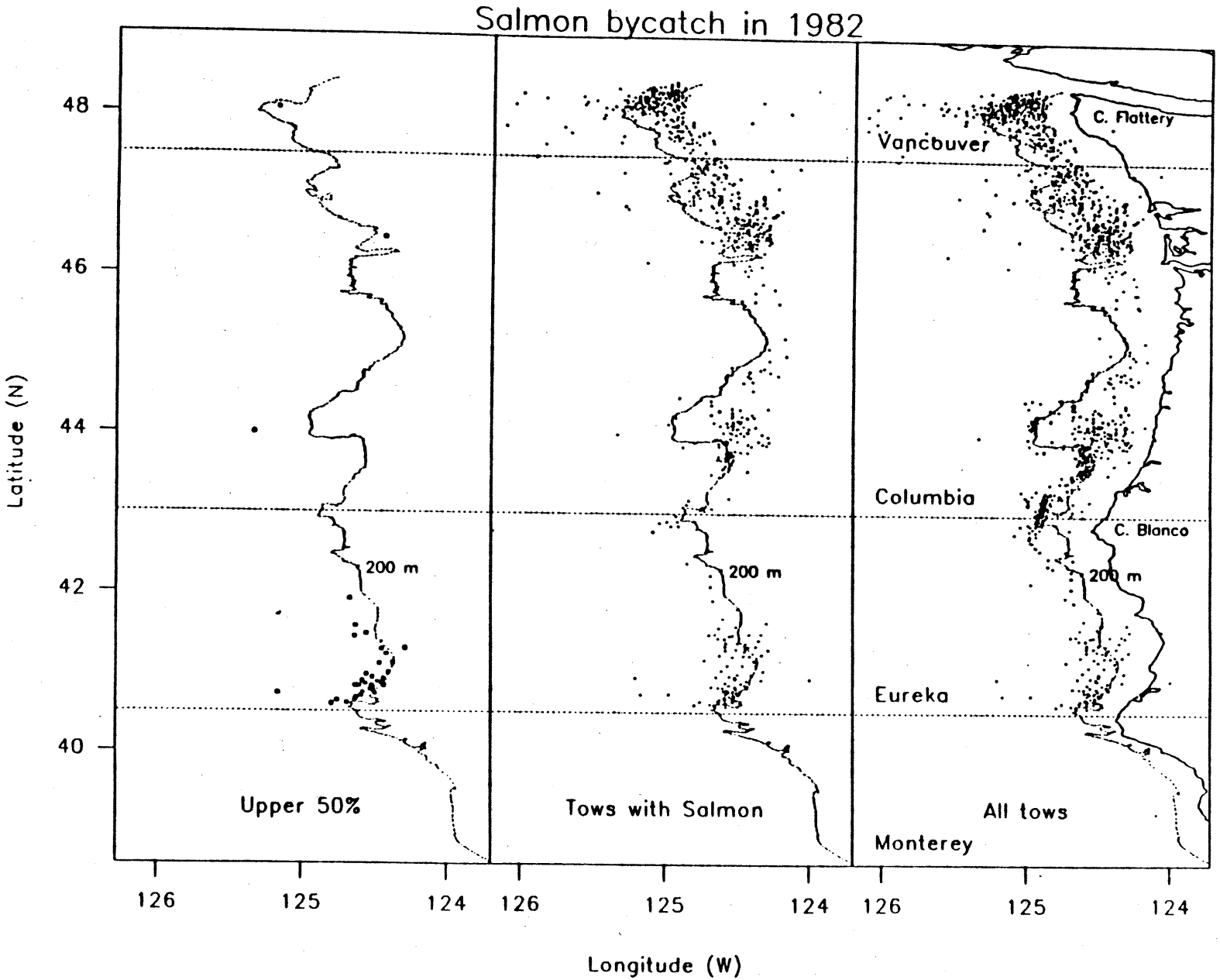
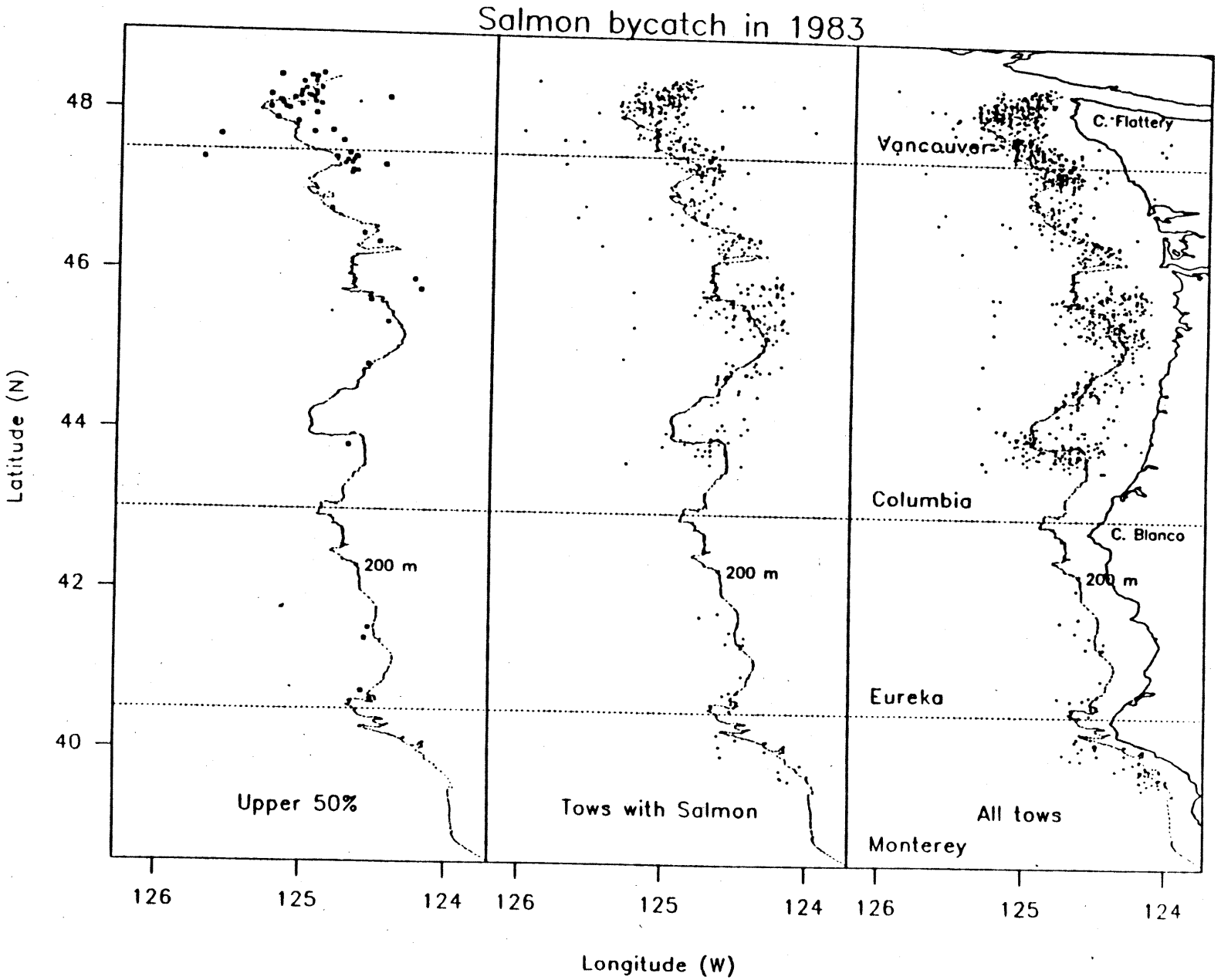
Latitude (N)
Vancouver
C. Flattery
Columbia
C. Blanco
Eureka
Monterey
200 m
200 m
200 m
Upper 50%
Tows with Salmon
All tows
126
125
124
126
125
124
126
125
124
Longitude (W)


Salmon bycatch in 1982
48
46
44
42
40
Latitude (N)
Vancouver
C. Flattery
Columbia
C. Blanco
Eureka
Monterey
200 m
200 m
200 m
Upper 50%
Tows with Salmon
All tows
126
125
124
126
125
124
126
125
124
Longitude (W)


Salmon bycatch in 1983
48
46
44
42
40
Latitude (N)
200 m
200 m
200 m
Upper 50%
Tows with Salmon
All tows
Vancouver
C. Flattery
Columbia
C. Blanco
Eureka
Monterey
126
125
124
126
125
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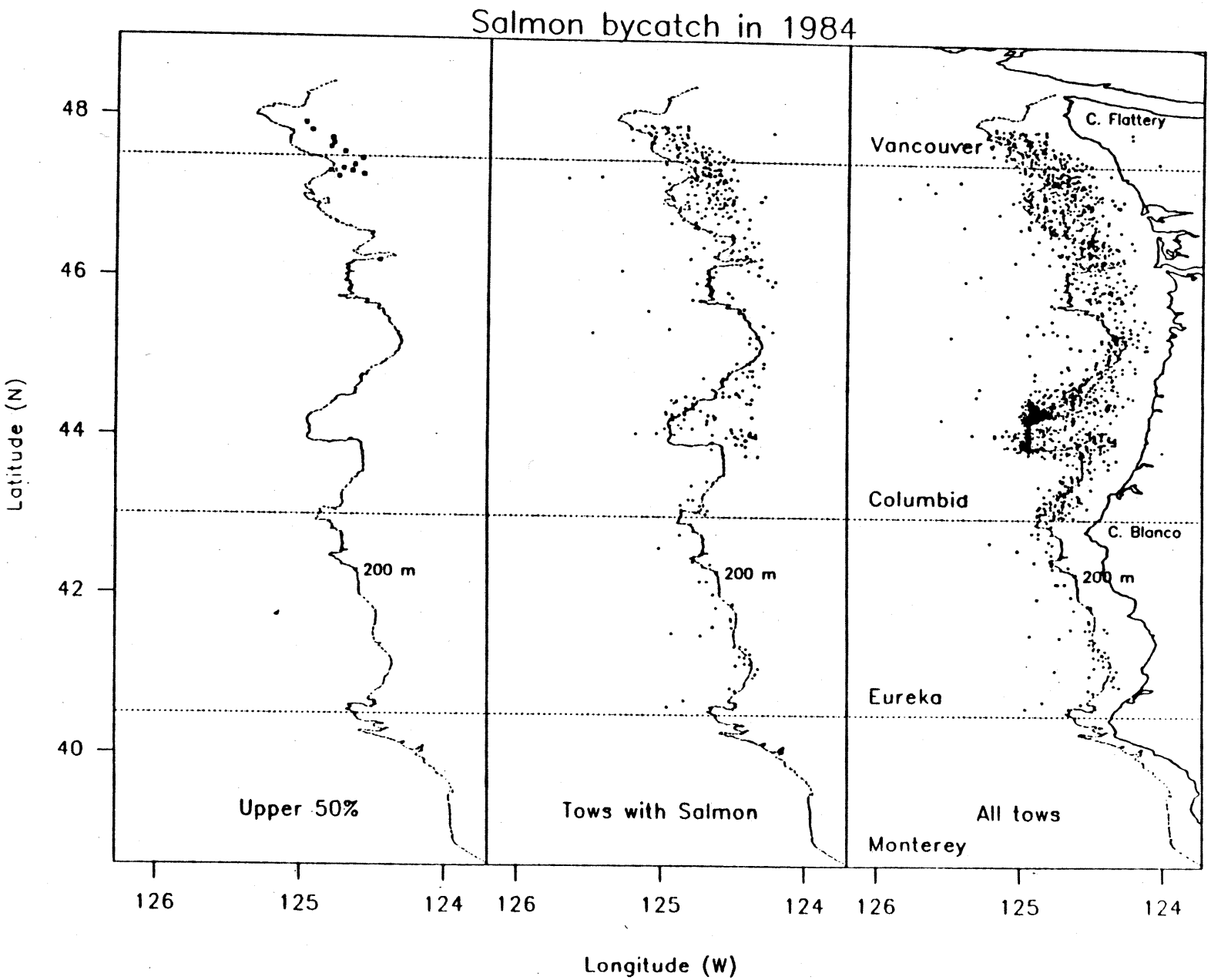
126
125
124
Longitude (W)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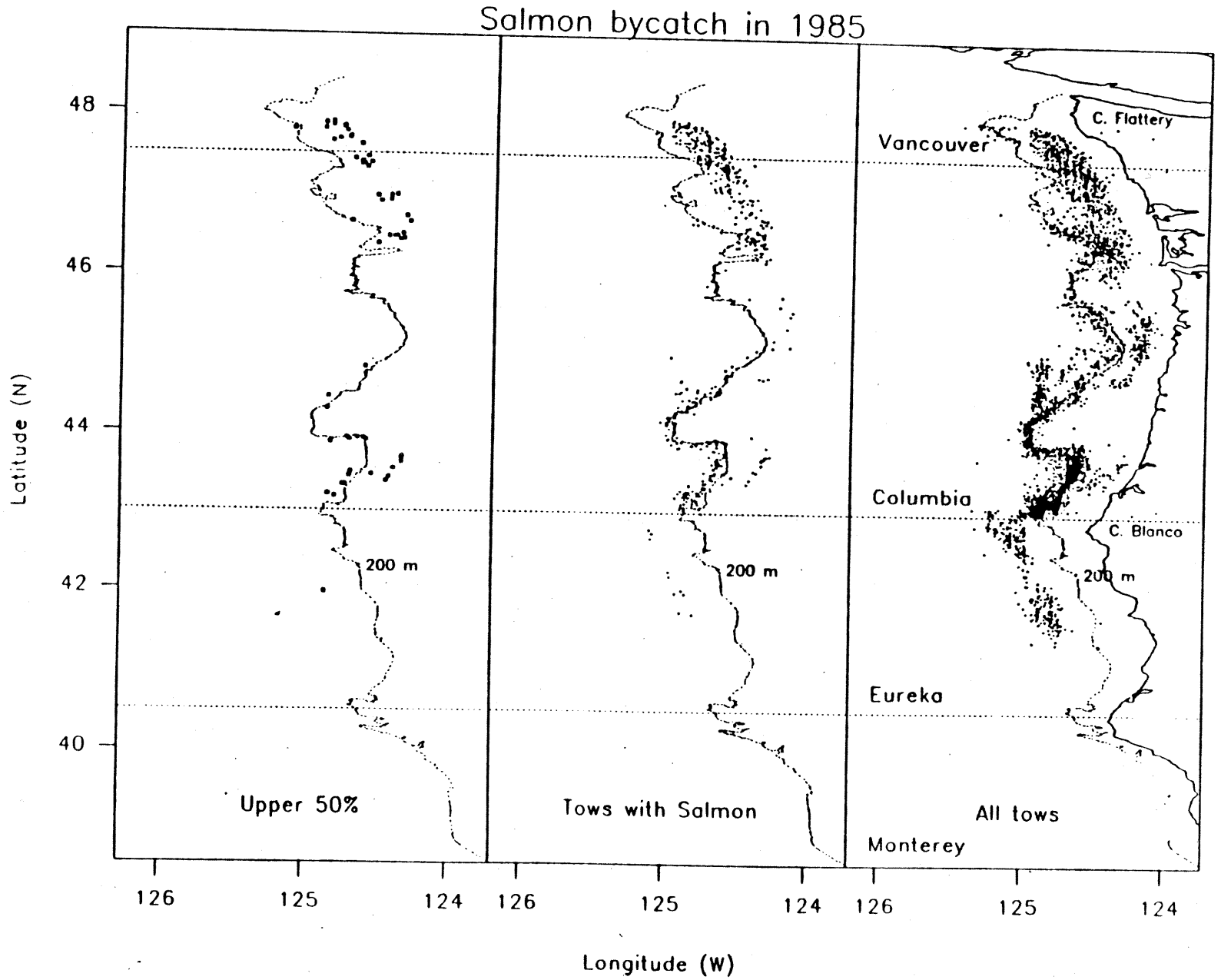
126
125
124
Longitude (W)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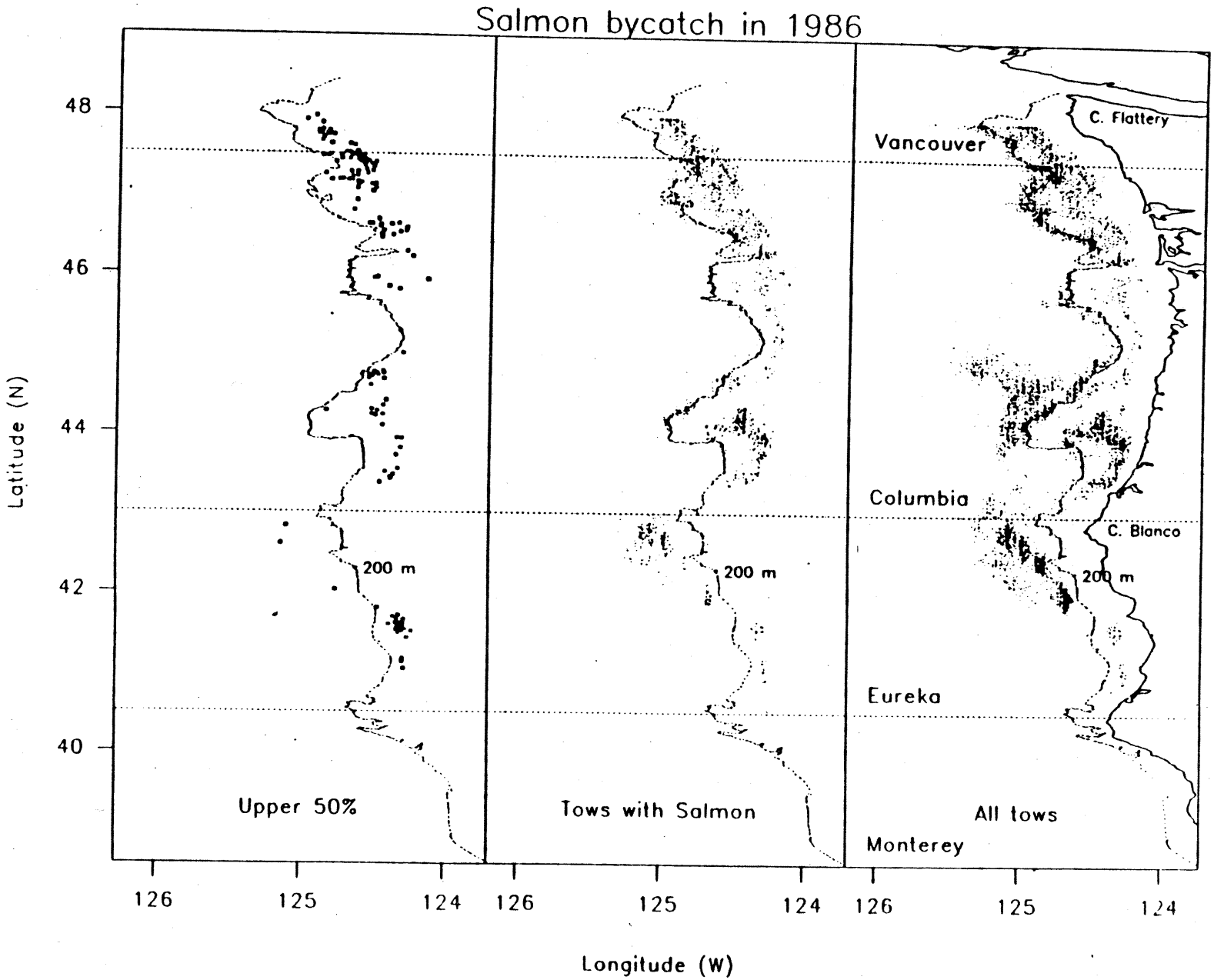
125
124
126
125
124
Longitude (W)


Salmon bycatch in 1986
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44
42
40
Latitude (N)
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C. Blanco
Eureka
Monterey
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Upper 50%
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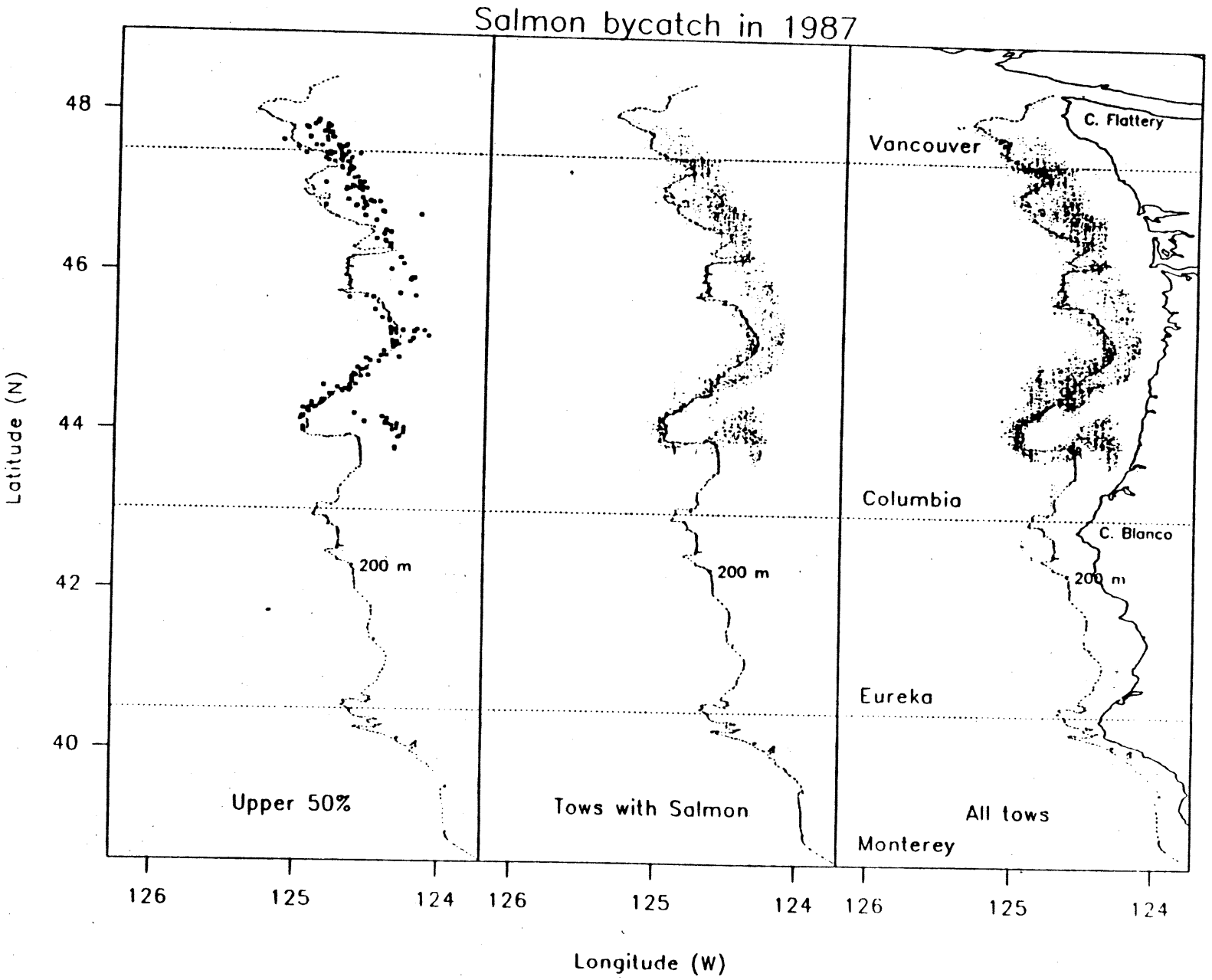
126
125
124
Longitude (W)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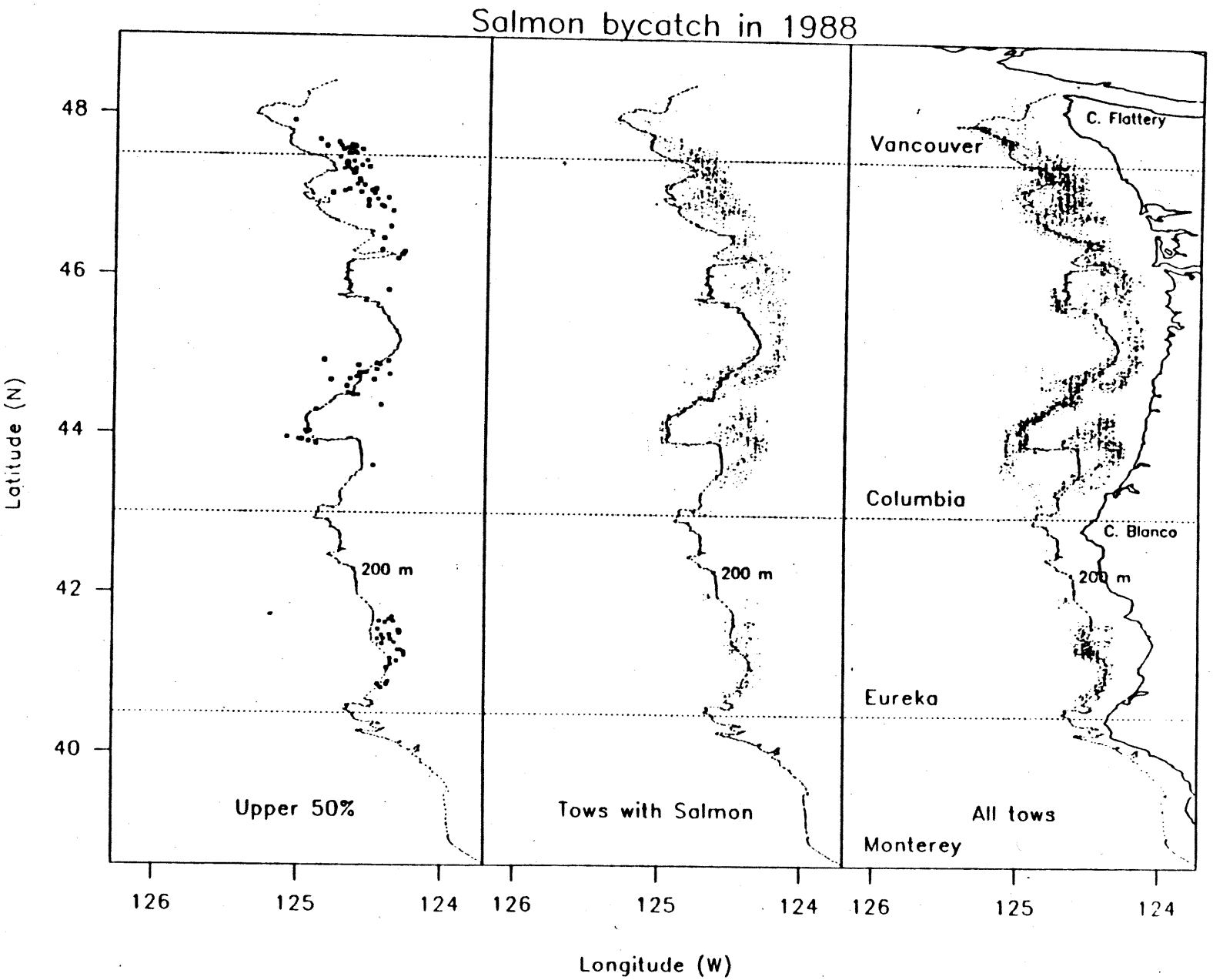
124
Longitude (W)


