

SUMMARY OF U.S. OBSERVER SAMPLING OF  
FOREIGN AND JOINT VENTURE FISHERIES  
IN THE NORTHEAST PACIFIC OCEAN  
AND EASTERN BERING SEA, 1987

by

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## INTRODUCTION

In 1987, foreign and joint venture fisheries in U.S. waters entered their second decade of operating under the auspices of the Magnuson Fishery Conservation and Management Act (MFCMA) of 1976. One of the requirements of this act is that foreign vessels wishing to engage in fishing operations must have a U.S. fisheries observer aboard (except in approved situations). In 1987, the Northwest and Alaska Fisheries Center sent 268 U.S. fisheries observers to sample aboard Japanese, Polish, Republic of Korea (ROK), Peoples Republic of China (PRC), and Soviet vessels involved with either foreign fisheries or as joint venture processing ships in fisheries conducted with U.S. fishermen. (See Table 1 for a description of the various vessel types and a listing of vessel class abbreviations which are used in tables in this paper.) In 1987, overall observer coverage of the total number of foreign vessel days on fishing grounds (100 x observer days/foreign vessel days) was 96%. This represented 16,417 days during which observers sampled aboard foreign vessels that spent a total of 17,096 vessel days on the fishing grounds in the Bering Sea, Gulf of Alaska, and off the Washington, Oregon, and California (WOC) coasts.

The purposes of placing observers on foreign and joint venture fishing vessels within the U.S. 200-mile exclusive economic zone (EEZ) were 1) to collect data that could be used to estimate the foreign and joint venture commercial catches; 2) to determine the incidental catches of species whose retention is prohibited by U.S. regulations; 3) to provide information needed to assess the biological status of the various stocks of fish; and 4) to report on suspected violations of U.S. fishing regulations.

The information obtained by observers included the location, duration, average depth, and catch weight of each trawl haul or longline set made while the observer was aboard. Observers on motherships recorded the noon (Greenwich mean time) position of the processing ship and the tonnage caught by the type of catcher boat. In addition, each observer sampled several hauls or portions of the longline set each day to determine species composition by weight, the incidence in the catch of those species whose retention is prohibited by U.S. regulations, and the age and length composition of designated species in the catch. Upon return to Seattle, observers also submitted reports of any suspected violations of U.S. regulations as well as descriptions of fishing strategy and sampling methods used.

## OBSERVER SAMPLING PROCEDURES

The sampling procedures used by observers in 1987 have been described by Nelson et al. (1981) and French et al. (1981). While on the vessel, the observer determined the species composition of the catch by taking representative basket samples of various trawl hauls or portions of a longline set. Individuals of each species in the samples were then counted and weighed. If the catch on a trawler or joint venture processing ship was composed of a high percentage of one species, the observer often determined the composition of the entire haul by separating, counting, and weighing all

nontarget species. The weight of the target species was calculated by subtracting the weight of the other species from the total haul weight. The numbers of the target species were obtained by dividing the total weight of the species by the average weight per fish determined from a sample of the catch. For those species for which additional biological information was desired, length frequencies were taken from random samples, and otoliths or scales were taken from subsamples stratified by length and sex. Observers monitored the catch being emptied from fish holding bins via conveyor belts, watched the emptying of nets or the landing of the longline catch, and recorded the number and weight of Pacific salmon (Oncorhynchus spp.), Pacific halibut (Hippoglossus stenolepis), snow (Tanner) crab (Chionoecetes spp.), and king crab (Paralithodes and Lithodes spp.) per unit weight of catch. These species have been designated as prohibited species and as such, U.S. regulations prohibit the retention of the incidental catch of these species. Observers also collected data on the sightings and incidental catch of marine mammals, the design and dimensions of fishing gear, and methods of fish processing, and at times they did other special studies.

#### METHODS OF CALCULATION

##### Estimates of Foreign and U.S. Joint Venture Catches

Estimates of the foreign catches were based on observer and foreign reported data using the method previously described by Nelson et al. (1981). In this technique, the average daily catch rates of each species by vessel class' (obtained by observers for the vessels sampled) for a particular statistical reporting area were applied to the total number of vessel days on the grounds in that area. Refer to the first figure in each section for the boundaries and designations of the statistical reporting areas of each region. Data on fleet vessel days on the grounds were obtained from the foreign vessel check-in and check-out summaries which are required by U.S. regulations and are verified by Coast Guard surveillance flights and ship patrols. In a very few instances during 1987, observer coverage of a given week-area-vessel class element was less than 20% (week is defined to be a calendar week). In these cases, it was thought that estimates based solely on the existing observer data might not be representative of the total foreign fishing in that element. In order to provide a "best estimate," the U.S. estimates were used when observer coverage of a week-area-vessel class element was at least 20% and when the U.S. estimate of the catch differed by more than 10% from the foreign-reported catch for that element. Catches reported by foreign vessels were used for those elements which did not meet both of the above criteria.