Salmon bycatch in 1988
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40
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C. Flattery
Columbia
C. Blanco
Eureka
Monterey
200 m
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Upper 50%
Tows with Salmon
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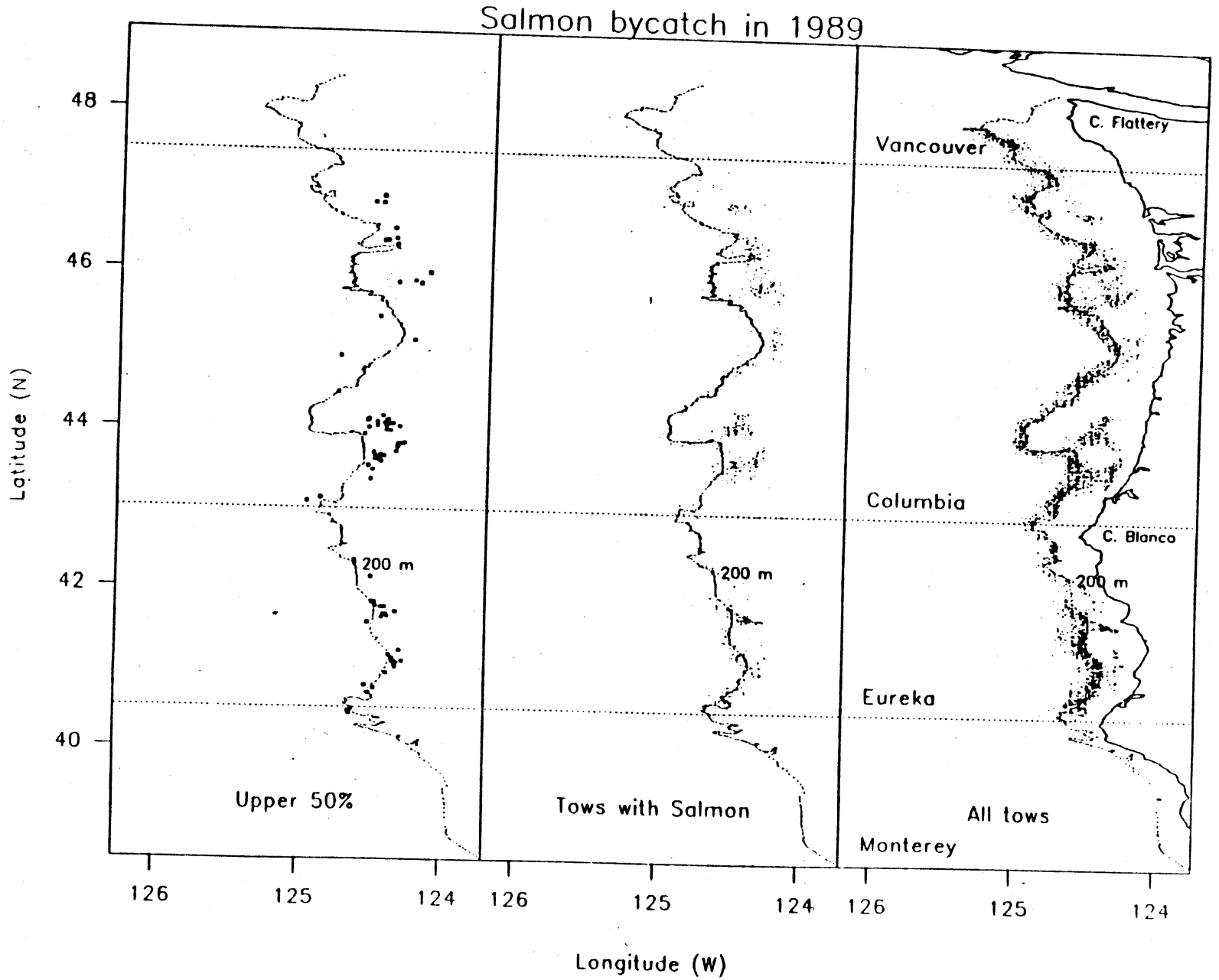
126
125
124
Longitude (W)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C. Flattery
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C. Blanco
Eureka
Monterey
200 m
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Upper 50%
Tows with Salmon
All tows
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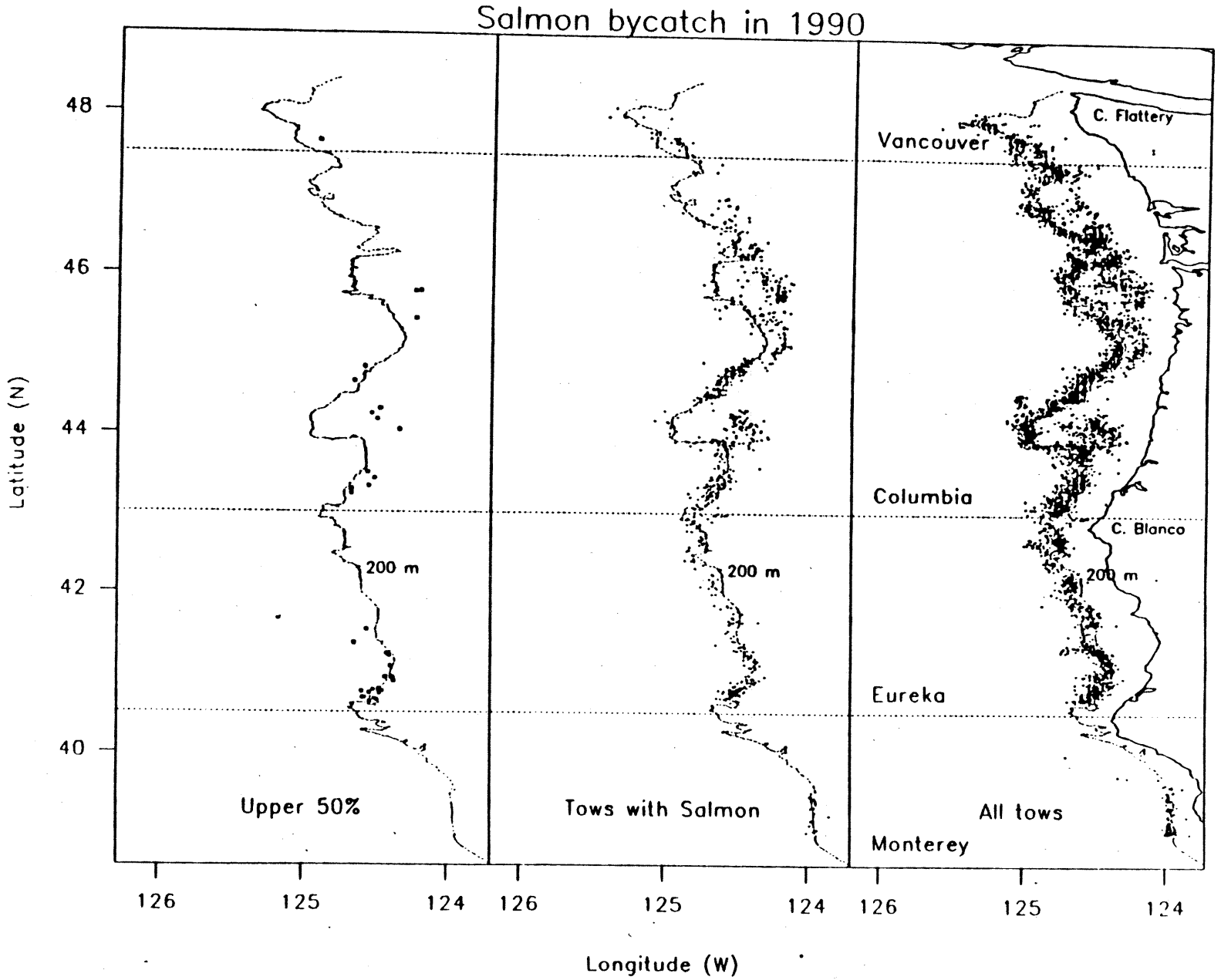
125
124
126
125
124
126
125
124
Longitude (W)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Monterey
200 m
200 m
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Tows with Salmon
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125
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126
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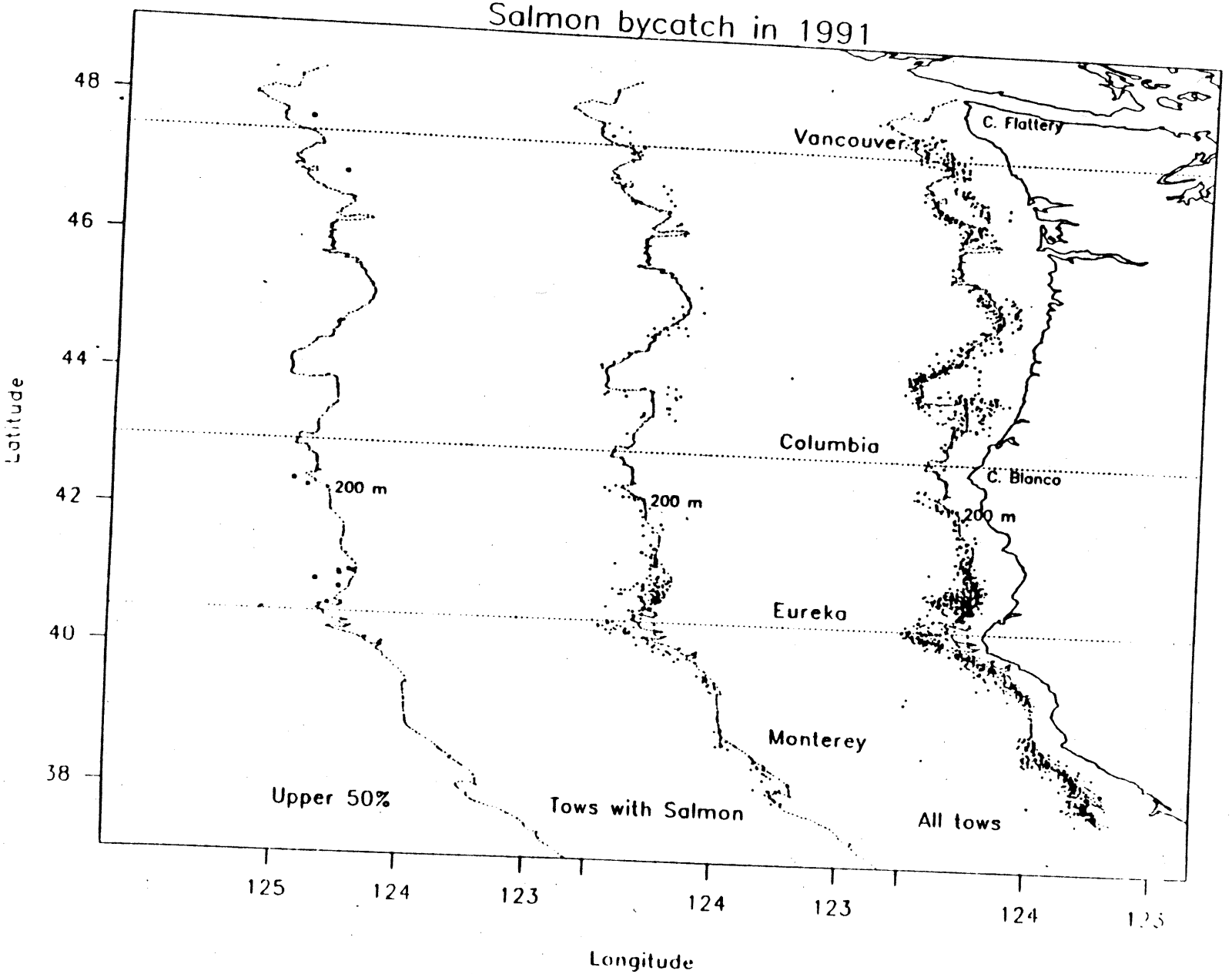
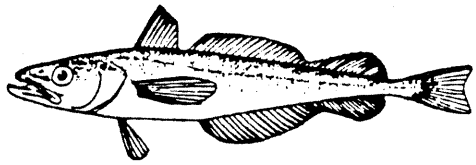
126
125
124
Longitude (W)


Salmon bycatch in 1991
48
46
44
42
40
38
Latitude
Vancouver
C. Flattery
Columbia
C. Blanco
Eureka
Monterey
200 m
200 m
200 m
Upper 50%
Tows with Salmon
All tows
125
124
123
124
123
124
Longitude

Appendix C. "Environmental Assessment: Measures for Reducing Bycatch in the Pacific Whiting Fishery off California, Oregon, and Washington in 1992," Pacific Fishery Management Council and National Marine Fisheries Service, March 1992.



ENVIRONMENTAL ASSESSMENT

MEASURES FOR REDUCING BYCATCH IN THE PACIFIC WHITING FISHERY OFF CALIFORNIA, OREGON, AND WASHINGTON IN 1992

Pacific Fishery Management Council
Portland, Oregon
and
National Marine Fisheries Service
Seattle, Washington

March 1992

TABLE OF CONTENTS

1.0 INTRODUCTION

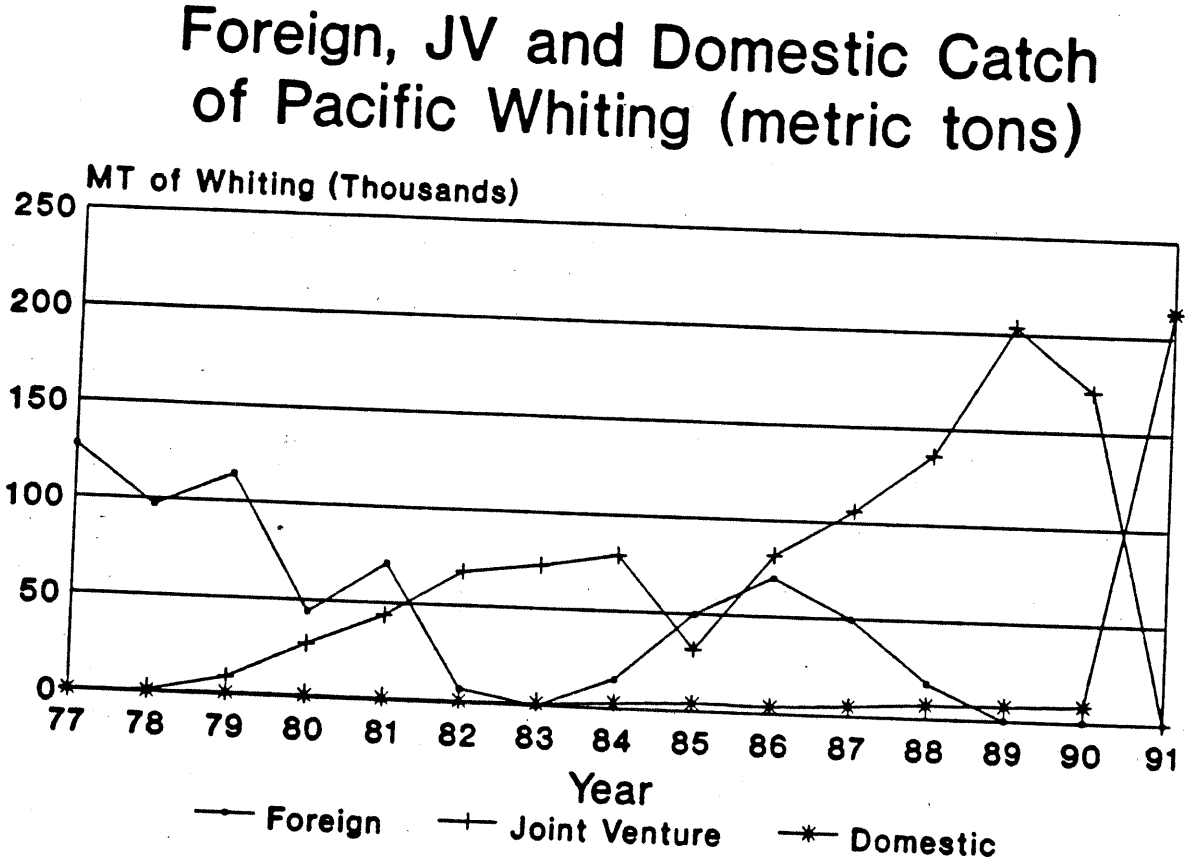
Pacific whiting (Merluccius productus) supports the largest groundfish fishery operating along the Washington, Oregon, California coast. In 1992, the harvest guideline for whiting in the US Exclusive Economic Zone (EEZ) is 208,800 metric tons. Pacific whiting are caught primarily in midwater trawl nets and are processed in plants on the shore and by processing vessel at-sea. Small amounts of whiting are taken in mixed catches in other fisheries. The large scale fisheries for whiting have low rates of bycatch of other species including salmon and rockfish. Because of the magnitude of the whiting catch, however, even low bycatch rates can result in significant levels of unintended catch in some areas at some times.

The Pacific whiting fishery developed as a foreign trawl fishery prior to passage of the Magnuson Act which extended U.S. management jurisdiction over the fishery resources within 200 miles of the coast. Although some whiting were taken by domestic fishermen and processed on shore, the establishment of joint venture operations in which U.S. vessels would sell their whiting catch to foreign processing vessels provided the first major market for U.S. whiting fishermen. From 1978 through 1989, the joint ventures grew until they completely displaced foreign harvesting vessels in this fishery. By 1991, the foreign processing vessels had also been displaced by the entry of U.S. trawler/processor vessels and mothership processors, as well as growth in the shore-based processing sector (Figure 1).

The Pacific whiting fishery is managed under the Fishery Management Plan for the California, Oregon, and Washington Groundfish Fisheries (FMP) which was prepared by the Pacific Fishery Management Council (Council) and approved by the Secretary of Commerce (Secretary) in 1982. Prior to the implementation of the FMP, the foreign fishing activity was regulated under a preliminary fishery management plan developed by National Marine Fisheries Service. During the period of foreign participation in the fishery, bycatch was monitored by observers on the processing vessels and limits on the acceptable bycatch rates were strictly enforced. If vessels from a nation reached their bycatch limit, they were required to cease fishing regardless of the amount of whiting remaining in their allocation. Foreign vessel activity was also restricted geographically. Initially, foreign fishing or processing vessels were not allowed to operate within 12 miles of shore or south of 39° North latitude. Later, processors operating in a joint venture with American fishermen were allowed to receive whiting as close as three miles from shore. The bycatch limits and to some extent the geographic restrictions were intended to protect

the fish stocks that were considered critical to the domestic fisheries that were delivered to processors in the coastal communities. Neither the bycatch rate limits nor the geographic restrictions which applied to foreign harvesting and processing vessels apply to domestic fishing or processing vessels.

FIGURE 1
FOREIGN, JOINT VENTURE AND DOMESTIC WHITING CATCH



1.1 PURPOSE OF AND NEED FOR ACTION

The proposed action is to reduce the bycatch of salmon and rockfish in the Pacific whiting fishery while continuing to allow adequate opportunity for all sectors of the whiting fishery to continue participating in that fishery and to achieve the full harvest guideline. A report on the status of Pacific coast salmon stocks was released by the Council in February which forecasts that most major salmon stocks are expected to return in very low numbers with some stocks approaching record lows. The abundance of Klamath River fall chinook salmon, the major stock off northern California and southern Oregon, is predicted to be at a record low level and is not expected to meet the escapement floor of 35,000 even in the absence of all fishing. 1992 will mark the third consecutive year of underescapement and will thus require the Pacific Fishery Management Council (Council) to conduct a review of the depressed status of the stock to determine the cause of the stock decline and its relationship to fishing.

Because of the depressed status of the Klamath River fall chinook stock, for the first time, the Council is considering severely restrictive fishing options for the commercial and recreational salmon fisheries, one of which is a prohibition of ocean salmon fishing along a substantial portion of the Oregon and California coasts. These circumstances prompted the Council to consider further ways to minimize the bycatch of salmon in the whiting fishery. Current management measures and regulations do not adequately address the issue of incidental catches in the domestic whiting fishery. An emergency rule is needed to make any restrictions effective on the whiting fishery when it opens on April 15, 1992. Although the bycatch of several important species is of concern to the fishing communities and managers along the coast, chinook salmon interceptions are of the greatest immediate concern.

The current condition of the salmon stocks along the Pacific coast has raised concern for the number of salmon that may be taken incidentally in fisheries for other species, particularly the Pacific whiting fishery. Although salmon taken in trawl fisheries cannot be retained legally, the additional mortality of stocks that are at critically low abundance levels is a problem. This concern is particularly urgent in the ocean area that is frequented by chinook salmon of Klamath River Basin origin. This is mainly the area off northern California, where the whiting fishing effort and salmon bycatch have been most concentrated in recent years.

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 THE PROPOSED ACTION

The Council has recommended that the following measures be implemented by emergency regulations to the Pacific whiting trawl fishery to reduce the potential of incidentally catching critical chinook stocks from the Klamath River as well as chili pepper and boccacio rockfish.

1. Vessels that process whiting at sea may not process fish in the Fishery Management Area south of 42° North latitude;

2. Fishing for whiting is prohibited between midnight and one-half hour after sunrise the following morning;

3. No midwater trawling for Pacific whiting may occur in waters shallower than 100 fathoms in the INPFC subarea, although non-whiting trawlers may fish and retain up to 2,000 pounds shoreward of 100 fathoms;

4. No fishing for whiting may take place in the river mouth sanctuaries designated for the Klamath River and Columbia River; and

2.2 ALTERNATIVES TO THE PROPOSED ACTION

The alternatives considered for this action included the prohibition of whiting fishing in waters inside of the 100 fathom curve along the entire coast, applying the 100 fathom limit only to areas north of 42° North, relying on a voluntary program alone to limit salmon bycatch, and taking no action.

3.0 AFFECTED ENVIRONMENT

A complete description of the affected environment including a description of the user groups and their gear, and biological information and historical harvests of groundfish coastwide can be found in Section 11 of the final Amendment 4 to the FMP (PFMC 1990). A description of the Pacific coast salmon stocks and their forecasted conditions for 1992 is included in "Preseason Report I: Stock Abundance Analysis for 1992 Ocean Salmon Fisheries" (PFMC 1992).

4.0 ANALYSIS OF THE ALTERNATIVES

Taking no action to reduce the salmon bycatch in the whiting fishery was rejected because forecasts indicate that most of the Pacific coast salmon stocks will be of low abundance in 1992. Klamath chinook stocks are forecast to be at such a low abundance

level that, even in the absence of directed salmon fisheries in the Klamath Zone in the ocean and with severe restriction on salmon fisheries to the north and south of that zone, the minimum threshold number of naturally-spawned chinook will not enter the river or reach the spawning grounds in 1992. Lack of effective controls on salmon bycatch in the large volume whiting fishery would present an unacceptable risk to these critically depressed salmon runs.

Voluntary measures to reduce salmon bycatch have been agreed upon prior to each of the recent past seasons and may have had a positive effect in the effort to avoid salmon. Some of these voluntary measures were not adhered to as the season progressed for various reasons. Despite these voluntary measures, the bycatch rate was highest in the Klamath River chinook area of concern. In light of the Klamath chinook stock conditions, reliance on a voluntary bycatch limitation in the whiting fishery is not considered sufficient protection during 1992.

Alternative measures for taking advantage of the differential catch rates of chinook in whiting trawls in waters greater than 100 fathoms were considered by the Council although the analysis of bycatch rate relative depth was specific to the Eureka area. Applying the 100 fathom limit coastwide or applying it only north of 42° North presented problems in treating areas of the Washington and Oregon coasts equitably. The 100 fathom curve is generally substantially further offshore in the north than it is off California. Requiring shore-based vessels to fish beyond the 100 fathom curve in those northern areas would greatly increase their running time to the fishing grounds and result in increased costs and possibly reduced product quality by prolonging the time between capture and processing. Failure to apply the 100 fathom restriction in the ocean area of primary concern for the Klamath chinook stocks -- off of southern Oregon and northern California -- was considered to be missing an opportunity to reduce salmon bycatch with minimal additional costs to the whiting fishery.

Alternatives to the prohibition on fishing between midnight and one-half hour after sunrise were considered also. The alternatives were based on varying time periods for the nightly closure, ranging from sunset to sunrise to no closure.

4.1 BIOLOGICAL AND PHYSICAL IMPACTS

4.1.1. Impacts on the Pacific Whiting Stock.

There will be little or no differential impact on the whiting stock from the proposed action relative to the no action alternative. As noted above, an overall harvest guideline of 208,800 metric tons has been set for 1992 to conserve the stock

and limit total fishing mortality. The potential fishing effort in the whiting fishery is sufficient to easily harvest the entire harvest guideline during the year even under the most restrictive conditions considered to reduce bycatch. The alternative measures considered may affect the location and timing of the catch but will have little effect on total mortality. Prohibiting the at-sea processors from operating south of 42° North may delay the start of their fishing activity from the April 15 opening date when they would probably have concentrated effort off of central California until May as the whiting move northward. Although some growth of individuals will occur during the delay, it is not expected that such a brief delay will result in any perceptible increase in yield.

4.1.2. Impacts on Salmon Bycatch.

The impacts on salmon bycatch were analyzed in a draft impact analysis prepared for the Council on the potential allocation of the Pacific whiting harvest, dated March 10, 1992. The results of that analysis of observer reports and vessel logs show that typically 50 percent of the salmon bycatch occurs in two percent of the tows. Among the factors influencing the rate of salmon bycatch that can be controlled in the whiting fishery are the time and area of operation.

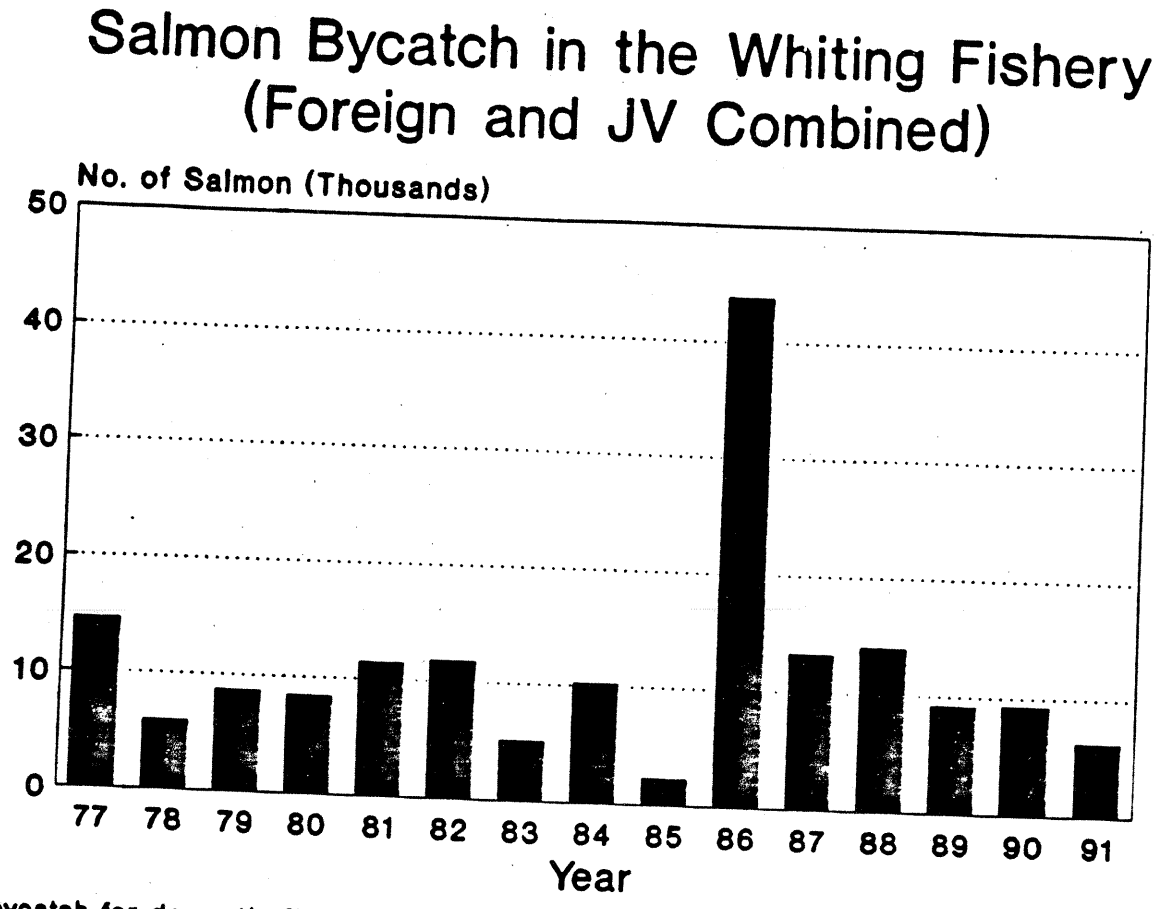
Salmon bycatch in the foreign and joint venture whiting fisheries ranged from about 2,000 salmon in 1985 to over 43,000 in 1986, averaging about 13,800 from 1977-1990 (Figure 2). The 1991 domestic at-sea fishery operated with a salmon bycatch rate substantially lower than the joint venture average rate. The overall bycatch rate was about 0.033 salmon per mt of whiting, equivalent to 1 salmon in 30 mt of whiting. By month and area, the 1991 at-sea processing fleet experienced much smaller interception rates of salmon than the joint venture average. Coastwide, the catcher-processors and mothership-processors experienced a similar rate (0.031 and 0.036 salmon per mt of whiting, respectively). This low catch rate for salmon in 1991 may be attributable, in part, to the low abundance of salmon along the Pacific coast. The relative rates among areas and months, however, continue to provide useful information with which bycatch rates may be reduced even further. The catcher-processor salmon bycatch rate was highest in the Vancouver and Eureka areas and lowest in the Columbia and Monterey areas. The mothership rate was highest in the Eureka area and lowest in the Vancouver and Monterey areas.

In 1991, the bycatch rate and number of chinook taken in the whiting fishery were highest by far in the Eureka area (Table 1). The impact of this relatively high salmon catch on the Klamath-origin chinook and the threatened Sacramento winter run chinook is assumed to be proportional to relative stock composition. The

Klamath Ocean Harvest Model (KOHM) (Dixon 1991) was developed to help understand and forecast the impact of salmon fisheries on the Klamath chinook, but one of the basic elements of the KOHM is the relative contribution of Klamath chinook to the total chinook encountered in the Klamath Management Zone (42°40'30"N to 40°05'00"N) which overlaps substantially with the Eureka INPFC area (43°00'00"N to 40°30'00"N). During 1991, most of the whiting catch in the Eureka area was taken in April and May. The KOHM uses an estimate of 0.18 as the proportion of Klamath River fall chinook in the troll and sport fisheries within the KMZ during May based on the observed average from 1986 through 1990. The estimates of stock composition from the KOHM are for adult fish and their applicablility to the immature fish taken in the whiting fishery is uncertain but represents the best available information.

Salmon Bycatch by Shore-based Vessels. Shore-based vessels represent another component of the fishery. The catch of the shore-based fleet has been a relatively small proportion of the total but has increased steadily since 1978. The estimated catch of whiting in 1991 by shore-based vessels was approximately 20,510 mt compared to the overall quota of 228,000 mt. While rapid growth in the shore-based whiting component is predicted for the Newport, Oregon area in 1992, the operations within the KMZ (Eureka and Crescent City, California) are not expected to grow as much. The deliveries to shore-based processors in these two ports and occasional landing at ports to the south are not expected to exceed 15,000 metric tons in 1992.

FIGURE 2
SALMON BYCATCH IN THE WHITING FISHERY 1977 - 1991



91 bycatch for domestic fishery

TABLE 1.
1991 PACIFIC COAST WHITING FISHERY SALMON BYCATCH
SUMMARY BY INPFC AREA

INPFC Area	Whiting (mt)	Salmon (#)	Bycatch Rate (#/mt)
Vancouver	5,735	268	0.047
Columbia	60,331	753	0.012
Eureka	66,600	4,811	0.072
Monterey	64,103	499	0.008
Total	197,771	6,331	0.032

Observer coverage on trawlers delivering to shore-based processors has been meager. Information related to salmon bycatch is therefore limited. Oregon Department of Fish and Wildlife did place observers on 25 vessel trips fishing out of Newport, Oregon during 1991. These trips accounted for approximately 1,026 mt of whiting and 1 chinook with a bycatch rate of 0.002 salmon per mt. There are some additional observations pertaining to bycatch by shore-based vessels from experimental fisheries conducted in the mid-1980s. In 1983, 24 salmon were observed in 103 mt of whiting landed in Eureka, California (0.233 salmon per mt); 1 salmon was observed in 21 mt of whiting (0.048 salmon per mt) landed in Charleston, Oregon in September 1985; and 21 salmon were taken in 136 mt of whiting (0.154 salmon per mt) landed in Charleston, Oregon in May 1986.

Salmon Bycatch in Waters Less than 100 Fathoms. Foreign trawler-processors were constrained to fishing outside of 12 miles from shore, which precluded them from fishing in shallower areas near shore. Joint venture motherships could receive and process fish as close as three miles from shore. The domestic fleet is not subject to these geographic constraints raising the concern that bycatch rates could increase because of more nearshore fishing. In addition to the tendency for certain areas (i.e. the Eureka area) to have a persistently higher incidence of salmon in the whiting catch, salmon bycatch tends to be greater in waters less than 100 fathoms than it is in deeper waters. Table 2 shows that relationship of depth to the rate of salmon bycatch from 1988 through 1990. In 1991 most fishing was conducted outside the 100 fathom curve. Prohibiting fishing for whiting shoreward of 100

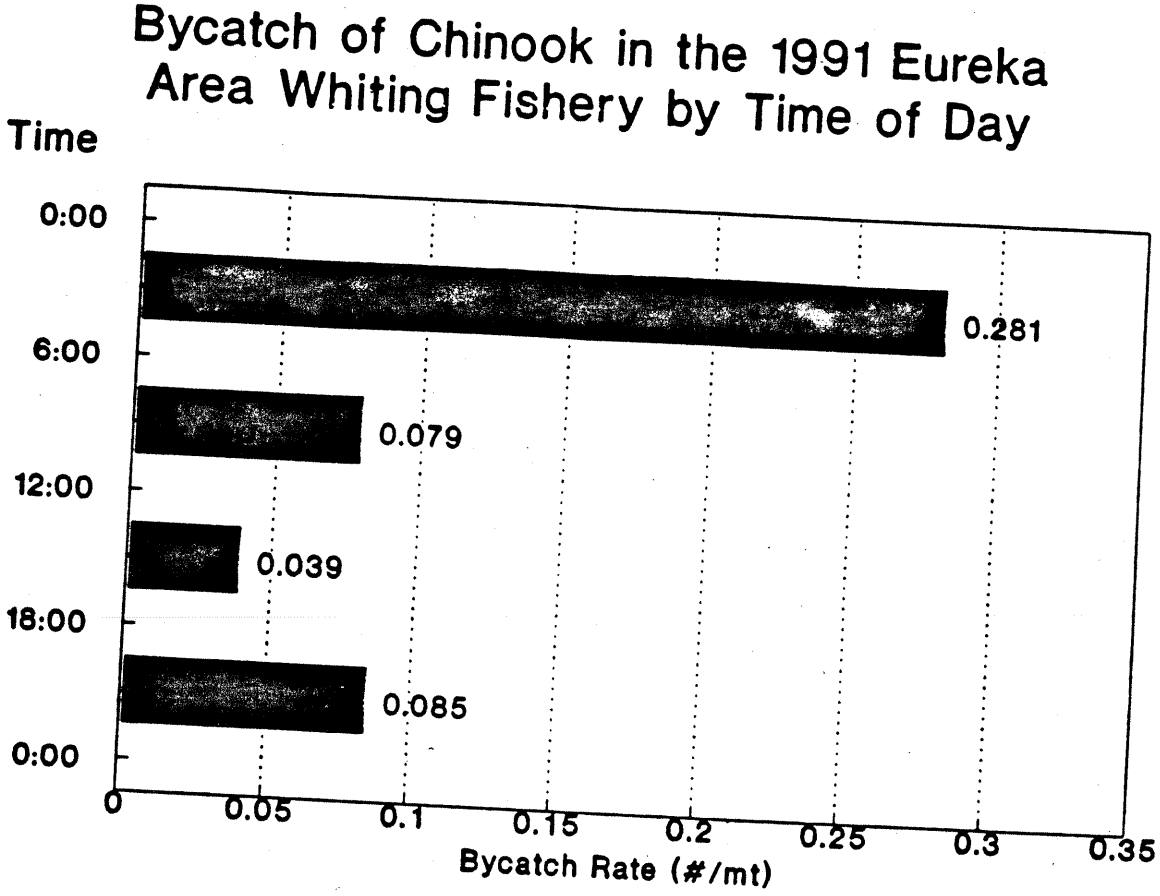
fathoms in the area of primary concern for the Klamath chinook stocks provides protection in the most critical area, with minimal additional costs to the whiting fishery.

Salmon Bycatch in Night Fishing. The catcher vessels which supplied whiting to foreign processing vessels in joint ventures did not routinely operate at night until high-capacity surimi processors appeared in the fishery during 1988. In 1991, some harvesting did occur at night. Data indicate that the bycatch rate for salmon in the Eureka area were higher by a factor of three in trawls completed during the midnight to six a.m. period than during any other quarter of the day (Figure 3). The proposed action to prohibit fishing from midnight to one-half hour after sunrise closely approximates that period of higher incidental catch. Based on the assumption that fishing effort shifted into another period of the day would result in a salmon bycatch rate similar to that experienced during that period of the day in 1991, the overall salmon bycatch could be reduced by prohibiting whiting fishing in the midnight to six a.m. period.

TABLE 2
BYCATCH RATE OF CHINOOK IN THE EUREKA AREA WHITING FISHERY BY 50 FATHOM DEPTH INTERVAL

	Year			
Fathoms	1988	1989	1990	1991
0-50	0.403	0.155	0.778	---
50-100	0.499	0.152	0.231	---
100-150	0.050	0.025	0.086	0.108
150-200	0.027	0.006	0.021	0.156
200-250	0.004	0.004	0.012	0.059
250-300	0.006	0.004	0.015	0.039
300-350	0.001	0.002	0.019	0.033
350-400	0.009	0.007	0.000	0.179
>400	0.000	0.002	0.000	0.136

FIGURE 3
BYCATCH OF CHINOOK IN THE 1991 EUREKA AREA WHITING FISHERY
BY TIME OF DAY



4.1.3. Impacts on Rockfish Bycatch.

During 1991, the at-sea processing fleet fished for a time in the area just north of San Francisco -- the Gulf of the Farrallons and near the Cordell Banks. In this area, they encountered a high bycatch of chilipepper rockfish, taking over 500 metric tons from that area. This take is not expected to pose an immediate problem for the continued productivity of chilipepper rockfish, but it does raise concern for bocaccio rockfish which are often taken in association with chilipeppers. Bocaccio are in danger of being overfished according to the most recent status of stocks analysis. Since bocaccio recruitment fluctuates widely and successful year-classes appear sporadic, a large volume whiting fishery having substantial bycatch of bocaccio could hinder the recovery of the stock.

4.2 IMPACTS ON THE HUMAN ENVIRONMENT

4.2.1. Impacts of taking No Action.

Taking no action to reduce the bycatch in the whiting fishery this year would allow a large volume whiting fishery to take a large number of Klamath River origin chinook salmon relative to the number of those salmon that will be allowed for harvest in the ocean by salmon fishermen. In fact, the Council is considering, as an option for managing the Pacific Coast ocean salmon fisheries in 1992, a complete closure of ocean salmon fishing from the Canadian border to the Mexican border to protect weak salmon runs that are expected. Bycatch in other fisheries, particularly such a large fishery as the whiting fishery, could undermine the strong conservation measures that the Council will have to impose on the salmon fishery to restore those weak runs.

4.2.2. Impacts of the Proposed Action.

The proposed action will change the area and time of day that the whiting fishery will take place. Total harvest is not expected to be affected by the proposed action nor is the distribution of the total catch among the various sectors of the fishery.

The prohibition on at-sea processing vessels operating south of 42° North may delay slightly the start of the fishing season for the at-sea processing sector of the fleet, but the capacity of that fleet is more than sufficient to compensate for that delay and to secure its share of the whiting harvest. Pacific whiting begin migrating northward about the time the season opens on April 15 and are expected to be available for harvest in abundance north of 42° N. latitude shortly after the season opens. This action will move the sector of the whiting fishery accounting for the largest salmon and rockfish bycatch out of the area with the highest bycatch rates and the area of greatest impact on Klamath River chinook salmon.

Shore-based vessels and processors south of 42° N. latitude may derive some slight benefit from the absence of the at-sea processors in the areas where they fish for whiting. Since whiting migrate northward along the coast during the spring and early summer, any advantages or disadvantages from this restriction will be short-lived, as the bulk of the whiting move north of 42° N. latitude. Because they account for a much smaller proportion of the whiting catch south of 42° N. latitude, catchers delivering to shoreside processors account for a relatively minor proportion of the salmon bycatch. Prohibiting shore-based vessels from operating in the area would impose an undue hardship on the catcher vessels and processors, since the

processing plants are not mobile and cannot follow the northward whiting migration.

Prohibiting whiting fishing in waters of less than 100 fathoms in the INPFC Eureka area (43° 00' 00" N. latitude to 40° 30' 00" N. latitude) is not expected to substantially impact any of the harvesting sectors. In 1991, NMFS data show that the vessels delivering to at-sea processors did not fish in the shallower water. Shore-based vessels do not necessarily fish nearer to shore than at-sea operations. The main difference between the two modes of operation is the latitudinal (i.e., north-south) distribution. South of 43° N. latitude the 100 fathom curve lies almost entirely within 12 miles of shore. While running time for vessels that deliver to shore-based processors may be increased, that increase is not expected to be a significant factor in their whiting operations.

Vessels fishing for non-whiting groundfish species will be allowed to retain and land up to 2,000 pounds of whiting from areas shoreward of the 100 fathom contour. Enforcing this prohibition on non-whiting vessels would force them to sort their catch at sea in order to discard whiting. This would cause undue disruption and hardship for these vessels with little benefit in terms of bycatch savings. Little data is available to determine the salmon bycatch rate by non-whiting groundfish vessels, but it is thought that bycatch rates by these vessels is higher in the winter than during the whiting season.

The 100 fathom restriction is being applied only to the Eureka area because it is the area of highest salmon bycatch impact and it will have little impact on the fleet's ability to harvest whiting. Compared to more northerly areas, the 100 fathom contour in the Eureka area runs close to shore. To the north the 100 fathom contour runs far offshore in many areas which, if implemented in those areas, could force many vessels to fish beyond their normal delivery range for maintaing a viable product. Since salmon bycatch rates have not been high in northern areas and restricting the area to offshore of 100 fathoms could disrupt the fishery in those areas, the restriction was limited only to the Eureka area.

The proposed restriction on fishing between midnight and one-half hour after sunrise will impact the high-capacity, surimi processing vessels the most because those vessels intend to operate continuously through the day and night. The operations of the surimi plant may have to be adjusted to accommodate the period after midnight when there may be no fish available to process. Adjustments in the timing of the last tow or codend delivery of the day can compensate in part for the approximately six hour closure until sunrise. Data to quantify the cost of changing the surimi processors' operations are not available.

5.0 EFFECTS ON ENDANGERED SPECIES AND THE COASTAL ZONE

The alternatives considered including the proposed action will not constitute an action that may affect endangered/threatened species listed under the Endangered Species Act (ESA) or their habitat within the meaning of the regulations implementing Section 7 of the ESA. In April 1991, the Council requested a Section 7 consultation for the potential impact of a whiting fishery south of 39°N latitude on Sacramento River winter-run chinook population, which has been listed as threatened under the Endangered Species Act (ESA). The Section 7 consultation was completed in November, 1991. The actions considered here fall within the scope of the actions analysed in the Section 7 consultation.

The proposed action is consistent to the maximum extent practicable with applicable State coastal zone management programs. NMFS will correspond with the responsible state agencies under Section 307 of the Coastal Zone Management Act to obtain their concurrence in this finding.

6.0. FINDINGS OF NO SIGNIFICANT IMPACT

For the reasons discussed in this document, neither implementation of the proposed action or the status quo would significantly affect the quality of the human environment, and the preparation of an environmental impact statement on the final action is not required by Section 102 (2)(C) of the National Environmental Policy Act or its implementing regulations.

7.0. COORDINATION AND CONSULTATION

Development of the proposed action and the analyses incorporated in this EA were coordinated with the Council's Groundfish Team members, Council staff, NMFS scientists and managers, and NOAA General Counsel. The details of the proposed action were developed and discussed by the PFMC at the their March 1992 public meeting and thereby included comments and input by the affected industry and the public.

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Assistant Administrator for Fisheries

8.0. LIST OF PREPARERS

This EA was prepared by or contributions received from the following.

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Appendix D. Additional supplemental information on day/night differences in bycatch rates in the 1991 offshore fishery for Pacific whiting. **[Revised since September 1992]**

Appendix D. ADDITIONAL SUPPLEMENTAL INFORMATION ON DAY/NIGHT DIFFERENCES IN BYCATCH RATES IN THE 1991 OFFSHORE FISHERY FOR PACIFIC WHITING. [Revised since September 1992]

In 1991, the joint venture fishery for Pacific whiting was replaced by a fleet of American factory trawlers and motherships. One way in which the American factory trawlers and mothership fleets operated differently than the joint venture fleet was that fishing typically took place both during daylight hours and at night. Concern that night fishing could increase the chinook salmon and rockfish bycatch prompted the Pacific Fisheries Management Council to ban fishing between the hours of midnight and one-half hour after official sunrise during 1992. A more detailed analysis of the bycatch rates by time of day in the 1991 Pacific whiting fishery is needed to provide the basis for proposed measures to control bycatch.

The ability to identify the conditions that are important factors affecting bycatch is limited by the extremely random nature of bycatch. Typically, only a small proportion of the tows in a given year account for a large fraction of the total bycatch. A high bycatch rate for a given combination of conditions could be due to a handful of tows that may have occurred by chance. Furthermore, when a large number of conditions are considered, the number of sampled tows in each cell can become too small to obtain meaningful estimates of the average bycatch in that cell. For these reasons, it is essential that decisions to control bycatch be based not only on point estimates of bycatch rates but also on an assessment of their precision. Determining the confidence intervals for an estimate is a basic statistical technique for assessing the precision of point estimates.

The data used in this analysis consists of 2312 tows sampled by observers in the 1991 Pacific whiting fishery (Table 1). Tows that occurred after September 6 were not included in the analysis. The catch of chinook salmon in numbers, and the catch of yellowtail and widow rockfish in weight (kilograms) are determined for each tow. The total catch of Pacific whiting and various descriptive information (latitude, longitude, duration of tow, etc.) are also recorded for each tow.

The bycatch rate was estimated as

$$\hat{R} = \frac{\Sigma x_i}{\Sigma y_i}$$

were y_i is the catch in numbers or weight of the bycatch species in the ith tow, and x_i is the catch of Pacific whiting in metric tons for the ith tow. Variances were estimated using the equation

$$Var(\hat{R}) = \frac{1}{n\bar{x}^2}(s_y^2 + \hat{R}^2 s_x^2 - 2\hat{R}s_{xy})$$

where s_y^2 is the sample variance of the bycatch species, s_x^2 is the sample variance of the Pacific whiting catch, and s_{xy} is the sample co-variance (Cochran 1977). Confidence intervals were obtained under the assumption that the bycatch rate is approximately log normally distributed:

$$\hat{R}_L = \hat{R}/C$$

and

$$\hat{R}_U = \hat{R}\,C$$

where

$$C = \exp\left(z_{\alpha/2}\sqrt{\ln(1 + [var(\hat{R})/\hat{R}^2])}\right)$$

(Burnham et al. 1987).

Bycatch rates were calculated for several levels of stratification. Tables 1-3 give the bycatch rates and associated 95% confidence intervals for chinook salmon, yellowtail rockfish, and widow rockfish north and south of 42° N. latitude (42°) for the mothership fleet, the factory trawler fleet, and for the combined data. Bycatch rates were calculated for three hour time intervals using local time (Pacific Daylight Savings Time). Figures 1-6 present the same information in graphical form. Table 4 gives the estimated bycatch rates and confidence intervals for the hours of midnight to 6:00 AM, and from 6:00 AM to midnight.

For chinook salmon, the highest bycatch rates occurred south of 42° from midnight to 6:00 AM. Factory trawlers had higher bycatch rates than the mothership fleet, and the higher bycatch rates in the combined data at night is mostly due to the factory trawler data. North of 42° there is no indication that the chinook salmon bycatch rates are higher during the night. The only combination of location (north or south of 42°), time of day, and fleet where the bycatch rate was significantly greater 0.05 chinook salmon per ton of Pacific whiting was the factory trawler fleet south of 42° during the hours from midnight to 3:00 AM.

For yellowtail rockfish, the bycatch rates south of 42° are extremely low, due largely, no doubt, to the limited geographic range of yellowtail rockfish. North of latitude 42°, higher bycatch rates tended to occur during the daylight hours, 9:00 AM to 6:00 PM. The lowest bycatch rates occurred from 3:00 AM to 6:00 AM in the morning. For widow rockfish, the bycatch rates south of 42° are low in comparison to the bycatch rates north of 42°. There is some indication that the widow rockfish bycatch is higher between the hours of 9:00 PM and 3:00 AM. However the confidence intervals for these two time periods are extremely wide, indicating that these estimates are not precisely estimated.

References:

Burnham, K. P., D. R. Anderson, G. C. White, C. Brownie, and K. H. Pollock. 1987. Design and analysis methods for fish survival experiments based on release recapture. Amer. Fish. Soc. Monograph 5. 437 p.

Cochran, W. G. 1977. Sampling Techniques. John Wiley. 428 p.

Table 1. Number of sampled tows in the 1991 Pacific whiting offshore fishery by vessel class (mothership or factory trawler), time of midpoint of the tows (grouped into three hour bins), and latitude (south of 42°, north of 42°).

	South of 42°00'N	North of 42°00'N
	Mothership	
00-03	36	12
03-06	43	4
06-09	132	69
09-12	115	71
12-15	117	64
15-18	104	79
18-21	64	61
21-24	32	22
	Factory Trawler	
00-03	51	26
03-06	80	14
06-09	120	52
09-12	132	73
12-15	126	76
15-18	151	71
18-21	141	65
21-24	74	35
Total		2312

Table 2. Estimates of chinook catch rates in the 1991 Pacific whiting offshore fishery. Bycatch rates are given in the number of chinook per metric ton of Pacific whiting catch. Hauls were aggregated into 3-hour periods using the midpoint of the haul (net down time + net up time)/2. Time of day was recorded in local time (Pacific daylight savings time). Bycatch rate estimates and 95% confidence intervals are given for the combined mothership and factory trawler data, and for the mothership and the factory trawler data separately.

A. Fishing south of 42°00'N

Hours	Combined fleets	95% Conf. Int. lower	upper	Mothership fleet	95% Conf. Int. lower	upper	Factory trawler	95% Conf. Int. lower	upper
00-03	0.117	0.062	0.221	0.056	0.019	0.167	0.153	0.074	0.317
03-06	0.064	0.025	0.167	0.014	0.004	0.049	0.090	0.033	0.247
06-09	0.052	0.025	0.104	0.078	0.035	0.171	0.029	0.008	0.111
09-12	0.015	0.008	0.029	0.031	0.014	0.068	0.004	0.002	0.007
12-15	0.009	0.005	0.015	0.015	0.007	0.030	0.004	0.002	0.007
15-18	0.018	0.006	0.055	0.017	0.007	0.040	0.019	0.004	0.084
18-21	0.017	0.009	0.031	0.041	0.017	0.096	0.008	0.004	0.014
21-24	0.048	0.022	0.105	0.019	0.005	0.077	0.061	0.026	0.145

B. Fishing north of 42°00'N

Hours	Combined fleets	95% Conf. Int. lower	upper	Mothership fleet	95% Conf. Int. lower	upper	Factory trawler	95% Conf. Int. lower	upper
00-03	0.005	0.002	0.012	0.006	0.002	0.018	0.005	0.001	0.015
03-06	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
06-09	0.022	0.007	0.070	0.013	0.008	0.022	0.030	0.006	0.147
09-12	0.030	0.009	0.104	0.012	0.006	0.025	0.044	0.010	0.186
12-15	0.006	0.003	0.012	0.014	0.007	0.029	0.001	0.001	0.004
15-18	0.044	0.016	0.124	0.013	0.007	0.023	0.071	0.022	0.225
18-21	0.009	0.005	0.017	0.008	0.004	0.017	0.010	0.004	0.024
21-24	0.003	0.001	0.007	0.003	0.001	0.011	0.003	0.001	0.009

Table 3. Estimates of yellowtail rockfish catch rates in the 1991 Pacific whiting offshore fishery. Bycatch rates are given in kilograms (kg) of yellowtail rockfish per metric ton of Pacific whiting catch. Hauls were aggregated into 3-hour periods using the midpoint of the haul (net down time + net up time)/2. Time of day was recorded in local time (Pacific daylight savings time). Bycatch rate estimates and 95% confidence intervals are given for the combined mothership and factory trawler data, and for the mothership and the factory trawler data separately.

A. Fishing south of 42°00'N

Hours	Combined fleets	95% Conf. Int. lower	upper	Mothership fleet	95% Conf. Int. lower	upper	Factory trawler	95% Conf. Int. lower	upper
00-03	0.001	0.000	0.004	0.000	0.000	0.000	0.001	0.000	0.006
03-06	0.005	0.001	0.018	0.004	0.001	0.015	0.005	0.001	0.027
06-09	0.004	0.002	0.010	0.009	0.004	0.021	0.001	0.000	0.002
09-12	0.001	0.001	0.004	0.003	0.001	0.009	0.000	0.000	0.000
12-15	0.003	0.001	0.006	0.006	0.003	0.014	0.000	0.000	0.001
15-18	0.015	0.006	0.041	0.009	0.005	0.017	0.018	0.005	0.062
18-21	0.226	0.046	1.111	0.820	0.161	4.180	0.008	0.002	0.037
21-24	0.223	0.046	1.088	0.703	0.141	3.497	0.007	0.001	0.031

B. Fishing north of 42°00'N

Hours	Combined fleets	95% Conf. Int. lower	upper	Mothership fleet	95% Conf. Int. lower	upper	Factory trawler	95% Conf. Int. lower	upper
00-03	11.209	3.231	38.888	27.367	4.912	152.461	5.725	1.388	23.618
03-06	0.657	0.172	2.518	0.512	0.105	2.484	0.695	0.151	3.201
06-09	2.238	1.221	4.101	1.864	0.723	4.803	2.628	1.229	5.618
09-12	8.013	3.699	17.358	0.200	0.091	0.440	13.982	6.405	30.519
12-15	6.891	2.345	20.251	1.145	0.289	4.547	10.381	3.327	32.389
15-18	6.775	3.126	14.684	1.586	0.386	6.519	11.113	4.828	25.580
18-21	3.282	1.337	8.052	4.532	1.138	18.039	2.428	1.118	5.271
21-24	4.064	1.812	9.114	0.023	0.004	0.117	6.010	2.697	13.395

Table 4. Estimates of widow rockfish catch rates in the 1991 Pacific whiting offshore fishery. Bycatch rates are given in kilograms (kg) of widow rockfish per metric ton of Pacific whiting catch. Hauls were aggregated into 3-hour periods using the midpoint of the haul (net down time + net up time)/2. Time of day was recorded in local time (Pacific daylight savings time). Bycatch rate estimates and 95% confidence intervals are given for the combined mothership and factory trawler data, and for the mothership and the factory trawler data separately.

A. Fishing south of 42°00'N

Hours	Combined fleets	95% Conf. Int. lower	upper	Mothership fleet	95% Conf. Int. lower	upper	Factory trawler	95% Conf. Int. lower	upper
00-03	0.303	0.142	0.650	0.240	0.078	0.740	0.341	0.132	0.878
03-06	0.645	0.158	2.628	1.728	0.374	7.983	0.096	0.043	0.212
06-09	0.531	0.263	1.070	1.036	0.482	2.225	0.101	0.053	0.192
09-12	0.331	0.210	0.523	0.584	0.333	1.026	0.164	0.082	0.327
12-15	2.698	1.155	6.299	3.441	1.266	9.355	2.124	0.564	7.997
15-18	0.671	0.275	1.635	1.107	0.282	4.353	0.440	0.220	0.877
18-21	0.455	0.234	0.887	0.763	0.369	1.578	0.342	0.124	0.942
21-24	1.348	0.552	3.291	2.073	0.630	6.818	1.022	0.303	3.452

B. Fishing north of 42°00'N

Hours	Combined fleets	95% Conf. Int. lower	upper	Mothership fleet	95% Conf. Int. lower	upper	Factory trawler	95% Conf. Int. lower	upper
00-03	21.653	6.253	74.971	24.739	5.026	121.763	20.605	4.441	95.612
03-06	0.806	0.409	1.590	1.182	0.514	2.720	0.708	0.292	1.714
06-09	1.781	0.694	4.571	0.676	0.400	1.142	2.932	0.944	9.108
09-12	2.647	1.423	4.924	1.197	0.811	1.767	3.755	1.761	8.008
12-15	2.636	1.260	5.515	5.691	2.383	13.587	0.780	0.413	1.475
15-18	4.057	1.467	11.216	2.401	1.485	3.883	5.441	1.456	20.333
18-21	3.590	1.970	6.545	4.536	1.744	11.796	2.944	1.526	5.681
21-24	15.375	4.034	58.605	36.727	7.170	188.124	5.091	1.750	14.807

Table 5. Estimates of bycatch rates in the 1991 Pacific whiting offshore fishery for chinook salmon, yellowtail rockfish, and widow rockfish. Bycatch rates are given as the number of chinook per metric ton, and kilograms (kg) per metric ton of Pacific whiting catch for yellowtail rockfish and widow rockfish. Hauls were aggregated into two periods (midnight to 6:00 AM, and 6:00 AM to midnight) using the midpoint of the haul (net down time + net up time)/2. Time of day was recorded in local time (Pacific daylight savings time). Bycatch rate estimates and 95% confidence intervals are given for the mothership and factory trawler fleets north and south of 42°00'N latitude.

A. Chinook catch rate (No. Chinook/ Mt Pacific whiting)

	South of 42°00'N			North of 42°00'N		
Hours	Catch rate	95% Conf. Int. lower	upper	Catch rate	95% Conf. Int. lower	upper
Mothership						
00-06	0.031	0.013	0.076	0.004	0.001	0.013
06-24	0.037	0.023	0.058	0.012	0.009	0.016
Factory Trawler						
00-06	0.113	0.060	0.215	0.003	0.001	0.009
06-24	0.017	0.009	0.032	0.029	0.013	0.064

B. Yellowtail rockfish catch rate (kg/Mt Pacific whiting)

	South of 42°00'N			North of 42°00'N		
Hours	Catch rate	95% Conf. Int. lower	upper	Catch rate	95% Conf. Int. lower	upper
Mothership						
00-06	0.002	0.001	0.009	18.674	3.467	100.595
06-24	0.129	0.037	0.457	1.706	0.783	3.718
Factory Trawler						
00-06	0.004	0.001	0.017	3.796	0.987	14.606
06-24	0.006	0.002	0.016	8.378	5.170	13.577

C. Widow rockfish catch rate (kg/Mt Pacific whiting)

	South of 42°00'N			North of 42°00'N		
Hours	Catch rate	95% Conf. Int. lower	upper	Catch rate	95% Conf. Int. lower	upper
Mothership						
00-06	1.117	0.270	4.625	17.114	3.645	80.355
06-24	1.495	0.839	2.665	4.310	2.046	9.077
Factory Trawler						
00-06	0.187	0.092	0.382	12.974	2.839	59.280
06-24	0.639	0.279	1.466	3.249	1.866	5.656

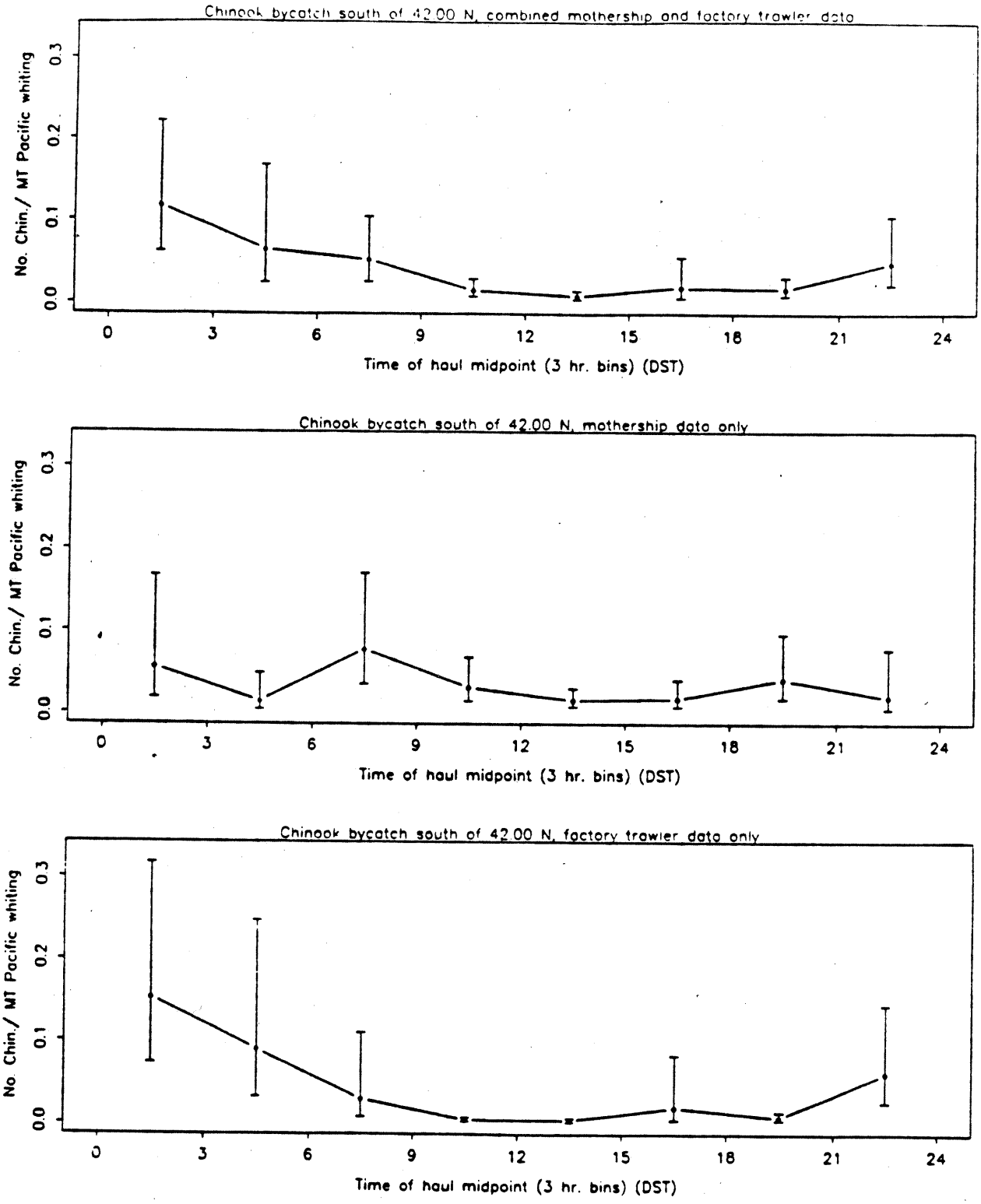


Figure 1. Chinook salmon bycatch rates in the 1991 Pacific whiting fishery south of 42.00 N. Bycatch rates are given as the number of fish per metric ton of whiting by 3-hour time intervals. 95% percent confidence intervals are indicated by vertical bars. The three panels show the bycatch rate for the combined mothership and factory trawler data, and for the mothership and factory trawler fleets separately.

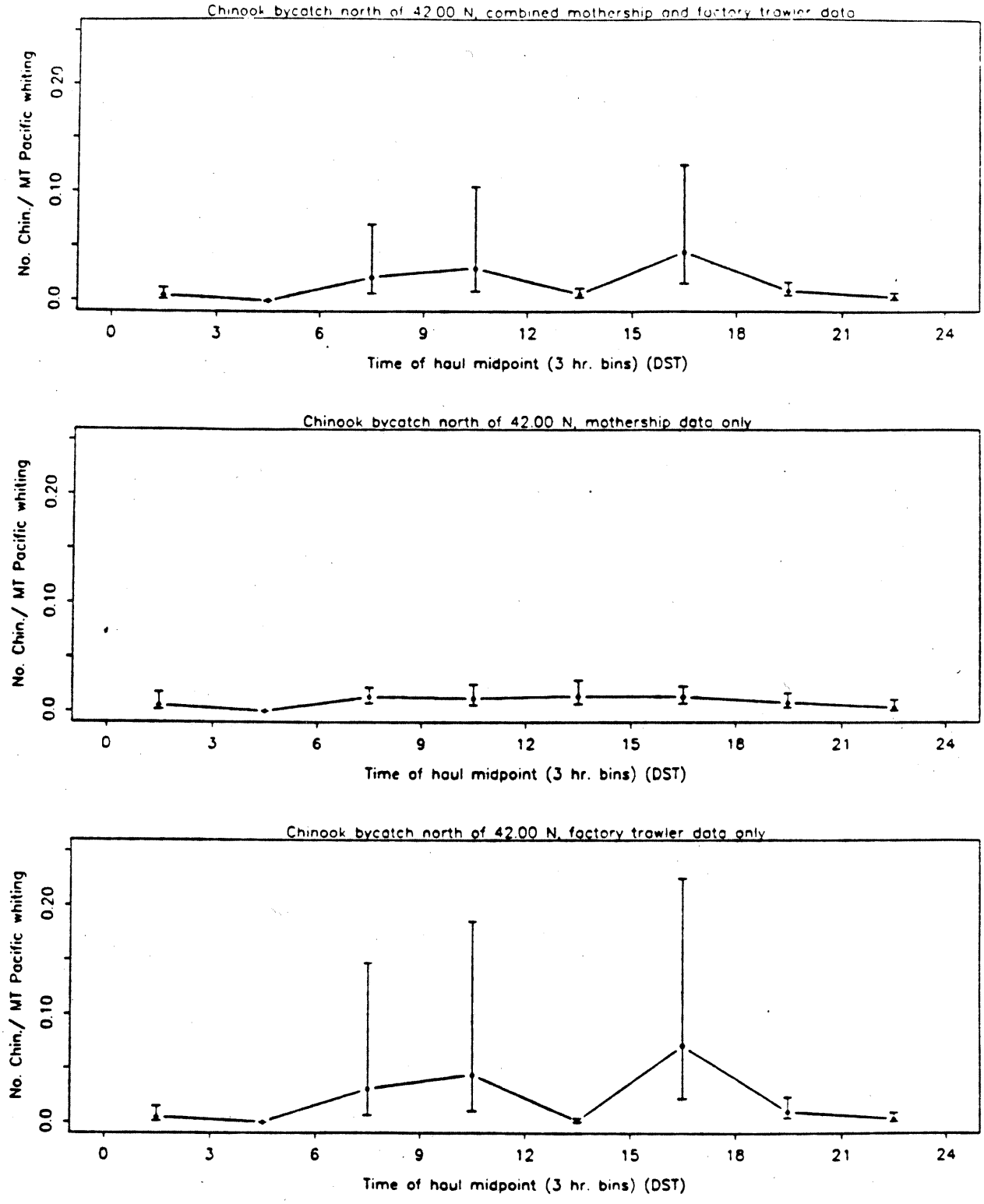


Figure 2. Chinook salmon bycatch rates in the 1991 Pacific whiting fishery north of 42.00 N. Bycatch rates are given as the number of fish per metric ton of whiting by 3-hour time intervals. 95% percent confidence intervals are indicated by vertical bars. The three panels show the bycatch rate for the combined mothership and factory trawler data, and for the mothership and factory trawler fleets separately.

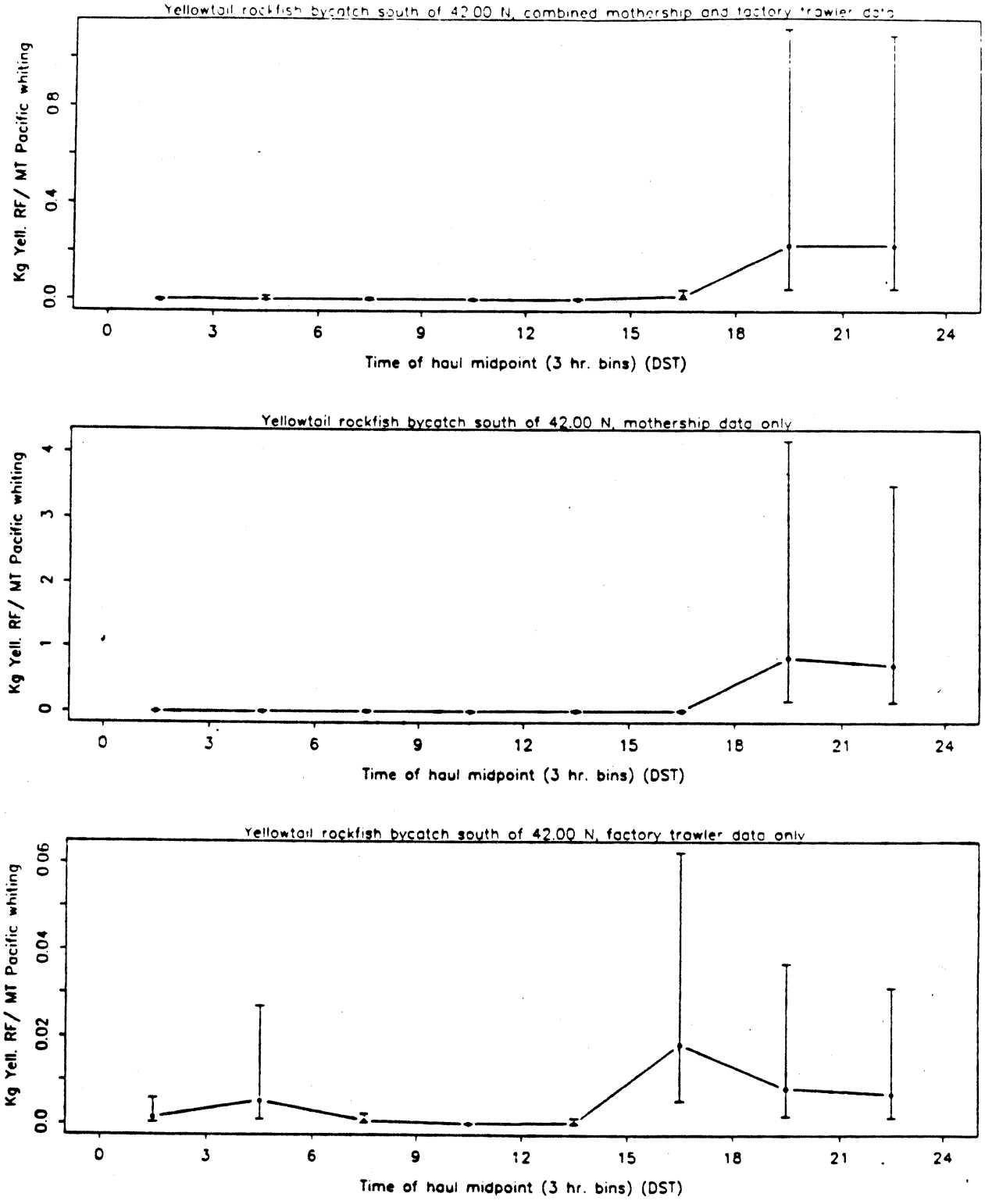


Figure 3. Yellowtail rockfish bycatch rates in the 1991 Pacific whiting fishery south of 42.00 N. Bycatch rates are given as the kilograms of fish per metric ton of whiting by 3-hour time intervals. 95% percent confidence intervals are indicated by vertical bars. The three panels show the bycatch rate for the combined mothership and factory trawler data, and for the mothership and factory trawler fleets separately.