In previous years, estimates of the joint venture catch had been made by applying the percent species composition of the catch by weight, as determined by observer sampling, to the sum of the total catch weights reported by the processing vessels. In 1987, however, management plans in the Bering Sea necessitated catch estimates by subarea within the INPFC areas. The processing vessels' inability to provide catch estimates other than by INPFC areas compelled us to estimate joint venture catches using the same method used in estimating foreign catches. The catch reported by processing vessels was apportioned by subarea based on the catch figures

reported by the U.S. fisheries observers. This method of estimating joint venture catches was also used in the Gulf of Alaska and in the WOC regions.

#### Estimates of Incidental Catches and Average Weights of Pacific Salmon, Pacific-Halibut, Snow (Tanner) Crab, and King Crab

The mean incidence (number of individuals caught per metric ton (t) of groundfish catch), and the total incidental catch (numbers and tonnage) of Pacific salmon, Pacific halibut, snow (Tanner) crab, and king crab in the 1987 foreign and joint venture groundfish fisheries were estimated from U.S. observer data. The incidental catches, in numbers, of these species were estimated by multiplying the average monthly-incidence rates for each nation, area, and vessel class by the estimated monthly groundfish catches for those same nations, areas, and vessel classes. Incidental catch by weight was calculated by multiplying the estimated numbers of fish or crab caught each month by the average weight per individual in kilograms determined from observer samples for that same data element. In instances where monthly incidence data were not available for a particular nation, area, or vessel class, mean quarterly or annual rates from those same areas or vessel classes were applied to monthly groundfish catches.

#### Estimates of Rockfish and Flatfish Catch by Species

Estimates of the foreign and joint venture catches of rockfish and flatfish by species were made by applying the mean annual species composition (percentage by weight) computed from samples collected by U.S. observers to the total rockfish and flatfish catch. Specific catch allocations were set for yellowfin sole (Limanda aspera) and Greenland turbot (Reinhardtius hippoglossoides) in the Bering Sea and Pacific ocean perch (Sebastes alutus) off the Washington-Oregon-California coast; therefore, the best estimates of catch were used for those species in those regions. All observers were trained in species identification and instructed in the use of fish identification keys but errors in the identification of some species could have been made.

Table 1.--Definition of foreign vessel classes used by U.S. observer program in the Bering Sea/Aleutian Islands and North Pacific groundfish fishery.

Vessel class	Abbreviation	Definition
Mothership - Surimi	SMS	Mothership fleets with capacity to produce surimi (a minced fish product), frozen products, and meal.
Mothership - Freezer	FMS	Mothership fleets with capacity to produce frozen products or meal.
Mothership - Freezer joint venture	FJV	Mothership fleets, producing primarily frozen products, where the catcher boat fleet is composed of U.S. trawlers and the mothership is of foreign registry. Fish caught are defined as U.S. landings.
Mothership - Surimi joint venture	SJV	Mothership fleets, producing primarily surimi products, where the catcher boat fleet is composed of U.S. trawlers and the mothership is of foreign registry. Fish caught are defined as U.S. landings.
Small stern trawler	SST	Independent stern trawlers less than 1,500 gross registered tons (GRT).
Large freezer trawler	LFT	Independent stern trawler 1,500 GRT or greater, with capacity to produce frozen products or meal.
Large surimi trawler	LST	Independent stern trawler 1,500 GRT or greater, with capacity to produce surimi, frozen products, and meal.
Longliner	LL	Independent vessels fishing with baited longline gear.

## SUMMARY OF OBSERVER SAMPLING FOR THE BERING SEA AND ALEUTIAN ISLANDS REGION

## Observer Coverage of Fishing Fleets

During 1987, 97 foreign vessels from Japan and the Republic of Korea (ROK) spent 3,286 vessel days in the U.S. 200-mile EEZ in the Bering Sea and Aleutian Islands region (Fig. 1) fishing on foreign quotas (Table 2). This level of effort was less than two-thirds (65.5%) that used in 1986 (Berger et al. 1988). United States fisheries observers spent 3,170 days sampling aboard these foreign vessels resulting in an observer coverage of 96.5%. The comparative level of observer coverage in 1986 was 92.0% (Berger et al., 1988).