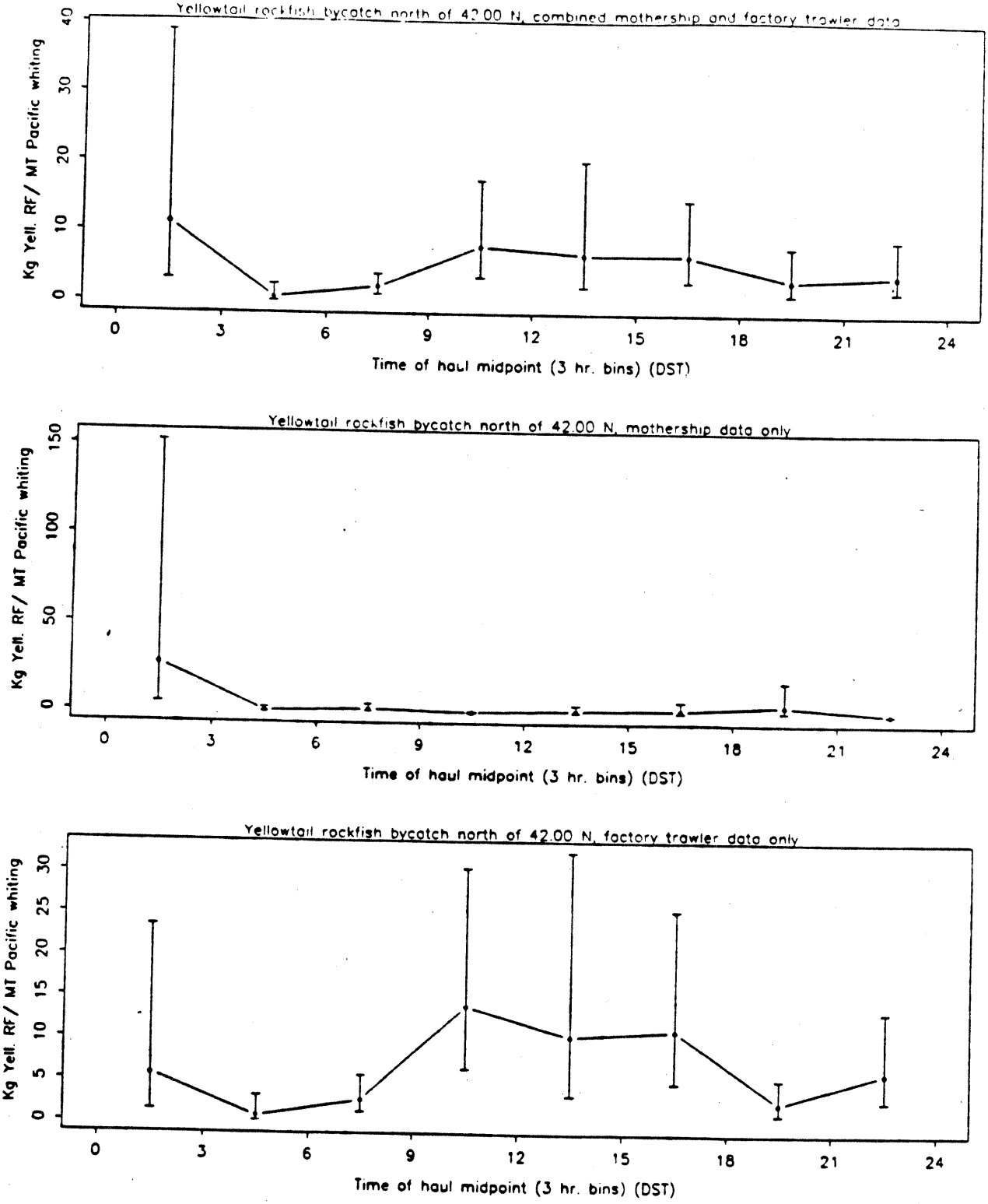


Figure 4. Yellowtail rockfish bycatch rates in the 1991 Pacific whiting fishery north of 42.00 N. Bycatch rates are given as the kilograms of fish per metric ton of whiting by 3-hour time intervals. 95% percent confidence intervals are indicated by vertical bars. The three panels show the bycatch rate for the combined mothership and factory trawler data, and for the mothership and factory trawler fleets separately.

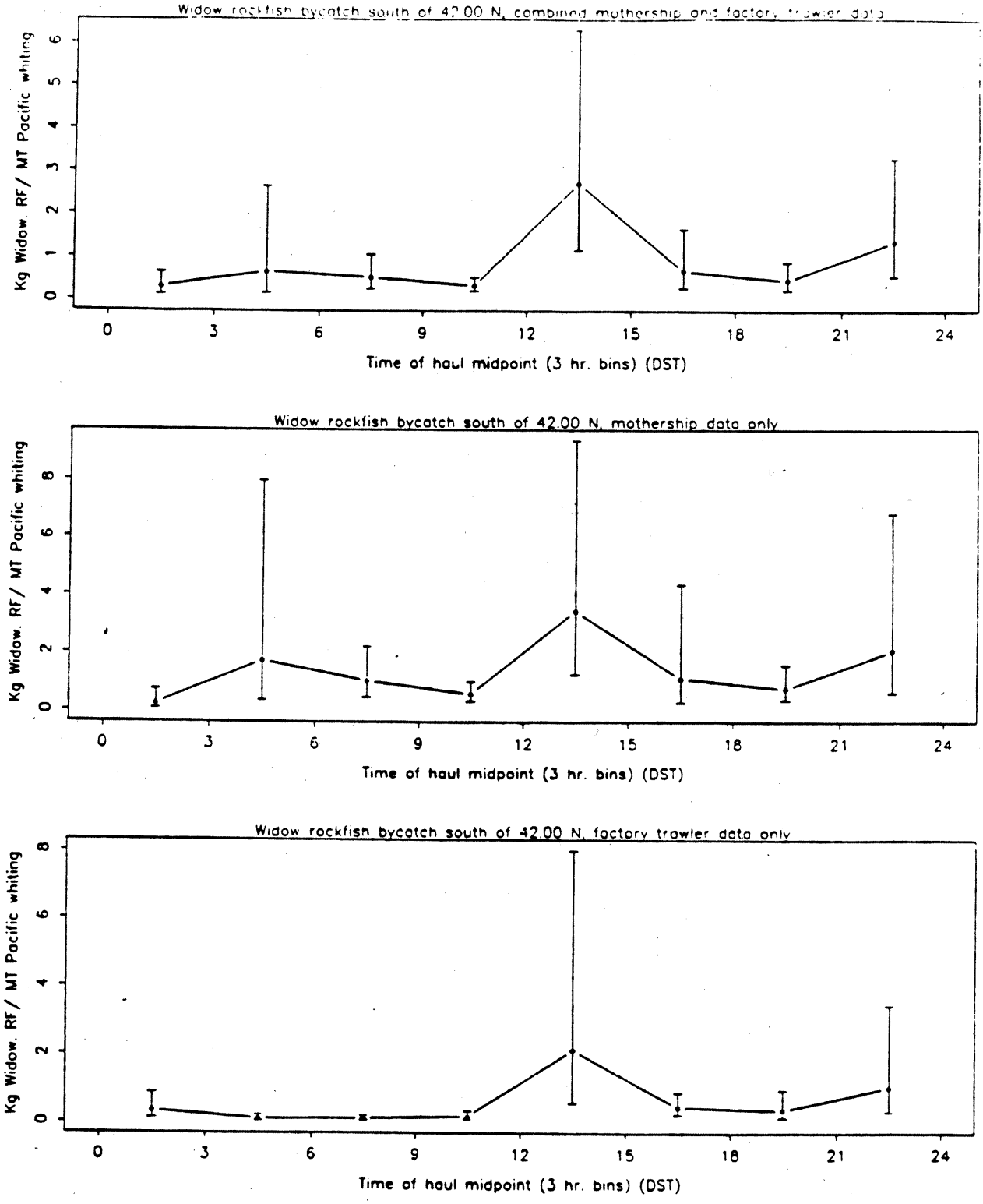


Figure 5. Widow rockfish bycatch rates in the 1991 Pacific whiting fishery south of 42.00 N. Bycatch rates are given as the kilograms of fish per metric ton of whiting by 3-hour time intervals. 95% percent confidence intervals are indicated by vertical bars. The three panels show the bycatch rate for the combined mothership and factory trawler data, and for the mothership and factory trawler fleets separately.

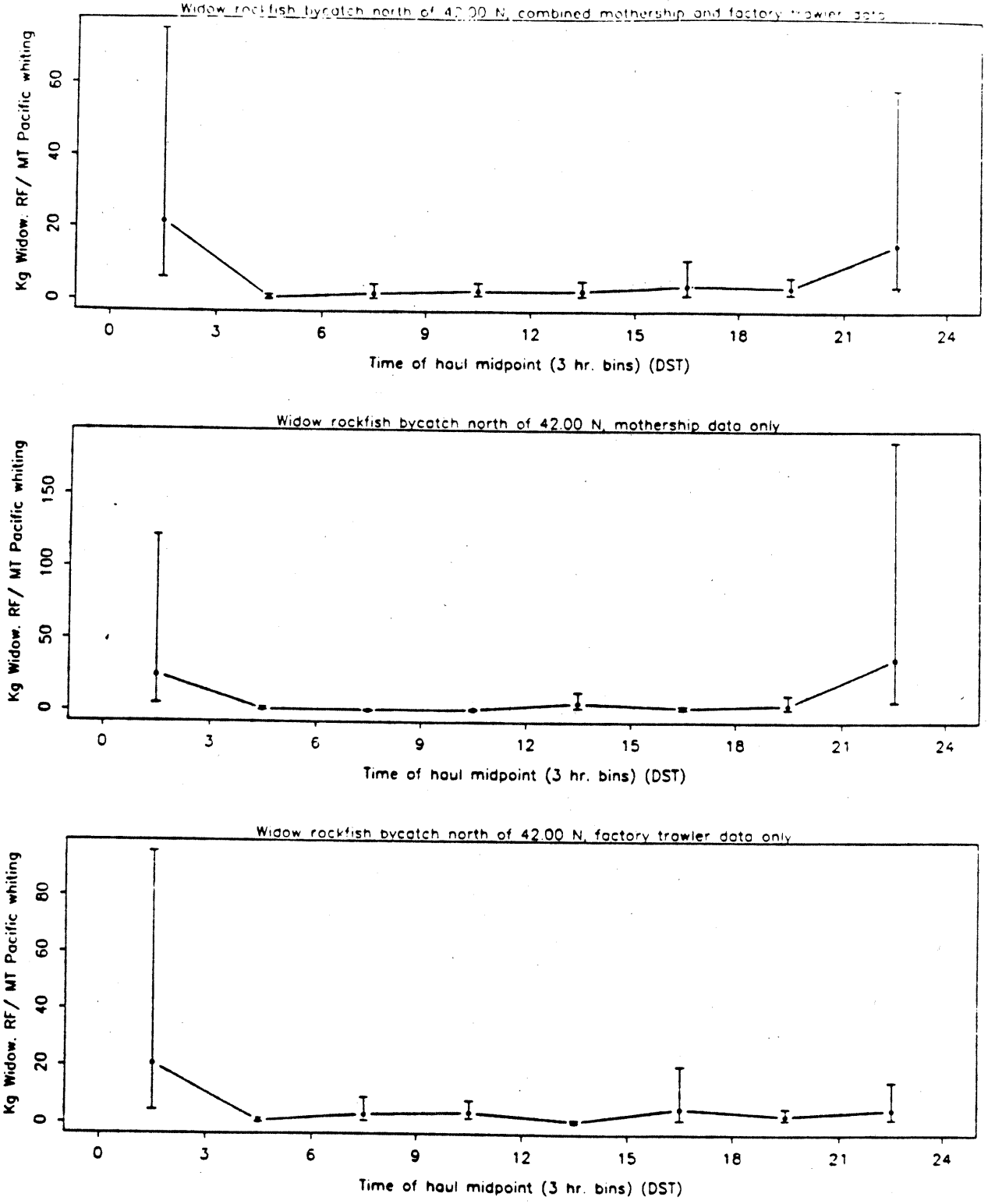


Figure 6. Widow rockfish bycatch rates in the 1991 Pacific whiting fishery north of 42.00 N. Bycatch rates are given as the kilograms of fish per metric ton of whiting by 3-hour time intervals. 95% percent confidence intervals are indicated by vertical bars. The three panels show the bycatch rate for the combined mothership and factory trawler data, and for the mothership and factory trawler fleets separately.

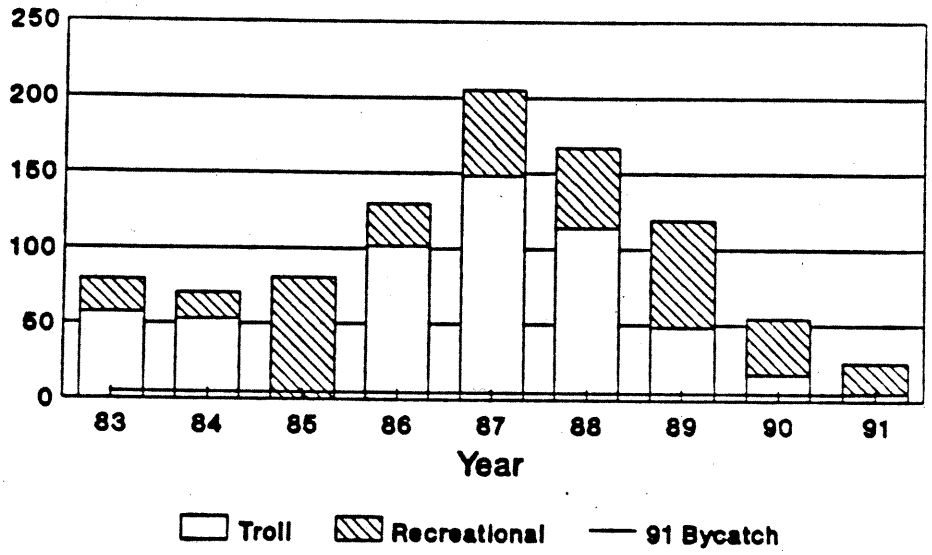
Appendix E. "1991 Pacific Coast Whiting Fishery Catch Summary," Supplemental Attachment C.3.a. March 1992.

SUPPL. ATTACHMENT
C.3.a
MARCH 1992

1991 PACIFIC COAST WHITING FISHERY CATCH SUMMARY

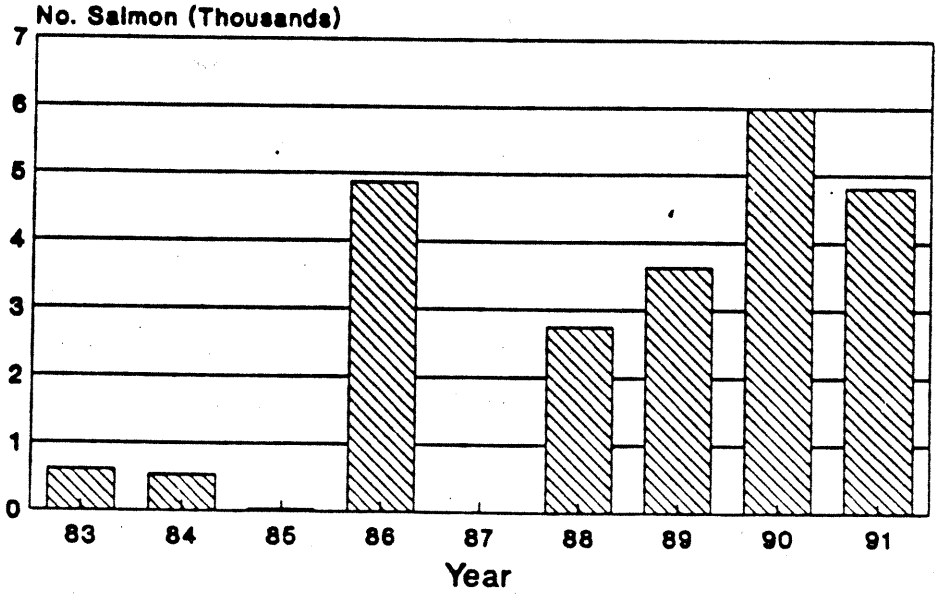
INPFC Area	Whiting (mt)	Salmon (#)	Bycatch Rate (#/mt)
Vancouver	5,735	268	0.047
Columbia	60,331	753	0.012
Eureka	66,600	4,811	0.072
Monterey	64,103	499	0.008
Total	197,771	6,331	0.032

Salmon Catch in the KMZ Recreational and Troll Fisheries

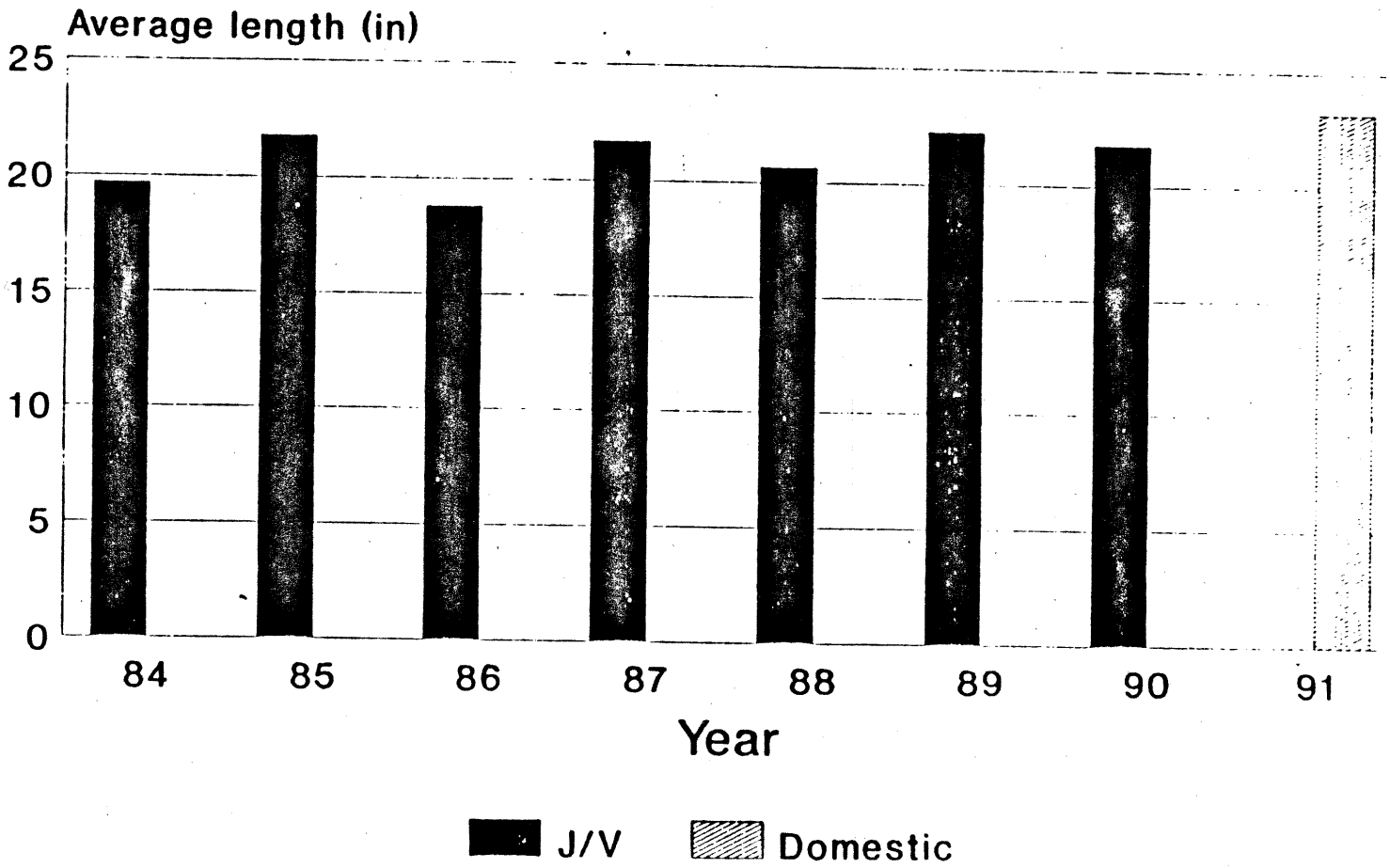


91 salmon bycatch in whiting fishery relative to salmon catch in other years

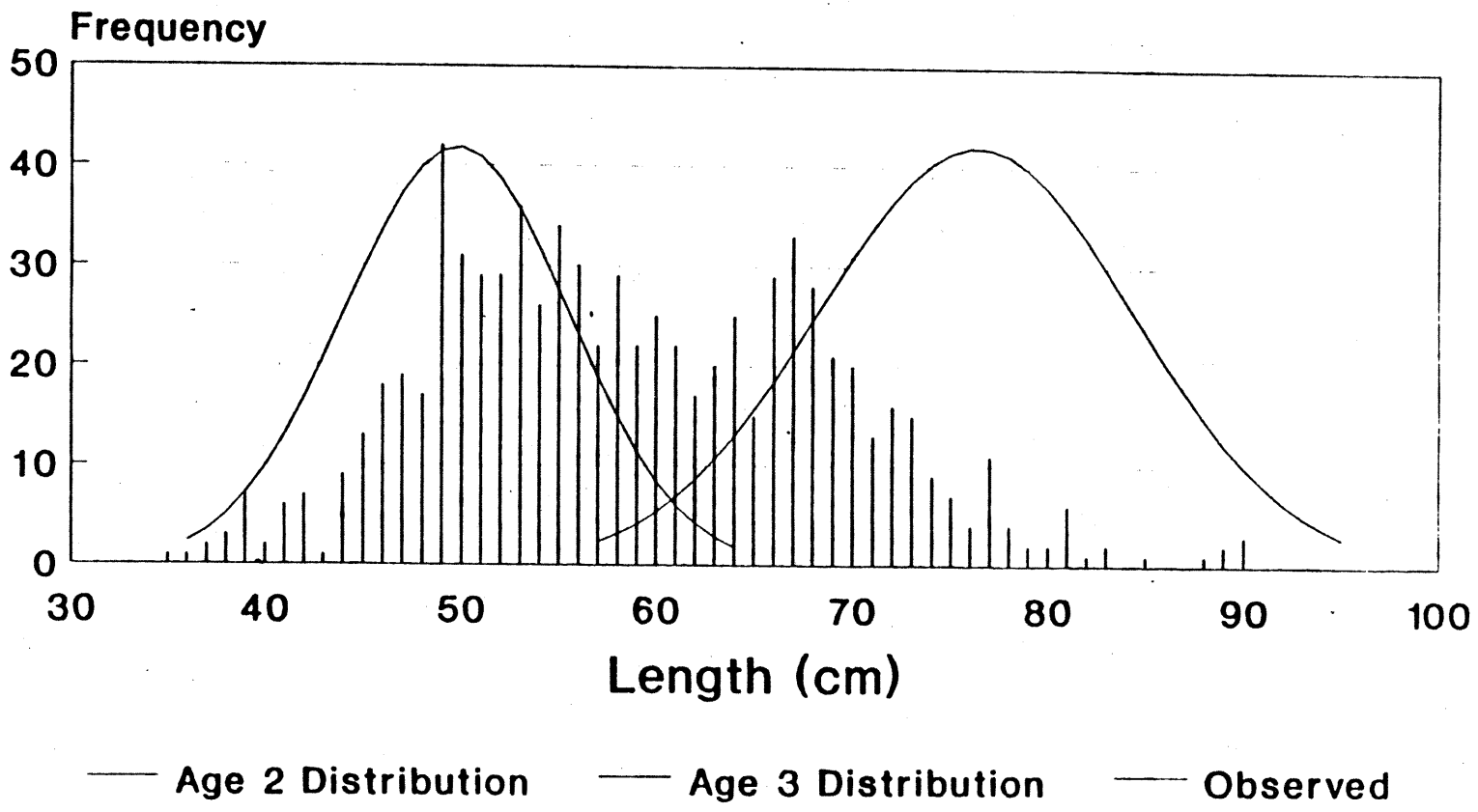
Salmon Bycatch in the Eureka Area Whiting Fishery



Chinook Salmon Length in the J/V and Domestic Whiting Fisheries



Length/Frequency Distribution of Chinook Bycatch in the 1991 Eureka Area Whiting Fishery



Age 2 and 3 are estimated distributions for the CVI stock during May

BYCATCH RATE (#/mt) OF CHINOOK IN THE 1991 EUREKA AREA WHITING FISHERY BY DEPTH

Depth	Year			
	1988	1989	1990	1991
<=100 fthm	0.479	0.154	0.315	---
>100 fthm	0.030	0.011	0.034	0.090

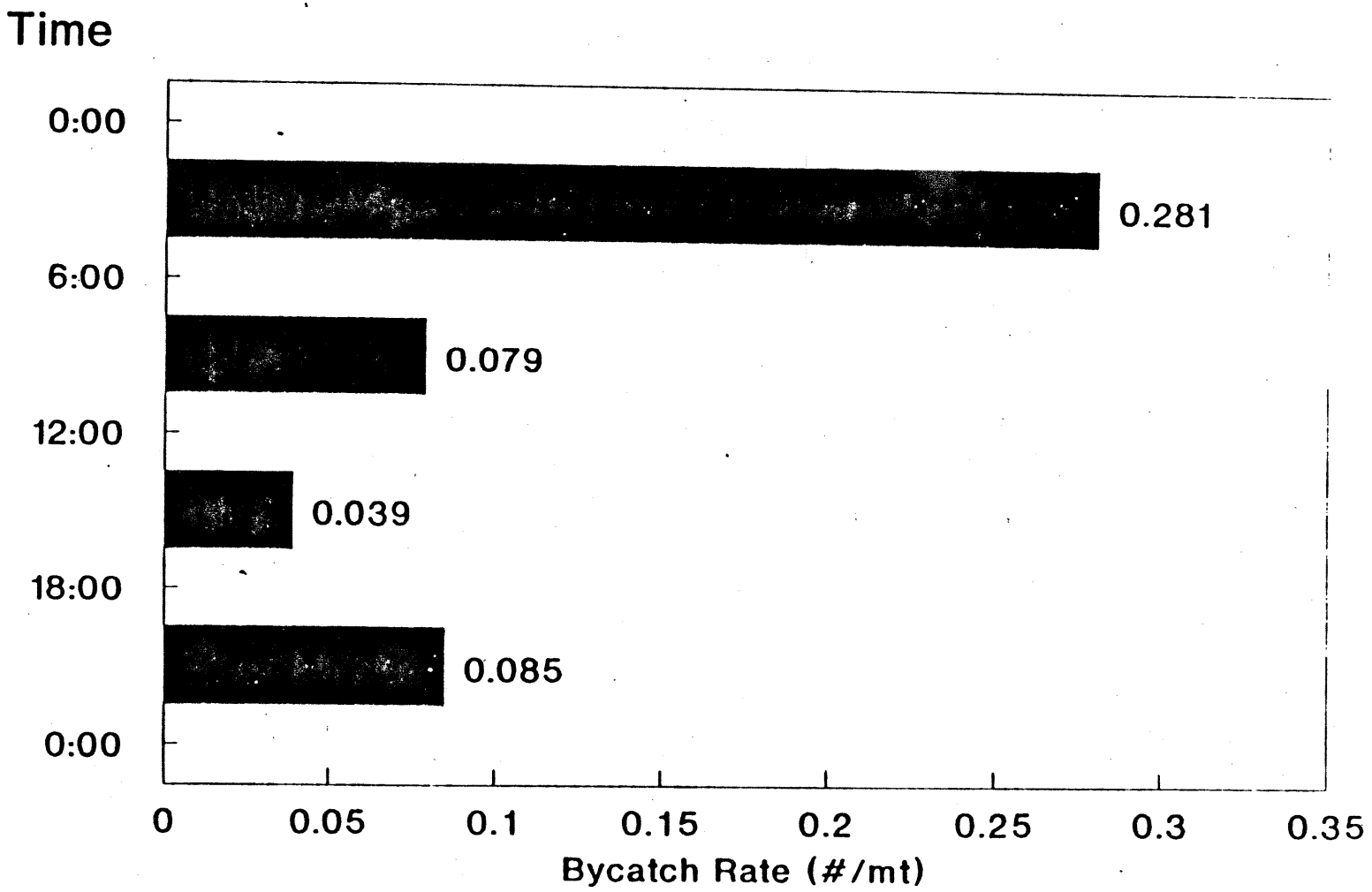
MONTHLY BYCATCH OF CHINOOK SALMON IN THE EUREKA AREA WHITING FISHERY IN 1991

Month	Whiting (mt)	Chinook (#)	Bycatch Rate (#/mt)
March	344	32	0.092
April	25,877	1,565	0.060
May	35,014	2,818	0.080
July	4,542	332	0.073
August	822	8	0.010
Total	66,599	4,755	0.071

BYCATCH RATE (#/mt) OF CHINOOK IN THE 1991 EUREKA AREA WHITING FISHERY BY 50 FATHOM DEPTH INTERVAL

	Year			
Fathoms	1988	1989	1990	1991
0-50	0.403	0.155	0.778	---
50-100	0.499	0.152	0.231	---
100-150	0.050	0.025	0.086	0.108
150-200	0.027	0.006	0.021	0.156
200-250	0.004	0.004	0.012	0.059
250-300	0.006	0.004	0.015	0.039
300-350	0.001	0.002	0.019	0.033
350-400	0.009	0.007	0.000	0.179
>400	0.000	0.002	0.000	0.136

Bycatch of Chinook in the 1991 Eureka Area Whiting Fishery by Time of Day



Appendix F. (1) "Final Environmental Assessment and Regulatory Impact Review (EA/RIR) for the Season Opening Date for Pacific Whiting", December 1991; (*The discussion regarding day/night fishing in this document is no longer appropriate. It is replaced by the more recent analysis at Appendix D.*)

(2) "Groundfish Management Team Statement on the Pacific Whiting Season," GMT Supplemental Report C.7., PFMC July 1992

Appendix F. (1) "Final Environmental Assessment and Regulatory Impact Review (EA/RIR) for the Season Opening Date for Pacific Whiting", December 1991;

(The discussion regarding day/night fishing in this document is no longer appropriate. It is replaced by the more recent analysis at Appendix D.)

F I N A L

ENVIRONMENTAL ASSESSMENT AND REGULATORY IMPACT REVIEW (EA/RIR)

FOR

THE SEASON OPENING DATE FOR PACIFIC WHITING

Pacific Fishery Management Council
Groundfish Management Team

December 1991

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Purpose and Need for Action.

The Pacific Fishery Management Council (Council) is concerned about the possibility of high bycatch of rockfish and salmon by the domestic at-sea processing fleet for Pacific whiting (whiting). The domestic processing fleet participated briefly in 1990 and dominated the whiting fishery in 1991. The domestic fleet is not subject to restrictions that applied to foreign vessels, and consequently is able to operate in areas that were closed to foreign processors south of 39° N. latitude.

An opening date for the whiting fishery may be established under the Council's Pacific Coast Groundfish Fishery Management Plan (FMP), under the authority of the Magnuson Fishery Conservation and Management Act (Magnuson Act).

1.2 Structure of the Document.

This EA/RIR first was presented to the Council at its September 1991 meeting, as a document titled "Analysis of the Change in Opening Dates for Pacific Whiting," Supplemental Attachment F.8.c.. A revised version of the EA/RIR was presented at the Council's November 1991 meeting, and included several additional alternatives recommended by the Council at its September 1991 meeting (April 15 and May 1 opening date options), and identified the Council's preferred opening date of April 15. The technical analysis has not been changed since earlier drafts except to refer to these additional alternatives, particularly the preferred alternative, and to incorporate suggestions from the Council's Scientific and Statistical Committee. At its November meeting, the Council confirmed its choice of an April 15 opening date. Therefore, the final EA/RIR is substantively the same as presented to the Council in November, with updates in this paragraph, the section describing the preferred alternative and the Council's intent after 1992 (Section 5), the section regarding other applicable law (Section 7), and the response to public comments (Section 10).

This document combines the EA and RIR and provides background information and assessments necessary for the Secretary of Commerce to determine that the proposed action is consistent with the Magnuson Act and other applicable federal law, such as the National Environmental Policy Act (NEPA) and Executive Order 12291.

The specific purpose of an EA is to analyze the potential impacts of the proposed action and reasonable alternatives on the quality of the human environment. If the action is determined not to be significant, then the EA will result in a finding of no significant impact (FONSI); the EA would then be the final environmental document required by NEPA. The FONSI determination is made by the Assistant Administrator for Fisheries, NOAA, during the processing of the final implementing regulations. If a FONSI cannot be made, then a more detailed environmental impact statement must be prepared. (See Section 7.1)

The purpose of an RIR is to analyze several socio-economic aspects of proposed regulatory actions to assure that such actions enhance the public welfare in an

efficient and cost-effective manner. The RIR serves as a basis for determining whether the proposed regulations are "major" under Executive Order 12291 and whether they will have a significant economic impact on a substantial number of small entities under the Regulatory Flexibility Act.

This EA/RIR also serves as the report required in the socio-economic framework procedures established in Amendment 4 to the FMP. Much of the information and analysis required in an EA/RIR also are required by the socio-economic framework which requires a report indicating the proposed management measure and the reasons it is preferred, a description of other viable alternatives considered, and an analysis that addresses how the proposed action will achieve the goals and objectives of the FMP, likely impacts on other management measures and other fisheries, biological and economic impacts, and the ability of the proposed action to achieve one or more of fifteen factors listed in the framework.

1.3 Background.

Until 1990, over 90 percent of the whiting harvest was taken by large foreign trawler/processor vessels (i.e., the foreign directed fishery) and smaller U.S. trawl vessels that delivered fish to foreign processing ships at sea (i.e., joint venture operations). Foreign processors were prohibited from operating south of 39°N latitude, primarily to minimize the harvest of rockfish and juvenile whiting. The fishery generally operated from 39° to northern Washington.

Foreign fishing was prohibited before June 1 each year, and joint ventures, although they had no season restriction, generally started only one to two months earlier because whiting were not available in fishable concentrations north of 39° much before April. Shore-based processors operated generally from April through September (Table 1). Whiting is a migratory species, and fishable populations first become available in the southern area.

Foreign fishing was phased out in the late 1980s and as competition increased among different joint venture companies, the season became shorter until in 1990 the joint venture fishery was closed on June 20 (with a small reopening later in the year). This increased competition and earlier fishing resulted in a change in north-south distribution of harvest, with more effort in southern areas.

In 1991 foreign processing vessels were completely displaced by domestic processors, due primarily to the introduction of large factory trawlers and motherships looking for alternative fisheries between seasons in Alaska. Domestic at-sea processing was not contemplated when the FMP was initially developed and, because shore-based processing occurs almost exclusively north of 39° the area restriction was not thought to be necessary for domestic fishermen. Since U.S. vessels are not subject to either the June 1 season date nor the area restriction, they are free to fish both earlier and farther south than the joint ventures.

2.0 ALTERNATIVES CONSIDERED

Option 1. January 1.

Option 2. April 1. Even though there was no prohibition against an earlier start, the traditional domestic fishery for whiting, both shore-based and joint venture, has not started much before April 1.

Option 3. April 15.

Option 4. May 1.

Option 5. A date later than May. For discussion, June 1 and September 1 are provided for reference, but are not intended to be the only possibilities that the Council may consider.

Option 6. "Flexible date" that would maximize yield, minimize bycatch of rockfish and salmon, enhance product quality, and be economically beneficial, to be determined after examining the analysis. The Council could establish a framework that would allow adjustment of the opening date for the whiting fishery (as a "routine" management action under the FMP) if consistent with the analysis provided herein.

> Note: January 1 (option 1) is the status quo in the regulations for the domestic fishery, i.e. there has been no season restriction for the domestic whiting fishery. Even though January 1 is the "regulatory" status quo, the fishery has never operated that early in the year. The fishery actually started between April and June most years (Table 1). Consequently, Options 2, 3 and 4 could be considered the "operational" status quo.

3.0 AFFECTED ENVIRONMENT

The domestic fishery for whiting previously was conducted in the ocean north of 39° N. latitude and after April. With the introduction of large-scale processing at-sea by the domestic fleet in 1991, the fishery expanded to waters (beyond 3 nautical miles) south of 39 ° N. latitude and started before April.

4.0 ANALYSIS OF THE ALTERNATIVES

The Council asked the Groundfish Management Team to examine the following issues with respect to the opening dates:

a. Bycatch of rockfish
b. Bycatch of salmon
c. Yield per recruit and sustainable yield
d. Product quality
e. Distribution of impacts (allocation)

4.1 DATA AND DISCUSSION

4.1.a. BYCATCH - ROCKFISH.

Because the totally domestic fishery for whiting developed in 1991, there is no long term data series from which to predict future performance of the fishery. Three data sets are available: (1) preliminary data from the 1991 fishery, through August 20, based on reports from NMFS observers; (2) historical joint venture data based entirely on observer samples (data blending foreign and observer reports, which usually is used when describing joint venture activities, is not available for individual rockfish species); and (3) data from 19 whiting trips in 1991 that were landed at a shore-based processor in Oregon. All three data sets include discards. It should be emphasized that none of these data sets may be indicative of future performance in the fishery. Data for the 1991 fishery (for the at-sea processors as well as for the shore-based landings in Oregon) are only a snap-shot of conditions in 1991, the first year of widespread participation by the domestic at-sea processing fleet. The Oregon shore-based data in particular are based on a very small sample size and should not be expanded to apply to shore-based landings along the entire coast. The joint venture data represent a different (much smaller) type of catcher vessel compared with the catcher/processor fleet, and except for 1989-90, tended to operate for a longer season than the 1991 fishery, and always north of 39° N. latitude. The catch data for all three data sets are provided in the figures and tables at the end of this report.

Five rockfish species (bocaccio, chilipepper, Pacific ocean perch (POP), widow rockfish, and yellowtail rockfish) were considered initially. They were selected because each currently is managed, separately or with a group of species, to reduce harvest levels, and potentially could be intercepted in the whiting fishery.

After further examination, two species, bocaccio and POP, were eliminated from further analysis. In both the 1991 domestic fishery (Table 2) and the 1986-1990 joint venture (Table 5), catches and catch rates for these species were quite small: for bocaccio, 12 mt in the 1991 fishery and 3 mt on average in the joint venture; for POP, 38 mt in the 1991 fishery (which may be the result of incorrect identification since 18 mt were recorded for the Monterey subarea where POP are unlikely to be this prevalent), and 10 mt on average in the joint venture.

Although the Council is interested in examining the effects of different seasons on the whiting fishery, catch performance by month can be deceptive. Catch levels depend not only on the size of the year classes available to the fishery (larger, older fish tend to migrate farther north), schooling patterns, and environmental conditions (such as water temperature) that influence the location of the fish, but also on the distribution of fishing effort and the size of fish needed for the particular product or market. In any given month, vessels desiring smaller fish will tend to operate in more southern areas and vessels preferring larger fish will stay farther north. In short, although whiting migrate from south to north, the fleet is not as predictable. Consequently, the bycatch of rockfish (and salmon) are presented by month as well as by INPFC area.

Most of the bycatch in the 1991 fishery occurred in April and May simply because

most of the fishery occurred during those months. In order to assess the relative impacts of the fishery in different months or areas, independent of effort, catch rates rather than catch are compared for the three data sets. However, because the level of fishing effort is not implied and sample size is small in some cases, the rates presented here should not be considered absolute; they merely indicate expected trends. Catch rates for rockfish are presented in terms of metric tons of rockfish per metric ton of whiting.

CHILIPEPPER (Figure 1): The 1991 acceptable biological catch (ABC) for chilipepper is 3,600 mt. There is no separate harvest guideline (HG) or trip limit for chilipepper. This species is one of many species managed as the Sebastes complex of rockfish.

1991 At-Sea (Tables 2A, 2B): In the 1991 fishery, approximately 554 mt of chilipepper, 15 percent of the 1991 ABC, were taken incidentally in the whiting fishery by catcher/processors and motherships. The overall catch rate for this fishery was about 0.0029 (equivalent to one mt of chilipeppers per 345 mt of whiting). The catch rate of chilipepper was highest early in the fishery, in March (0.0104) and April (0.0043), and lowest in August (less than 0.0005). By area, the catch rate of chilipepper was highest in Monterey (0.0075), almost 4 times higher than in any other INPFC area, and lowest in the Eureka area (less than 0.0005).

Motherships and Catcher/processors (Table 3): Overall, the rate of chilipepper catch in the mothership fishery was 6 times higher than in the catcher/processor fishery, due overwhelmingly to the peak rate (0.0176) in the Monterey area.

1991 Shore-based, Columbia area (Table 4): The incidence rate of "other rockfish," which includes chilipeppers, was less than 0.00005, only 32 pounds of rockfish other than widow and yellowtail in 814 mt of whiting.

1986-1990 Joint Venture Average (Tables 3, 5A, 5B): In the joint venture, the annual average catch of chilipepper was less than 10 mt, with the highest catch rate in April (0.0002) and in the Monterey area (0.0047). The average joint venture catch rate of chilipepper (0.0006) is much lower than for either the catcher/processors (0.0010) or motherships (0.0060) in the 1991 fishery. This can be explained simply by the fact that the joint ventures spent little time in the Monterey area where chilipepper are most likely to be caught.

WIDOW ROCKFISH (Figure 2): The 1991 ABC and HG for widow rockfish both are 7,000 mt. Widow rockfish are fully utilized and have been managed by increasingly restrictive trip limits during the year to keep landings within the HG.

1991 At-Sea (Tables 2A, 2B): In the 1991 fishery, approximately 347 mt of widow rockfish, 5 percent of the 1991 ABC, were taken incidental to the at-sea whiting fishery. The overall catch rate for widow rockfish was about 0.0018 (equivalent to one mt of widow rockfish in 555 mt of whiting). By month, the catch rate of widow was highest in June (0.0033) and July (0.0043), and lowest in March (0.0001). By area, the catch rate was highest in the Vancouver (0.0067) and

Columbia (0.0035) areas, and lowest in the Eureka area (0.0003).

Motherships and Catcher/processors (Table 3): Overall, the catch rate of widow rockfish in the mothership fleet was 1.5 times higher than by catcher/processors. The mothership rate was highest in the Vancouver area (0.0106).

1991 Shore-based, Columbia area (Tables 3, 4): The incidence rate of widow rockfish was 0.0002, less than both the catcher/processor (0.0035) and mothership (0.0034) rates for the Columbia area.

1986-1990 Joint Venture Average (Tables 3, 5A, 5B): In the joint venture, the average annual catch of widow rockfish was less about 250 mt. The joint venture rate was highest in September (0.0021) and in the Monterey area (0.0172). The overall joint venture average rate of 0.0016 is similar to the catcher/processor rate (0.0015), but lower than the mothership rate (0.0024) in 1991.

YELLOWTAIL ROCKFISH (Figure 3): The 1991 ABC for yellowtail rockfish (in the Vancouver, Columbia, and Eureka subareas) is 4,600 mt. Yellowtail rockfish are fully utilized and are managed separately, but within the Sebastes complex of rockfish, to keep landings within the harvest guideline that applies to the Vancouver and Columbia subareas.

1991 At-Sea (Tables 2A, 2B): In the 1991 fishery, approximately 321 mt of yellowtail rockfish, 7 percent of the 1991 ABC, was taken incidental to the at-sea whiting fishery. The overall catch rate for yellowtail rockfish was about 0.0017 (equivalent to one mt of yellowtail in 588 mt of whiting). By month, the catch rate was highest in June (0.0143) and lowest in March and August (less than 0.0005). By area, the highest catch rates occurred in the Vancouver (0.0058) and Columbia (0.0053) areas, and were 100 times lower in Eureka and Monterey (about 0.00005).

Motherships and Catcher/processors (Table 3): Coastwide, the catcher/processor rate was twice the mothership rate. The peak rate by catcher/processors (0.0152) occurred in the Vancouver area.

1991 Shore-based, Columbia area (Tables 3,4): The incidence rate of yellowtail rockfish was 0.0009, much lower than for catcher/processors (0.0062) or motherships (0.0039) in the 1991 fishery in the Columbia area.

1986-1990 Joint Venture Average (Tables 3, 5A, 5B): In the joint venture, the yellowtail catch averaged about 500 mt annually between 1986-1990. Catch rates were highest in October (0.0145, but this is a small sample), and were fairly consistent from June to September (between 0.0033 and 0.0043). The joint venture overall rate (0.0034) is higher than for both catcher/processors (0.0021) and motherships (0.0011) in the 1991 fishery. This is not surprising since the 1991 fishery expended a greater proportion of its fishing effort in southern waters (where yellowtail are not prevalent) than did the joint ventures.

4.1.b BYCATCH -SALMON (Figure 4).

The salmon resource off Washington, Oregon, and California is managed with season and catch limits to keep landings within specified levels. The interception of salmon, particularly of Sacramento River winter-run chinook which has been listed as "threatened" under the Endangered Species Act (ESA), is of great concern to the Council and industry. A biological opinion was prepared by the National Marine Fisheries Service (NMFS) to examine the potential impacts of the whiting fishery south of 39° N. latitude. A copy of the biological opinion, which concludes that the whiting fishery is not likely to jeopardize the continued existence of Sacramento winter-run chinook, is available from the NMFS (Northwest Region, 7600 Sand Point Way NE, BIN C15700, F/NWO2, Seattle WA 98115).

The same three data sets exist as for rockfish, except the joint venture averages apply to a longer time period (1981-1990). The same limitations of the data sets apply as for rockfish: neither the 1991 at-sea processing, Oregon shore-based, or 1981-90 joint venture data may be representative of future performance in the fishery. For salmon, rates are presented in terms of numbers of salmon per metric ton of whiting. As for rockfish, catch rates should not be considered absolute, but rather indicative of trends.

1991 At-Sea (Tables 6,7): In the 1991 fishery, approximately 6,279 salmon were caught, of which 6,115 (97 percent) were chinook. The industry agreed to maintain the rate of salmon catch to less than 0.05 salmon per mt of whiting, the rate experienced in the 1990 joint venture (but less than half the 1981-1990 joint venture average). The overall catch rate for salmon in the 1991 fishery was about 0.033 (equivalent to one salmon in 30 mt of whiting). Both by month and by area, the 1991 at-sea processing fleet experienced much smaller interception rates of salmon than the joint venture average.

By month, the salmon catch was highest in April and May, when most of the fishery occurred, but the catch rates were highest in May and June (0.044 and 0.040, respectively) and lowest in August (0.004). By area, the catch and catch rates were highest in the Eureka area (0.072). The lowest catch rate (0.008) occurred in the Monterey area.

Mothership and catcher/processors (Table 3): Coastwide, the catcher/processors and motherships experienced a similar rate of interception (0.031 and 0.036 salmon per mt of whiting, respectively). The catcher/processor rate was highest in the Vancouver (0.093) and Eureka (0.073) areas, and lowest in the Columbia and Monterey areas (both 0.009). The mothership rate was highest (0.072) in the Eureka area, and lowest in the Vancouver and Monterey areas (0.005 and 0.006, respectively).

1991 Shore-based, Columbia area (Tables 3, 4): The incidence rate of salmon through September 5, 1991 was 0.002 (2 salmon in 814 mt of whiting), much lower than the rates for either the catcher/processors (0.009) or motherships (0.022) in the Columbia area in 1991.

1981-1990 Joint Venture Average (Tables 3, 6, 7): The average incidence of salmon in the joint venture was 0.109 salmon per mt of whiting, much higher than in the 1991 catcher/processor (0.031) and mothership (0.036) fishery. The

highest average rates occurred in July (0.246) in the joint venture, in contrast with May-June in the 1991 fishery. The lowest joint venture rates occurred in April (0.040), compared with March and August in 1991. By area, the highest average joint venture rates occurred in the Vancouver and Eureka areas (0.163 and 0.147, respectively), and the lowest occurred in the Monterey area (0.027); this is consistent with the high and low areas in the 1991 fishery. Salmon taken in the joint ventures were usually over 90 percent chinook, and not of a size legal in the current year's salmon fishery.

4.1.c. YIELD PER RECRUIT AND SUSTAINABLE YIELD.

An analysis of the effect of changes in the opening date on the yield per recruit of whiting is found in the Appendix. The analysis examines different yield per recruit and exploitable biomass levels expected if the entire whiting quota were harvested in a given month. Consequently, the results provide a relative rather than absolute basis of comparison of the effects of different seasons in the whiting fishery. In all cases, a later opening date gave higher yield per recruit and higher sustainable yield.

In April, the mature whiting have recently spawned and then migrated over 1000 km, and are at the minimum of their annual growth cycle. A June fishery would increase sustainable yield by 4 percent relative to an April fishery, resulting in increases in annual yield between 4,700 and 7,300 mt depending on the harvest level. A September fishery would increase sustainable yield by about 10 percent relative to an April fishery, resulting in increases in annual yield between 11,500 and 18,100 mt. This analysis does not consider whether the loss of catch biomass caused by taking fish early in the season represents a genuine loss of yield (i.e., usable product), or whether the lost yield consists of gonad or liver growth.

The higher yield per recruit later in the year also is supported by fishery data from the joint venture (Table 8). The average weight of whiting retained by the joint ventures (1986 - 1990) increased by month as the year progresses, from 0.46 kg (1.0 lbs) in April to 0.59 kg (1.3 lbs) in September. As expected, whiting caught in the Monterey area weighed less (0.38 kg, 0.8 lbs) than whiting from the Vancouver area (0.58 kg, 1.3 lbs).

4.1.d. QUALITY.

There is little data relevant to product quality. Anecdotal information that gel strength (important for high quality surimi) was not as good as desired in March but improved by May could be due to the spent condition of whiting after spawning. Or, because this was the first year of large-scale operations, quality may have suffered due to lack of experience in processing this relatively fragile species.

Acceptable quality is largely a market-driven factor. Although there have been isolated problems, whiting produced in 1991 generally seems to have been accepted in the market. However, the volume of whiting product is quite small relative to pollock, and the sale of whiting product could in many instances still be considered a test market.

4.1.e. DISTRIBUTION OF IMPACTS (ALLOCATION).

In 1991, 17 domestic at-sea processing vessels (3 motherships that processed fish delivered by 24 catcher vessels, and 14 catcher/processors that both fished and processed their catch), and approximately 11 shore-based processors operated in the whiting fishery. Peak harvest rates exceeded 25,000 mt of whiting (round weight) per week. This was due overwhelmingly to the high effort in the high-capacity at-sea processing fleet. Shore-based processors are believed to have used less than 2,000 mt per week when at peak production. By September 3, 1991, the at-sea processing fleet had taken about 195,000 mt of whiting, compared with about 15,000 mt by shore-based processors.

The different processing sectors have different needs. Whereas the shore-based industry prefers a slower, more extended season, the mothership and catcher/processing fleet generally has preferred a pulse fishery (in the spring and fall/winter) between pollock seasons in Alaska. Nonetheless, this is not absolute; one mothership and one catcher/processor continued operating in the whiting fishery rather than returning to the pollock fishery in the summer of 1991.

Alaska pollock seasons in 1992 are expected to be similar to 1991, although the first opening may be delayed from January to February. If the pollock fishery occurs at similar rates as in 1991, it is expected to close well before April. The second pollock opening in 1992 is expected to occur in June and, if the fishery proceeds as in 1991, will last until late August or early September.

In 1991, the 228,000 mt harvest guideline for whiting was allocated among user groups: 104,000 mt for catcher vessels that process (catcher/processors); 88,000 mt for catcher vessels that do not process (but deliver shore-side or to motherships at sea); and the remaining 36,000 mt was to be held in reserve to accommodate the needs of shore-based processors. At its September 1991 meeting, the Council initially recommended that shore-based processing needs receive priority as well in 1992, but the final allocation recommendation has not yet been made by the Council or approved by the Secretary of Commerce.

4.2 COMPARISON OF ALTERNATIVES

This discussion assumes that fleet composition, catch rates, and effort in 1992 will be similar to 1991, and data from the 1991 fishery is used rather than from the joint venture (Tables 6,9). Therefore, performance by the 1991 at-sea processing fleet, which harvested over 85 percent of the available whiting in 1991, is applied to all harvesters, even though it may not be representative of performance by vessels delivering shoreside.

4.2.a. BIOLOGICAL AND PHYSICAL IMPACTS.

BYCATCH OF ROCKFISH: Of the rockfish species most prevalent in the whiting fishery and of greatest management concern, chilipepper are most likely to be taken in the Monterey area, whereas widow and yellowtail are most likely to be taken in the Vancouver and Columbia areas. By month, the rate of interception

was highest in March and April for chilipepper, in June and July for widow, and June for yellowtail. Catch levels of these species in the 1991 fishery (15 percent of the chilipepper ABC, 5 percent of the widow ABC, and 7 percent of the yellowtail ABC) were not alarming.

Bycatch of POP and bocaccio are expected to be insignificant in the near future. (The catch of bocaccio could increase if the fishery occurred more in southern waters. Similarly, the catch of POP could increase if the fishery occurred more northward.) However, if bocaccio historical recruitment patterns continue (recruitment in some years is quite high), the future bycatch could increase dramatically with the presence of a strong year class. Bocaccio are found in the same habitat, and are caught coincidentally with, chilipepper.

There are no data to indicate the species and catch rates likely to occur if the fishery developed between January and April, except that offshore species in more southern waters (particularly mackerel) are more likely to be encountered. An opening later than April is likely to reduce the catch of chilipeppers, but may increase the catch of widow and yellowtail.

BYCATCH OF SALMON: The highest rate of salmon interception in 1991 occurred in the Eureka area, followed by the Vancouver area, and was lowest in the Monterey area. By month, the highest rates were observed in May and June, and the lowest rates occurred in March and August.

If the fishery developed between January and March, more effort would be expended in southern waters, particularly the Monterey and Conception areas. Although this almost certainly would lower the overall rate of salmon interception in the whiting fishery, it also could increase the very small probability of taking Sacramento winter-run chinook, especially if the fishery occurred in nearshore waters of the Monterey area. However, whiting are believed to be far offshore and south this time of year. Increased interception of winter-run chinook early in the year before the maturing fish have yet to exit the ocean would be based on an assumption that mature fish are as susceptible to trawl gear as smaller immature fish. Smaller, and presumably immature salmon tended to be the bulk of the bycatch in the joint venture trawl fisheries for whiting.

YIELD PER RECRUIT, MAXIMIZING SUSTAINABLE YIELD: The analysis in the appendix indicates that yield per recruit and sustainable yield increase the later the fishery starts. If the fishery occurred, in its entirety, in September instead of April, sustainable yield could be increase by about 10 percent (assuming a moderate exploitation rate). A June fishery is estimated to result in 4 percent greater sustainable yield than an April fishery. It is not known if differences in yield would be due to gonad and liver development or to marketable flesh.

There are no data on which to estimate yield per recruit or sustainable yield if the whiting fishery occurred predominantly in January - March.

The Council could choose to maximize sustainable yield by delaying the fishery until the fall, but the benefit of a maximum 10 percent gain in yield would need to be balanced against the significantly shortened season for shore-based

processors, reduced availability of local whiting for shore-based processors in California, and potential increases in bycatch of widow and yellowtail rockfish. A fall opening also could allow more fish to enter Canadian waters than if an earlier fishery had been conducted in U.S. waters.

In discussing changes in yield, the Council should keep in mind that these are relatively small numbers. For reference, 13,000 mt (almost 7 percent of the whiting catch) was estimated to be discarded in 1991. The amount of fish available to the fishery also will be determined by the size of incoming year classes and the sharing of the resource between the U.S. and Canada.

PHYSICAL IMPACTS. No change in impact to the physical environment is expected from any of the options.

4.2.b. ECONOMIC AND SOCIAL IMPACTS.

DISTRIBUTION OF IMPACTS (WITH AND WITHOUT DIRECT ALLOCATIONS). The season opening options must be viewed (1) in the absence of an allocation between fishing groups and (2) with allocation. In 1991, the Council approved an allocation between vessels that catch and process whiting and vessels that catch but do not process. One objective of this allocation was to protect existing on-shore fish processors from preemption by the high-capacity at-sea processors. If a similar allocation is not implemented for 1992 and beyond, there is a potential for at-sea processors to take the entire quota in 2 or 3 months. However, if allocations are approved, it is not possible at this time to determine with certainty how the opening date would affect the achievement of the allocations; the impacts would vary depending on the size of the overall whiting harvest guideline, the needs of the various domestic fishing and processing sectors, the choice to participate in alternate fisheries (particularly pollock in Alaska), the amount and rate of fishing effort, and the level of allocation. The use of "allocation" in this discussion presumes only that specified amounts would be reserved for shore-based processors, but does not imply amounts. The following discussion compares relative impacts, with and without allocation, using 1991 catch performance for illustration.

A January 1 (option 1) opening could provide more opportunity to fish for the at-sea processing fleet, particularly if the pollock season is delayed until February. However, there is little evidence that whiting will be available in fishable concentrations so early in the year. Whiting are expected to be far south, perhaps near the Mexican border, and offshore. If no allocations are in place and the fishery is conducted successfully earlier than April 1, at-sea processors stand to benefit since they will be able to fish at greater distances from shore than vessels delivering to shore-based processors (that need to be relatively close to the processing plant to maintain product quality). However, if allocations are in place, shore-based processors would be protected and should not be directly disadvantaged by an early fishery by the at-sea processing fleet, except perhaps to the extent that sustainable yield is reduced in the longterm.

An opening in April or May (options 2, 3, or 4) approximates the chosen opening date by joint venture operations. Traditionally, joint ventures, which were prohibited from operating south of 39°, choose to start in April or May because

whiting generally were not available in fishable concentrations north of 39° before that time. Shore-based operations, all which currently are found north of 39°, also have not started much before April (Table 1). If allocations are in place, shore-based processing needs would be protected under all three of these options. If no allocations are in place, the later the fishery starts (between April and May), the greater the likelihood that shore-based processors will receive the whiting they intend to use.

For example, if the fishery opens April 1 (option 2), the at-sea processing fleet is capable of harvesting the entire quota in about 2 to 3 months, which would preclude further operations by shore-based processors. (The peak rate of processing by motherships and catcher/processors in 1991 was about 25,000 mt/week.)

If the fishery opens April 15 (option 3), about 5 weeks of fishing could be available to the at-sea processing fleet before the second pollock opening in Alaska (expected near June 1). Applying 1991 catch rates, the at-sea processing fleet could take at least 125,000 mt of whiting before most vessels depart for the summer pollock fishery.

If the fishery opens May 1 (option 4), about 3 weeks of fishing (and 75,000 mt of whiting) could be taken by the at-sea processing fleet before departing for the pollock fishery. Such a short whiting opening might not justify the transit costs from Alaska, particularly if alternative fisheries are available, or if the fleet expects to harvest whiting in the fall after the end of the pollock season. However, at-sea processors based in Washington may already be in the area for repairs and provisions. There is no way at this time to predict what is likely to occur, and no way to estimate the amount of at-sea processing effort that may remain in the whiting fishery rather than returning to the Alaska in the summer.

If the fishery opens later than May (option 5) and no allocations are in place, different impacts will occur depending in large part on the relationship to the opening of the pollock fisheries and choice of at-sea processors to use either pollock or whiting. For example, a late spring opening that coincides with the second large-scale pollock opening in the Bering Sea (which in recent years has occurred on June 1) would probably slow the fishery compared to an April opening because at-sea processors would be forced to choose between pollock and whiting. Unless conditions or quotas in Alaska were poor, we would expect most effort to be concentrated in the Alaska fishery because pollock provides a known product, has established markets, and in most cases a higher value per product type. However in 1991, two vessels remained in the whiting fishery rather than fish for pollock. If whiting proves competitive, some at-sea processing could occur with a June opening, but fewer at-sea processors are likely to be involved during the pollock season than between pollock seasons. Shore-based processors also would loose several months processing opportunity if the season did not open until June. Therefore, if no allocations were in place, the at-sea processing fleet would probably operate at a slower pace than under an April opening because at-sea processors would at least in part be diverted to Alaska, and thus shore-based processors would have a longer season than if the season opened in January or April. However, there is no guarantee that shore-based processors would have the opportunity to process as much whiting as desired. If allocations were in place, shore-based processors would loose 2 months at the beginning of the season, but

probably could compensate by having a longer season than otherwise would occur. A delayed opening would have the greatest impact on California processors, who already compensate for low local landings by trucking whiting in from more northern ports.

A fall opening would preclude much of the shore-based processing opportunity, even if allocations were in place. Most shore-based plants would not have the time or plant capacity to take their intended amount of whiting if the fishery opened this late in the year; off California, whiting might not be available at all. Shore-based processors traditionally have started by April (in California) and have testified that they need an extended season because whiting supplements their other processing operation. Potentially, at-sea processors could operate successfully this late in the year; in 1990, three catcher/processors took approximately 4,700 mt in November and December. In 1991, the Alaska pollock season closed on September 4. If this is predictive of the future, the at-sea processing fleet would be available to operate in the whiting fishery in early September, but surimi processors at-sea may be disadvantaged by the lack of small fish in the fall.

Summary. If no allocations are in place, shore-based processing needs are unlikely to be met regardless of the season opening date. Lacking allocations, shore-based needs are most likely to be met if the whiting season opens close to or concurrent with the second pollock season (currently June 1) (options 3 or 4) -- the slower the harvest by at-sea processors, the greater the opportunity for shore-based processors to take whiting. Although at-sea processors would be forced to choose between pollock and whiting, under any opening except very late in the year, at-sea processors are assumed to be capable of taking whatever amount of the quota is available to them.

If allocations are in place, the choice of an opening in January or April will have minimal direct impact on shore-based operations, except to the extent that the highest sustainable yield is not realized. Even with allocations, if the season opens much later than May, and clearly if it opens as late as September, shore-based processors would not be capable of processing as much whiting as they would with a spring opening, and shore-based processors in California would lose the most processing opportunity.

ECONOMIC IMPACTS (independent of allocation). In evaluating the economic impacts of a given alternative, changes in the following factors are typically analyzed relative to the status quo: costs, prices, employment, distribution of catch between user groups, etc. However the problem in doing such an analysis for the Pacific whiting fishery is that insufficient data exists for two reasons. The first reason is that appropriate data on costs and prices are not available. The second reason is that 1991 is the first year in which the whiting quota was fully harvested and processed by U.S. companies. For the majority of companies, Pacific whiting was a new fishery. Consequently, even if there were data on costs and prices, because there was a significant degree of learning and re-tooling of harvesting and processing strategies as the season progressed, it would be difficult to perceive 1991 as representative of years to come. That is the "status quo" has really yet to be established. To draw an analogy, just as a

biologist can do very little quantitatively based on a single trawl survey, the economist can say very little based on data taken from one year's worth of market and industry data. What follows is a qualitative; and perhaps, speculative review of some of the changes in key economic factors.