While foreign effort devoted to fishing on foreign quotas decreased in 1987, the effort of foreign vessels participating in joint ventures with U.S. catcher vessels increased 7%. Foreign vessels spent 10,496 days in joint venture fishing operations. Joint ventures were conducted between U.S. vessels and processing vessels from the U.S.S.R., Japan, Poland, the ROK, and the People's Republic of China (PRC). Observers spent 10,070 days sampling aboard the 107 foreign processing vessels in joint venture fisheries, providing a level of observer coverage of 95.9%, an increase of 1.7% from the 94.2% coverage level obtained in 1986 (Berger et al. 1988).

A total of 13,240 of the 13,782 vessel days (foreign and joint venture fisheries combined) were sampled by observers in 1987, making an overall observer coverage of 96.1%. This level of coverage was 2.6% greater than the observer coverage of the Bering Sea fleets achieved in 1986.

## Estimates of Foreign and U.S. Joint Venture Catches

In 1987, fish allotments granted to domestic and joint venture operations severely limited the tonnage and species groups of groundfish available to foreign fishing operations. This resulted in greatly reduced catches and radical differences in species composition as foreign vessels conducted fishing operations within these limitations. The estimated foreign catch of groundfish in 1987 was, therefore, only 69,600 t (Table 3). Pacific cod (Gadus macrocephalus) was the principle target and accounted for 78.7% of the total catch. The combined catches of the four categories of flatfish--yellowfin sole, arrowtooth (Atheresthes stomias) and Kamchatka (A. evermanni) flounders, Greenland turbot, and other flatfishes--accounted for 10.8% of the catches, and walleye pollock (Theragra chalcogramma) made up 5.2%. As in previous years, Japanese vessels landed the largest portion of the catch, 97.7%; ships from the ROK took 2.3%. Foreign trawl fisheries were closed 26 November 1987 due to the prohibited species cap (quota) of halibut being exceeded.

United States vessels delivered 1.356 million t of groundfish to foreign processing vessels in the 1987 joint venture fisheries. Walleye pollock (77.0%), yellowfin sole (13.2%), Pacific cod (4.3%), other flatfishes (2.5%), and Atka mackerel (Pleurogrammus monopterygius, 2.2%) were the five major species groups targeted on in the joint venture operations.

Table 4 presents a summary of the foreign and joint venture catches by species for the years 1977 to 1987. The 1987 total foreign catch of about 69,600 t represents an 85.4% decrease from the 1986 estimated catch of 475,900 t. The U.S. joint venture landings continued the steady increase in size they have experienced since the beginning of that fishery in 1980. The 1987 joint venture catch of 1.356 million t represents an increase of 16.9% over the 1986 figure of 1.160 million t. The increase by the joint venture fisheries was in the catch of walleye pollock. Catches of Pacific cod and Atka mackerel decreased slightly (9.0% and 6.0%, respectively) and the yellowfin sole/other flatfish catch remained the same. On 29 June 1987, joint venture operations targeting on yellowfin sole were closed due to catch limit restrictions on this species.

#### Incidence and Incidental Catch of Prohibited Species

Incidence rates of Pacific salmon, Pacific halibut, snow (Tanner) crab, and king crab for all the statistical reporting areas were calculated as described in the introduction section. In addition, incidence rates were also calculated for the triangular area labelled "outside EEZ" (exclusive economic zone) in Figure 1. In recent years, pelagic trawling for walleye pollock has occurred in this area, and at times observers have been aboard and sampled the catches. As the area is outside U.S. jurisdiction, no data are available on vessel days on the grounds, thus total catch estimates for this area cannot be calculated. Incidental catch rate data for this region are included in the tables for informational purposes.

In 1986, the Secretary of Commerce imposed emergency regulations on fisheries conducted for yellowfin sole and other flatfishes in order to control the incidental catches of red king crab (Paralithodes camtschatica) and Chionoecetes bairdi Tanner crab which are taken in these fisheries and to help protect the stocks of these two species of crab from further decline. In 1987, Amendment 10 to the Bering Sea/Aleutian Island Groundfish Management Plan included these regulations (and ones for Pacific halibut and Pacific salmon) and imposed the following restrictions on the groundfish fishery:

- a) Prohibited all foreign and joint venture trawling in the area between 160 and 162°W long. and south of 58°N lat. Under controlled circumstances, a domestic trawl fishery for Pacific cod was allowed in a limited section of the closed area;
- b) Created an area designated as Zone 1 (Fig. 2) in which joint venture and domestic fisheries for yellowfin sole and other flatfishes could not catch more than 135,000 red king crab or 80,000 C. bairdi Tanner crab. If either quota was reached, the area would be closed to these fisheries and if the closure was due to reaching the red king crab limit, then the area would be closed to any foreign fishing for yellowfin sole and other flatfish for the remainder of the year;
- c) Created an area designated as Zone 2 (Fig. 2) in which the joint venture and domestic yellowfin sole and other flatfish fisheries could not catch more than 326,000 C. bairdi Tanner crab. If the quota was reached, the area would be closed to these fisheries for the remainder of the year;

- d) Created an area designated as Zone 3 (Fig. 2) in which fisheries for yellowfin sole and other flatfishes could be conducted without any limitations placed on the incidental catches of red king crab or C. bairdi Tanner crab;
- e) In the combined area of Zone 1 and Zone 2, a limit of 64,000 C. bairdi Tanner crab was placed on foreign fisheries for yellowfin sole and other flatfishes. If the limit was reached, Zones 1 and 2 would be closed to all foreign fishing for yellowfin sole and other flatfishes for the remainder of the year;
- f) Established a formula for determining foreign prohibited species catch (PSC) limits for Pacific salmon (all gear types) and Pacific halibut, king crab, and Tanner crab (trawl vessels). The PSC limits for each nation are apportioned based on their percentage of the total allowable level of foreign fishing (TALFF). In 1987, the foreign PSC limit for Pacific halibut was 163 t.

On 25 April 1987, Zone 1 was closed to any further fishing for yellowfin sole and other flatfish due to the incidental catch limit of 80,000 C. bairdi Tanner crab being exceeded by the joint venture fishery. The estimated incidental catches of king crab, Tanner crab, and halibut taken by the yellowfin sole/other flatfish fishery in each of the three zones have been included in this report.

#### Pacific Salmon

The incidence rates and average weights of Pacific salmon taken in the catches sampled by observers are shown in Table 5. Incidence rates were very low in 1987, exceeding 0.1 salmon/t only three times. Japanese small trawlers fishing in Area II caught 0.149 salmon/t in October and 0.299 salmon/t in November. In Area IV, United States joint venture operations with the PRC caught 0.105 salmon/t in August. The highest annual average incidence rate (0.125 salmon/t) occurred on the Japanese small trawlers in Area II. All other nations and vessel classes had annual incidence rates less than 0.050 salmon/t.

The incidence of salmon by vessel class, quarter, and 1/2° latitude by 1° longitude statistical area is illustrated in Figures 3-4. Small stern trawlers (Fig. 3) had three occurrences of incidence rates greater than 0.5 salmon/t (58°30'-59°00'N lat., 176°-177°W long.) in the fourth quarter. Aside from these, there were no other occurrences of salmon incidence rates which exceeded 0.5 salmon/t in the foreign fishery. Salmon incidence rates were also low aboard joint venture vessels (Fig. 4), with only one occurrence of rates greater than one salmon/t (in the third quarter at 58°30'N lat., 166°W long.).

Table 6 presents the estimated incidental catches of Pacific salmon by nation, area, and vessel class. In 1987, foreign vessels caught 3,386 salmon incidental to the groundfish fishery; more than double 1986's estimated catch of 1,643 salmon. In 1986, most of the salmon were landed in Area II, during September through November, aboard small trawlers targeting on pollock. In

1987, the small trawlers fished for Pacific cod in this area and time period and experienced much higher incidence rates. In 1986, U.S. pollock joint venture operations with the ROK in Subareas 511 and 513 in August had caught over 9,000 salmon; in August 1987, this operation fished in Subarea 515, landed only 8 tons of groundfish, and caught no salmon. The reduction in this operation led to an overall reduction of 44% in the 1987 estimated incidental catch of salmon in the joint venture fisheries (19,340 salmon in 1986, 10,848 salmon in 1987).

The 1987 foreign catch of 3,386 salmon or 13 t is the second lowest estimated catch for all years from 1977 through 1987 (Table 7). The 1987 joint venture catch of 10,848 fish was the second lowest catch since 1983. The total salmon interception (foreign and joint venture fisheries combined) of 14,234 fish was the lowest number caught since the implementation of the MFCMA in 1977.

The species composition, sex composition, average weight, and average length of the salmon in the incidental catch are given in Table 8. Two species of Pacific salmon were represented in the catches taken on foreign vessels. Chum salmon (Oncorhynchus keta) composed 70.25% of the foreign incidental catch and chinook salmon (O. tshawytscha) made up 29.75%. Four salmon species were observed in the joint venture catches: chinook salmon, 77.6%; chum salmon, 22.3%; pink salmon (O. gorbuscha), 0.1%; and sockeye salmon (O. nerka), 0.04%.