Short Run Economic Impacts (assuming a relatively fixed level of harvesting and processing capacity).

o Operating Costs -- Catcher Vessels (including catcher/processors). One of the key factors that influence costs is catch-per-unit of-effort. Starting seasons later in the year usually implies that fish are given more time to mature and grow larger, and thus, all other things equal, one unit of effort later in the year should catch more fish (in terms of total weight) relative to an earlier season. The yield per recruit analysis in the Appendix estimates, for example, that the total yield from the fishery could increase by about 10 percent in comparing a fishery that takes place only in April to one that takes place only in September. However, the effect of delaying the season on fishing effort is unknown. As the year progresses, the stock may be more dispersed or more concentrated, resulting in changes in search time. Similarly, weather patterns may differ. (April may or may not be a rougher month to fish than September.) While the monthly trend in gross estimates of catch per unit of effort by joint venture vessels seems to increase as the months progress, it must be noted that the peak months are May and June (Table 8). (It must also be noted that catch per unit of effort shown in this table is not adjusted for relative fishing power of the difference mix of vessels that fished during these months.) Until all of these factors are explored, a definitive answer on how much catch per unit of effort would be increased and correspondingly operating costs reduced cannot be defined except to note that a slight increase in yield may be available.

o Operating Costs -- Processors (shoreside and at-sea). In addition to changing harvesting costs and thus the costs of raw product for processing, a change in seasons may cause processing costs to change with respect to changing quality of the fish throughout the year, and with respect to conflicting with alternative operations.

Quality of the fish affects processing costs as changing sizes, and changing consistency of the flesh, may make it difficult to achieve optimum fillet sizes, recovery rates, or in the case of surimi, gel strength. As discussed in 4.1.d. there is insufficient data from which to determine the extent quality is improved as the season is postponed.

When reviewing implications on processing costs, one must consider the alternative possibilities for the various processing sites. For example, for shoreside plants that process other species of fish such as salmon--the more the whiting season coincides with the salmon season, or with periods that they are at peak capacity, the more costly it will be to process whiting because processing whiting implies a reduction in the processing of salmon. So in order to analyze the economic impacts of changing seasons, one needs to measure on a monthly basis the degree of plant utilization. Such changes in utilization will also translate into changes in employment. Information has not been developed concerning when the shore-based capacity, especially the new capacity, will be

most idle. Clearly, at-sea processing vessels are most idle between pollock seasons; it is unknown what they will do if whiting are not available.

To the extent that the whiting season is timed to conflict with the pollock season, or occurs at a time when at-sea processors would normally return to port in Washington, transit costs may be reduced. For example, postponing the whiting season until September would mean that pollock processing vessels would only have to make one round trip transit to Alaska per year, instead of the two trips that many of these vessels took in 1991.

o Marketing Costs and Prices. Ideally, to maximize fresh or frozen prices, domestic or export (unless there was a significant difference in seasonality between export markets and domestic markets), one would time the seasons such that catches and processing occurs in the months where prices are the greatest. In the case of frozen product, one would minimize the need for cold storage costs if seasons were timed to periods of the greatest shortages. If the quality of the fish changes, not only would this have an implication for costs but obviously on prices as well. Again, as the fishery is quite new, there have been no established seasonal patterns in prices. With respect to shoreside operations, in past years the major product was headed and gutted; increasing amounts of fillets now are being produced.

Long Run and Social Accounting Considerations. For Long Run analysis, the assumption of a relatively fixed level of harvesting and processing capacity is relaxed. If profits exist in the fishery, new firms may enter while existing firms may expand capacity. (Without a proper form of limited entry, in the long run all economic benefits as measured by economic efficiency will be dissipated.) To the extent that the whiting season coincides with the pollock season, then obviously if it is more profitable to fish pollock than whiting, then the majority of the boats that participated in 1991 fishery will choose to fish pollock. Under such a scenario, given that existing shoreside processors cannot or choose not to use the total harvest guideline, new investments in harvesting and processing capacity could take place. This means from the perspective of the Nation more investment than necessary has taken place to harvest the pollock and whiting fisheries and thus social costs increased. However, given the relatively short pollock seasons in recent years and lack of alternate fisheries, it appears that the harvest guideline for whiting could be fully utilized by at-sea processors even if the fishery opened in the fall.

In distinguishing between financial costs and social costs, economists ask the question what goods and services are not being produced if a particular management alternative is chosen. To the extent that resources such as labor are being drawn from the ranks of the unemployed, then their employment while having a financial cost (wage rate times hours worked) does not have a social cost (society is not suffering any reduction in goods and services produced elsewhere). This suggests that in order to maximize economic benefits to the nation, that the whiting season should be timed to take advantage of otherwise idle processing, harvesting, and employment resources. This approach would also minimize impacts on other fisheries as the whiting fishery would absorb effort that might otherwise to applied to the already over-capitalized traditional fisheries.

With respect to bycatch, the discussion in the earlier part of this document indicates that such bycatch is not significant. Otherwise, these impacts should also be included as part of an economic analysis.

SOCIAL IMPACTS. Pacific whiting are the object of commercial fisheries; there is no notable recreational interest to date. The social impact of the season opening depends on the relative ability of the various sectors of the industry to harvest or process whiting.

In the draft EA/RIR prepared by the Council to analyze various allocations, the at-sea processing fleet is described as originating predominantly from the Puget Sound area, with employees from throughout the Pacific Northwest and other western states. Catcher vessels that deliver whiting (to motherships at sea or to shore-based processors) are described as local vessels, some which operated in the traditional whiting joint ventures and some which operated in Alaska fisheries. The whiting shore-based processors are located mostly in Oregon and California (north of 39° N. latitude). The various effects of the season opening date on these sectors of the industry is described above in the discussion of the opening date options, with and without allocation.

Recommendations for direct allocations to different user groups are beyond the scope of this analysis. Such allocations would have a greater impact than the choice of a season opening date (in April or May), unless extreme dates were selected. If the season were to open and the fishery occurred prior to April (option 1), the entire harvest guideline potentially could be taken by the at-sea processing sector, leaving none for shore-based operations. Conversely, if the season opened later than May (option 5), shore-based processors would lose more than 2 months of processing opportunity. Presumably at-sea processors would be able to harvest any remaining whiting in the fall after the end of the second pollock season in Alaska.

Bycatch of salmon and rockfish also may affect the commercial and recreational users of those species, particularly in localized areas. Clearly, southern California interests fear loss of commercial and recreational fishing opportunities for salmon if the bycatch increases in that area (particularly in the Eureka area and south of 39° N. latitude) (option 1). Similar concerns apply to fishermen and processors using chilipepper and bocaccio caught south of 39° N. latitude, who fear preemption due to high bycatch by the at-sea processing fleet. On the other hand, if the fishery were to shift to late summer/early fall (option 5), increased bycatch of widow and yellowtail rockfish could occur. These species are fully utilized and increased interception by the whiting fleet could disadvantage traditional harvesters and processors. Options 2, 3 and 4 seek to minimize changes in traditional bycatch patterns by spreading the fishery along the coast (when whiting are well into their northern migration), and thus minimize changes in impacts on different sectors of the industry and public who rely on those bycatch species.

ENFORCEMENT. No major difference among the options is expected in enforceability, enforcement costs, or compliance.

ADMINISTRATIVE COSTS. Any regulatory change in the season (options 2, 3, 4, 5

or 6) will result in two Federal Register notices with a one-time preparation cost of about $1,000 - $2,000 at the Federal level. Although the flexibility of option 6 provides for annual changes in the season opening date, such an action would most likely be included with the announcement of other annual or routine management measures and thus would not result in the cost of publishing additional Federal Register notices.

SAFETY. Options 2 through 5 are not expected to have different impacts relative to safety. Option 1 could encourage participation during rough winter weather offshore in January - March. Large at-sea processors are equipped to operate in rough weather and do so in the winter off Alaska. The greatest risk would be for small (relative to processing vessels) trawlers delivering to motherships at sea which traditionally have fished for whiting between April and October; there currently is no information regarding these vessels' normal operations in the winter. Catcher vessels delivering shore-side are not expected to operate far offshore at this time of year because they need to be close to processing plants to maintain product quality. However, they could feel compelled to operate January-March if they perceive little whiting will remain later in the year when weather is better.

4.2.c COMPARISON OF IMPACTS RELATIVE TO THE PREFERRED OPTION 3 (based on NMFS observer data from the 1991 fishery -- assuming the same fishing effort, patterns and performance)

	OPTIONS					
	Regulatory Status Quo*	Operational Status Quo *				
	#1 JAN.1	#2 APR 1	#3 APR 15	#4 MAY 1	#5 LATER	#6 FLEXIBLE
BIOLOGICAL						
Bycatch Rate:	(to minimize bycatch, "--" is best)					
Bocaccio	++	+	SQ	-	--	depends on range of dates
Chilipepper	++	+	SQ	-	--	
POP	--	SQ	SQ	SQ	++	
Widow rock.	--	SQ	SQ	SQ	++	
Y'tail rock.	--	-	SQ	+	++	
Sacr. Winter-run Chinook	++	SQ	SQ	SQ	-	
All Salmon	--	-	SQ	+	+ -	
Sustainable Yield:	(to maximize yield, "++" is best) --	-	SQ	+	++	
Yield per Recruit:	--	-	SQ	+	++	
SOC-ECONOMIC:						
CPUE (JV data):	-	-	SQ	SQ	-	
Quality:	-	SQ	SQ	SQ	SQ	
Admin. cost:	SQ	+	+	+	+	
Safety:	-	SQ	SQ	SQ	SQ	
Enforcement:	SQ	SQ	SQ	SQ	SQ	
Operating cost:	?	?	?	?	?	

* January 1 is the regulatory status quo for the domestic fishery, i.e. to date, there has been no season set for domestic fishermen. Even though January 1 is the regulatory status quo, the fishery has never operated that early in the year. Between 1982-90, the whiting fishery was taken predominantly in the joint venture fishery (U.S. caught-foreign processed at sea). Because foreign processing vessels were prohibited from operating south of 39° N. latitude, and whiting generally were not in fishable concentrations north of 39° until April-May, the joint venture fishery rarely started before April. However, the large-scale domestic at-sea processing fleet may choose to fish for whiting on January 1, particularly if the Alaska pollock season is not yet open. Consequently, a fishery that starts in April or May represents the actual, operational status quo in the whiting fishery. Impacts for a fishery starting January 1 are POTENTIAL impacts; since the fishery has never occurred at this time, there are no direct observations for this option.

4.3 Relevant FMP Goals and Objectives. The relevant FMP management goals and objectives are discussed below.

Goal 1 - Conservation. Prevent overfishing by managing for appropriate harvest levels, and prevent any net loss of the habitat of living marine resources.

None of the options affect the Council's conservation objectives. The Council still will adopt harvest specifications and management measures consistent with resource stewardship responsibilities, for each groundfish species or species group (FMP objective 2), regardless of the choice of opening date for the whiting fishery.

Goal 2 - Economics. Maximize the value of the groundfish resource as a whole.

FMP Objective 5. Identify those sectors of the groundfish fishery for which it is beneficial to promote year round marketing opportunities and establish management policies that extend those sectors fishing and marketing opportunities as long as practicable during the fishing year.

In discussing allocation alternatives (independent of this analysis), the Council has indicated its intent to provide opportunities for shore-based processors of whiting who prefer an extended season. At-sea processors generally (but not unanimously) prefer a shorter, more intense fishery that is conducted between pollock seasons in Alaska. If allocations are not implemented, an opening before April could result in preemption of shore-based processing opportunities by the high-capacity, high-effort at-sea processing fleet. However, an opening date of April 15, May 1, or later than May 1 (options 3, 4 or 5) provide successively greater likelihood that shore-based processors would not be preempted by the high-capacity at-sea processors early in the year -- the shorter the amount of time spent fishing for whiting, the more whiting will be left for a slower, extended shore-based fishery. This assumes that most of the at-sea processing fleet would return to the Alaska pollock fishery in the summer, and that shore-based processors could compensate for some delay in

their normal operations, at least until May. It also assumes that at-sea processors would have an adequate opportunity to operate later in the year, and that they would not be totally precluded by shore-based operations.

Goal 3 - Utilization. Achieve the maximum biological yield of the overall groundfish fishery, promote year round availability of quality seafood to the consumer, and promote recreational fishing opportunities.

The maximum biological yield for whiting would be achieved with the latest opening date (option 5). Sustainable yield and yield per recruit increases later in the year. However the difference between a fishery conducted entirely in April with one in September is only 10 percent, and it is not known if the increase in yield is gonad and liver growth or if it could be converted to usable product.

FMP Objective 7. Develop management measures and policies that foster and encourage full utilization (harvesting and processing) of the Pacific coast groundfish resources by domestic fisheries.

All the options are assumed to encourage full domestic utilization. Even if the fishery were to open in the fall, it is assumed that the at-sea processing fleet would be capable of harvesting the entire harvest guideline if effort were similar to that seen in the spring of 1991.

FMP Objective 9. Strive to reduce the economic incentives and regulatory measures that lead to wastage of fish.

Juvenile whiting predominate south of 39° N. latitude. Whiting too small to process into food fish either are discarded or made into low-value meal. If the fishery were to occur to any great extent before April, increased discards of whiting due to small size could result. If whiting quality is worse close to the winter spawning season, this could also result in reduced product value, or increased discards of fish or fish waste. An opening in April or later would minimize these problems.

Social Factors.

FMP Objective 11. When conservation actions are necessary to protect a stock or stock assemblage, attempt to develop management measures that will affect users equitably.

An April 15 (option 3) or May 1 (option 4) opening appears to provide the greatest opportunities for both the shore-based and at-sea processing sectors to operate successfully.

FMP Objective 13. When considering alternative management measures to resolve an issue, choose the measure that best accomplishes the change with the

least disruption of current domestic fishing practices, marketing procedures and environment.

An opening in April or May (options 2, 3, or 4) approximates the performance of the traditional whiting fishery. The fishery has never occurred to any great extent prior to April nor, until 1991, south of 39° N. latitude.

5.0 PREFERRED OPTION(S).

At its September 1991 meeting, the Council stated limited its realistic choices to April 1 (option 2), April 15 (option 3), and May 1 (option 4), and initially selected April 15 as its preferred option for an opening date in the whiting fishery. The Council confirmed this date at its November 1991 meeting.

The Council selected this option because it seemed to balance the needs of all sectors of the industry while maintaining traditional fishing patterns. In doing so, the fishery and its impacts will be spread along the coast and operations in new areas (south of 39° N. latitude) will be minimized.

At its November meeting, the Council also indicated interest in examining different opening dates for the shore-based and at-sea processing fleets after 1992, and/or the possibility of adding flexibility to setting seasons by designating them as "routine" under the FMP. Although the basis for the analysis appears in this final EA/RIR, these alternatives are beyond the scope of the proposed rule and would not be effective in 1992.

6.0 AMENDMENT 4 - SOCIO-ECONOMIC FRAMEWORK ISSUES.

Section 6.2.3 of Amendment 4 to the FMP directs identification of other specific issues that would be addressed by a management measure proposed under the socio-economic framework. Of the 15 factors listed in section 6.2.3 of the FMP, the following pertain to the preferred option of an April 15 opening date:

Factor #3 -- Extend domestic fishing and marketing opportunities as long as practicable during the fishing year, for those sectors for which the Council has established this policy. (See discussion under Objective 5 above.)

Factor #5 -- Maintain or improve product volume and flow to the consumer. This is particularly true for domestic markets that are served by the shore-based industry.

Factor #7 -- Improve product quality. Although not definitively proven, there is general agreement that whiting quality is not optimal after spawning early in the year.

Factor #8 -- Reduce anticipated discards. By minimizing the fishery in areas and times where small, juvenile whiting may predominate, discards of whiting could

be reduced.

Factor #10 -- Develop fisheries for underutilized species with minimal impacts on existing domestic fisheries. The at-sea processing industry displaced joint ventures in 1991; shore-based processors currently are not interested in taking the entire harvest guideline. At-sea processing therefore enables full "Americanization" of the whiting fishery, which otherwise would be considered underutilized and available to joint ventures. The preferred alternative provides an opportunity for the domestic at-sea processors to operate, but also is intended not to preclude processing opportunities for shore-based processors. In addition, a spring opening will spread the impact of the fishery, particularly with regard to bycatch, along the coast, so that localized impacts are less likely to occur.

7.0 OTHER APPLICABLE LAW.

7.1 National Environmental Policy Act (NEPA). The Council initially has determined that opening the whiting fishery in April or May would not significantly affect the quality of the human environment, and therefore preparation of an environmental impact statement is not required by Section 102(C) of NEPA or its implementing regulations.

FINDING OF NO SIGNIFICANT IMPACT:

Based on the information presented in this environmental assessment, the Assistant Administrator for Fisheries, NOAA has determined that this action will not have a significant effect on the human environment, in accordance with the Council on Environmental Quality's regulations implementing the NEPA. Therefore, a finding of no significant impact is appropriate.

William W. Fox, Jr. Date
Assistant Administrator for Fisheries, NOAA

7.2 Endangered Species Act (ESA). The NMFS issued a Biological Opinion under the Endangered Species Act (ESA) on August 10, 1990 pertaining to Amendment 4 of the FMP. It concluded that implementation of the FMP would not jeopardize the continued existence of any of the species considered. Consultation was reinitiated at the request of the Council because of substantial changes in the structure of the whiting fishery and renewed concern about salmon bycatch and the resulting effect on Sacramento winter-run chinook salmon. NMFS completed the ESA Section 7 Biological Opinion on this issue on November 26, 1991, which concluded that the changes in the whiting fishery are unlikely to jeopardize the continued existence of the Sacramento winter-run chinook. This action falls within the scope of that biological opinion.

7.3 Executive Order 12291. Opening the whiting season in April or May will not have a cumulative effect on the economy of $100 million or more nor will it result in a major increase in costs to consumers, industries, government agencies, or geographical regions. No significant adverse impacts are anticipated on competition, employment, investments, productivity, innovation, or competitiveness of U.S.-based enterprises. The gross revenues generated from the whiting fishery are not expected to differ substantially as a result of setting an opening date in April or May (when the traditional domestic whiting season started). The net effect of opening the season in April or May will be to distribute the impact of the fishery along the coast; it does not guarantee shares to any particular user group.

7.4 Regulatory Flexibility Act. An opening in April or May will not have a significant economic impact on a substantial number of small entities under the Regulatory Flexibility Act, 5 U.S.C. 603 et seq.. This spreads the impact of the fishery along the coast (whiting are well into their northward migration by April or May), without encouraging additional effort early in the year in areas that traditionally have been unexploited by the whiting fleet south of 39° N. latitude. As a result, the approximately 15 shore-based processors north of 39° N. latitude, who rely predominantly on local concentrations of whiting, will not be precluded by an early fishery in southern waters. (Large at-sea processors are not considered small businesses based on NMFS survey information indicating average annual gross revenues in the range of $8,000,000.) Consequently, a regulatory flexibility analysis was not prepared.

7.5 Paperwork Reduction Act (PRA). There is no collection of information requirement subject to the Paperwork Reduction Act, 44 U.S.C. 3501 et seq.

7.6 Coastal Zone Management Act (CZMA). The Council has determined that this action is consistent to the maximum extent practicable with the applicable State coastal zone management programs as required. This determination has been submitted for review by the responsible State agencies under section 307 of the Coastal Zone Management Act. The State of Washington concurred in this determination. The states of Oregon and California did not comment within the statutory time period, and therefore consistency is automatically implied.

7.7 Executive Order 12612. This rule does not contain policies with federalism implications sufficient to warrant preparation of a federalism assessment under Executive Order 12612.

8.0 COORDINATION AND CONSULTATION.

Development of this EA/RIR was coordinated with the Council's Groundfish Management Team, Scientific and Statistical Committee and staff, NMFS scientists and managers, and NOAA General Counsel. The preferred option was selected initially at the September Council meeting, after review of this document in draft form and after consultation with its advisory subpanels and testimony from the public. The Council confirmed its choice of preferred option at its November 1991 meeting. (See also Section 1.2.)

9.0 LIST OF PREPARERS.

This EA/RIR and Appendix were prepared by or include contributions from:

Mr. Bob Demory	Oregon Dept. of Fish and Wildlife Groundfish Management Team
Martin Dorn	National Marine Fisheries Service
Mr. John Geibel	California Dept. of Fish and Game Scientific and Statistical Committee
Mr. Jim Glock	Pacific Fishery Management Council staff
Ms. Kate King	National Marine Fisheries Service Groundfish Management Team
Dr. Rick Methot	National Marine Fisheries Service Chair, Groundfish Management Team
Mr. Al Millikan	Washington Dept. of Fisheries Groundfish Management Team
Mr. Don Pearson	National Marine Fisheries Service Groundfish Management Team
Dr. Wes Silverthorne	National Marine Fisheries Service Groundfish Management Team
Dr. Dale Squires	National Marine Fisheries Service Groundfish Management Team
Dr. Gary Stauffer	National Marine Fisheries Service Chair, Scientific and Statistical Committee
Mr. Dave Thomas	California Dept. of Fish and Game Groundfish Management Team
Domestic Observer Program	National Marine Fisheries Service

10.0 RESPONSE TO COMMENTS.

No comments were received specific to this environmental assessment. One comment was received relevant to the proposed implementing rule.

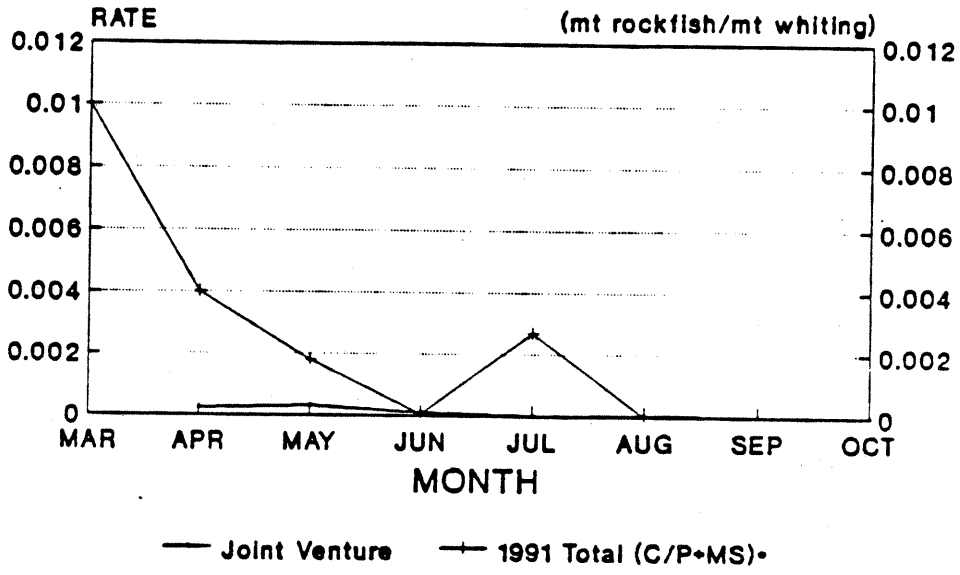
Comment. A fisherman delivering to a shore-side processor in Oregon prefers a staggered season of May 1 to September 15 for at-sea processing and an April 15 opening for shoreside processors.

Response. The Council has indicated that different opening dates for shore-based and at-sea processors may be considered for the 1993 season. A staggered season was not proposed or specifically analyzed for 1992 and is beyond the scope of the proposed rule for this action.

11.0 FIGURES AND TABLES.

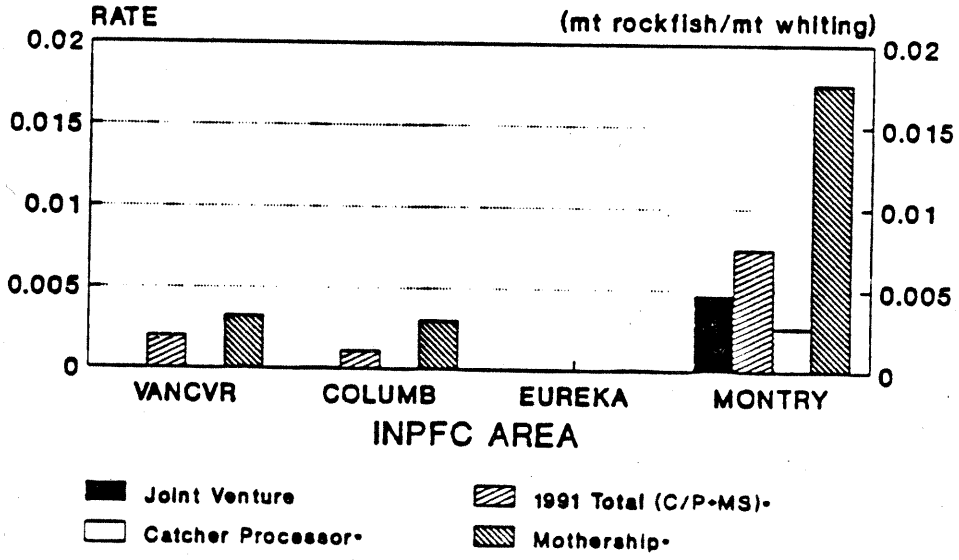
Figure -1

CHILIPEPPER
BYCATCH RATE BY MONTH



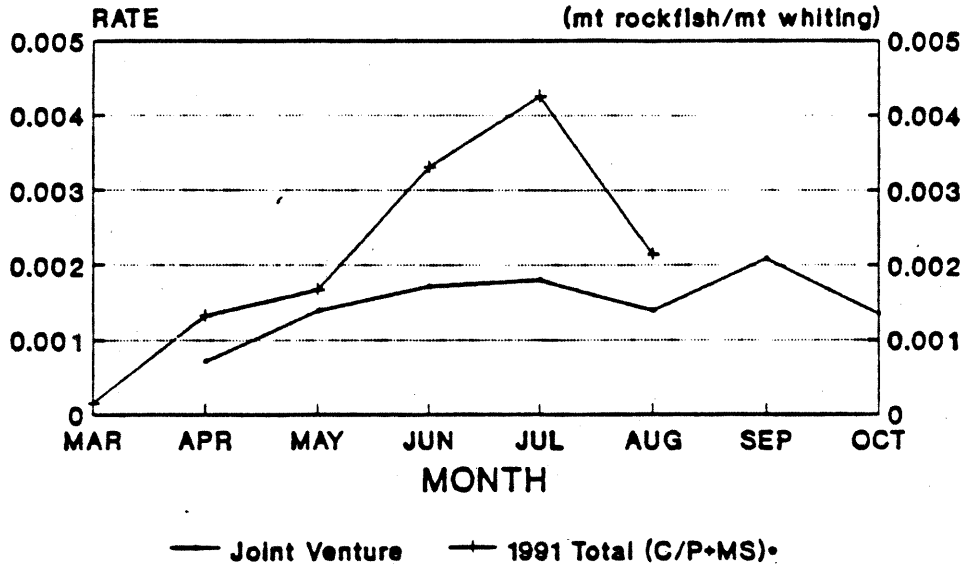
• Preliminary data through 08/20/91

CHILIPEPPER
BYCATCH RATE BY INPFC AREA



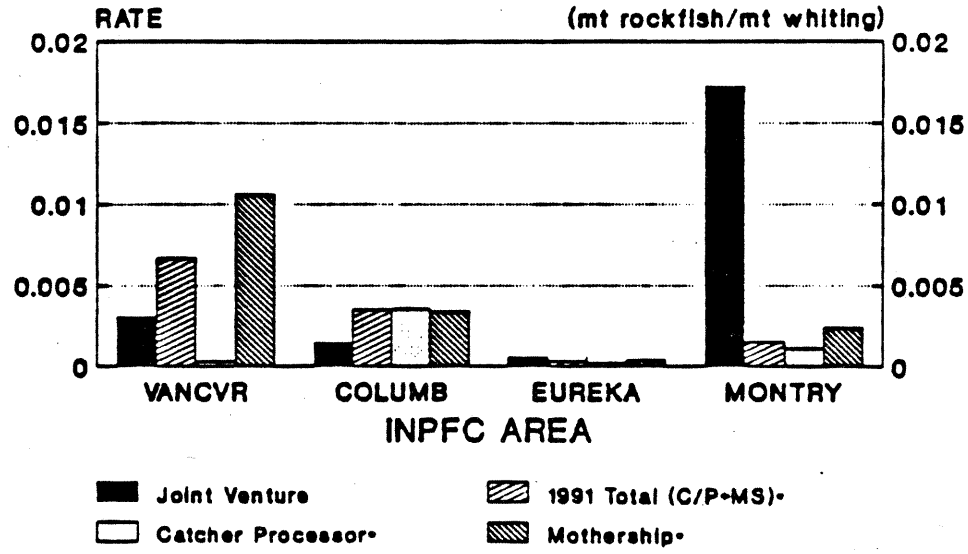
• Preliminary data through 08/20/91

WIDOW
BYCATCH RATE BY MONTH



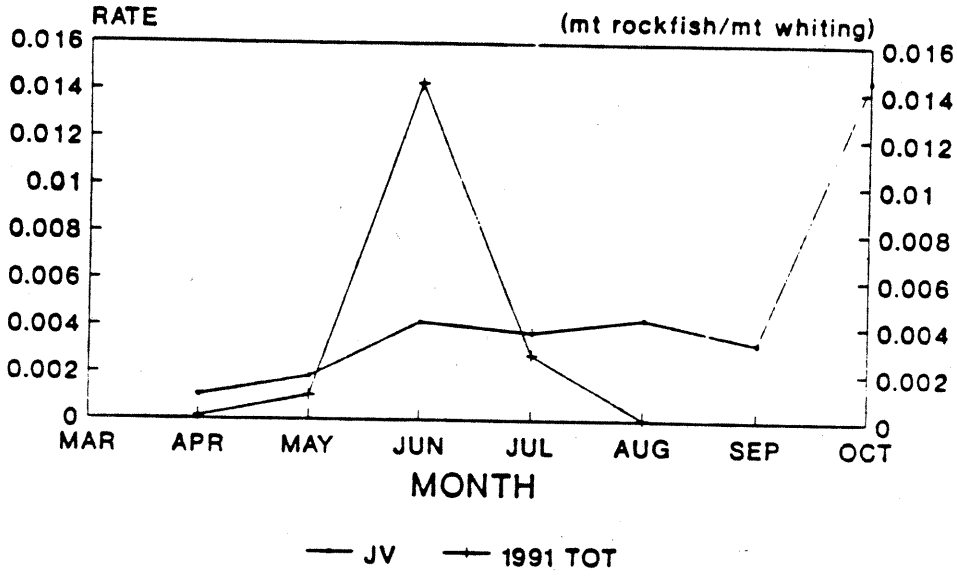
• Preliminary data through 08/20/91

WIDOW
BYCATCH RATE BY INPFC AREA



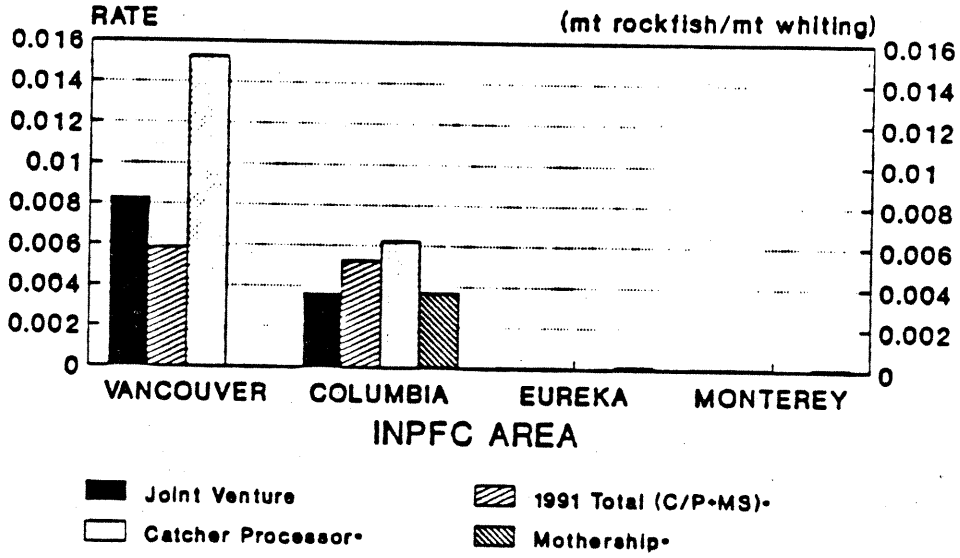
• Preliminary data through 08/20/91

YELLOWTAIL
BYCATCH RATE BY MONTH



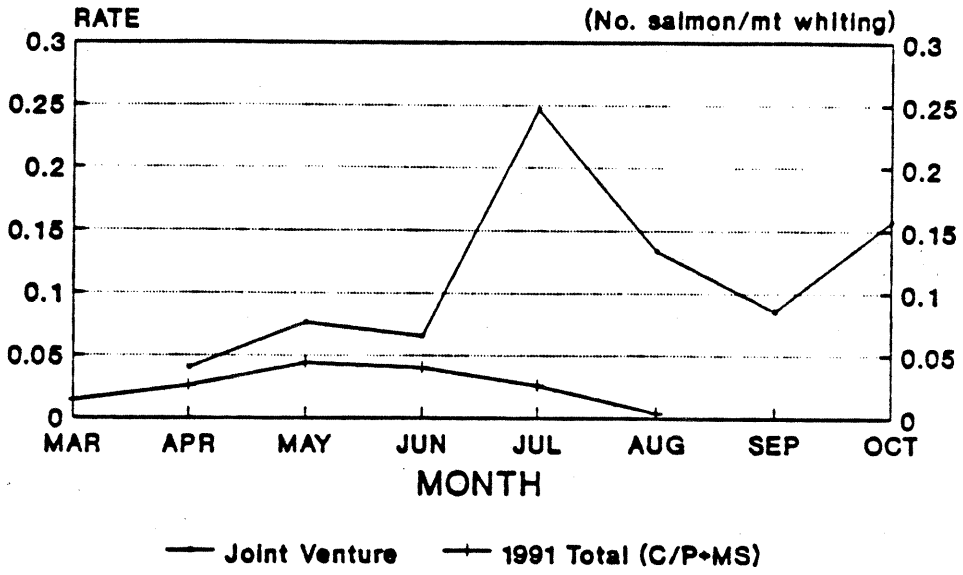
• Preliminary data through 08/20/91

YELLOWTAIL
BYCATCH RATE BY INPFC AREA



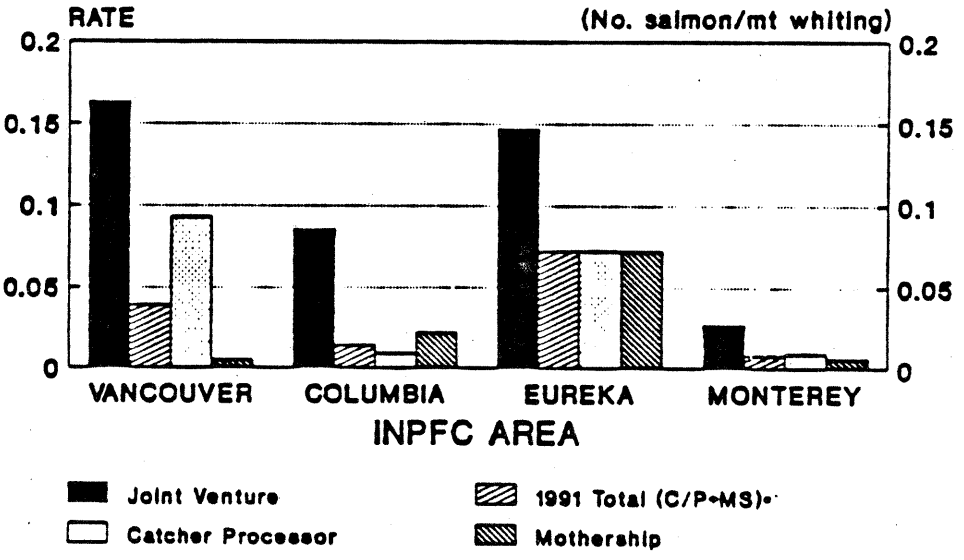
• Preliminary data through 08/20/91

SALMON
BYCATCH RATE BY MONTH



• Preliminary data through 08/20/91

SALMON
BYCATCH RATE BY INPFC AREA



• Preliminary data through 08/20/91

Table 1

PACIFIC WHITING LANDED CATCH -- ALL GEAR -- ALL AREAS (FROM PACFIN)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
D: SHORE-BASED	1	TR	TR	324	1,526	1,852	1,935	307	750	979	440	TR	8,114
US AT-SEA	0	0	0	0	0	0	0	0	0	0	1,401	3,312	4,713
JOINT VENTURE	0	0	0	26,743	77,649	53,246	122	5,599	5,981	1,631	0	0	170,971
FOREIGN	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1	TR	TR	27,067	79,175	55,098	2,057	5,906	6,731	2,610	1,841	3,312	183,798
): SHORE-BASED	TR	1	76	1,560	1,282	1,510	1,890	1,038	23	21	15	TR	7,416
JOINT VENTURE	0	0	0	24,225	89,200	79,583	2,628	0	0	0	0	0	195,636
FOREIGN	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	TR	1	76	25,785	90,482	81,093	4,518	1,038	23	21	15	0	203,052
): SHORE-BASED	0	0	502	1,524	1,851	1,884	946	41	25	69	TR	34	6,876
JOINT VENTURE	0	0	0	3,595	13,423	19,512	44,511	30,345	21,452	2,943	0	0	135,781
FOREIGN	0	0	0	0	0	874	2,601	0	1,631	12,308	570	57	18,041
TOTAL	0	0	502	5,119	15,274	22,270	48,058	30,386	23,108	15,320	570	91	160,698
: SHORE-BASED	TR	TR	30	883	1,053	1,391	1,074	245	53	49	16	TR	4,794
JOINT VENTURE	0	0	30	302	13,472	21,612	21,904	33,968	11,001	3,707	0	0	105,996
FOREIGN	0	0	0	0	0	1,517	5,199	9,476	10,145	23,319	0	0	49,656
TOTAL	TR	TR	60	1,185	14,525	24,520	28,177	43,689	21,199	27,075	16	0	160,446
: SHORE-BASED	TR	1	TR	537	1,052	890	505	374	39	64	TR	TR	3,462
JOINT VENTURE	0	0	24	359	11,931	20,038	16,671	20,656	8,292	3,554	115	0	81,640
FOREIGN	0	0	0	0	0	10,316	16,814	18,528	12,124	11,701	377	0	69,860
TOTAL	TR	1	24	896	12,983	31,244	33,990	39,558	20,455	15,319	492	0	154,962
: SHORE-BASED	TR	TR	0	322	1,156	743	887	609	174	1	0	0	3,892
JOINT VENTURE	0	0	0	8	87	6,962	12,868	9,322	2,214	216	14	0	31,691
FOREIGN	0	0	0	4	43	3,040	9,330	14,911	12,589	9,334	602	0	49,853
TOTAL	0	0	0	334	1,286	10,745	23,085	24,842	14,977	9,551	616	0	85,436

TR = trace, which means less than 0.5 metric tons (or 50 lbs)
This report includes only data for INPFC Vancouver, Columbia, Eureka, Montery, anand Conception areas.

Foreign season: June 1 through October 31. Joint venture and shore-based fisheries for whiting had no season restrictions.

TABLE 1

TABLE 2A

1991-DOMESTIC AT-SEA PROCESSING FLEET - ROCKFISH BYCATCH (IN MT)
PRELIMINARY OBSERVER DATA THRU AUGUST 20, 1991 (INCLUDES DISCARDS)

A. CATCH BY INPFC AREA

	WHITING	%	BOCACCIO	%	CHILI'S	%	POP	%	WIDOW	%	YELLOWTL	%
VANC	6,848.211	4	0.020	0	13.702	2	2.077	5	45.674	13	40.040	12
COL	52,234.388	28	0.216	2	59.233	11	11.855	31	182.647	53	274.564	86
EUREKA	66,408.417	35	0.011	0	1.547	0	5.837	15	20.874	6	3.571	1
MONTEREY	64,103.239	34	11.913	98	479.177	87	18.312	48	97.947	28	2.367	1
TOTAL	189,594	100	12	100	554	100	38	100	347	100	321	100

B. CATCH BY "MONTH"

	WHITING	%	BOCACCIO	%	CHILI'S	%	POP	%	WIDOW	%	YELLOWTL	%
"MARCH"	6,275.913	3	0.016	0	65.078	12	0.000	0	0.946	0	0.002	0
"APRIL"	71,138.488	38	10.260	84	304.043	55	20.995	55	94.520	27	8.248	3
"MAY"	77,179.997	41	1.754	14	143.940	26	11.962	31	129.718	37	79.351	25
"JUNE"	13,372.182	7	0.110	1	0.619	0	3.743	10	44.254	13	191.365	60
"JULY"	14,823.859	8	0.020	0	39.905	7	1.381	4	63.095	18	41.201	13
"PART AUG	6,803.816	4	0.000	0	0.074	0	0.000	0	14.609	4	0.375	0
TOTAL	189,594	100	12	100	554	100	38	100	347	100	321	100

note: Months are not exact calendar months, but include fishing weeks (Wed-Tues) with more than 4 days in a calendar month.

TABLE 2B

1991-DOMESTIC AT-SEA PROCESSORS' BYCATCH RATES OF ROCKFISH
(MT ROCKFISH/MT HAKE) THRU AUG. 20, 1991 (INCL. DISCARDS)

A. CATCH RATES BY INPFC AREA

	WHITING	BOCACCIO	CHILI'S	POP	WIDOW	YELLOWTL
VANC	1.000	0.000003	0.002001	0.000303	0.006669	0.005847
COL	1.000	0.000004	0.001134	0.000227	0.003497	0.005256
EUREKA	1.000	0.000000	0.000023	0.000088	0.000314	0.000054
MONTEREY	1.000	0.000186	0.007475	0.000286	0.001528	0.000037
"TOTAL"	1.000	0.000064	0.002920	0.000201	0.001831	0.001691

B. CATCH RATES BY "MONTH"

"MARCH"	1.000	0.000003	0.010369	0.000000	0.000151	0.000000
"APRIL"	1.000	0.000144	0.004274	0.000295	0.001329	0.000116
"MAY"	1.000	0.000023	0.001865	0.000155	0.001681	0.001028
"JUNE"	1.000	0.000008	0.000046	0.000280	0.003309	0.014311
"JULY"	1.000	0.000001	0.002692	0.000093	0.004256	0.002779
"PART AUG	1.000	0.000000	0.000011	0.000000	0.002147	0.000055
'TOTAL"*	1.000	0.000064	0.002920	0.000201	0.001831	0.001691

note: Months are not exact calendar months, but include fishing weeks (Wed - Tues) with more than 4 days in a calendar month.

TABLE 3

1991 BYCATCH RATES, SEPARATELY FOR CATCHER/PROCESSORS AND MOTHERSHIPS THRU AUG. 20, 1991
(MT ROCKFISH/MT WHITING OR NO. SALMON/MT WHITING, INCLUDING DISCARDS)

A. CHILIPEPPER

	CATCHER/PROCESSOR			MOTHERSHIP			TOTAL		
	WHITING	CHILI'S	RATE	WHITING	CHILI'S	RATE	WHITING	CHILI'S	RATE
VANC	2631	0.000	0.00000	4,217	14	0.00325	6,848	14	0.00200
COL	32552	0.000	0.00000	19,682	59	0.00301	52,234	59	0.00113
EUREKA	38383	0.004	0.00000	28,025	2	0.00006	66,408	2	0.00002
MONTEREY	43484	116.139	0.00267	20,619	363	0.01761	64,103	479	0.00748
TOTAL	117,050	116	0.00099	72,544	438	0.00603	189,594	554	0.00292

B. WIDOW ROCKFISH

	CATCHER/PROCESSOR			MOTHERSHIP			TOTAL		
	WHITING	WIDOW	RATE	WHITING	WIDOW	RATE	WHITING	WIDOW	RATE
VANC	2631	1	0.00034	4,217	45	0.01062	6,848	46	0.00667
COL	32552	115	0.00355	19,682	67	0.00341	52,234	183	0.00350
EUREKA	38383	9	0.00023	28,025	12	0.00043	66,408	21	0.00031
MONTEREY	43484	49	0.00112	20,619	49	0.00239	64,103	98	0.00153
TOTAL	117,050	174	0.00149	72,544	173	0.00239	189,594	347	0.00183

C. YELLOWTAIL ROCKFISH

	CATCHER/PROCESSOR			MOTHERSHIP			TOTAL		
	WHITING	YELLOWTL	RATE	WHITING	YELLOWTL	RATE	WHITING	YELLOWTL	RATE
VANC	2631	40	0.01522	4,217	0	0.00000	6,848	40	0.00585
COL	32552	202	0.00621	19,682	72	0.00368	52,234	275	0.00526
EUREKA	38383	0	0.00001	28,025	3	0.00012	66,408	4	0.00005
MONTEREY	43484	0	0.00001	20,619	2	0.00010	64,103	2	0.00004
TOTAL	117,050	243	0.00207	72,544	78	0.00107	189,594	321	0.00169

D. SALMON

	CATCHER/PROCESSOR			MOTHERSHIP			TOTAL		
	WHITING	SALMON	RATE	WHITING	SALMON	RATE	WHITING	SALMON	RATE
VANC	2631	245	0.09325	4,217	22	0.00532	6,848	268	0.039101
COL	32552	292	0.00899	19,682	426	0.02167	52,234	719	0.013764
EUREKA	38383	2,774	0.07226	28,025	2020	0.07208	66,408	4,794	0.072186
MONTEREY	43484	370	0.00851	20,619	129	0.00624	64,103	499	0.007783
TOTAL	117,050	3,682	0.03145	72,544	2,598	0.03581	189,594	6,279	0.033120

Note: Based on preliminary observer data through August 20, 1991.

TABLE 4

OBSERVED CATCH IN THE OREGON SHORE-BASED FISHERY FOR WHITING IN 1991
(IN METRIC TONS AND POUNDS FOR GROUNDFISH, IN NUMBERS FOR SALMON)

		ROCKFISH					
	WHITING	WIDOW	Y'TAIL	OTHER ROCK.	TOTAL ROCK.	FLAT-FISH	SALMON
MT	814	0	1	0	1	trace	--
LBS	1,794,575	445	1,573	32	2,050	36	16
NO.	--	--	--	--	--	--	2
RATE PER MT WHITING		0.0002	0.0009	0.0000	0.0010	trace	0.0024

Note: Estimated catch based on 19 trips landed in Newport OR (Columbia area) through 9/5/91.

TABLE 5A

ROCKFISH BYCATCH IN THE JOINT VENTURE - ANNUAL AVERAGES 1986-1990
BASED ON EXPANDED OBSERVER SAMPLES; INCLUDES DISCARDS (IN MT)

A. CATCH BY INPFC AREA

1986-90	WHITING	%	BOCACCIO	%	CHILI'S	%	POP	%	WIDOW	%	YELLOWTL	%	AVERAGE HOURS
VANC	21,927.356	14	0.633	19	0.056	1	2.272	23	67.183	28	181.172	34	87
COL	95,045.016	61	2.390	72	6.135	65	7.385	74	140.516	59	346.231	65	780
EUREKA	36,959.562	24	0.240	7	0.310	3	0.271	3	21.308	9	1.609	0	207
MONTEREY	637.130	0	0.038	0	2.980	0	0.046	0	10.989	0	0.022	0	4
TOTAL	154,569.064	100	3.301	100	9.481	100	9.974	100	239.996	100	529.033	100	10798

B. CATCH BY MONTH

1986-90	WHITING	%	BOCACCIO	%	CHILI'S	%	POP	%	WIDOW	%	YELLOWTL	%	AVERAGE HOURS
APRIL	8,453.758	5	0.031	1	2.040	22	0.252	3	5.989	2	8.556	2	741
MAY	42,590.317	28	1.775	54	1.347	14	1.458	15	59.438	25	78.386	15	2654
JUNE	46,050.869	30	0.506	15	5.103	54	1.762	18	79.081	33	192.099	36	2889
JUL	20,237.968	13	0.456	14	0.214	2	6.220	62	36.586	15	75.458	14	1710
AUG	24,397.272	16	0.274	8	0.717	8	0.148	1	33.892	14	105.041	20	1864
SEPT	10,407.598	7	0.142	4	0.051	1	0.113	1	21.745	9	34.179	6	778
OCT	2,431.283	2	0.116	4	0.009	0	0.021	0	3.266	1	35.314	7	162
TOTAL	154,569.064	100	3.301	100	9.481	100	9.974	100	239.996	100	529.033	100	10798

TABLE 5B

ROCKFISH BYCATCH RATES IN THE JOINT VENTURE - ANNUAL AVERAGES
1986-1990 (MT ROCKFISH/MT WHITING, INCLUDING DISCARDS)
(BASED ON EXPANDED OBSERVER SAMPLES)

A. CATCH RATES BY INPFC AREA

1986-90	WHITING	BOCACCIO	CHILI'S	POP	WIDOW	YELLOWTL
VANC	1.000000	0.000029	0.000003	0.000104	0.003064	0.008262
COL	1.000000	0.000025	0.000065	0.000078	0.001478	0.003643
EUREKA	1.000000	0.000006	0.000008	0.000007	0.000577	0.000044
MONTEREY	1.000000	0.000060	0.004677	0.000073	0.017248	0.000035
TOTAL	1.000000	0.000021	0.000061	0.000065	0.001553	0.003423

B. CATCH RATES BY MONTH

	WHITING	BOCACCIO	CHILI'S	POP	WIDOW	YELLOWTL
APRIL	1.000000	0.000004	0.000241	0.000030	0.000708	0.001012
MAY	1.000000	0.000042	0.000032	0.000034	0.001396	0.001840
JUNE	1.000000	0.000011	0.000111	0.000038	0.001717	0.004171
JUL	1.000000	0.000023	0.000011	0.000307	0.001808	0.003729
\UG	1.000000	0.000011	0.000029	0.000006	0.001389	0.004305
SEPT	1.000000	0.000014	0.000005	0.000011	0.002089	0.003284
OCT	1.000000	0.000048	0.000004	0.000009	0.001343	0.014525
TOTAL	1.000000	0.000021	0.000061	0.000065	0.001553	0.003423

TABLE 6

1991-DOMESTIC AT-SEA PROCESSING FLEET- SALMON - PRELIMINARY
TOTAL CATCH THRU AUGUST 20, 1991, WHITING IN MT AND SALMON IN NUMBERS OF WHOLE FISH

	MT WHITING	NO. SAL.	RATE	MEAN JV '81-90	1991 RATE/ JV RATE
VANC	6,848.211	268	0.039	0.163	0.24
COL	52,234.388	717	0.014	0.086	0.16
EUREKA	66,408.417	4795	0.072	0.147	0.49
MONTEREY	64,103.239	499	0.008	0.027	0.29
TOTAL	189,594.255	6279	0.033	0.109	0.30

	MT WHITING	NO. SAL.	RATE	MEAN JV '81-90	1991 RATE/ JV RATE
"MARCH"	6,276	91	0.014	NA	NA
"APRIL"	71,138	1865	0.026	0.040	0.66
"MAY"	77,180	3367	0.044	0.076	0.57
"JUNE"	13,372	536	0.040	0.065	0.62
"JULY"	14,824	390	0.026	0.246	0.11
"AUGUST"*	6,804	30	0.004	0.134	0.03
SUB-TOT	189,594	6279	0.033	0.110	0.30
SEPTEMBER	NA	NA	NA	0.086	NA
OCTOBER	--	--	--	0.157	NA
TOTAL				0.109	

* ONLY THRU AUG 20 FOR 1991 FISHERY

note: Months are not exact calendar months, but include fishing weeks (Wed. - Tues.) with more than 4 days in a calendar month.

RATE means number of salmon per metric ton of whiting.

Table 7

SALMON INCIDENCE (# SALMON PER MT HAKE) IN THE JOINT VENTURE OFF WOC, 1981 - 1990

	Vancouver			Columbia			Eureka			Monterey			TOTAL			
1981-1990	# SAL	MT HAKE	RATIO	# SAL	MT HAKE	RATIO	# SAL	MT HAKE	RATIO	#SAL	MT HAKE	RATIO	# SAL	MT HAKE	RATIO	INVERSE
APRIL	0	0		1018	23697.3	0.042958	1154	29541.59	0.039063	94	3175.2	0.029604	2266	56414.09	0.040167	24.89589
MAY	350	11381.46	0.030751	10261	166235.6	0.061725	9400	82423.73	0.114044	43	2386.89	0.018015	20054	262427.6	0.076417	13.08605
JUNE	2151	24504.52	0.087779	8372	166947.2	0.050147	6766	72614.5	0.093176	55	1414.6	0.038880	17344	265480.9	0.065330	15.30678
JULY	6352	32312.04	0.196583	19236	89743.36	0.214344	12696	32616.21	0.389254	2	721.7	0.002771	38286	155393.3	0.246381	4.058750
AUGUST	8317	34846.47	0.238675	9640	112623.9	0.085594	3130	10265.37	0.304908	18	91.6	0.196506	21105	157827.4	0.133722	7.478199
SEPT	1886	15093.44	0.124954	3843	59367.89	0.064731	1046	4585.87	0.228091	0	0		6775	79047.2	0.085708	11.66748
OCT	612	2611.67	0.234332	1758	12467.59	0.141005	0	0		0	0		2370	15079.26	0.157169	6.362556
	0	0		0	0		0	0		0	0					
TOTAL	19668	120749.6	0.162882	54128	631082.9	0.085770	34192	232047.2	0.147349	212	7789.99	0.027214	108200	991669.8	0.109108	9.165155
AVERAGE													10820	99166.98	0.109108	9.165155

compiled 3/7/91 kking F/NWR3

TABLE 7

TABLE 8

AVERAGE CATCH PER UNIT EFFORT (CPUE) AND KG/WHITING
IN THE JOINT VENTURE, 1986-1990, BASED ON OBSERVER SAMPLES

A. BY INPFC AREA

	MT WHITING	HOURS	CPUE (mt/hr)	NO. WHITING	MEAN WT (kg/whiting)
VANC	109637	4362	25.137	189,526,025	0.5785
COL	475225	39021	12.179	910,039,973	0.5222
EUREKA	184798	10380	17.803	391,227,143	0.4724
MONTEREY	3186	218	14.646	8,346,781	0.3817
TOTAL	772845	53980	14.317	1,499,139,923	0.5155

B. BY MONTH

	MT WHITING	HOURS	CPUE (mt/hr)	NO. WHITING	MEAN WT (kg/whiting)
APRIL	42269	3704	11.413	91,606,021	0.4614
MAY	212952	13272	16.045	435,756,703	0.4887
JUNE	230254	14433	15.953	444,534,543	0.5180
JUL	101190	8548	11.838	192,255,941	0.5263
AUG	121986	9322	13.085	225,282,937	0.5415
SEPT	52038	3888	13.383	88,121,521	0.5905
OCT	12156	812	14.970	21,582,255	0.5633
TOTAL	772845	53980	14.317	1,499,139,923	0.5155

Note: Observers' sample size of whiting is less than the expanded catch in Tables A and B. Discards are included.

TABLE 9

MARCH THRU AUGUST ONLY --
COMPARISON OF CATCH RATES BETWEEN 1991 US AT-SEA PROCESSORS
AND JOINT VENTURE AVERAGE FOR 1986-90 (MT BYCATCH/MT WHITING)

		BOCACCIO	CHILI'S	POP	WIDOW	YELLOWTL
MARCH	US-91	0.000003	0.010369	0.000000	0.000151	0.000000
	JV 86-90	NO FISHING DURING THIS TIME PERIOD				
APRIL	US-91	0.000144	0.004274	0.000295	0.001329	0.000116
	JV 86-90	0.000004	0.000241	0.000030	0.000708	0.001012
COMPARE	US TO JV	38.83	17.71	9.92	1.88	0.11
MAY	US-91	0.000023	0.001865	0.000155	0.001681	0.001028
	JV 86-90	0.000042	0.000032	0.000034	0.001396	0.001840
COMPARE	US TO JV	0.55	58.98	4.53	1.20	0.56
JUNE	US-91	0.000008	0.000046	0.000280	0.003309	0.014311
	JV 86-90	0.000011	0.000111	0.000038	0.001717	0.004171
COMPARE	US TO JV	0.75	0.42	7.32	1.93	3.43
JULY	US-91	0.000001	0.002692	0.000093	0.004256	0.002779
	JV 86-90	0.000023	0.000011	0.000307	0.001808	0.003729
COMPARE	US TO JV	0.06	254.34	0.30	2.35	0.75
"AUGUST"	US-91 *	0.000000	0.000011	0.000000	0.002147	0.000055
	JV 86-90	0.000011	0.000029	0.000006	0.001389	0.004305
COMPARE	US TO JV	0.00	0.37	0.00	1.55	0.01
SUBTOTAL MAR-AUG	US-91	0.000064	0.002920	0.000201	0.001831	0.001691
	JV 86-90	0.000021	0.000066	0.000069	0.001517	0.003242
COMPARE	US TO JV	2.99	43.93	2.89	1.21	0.52

12.0 APPENDIX.

The Effect of Altering the U.S. Fishery Opening Date on the Yield Per Recruit of Pacific Whiting

There are two important biological factors that determine how the seasonal pattern of the fishery affects yield per recruit. Mortality from natural causes (predation, stress from spawning and migration, old age) reduce the abundance of the population during the year. At the same time, the surviving individuals are growing, adding biomass to the population. During the summer, when Pacific whiting feed on dense aggregations of invertebrates along the shelf break, mean weight increases rapidly. Surveys and fisheries sampling programs have been concentrated during the summer months, so little is known about the growth pattern of whiting from November to March. Fish sampled in April after the spawning season (January-March) have lower mean body weights than the previous fall (Table 12-1); from age 4 to age 11, the weight in April is lower than the October weight of the fish that are a year younger. Spawning and the energy requirements of migration are thought to be responsible for this weight loss.

Although our understanding of the annual energy budget of Pacific whiting is incomplete due to the lack of year-round sampling, several general comments can be made. Food for Pacific whiting is abundant from May through the summer months along the shelf break where most of the population is located. Growth is rapid during this time. Both the northern migration and the southern migrations require significant energy expenditures, as does spawning, which takes place from January to March. Food is not as abundant during the winter as during the summer, though some feeding probably takes place during both the northern and the southern migrations and during the winter months. Nevertheless, for Pacific whiting the period from December to March is a period when growth slows, and weight is constant or declining.

To examine the effect of the seasonal exploitation pattern on sustainable yield, we configured a yield-per-recruit model to describe the seasonal pattern of the Pacific whiting population in one month time increments. The model was also configured to model the migration of the older fish into the Canadian zone. It was assumed that the migration occurred prior to the start of the fishery in either zone. (Whiting begin to appear in the Canadian zone in late May, and are usually present in fishable concentrations by mid-June (Stauffer 1985). These fish migrate through U.S. waters. It is probable that a U.S. fishery in April or May would intercept some of these fish. With the information available, it is not possible to determine whether this would amount to a significant fraction of migrating fish. This would depend on the migratory path followed by the Canada-bound fish and the extent to which they are mixed in with the fish that will stay in U.S. waters during the summer.) The U.S. and Canadian fishery selectivity coefficients were estimated by the stock synthesis model, and describe the selectivity of the U.S. and Canadian fishery with reference to the component of the population in their respective national zones. Table 20 in Dorn et al. (1991) contains the other parameters used to model the dynamics of the population. Since the seasonal pattern of the Canadian fishery was not of interest in this analysis, it was fixed with a constant fishing mortality rate during June-August. The level of fishing mortality in the Canadian zone was set so that the annual full recruitment

fishing mortality rate was the same in the Canadian zone as in the U.S. zone.

Natural mortality was assumed to be constant throughout the year at an annual rate of 0.24. The true rate of natural mortality would not be constant if physiological stresses and predation on Pacific whiting vary significantly during the year. Unfortunately, quantitative measures of mortality are not easily obtainable, even on an annual basis. A constant natural mortality rate is the simplest necessary assumption to model the dynamics of the population.

To calculate the yield per recruit of a seasonal exploitation pattern, fishery weight-at-age estimates by month are needed for each month in which the fishery occurs. In recent years (1989-91), the off-shore fishery has ended in June, so there are no samples from these years to estimate weight at age through the summer months. During 1986-88, the U.S. joint venture fishery began in late April or early May, and extended to October. Individual weights, ages, and collection dates obtained during these years were used to estimate weight at age for each month from April to October. The total sample size was 9,535, with each year contributing about third of the total.

The LOWESS scatterplot smoother was used to smooth the weight-at-age data, considered as a function of collection date. LOWESS uses local linear fits, where data points within in a window are weighted depending on the distance from the point being smoothed. The weights at age for each month in Table 12-1 are the predicted (smoothed) weights nearest to the midpoint of the month. To obtain samples of sufficient size to smooth the weight at age, fish age 11 and 12 were grouped, and all the fish age 13 and older were grouped.

The yield per recruit depends on when the fish are caught, which is restricted by the opening date, but not completely determined by it. In the analysis reported here, we examined the effect of changing the timing of the fishery for a yield per recruit model where the entire fishery occurs in a single month. Only the months April to October were investigated because weight-at-age data was available only for these months. From its inception in 1966, the Pacific whiting fishery has always lasted longer than a month, but the trend in recent years has been towards compression of the fishery. In 1991, the at-sea processing fleet caught 105,224 mt in 35 days beginning April 10. The size of this fleet varied between 10 and 16 vessels. If the at-sea processing fleet is not occupied with activities in Alaskan waters or elsewhere, a similarly intense fishery can be expected shortly after an opening for Pacific whiting.

The yield per recruit analysis was based on the assumption that the interception of the Canada-bound fish by an early fishery in the U.S. zone is minor. If this assumption is incorrect, then the Canadians would need to increase the harvest rate on the fish that reached Canadian waters to maintain yield at the same level, while the fish that remained in U.S. waters would experience a somewhat lower harvest rate. This should not seriously affect the conclusions of the yield per recruit analysis--at least over the short term. The long-term effects of sustained interception of Canada-bound fish by an early U.S. fishery are difficult to predict, but include the possibility of a permanent reduction in the fraction of the stock migrating into Canadian waters.

Table 12-2 gives the sustainable yield under these assumptions for the three

harvest rates presented in Dorn et al. (1991). The low, moderate, and high harvest rates are determined by probability that female spawning biomass will fall below a cautionary level of 457,000 t in long-term simulations of the Pacific whiting population. The low, moderate, and high harvest rates reduce the spawning biomass to 61.8, 54.4, and 47.8% of the pristine spawning biomass respectively. See Dorn et al. (1991) for details. A constant recruitment of 1.23 billion fish was used to convert the yield per recruit into estimates of annual yield. This is the average recruitment to Pacific whiting population from 1960-89.

In all cases, delaying the opening date gave higher sustainable yield. This is not surprising. In April, the mature Pacific whiting have recently spawned, and then migrated over 1000 km, and are at minimum of their annual growth cycle. A June fishery would increase sustainable yield by 4% relative to an April fishery, resulting in increases in annual yield between 4.7 and 7.3 thousand mt depending on the harvest level. A September fishery would increase sustainable yield by 10% relative to a April fishery, resulting in increases in annual yield between 11.5 and 18.1 thousand mt.

The sustainable yield for a fishery that extends for several months can be approximated by averaging the yields given in Table 12-2 for those months. Several trials using this method gave results with good accuracy.

This analysis does not touch on the question of whether the loss of catch biomass caused by taking fish early in the season represents a genuine loss of yield (i.e., usable product), or whether the lost yield consists of gonad or liver growth. If a large percentage of this growth is gonads or liver, then the fillet yield would be lower than suggested from increases in sustainable yield.

References

Dorn, M. W., R. D. Methot, E. P. Nunnallee, and M. W. Wilkins. 1991. Status of the coastal Pacific whiting resource in 1990. U.S. Dep. Commer., NOAA Tech. Memo. NMFS F/NWC-204, 97 p.

Stauffer, G. D. 1985. Biology and life history of the coastal stock of Pacific whiting, Merluccius productus. U.S. Natl. Mar. Fish. Serv., Mar. Fish. Rev. 47(2):2-7.

Table 12-1. -- Predicted weight at age (kg) by month for the U.S. fishery for Pacific whiting using weight at age data for 1986-88, and the LOWESS scatterplot smoother.

	Month						
Age	April	May	June	July	Aug.	Sept.	Oct.
2	0.265	0.271	0.284	0.300	0.312	0.307	0.303
3	0.308	0.344	0.383	0.410	0.405	0.401	0.397
4	0.386	0.418	0.452	0.474	0.502	0.527	0.553
5	0.474	0.472	0.476	0.514	0.543	0.575	0.603
6	0.519	0.523	0.534	0.547	0.570	0.600	0.627
7	0.513	0.543	0.581	0.590	0.606	0.604	0.599
8	0.512	0.548	0.596	0.612	0.647	0.680	0.719
9	0.668	0.683	0.716	0.768	0.757	0.772	0.803
10	0.733	0.739	0.738	0.718	0.730	0.781	0.827
11	0.754	0.754	0.754	0.754	0.754	0.754	0.754
12	0.754	0.754	0.754	0.754	0.754	0.754	0.754
13	1.310	1.340	1.406	1.364	1.317	1.273	1.105
14	1.310	1.340	1.406	1.364	1.317	1.273	1.105
15	1.310	1.340	1.406	1.364	1.317	1.273	1.105

Table 12-2.--Annual sustainable U.S. yield in thousands of mt for a Pacific whiting fishery where the entire catch occurs within a single month (April-October). Yield was calculated using a geographic yield per recruit model and constant recruitment of 1.230 billion age 2 recruits. The low, moderate, and high harvest rates are determined by probability that female spawning biomass will fall below a cautionary level of 457,000 t in long-term simulations of the Pacific whiting population. The low, moderate, and high harvest rates reduce the spawning biomass to 61.8, 54.4, and 47.8% of the pristine spawning biomass respectively. See Dorn et al. (1991) for details.

	Harvest level		
Month	Low	Moderate	High
April	116.5	140.3	161.9
May	118.2	142.5	164.7
June	121.2	146.3	169.2
July	123.9	149.8	173.6
August	125.9	152.4	176.8
September	128.0	155.1	180.0
October	129.8	157.3	182.7

Appendix F. (2) "Groundfish Management Team Statement on the Pacific Whiting Season," GMT Supplemental Report C.7., PFMC July 1992

GMT Supplemental Report C.7.
July 1992

GROUNDFISH MANAGEMENT TEAM STATEMENT ON THE PACIFIC WHITING SEASON

BACKGROUND: In 1991, the Council considered various alternatives before selecting April 15 as the opening date for the Pacific whiting season. The options considered at that time were: Jan. 1; April 1; April 15 (preferred); May 1; later than May 1 (with June 1 and Sept 1 as examples); and, a flexible framework.

January 1 was considered the "regulatory status quo," meaning nothing in the regulations precluded the domestic fishery from starting on January 1. However, the April 1–May 1 period was considered the "operational status quo," because this is the time period during which the domestic whiting fishery (joint venture and shore–based) generally started. The Council selected April 15 as the opening date, which applied to all sectors of the whiting fishery in 1992.

The Council's purpose was to: maintain the traditional fishing season, prevent potential bycatch of rockfish and salmon south of 39° N. latitude from exceeding then current levels, spread the harvesting and processing of whiting along the entire coast so that effort is not concentrated in a particular area.

RECONSIDERATION. At its November 1991 and April 1992 meetings, the Council stated its intent to consider: (1) establishing different opening dates for the different processing sectors — between April 1 and June 1 for at–sea processors and as early as January 1 for shore–based processors; (2) allowing for small landings before and after the large–scale target season to accommodate small target and incidental fisheries; and (3) designating the above provisions as "routine" framework management actions that can be changed, within limits, by a single notice in the Federal Register.

NEW DATA. There are little additional data beyond those included in the initial Environmental Assessment/Regulatory Impact Review (EA/RIR) prepared for the opening date last year. Some tables from last year's EA/RIR are attached for your reference. The complete document is available from the Council or the NMFS Northwest Regional Office.

In 1992, the fishery started on April 15. Although whiting initially were difficult to find, the at–sea fleet reached full productivity within the first week , and the entire at–sea allocation of 98,800 metric tons was reached in a record three weeks. The southernmost shore–based fishery was not initially as successful. Atypical El Nino conditions resulted in whiting showing up early (in March) off the California coast. By the time the fishery opened on April 15, most of the whiting were unacceptably small, suggesting larger fish may have already migrated north out of fishing range for these shore–based plants. In April 1992, 170 metric tons (mt) of whiting were landed, compared with 2,240 mt in April 1991. Although it is not possible to distinguish between the effect of the delayed season opening and El Nino conditions (landings in May 1992 were 500 mt less than in May 1991), it appears that the April 15 opening disadvantaged shore–based processors in the Eureka and Crescent City areas to some extent. The ability to compensate later in the year is not yet known.

COUNCIL ACTION. In order to update last year's analysis, the GMT needs clear instruction as to the Council's purpose for (1) changing the current April 15 opening date, (2) for setting different opening dates for at–sea and shore–based processors; and (3) for allowing for small fisheries outside the major target seasons.

GMT COMMENTS

In the following discussion, the GMT assumes that allocations will be in place for different sectors of the whiting industry, and that the change in opening date is not made for allocative reasons.

1. Changing The April 15 Opening Date: Just last year, the Council did not choose opening dates of January 1 and later than May 1. The GMT will need explicit guidance as to why these options now are being reconsidered.

Last year the Council rejected a January 1 opening because it was concerned that significant amounts of fishing earlier in the year would increase the potential for higher catches of chilipepper and bocaccio rockfish and of salmon, particularly Sacramento winter-run chinook (which is listed as endangered under the Endangered Species Act), and also because of the preemptive capability of the high-capacity at-sea processing fleet. The preemption issue may be addressed by explicit allocation or a staggered season, which the Council is considering. However, there is no new information which would alleviate the Council's concerns over bycatch in southern waters earlier in the year. Consequently, the GMT does not at this time endorse a large-scale whiting fishery starting January 1 for either shore-based or at-sea processors. However, modest operations before April 15 might be feasible.

In its deliberations last year, the Council also did not select an opening date later than May 1 presumably because the delay would be too burdensome on the shore-based fleet which traditionally started in March or April. An opening later than May 1 could have disadvantaged at-sea processors, because most intend to operate in the pollock "B" season in Alaska (currently scheduled for June 1).

The GMT notes that the initial EA/RIR indicated minimal biological differences between a season opening date (for all processing sectors) between April 1 and May 1. Extending this window one month either way (March - June) may also have minimal biological impacts.

If the Council wants a single opening date for all sectors of the industry, and to make the choice of opening date a "routine" framework, the GMT suggests consideration of an April 1 - May 1 range. Any change to the opening date must fall within this range and could not preclude a user group from achieving its allocation, if any. The exact opening date could be chosen for the following reasons:

a) to keep bycatch at a biologically acceptable level (for example, for those species listed under the Endangered Species Act, "overfished" as defined by the governing FMP, or subject to other conservation concerns); or

b) to provide for environmental variations (such as the 1992 El Nino) which may influence the distribution or availability of the resource (whiting or other species); or

c) to accommodate industry preference as long as the change appears to have a minor or positive impact on bycatch or on other fisheries.

2. Setting Different Opening Dates For At-sea And Shore-based Processors:

Shore-based. As stated above, the GMT does not endorse a large-scale whiting fishery which begins on January 1. However, it may be reasonable to provide for an opening before April 15 (perhaps

April 1 or March 15) for shore-based processors in California since whiting migrate north and out of fishing range earlier than for more northern processors. It also may be reasonable to provide for bycatch and small target fisheries for whiting that occur outside the main season (see item 3). As long as the magnitude of the fishery remains relatively small, the biological impact on salmon or rockfish bycatch would be insignificant. California processors took about 7,000 mt of whiting in 1991; 2,240 mt (one-third) was taken in April and only a trace in March. Currently, California whiting processors all are located north of 39° N. latitude, north of the area where Sacramento winter-run chinook and rockfish are potential problems. Oregon and Washington shore-based processors are not expected to want an opening before April 15 because whiting generally are not available in fishable concentrations that far north before April. (A March 1 opening is not desirable for at-sea processing for the bycatch reasons seen last year.) A shore-based fishery starting as late as May 1, although acceptable for biological reasons, may be unacceptable to the industry if it precludes California processing opportunities.

An alternate approach to an earlier shore-based opening might be to allow trip or cumulative landing limits to accommodate the California processors before April 15. (Shore-based whiting vessels in California are believed to make mostly day trips, landing less than 60 mt (133,000 pounds) per trip.) However, this solution would not provide for the small bait fisheries off Oregon and Washington.

At-Sea. As mentioned above, the biological impact of starting at-sea processing between April 1 and May 1, and perhaps June 1, is probably minimal. However, the economic and allocative impact of a June opening is not so straightforward. A June 1 opening would probably delay most, if not all, at-sea processing until August or September, when pollock opportunities have vanished. Analysis of the impact of a fall fishery on bycatch of rockfish and salmon would need to rely on joint venture data since little at-sea processing occurred in the fall of 1991. Even if a fall fishery by at-sea processors occurs in 1992, the data from that fishery would not be completely processed by November, and therefore would not be available for analysis.

The Council should be aware that there have been some efforts to delay the pollock "B" season, perhaps as late as the fall. If this were to occur, concurrent with a fall season for whiting, at-sea processing for whiting could be severely curtailed.

The GMT reminds the Council that, at this time, there is no compelling biological reason to delay at-sea processing until the fall. In the initial EA/RIR, the GMT compared the sustainable yield that would be produced if the fishery were conducted **entirely** in April or **entirely** in September. The GMT found that sustainable yield could be increased by as much as 10% by catching the entire harvest guideline in September rather than April. However, this is an extreme result because the entire harvest guideline will not be taken in any single month, and, to the extent that the fishery lasts longer than a month (ie. more is taken by the shore-based fleet), the potential 10% gain is lessened. Moreover, it is not known if the 10% increase in yield represents marketable flesh, or gonad or liver growth.

There may be valid non-biological reasons to prefer a fall fishery for at-sea processors. Issues of quality and size of fish depend on the particular product and market. The GMT defers to the at-sea processing industry to present reasons in support of a fall fishery.

If the Council wants "routine" flexibility to set different season openings for at-sea and onshore processing, the following reasons could be added to those above:

d) to mitigate the effects of environmental conditions which may affect the availability of the resource to a particular sector; or

e) to mitigate operational or economic hardship for a particular sector that would result from having the same opening date for all sectors.

In any event, an opening date could not be selected which effectively prevents a sector from taking its allocation, if any.

3. Allowing For Small Fisheries Outside The Large-Scale Target Fishery: It appears that a case may be made for small landings at the beginning or the end of the large-scale target season, similar to the nontrawl sablefish fishery. New testimony has surfaced that small amounts of whiting are used for fixed gear bait before April 15 (and possibly later in the year) and for a small fresh market in southern California (market season not known). Little data are available to document this need, and the GMT requests guidance from the industry. It appears that less than 500 pounds per trip would accommodate the Newport dory fleet's fresh market. The bait fishery may need larger, but less frequent landings. In total, the magnitude of these removals is expected to be negligible. Presumably, this small catch, if measurable, would count against any shoreside allocation for whiting, and would remain in effect even if the shore-based allocation or coastwide harvest guideline for whiting is reached.

If the Council chooses to establish routine landing limits outside the regular whiting season (cumulative or per trip), the reasons appear to be the same as for other routine trip landing and frequency limits in the groundfish fishery (50 CFR 663.23(c)(1)):

- to extend the fishing season;
- to minimize disruption of traditional fishing and marketing patterns;
- to reduce discards;
- to discourage target fishing while allowing small incidental catches to be landed;
- to allow small fisheries to operate outside the normal season.

SUMMARY: If the Council prefers a single opening date for the large-scale shore-based and at-sea fisheries, an April 1 - May 1 window appears supportable under last year's EA/RIR. If the Council prefers staggered openings for shore-based and at-sea processors, the GMT believes it would be feasible to establish a March 1 - May 1 (or April 15) window for the large-scale shore-based fishery, and an April 1 - May 1 window for the at-sea processing fleet. Because an April - May window (for all sectors of the whiting fishery) was supported by the previous EA/RIR, a one-month earlier opening for the relatively small shore-based operations in California is not expected to have a significant biological impact. However, delaying at-sea processing until June 1 (which may have the result of delaying at-sea processing until the fall), would necessitate additional analysis,

particularly of the economic and potentially allocative impacts. Little new information would be available in time to make a decision for 1993, even if at-sea processing resumes in the fall of 1992. If the opening date is chosen for allocation purposes, then the more rigorous allocation provisions of the socio-economic framework would need to be used.

The GMT believes that minimal allowances can be justified for the incidental and target (bait and fresh fish) whiting fisheries which target on small amounts of whiting outside of the "regular" whiting season. The GMT needs guidance as to the appropriate levels for these fisheries.

Designating actions as "routine" will simplify future changes within the limits that are specified.

ANOTHER IDEA: The GMT asks the Council to make its objectives explicit for changing the season from April 15, or for staggering it for different sectors of the industry. The Council's objective last year was to minimize the bycatch of salmon and rockfish, particularly south of 39° N. latitude. By delaying the season until April 15, the Council hoped whiting would be more dispersed along its northward migration, and that the impact of the fishery would be less intense in localized areas. Subsequently, the Council imposed additional restrictions by emergency rule to protect salmon in the Eureka area up to 42° N. latitude.

If bycatch concerns continue to be the motivation behind the season dates, the Council may want to consider the season in conjunction with the other restrictions for limiting bycatch in the whiting fishery.
For example, if the Council chooses to continue the prohibition against at-sea processing of whiting south of 42 degrees, the reason for imposing a season on at-sea processing becomes less clear.
A composite solution might be to continue the prohibition against at-sea processing south of 42° N. latitude, in conjunction with a single season "opening" date (March 15 or April 1) for shore-based operations which would discourage major increases in shore-based effort before that time in the areas of concern south of 39°. A small trip limit could remain in effect from January 1 to March 15 or April 1 to accommodate the incidental and small target fisheries for whiting, and could remain in effect after the shoreside allocation or whiting harvest guideline is reached. This would alleviate concerns of localized depletion of salmon and rockfish south of 42°, would enable California shore-based processors to operate as soon as the whiting reach fishable concentrations, and would provide for the small bait and fresh fish fisheries. If fishing off California were to increase substantially such that shoreside bycatch becomes of concern, or if shore-based fishers from more northern ports were to fish in California and land elsewhere, which currently is impractical, then other restrictions might be needed.

Table 1

PACIFIC WHITING LANDED CATCH -- ALL GEAR -- ALL AREAS (FROM PACFIN)

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1990:	SHORE-BASED	1	TR	TR	324	1,526	1,852	1,935	307	750	979	440	TR	8,114
	US AT-SEA	0	0	0	0	0	0	0	0	0	0	1,401	3,312	4,713
	JOINT VENTURE	0	0	0	26,743	77,649	53,246	122	5,599	5,981	1,631	0	0	170,971
	FOREIGN	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	1	TR	TR	27,067	79,175	55,098	2,057	5,906	6,731	2,610	1,841	3,312	183,798
1989:	SHORE-BASED	TR	1	76	1,560	1,282	1,510	1,890	1,038	23	21	15	TR	7,416
	JOINT VENTURE	0	0	0	24,225	89,200	79,583	2,628	0	0	0	0	0	195,636
	FOREIGN	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	TR	1	76	25,785	90,482	81,093	4,518	1,038	23	21	15	0	203,052
1988:	SHORE-BASED	0	0	502	1,524	1,851	1,884	946	41	25	69	TR	34	6,876
	JOINT VENTURE	0	0	0	3,595	13,423	19,512	44,511	30,345	21,452	2,943	0	0	135,781
	FOREIGN	0	0	0	0	0	874	2,601	0	1,631	12,308	570	57	18,041
	TOTAL	0	0	502	5,119	15,274	22,270	48,058	30,386	23,108	15,320	570	91	160,698
1987:	SHORE-BASED	TR	TR	30	883	1,053	1,391	1,074	245	53	49	16	TR	4,794
	JOINT VENTURE	0	0	30	302	13,472	21,612	21,904	33,968	11,001	3,707	0	0	105,996
	FOREIGN	0	0	0	0	0	1,517	5,199	9,476	10,145	23,319	0	0	49,656
	TOTAL	TR	TR	60	1,185	14,525	24,520	28,177	43,689	21,199	27,075	16	0	160,446
1986:	SHORE-BASED	TR	1	TR	537	1,052	890	505	374	39	64	TR	TR	3,462
	JOINT VENTURE	0	0	24	359	11,931	20,038	16,671	20,656	8,292	3,554	115	0	81,640
	FOREIGN	0	0	0	0	0	10,316	16,814	18,528	12,124	11,701	377	0	69,860
	TOTAL	TR	1	24	896	12,983	31,244	33,990	39,558	20,455	15,319	492	0	154,962
1985:	SHORE-BASED	TR	TR	0	322	1,156	743	887	609	174	1	0	0	3,892
	JOINT VENTURE	0	0	0	8	87	6,962	12,868	9,322	2,214	216	14	0	31,691
	FOREIGN	0	0	0	4	43	3,040	9,330	14,911	12,589	9,334	602	0	49,853
	TOTAL	0	0	0	334	1,286	10,745	23,085	24,842	14,977	9,551	616	0	85,436

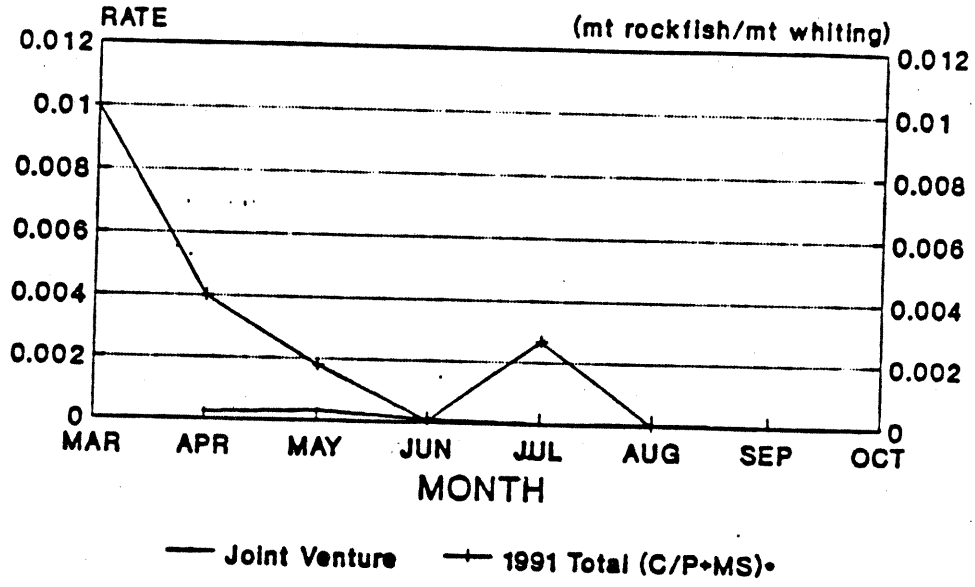
TR = trace, which means less than 0.5 metric tons (or 50 lbs)
This report includes only data for INPFC Vancouver, Columbia, Eureka, Montery, anand Conception areas.

Foreign season: June 1 through October 31. Joint venture and shore-based fisheries for whiting had no season restrictions.

TABLE 1

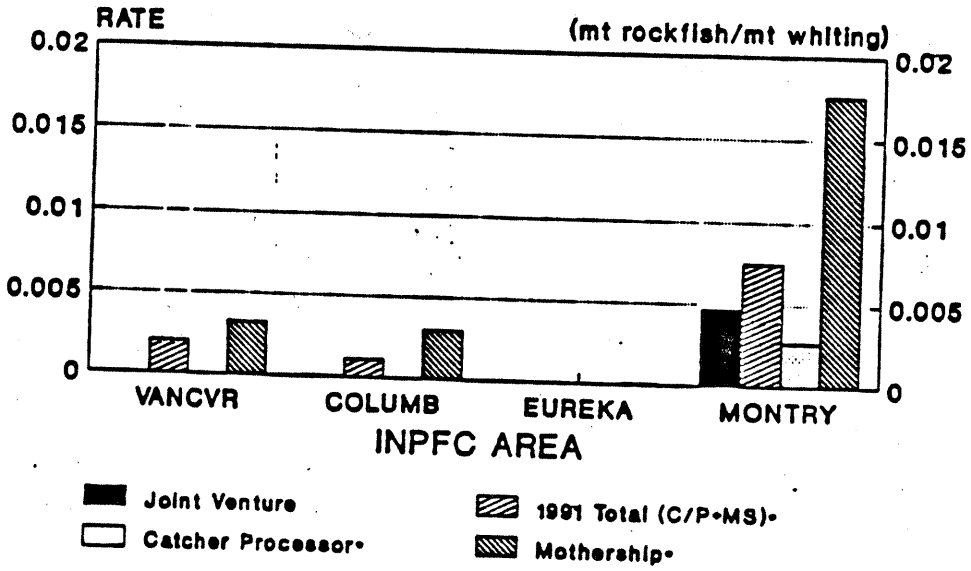
Figure -1

CHILIPEPPER
BYCATCH RATE BY MONTH



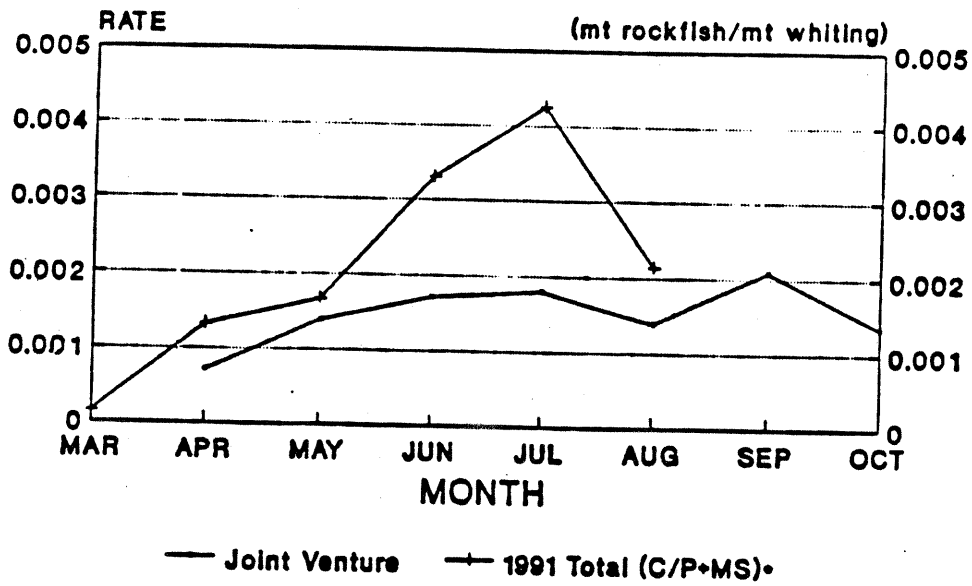
• Preliminary data through 08/20/91

CHILIPEPPER
BYCATCH RATE BY INPFC AREA



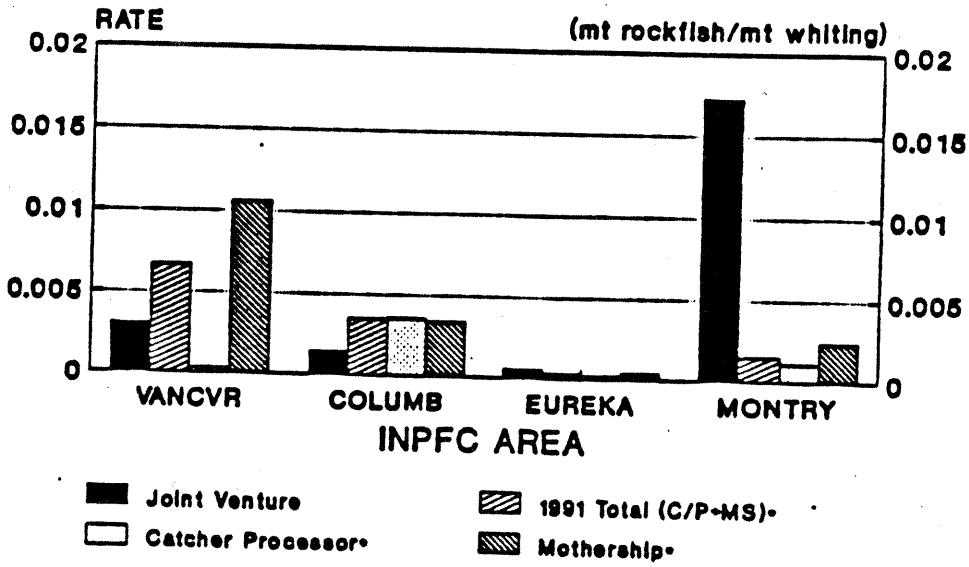
• Preliminary data through 08/20/91

WIDOW
BYCATCH RATE BY MONTH



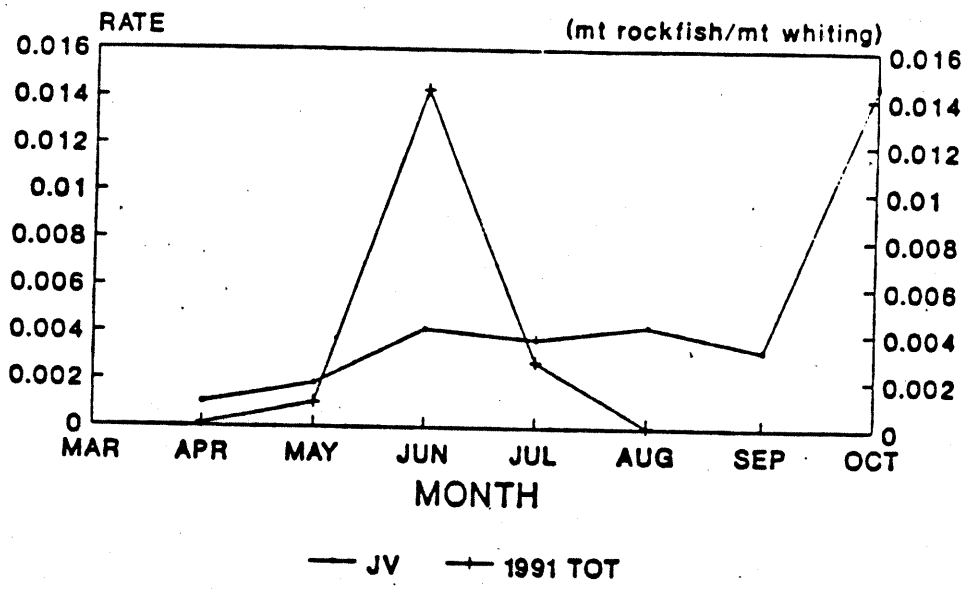
• Preliminary data through 08/20/91

WIDOW
BYCATCH RATE BY INPFC AREA



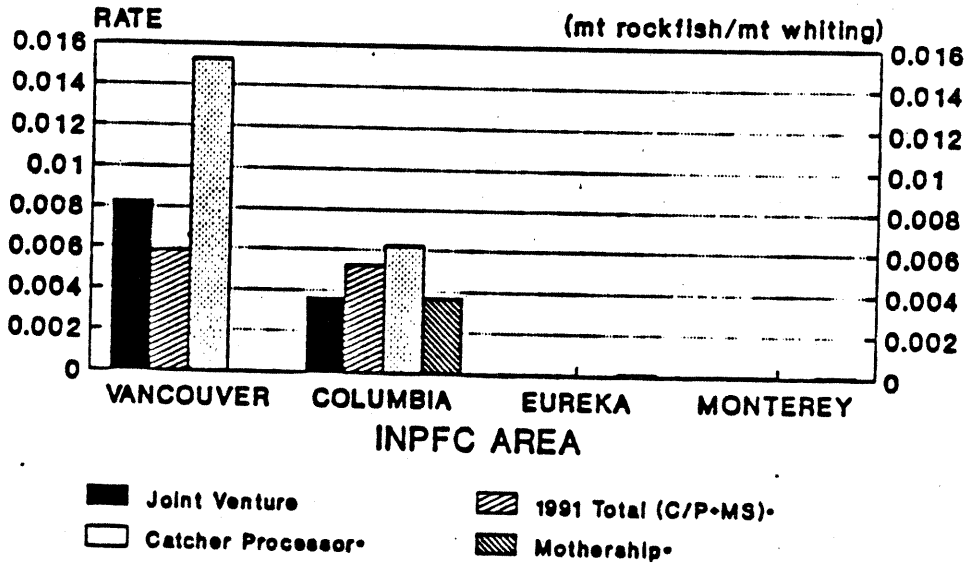
• Preliminary data through 08/20/91

YELLOWTAIL
BYCATCH RATE BY MONTH



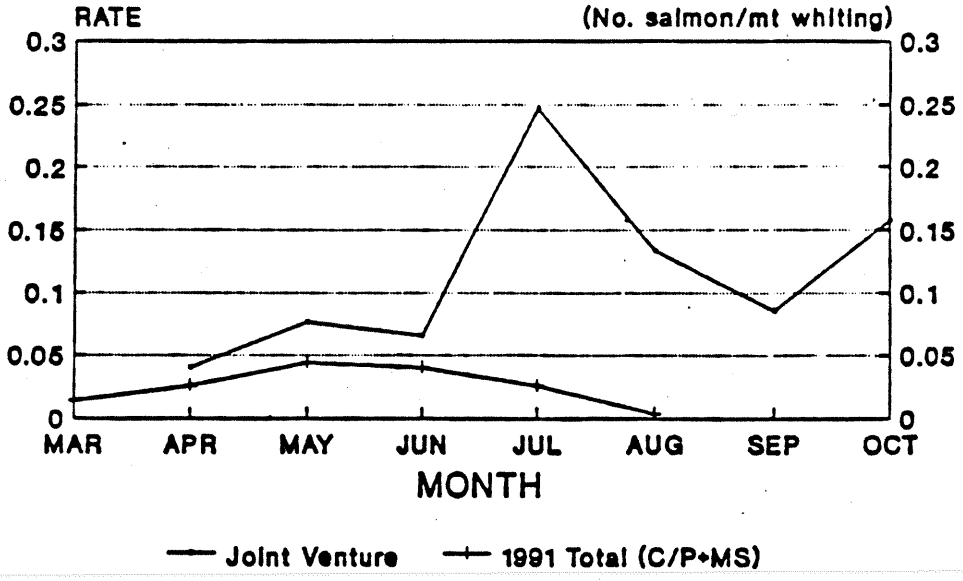
• Preliminary data through 08/20/91

YELLOWTAIL
BYCATCH RATE BY INPFC AREA



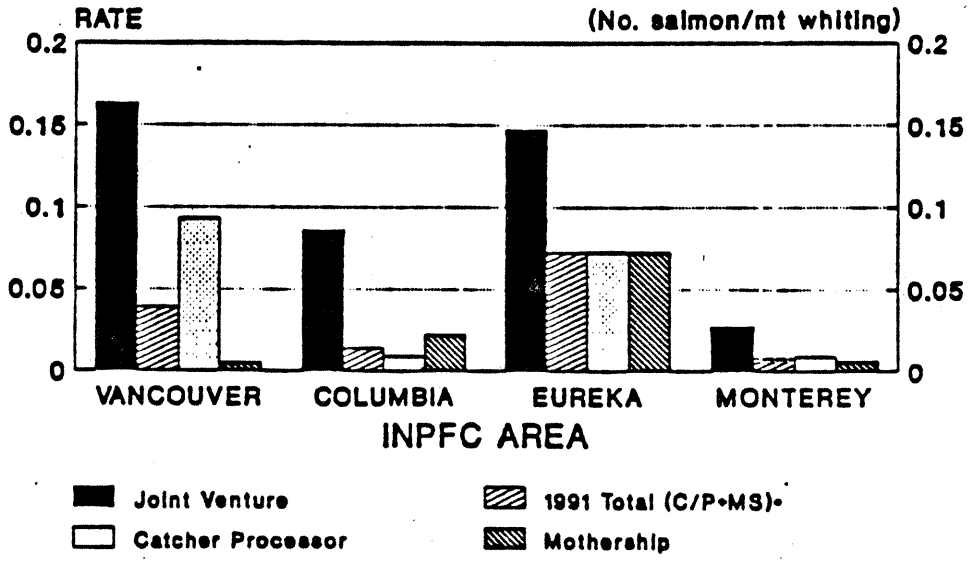
• Preliminary data through 08/20/91

SALMON
BYCATCH RATE BY MONTH



• Preliminary data through 08/20/91

SALMON
BYCATCH RATE BY INPFC AREA



• Preliminary data through 08/20/91

Appendix G. Supplemental Deliveries of Whiting by Catcher Boats to Catcher/Processors in the 1992 Spring Fishery

Supplemental Deliveries of Whiting by Catcher Boats to Catcher/Processors in the 1992 Spring Fishery
(ie: Catcher/processors that also acted as motherships)

C/P	total # hauls	# hauls from catcher boats		catcher hauls started or ended within 3 hrs of nite closure		# catcher boats
		no.	percent	no.	percent	
1	102	34	33	27	79	1
2	124	42	34	37	88	2
3	120	41	34	17	71	2
4	102	20	20	11	61	1
5	33 *	4	12	1	25	1
6	93	26	28	23	88	1
	574.00	167.00	29.09	116.00	69.46	6 **

* a subset of total hauls

** one catcher vessel delivered to 3 different processing vessels

167 tows/6 catcher boats = 27.8 tows/catcher for the entire season
= averaging 9 tows/catcher per week

Four of the six catcher vessels were "traditional" joint venture catcher vessels.