#### Pacific Halibut

Table 9 lists the incidence rates and average weights of Pacific halibut in foreign and joint venture catches by nation, vessel class, area, and month. In the foreign fishery, each nation had an annual average incidence rate greater than 1.0 halibut/t in Areas I and II. The highest annual average incidence rates were observed on Japanese longline vessels fishing for Pacific cod in waters shallower than 500 m (7.695 halibut/t in Area I and 4.500 halibut/t in Area II). All other annual average incidence rates in Areas I and II were between 1.0 and 2.0 halibut/t. In the joint venture fisheries, all observed annual incidence rates of halibut were less than 1.0 fish/t with three exceptions. In the U.S.-U.S.S.R. joint venture, high rates in the Pacific cod fishery in Subareas 511 and 513 from January through March and in the yellowfin sole fishery in both Subarea 513 from March through July and Subarea 514 in June and July resulted in an average annual incidence rate of 1.339 halibut/t in Area I. In Area II, the U.S.-U.S.S.R. annual incidence rate of 1.208 halibut/t was due to high incidence rates in July in the other flatfish fishery in Subareas 521 and 522. The U.S.-Poland pollock fishery experienced high incidence rates of halibut in Subarea 511 from March through May and had an annual incidence rate of 1.031 halibut/t in Area I. Figures 5-7 illustrate the incidence of halibut by vessel type, quarter, and 1/2° latitude by 1° longitude areas. High incidence rates of 10 halibut/t or greater were observed on small stern trawlers (Fig. 5) in the third quarter (58°00'N lat., 162°-164°W long.), and the fourth quarter (56°00'N lat., 166°W long.). In addition, incidence rates of 1-5 halibut/t were frequently observed during both the third and fourth quarters on small stern trawlers. Incidence rates exceeding 5 halibut/t were commonly observed on longline vessels throughout the year (Fig. 6). The incidence of halibut

frequently exceeded 10 halibut/t during the third and fourth quarters on longline vessels fishing along the continental slope between 170° and 174°W longitude. Figure 7 shows the halibut quarterly incidence rate for the joint venture operations. In the first and second quarters, incidence rates in the continental shelf area were frequently between 1 and 5 halibut/t (54°00' 59°30'N lat., 158°-168°W long.), with 5 occurrences of 5-10 halibut/t in the second quarter (54°00'N lat., 166°W long.; 54°30'N lat., 165°W long.; 58°00'N lat., 158°W long.; 58°00'N lat., 165°W long.; 59°00'N lat., 165°W long.) and 5 other locations in the second quarter yielding greater than 10 halibut/t (54°00'N lat., 165°W long.; 55°00'N lat., 166°W long.; 59°00' - 59°30'N lat., 166°-167°W long.). In the third and fourth quarters, fishing occurred primarily in the outer continental shelf and along the Aleutian peninsula and yielded rates generally between 1 and 5 halibut/t with one occurrence of 5-10 halibut/t in the third quarter (51°30'N lat., 172°W long.), one occurrence of 5-10 halibut/t in the fourth quarter (52°00'N lat., 173°W long.), and two occurrences of rates greater than 10 halibut/t in the third quarter (57°30' - 58°00'N lat., 171°-172°W long.).

The estimated halibut catch in the 1987 foreign fishery (273,197 fish) was 8% lower than the amount caught in 1986 (Tables 10 and 11). This decrease was due to reduced foreign fishing operations in the Bering Sea imposed by quota reductions and by the closure of Japanese trawling operations on 26 November due to their reaching the prohibited species catch limit of 124 t of halibut. Unfortunately, the 85% reduction in the 1987 groundfish catch did not result in a similarly large reduction in the halibut by-catch. Incidence rates aboard small trawlers increased 155%, and the groundfish catch by longliners (high incidence rates of halibut) increased 79%.

Most of the estimated catches of halibut in the joint venture fisheries were taken in operations targeting on yellowfin sole and other flatfish, Pacific cod, and pollock in Area I. Joint venture operations in Area I between the United States and the ROK caught an estimated 208,700 halibut in 1987 (a 44% increase over 1986). In this joint venture, 124,400 halibut were landed in tows predominating in the catch of pollock and Pacific cod (roundfish operations), and 84,250 halibut were landed in tows targeting on yellowfin sole/other flatfish. Incidence rates in the U.S.-ROK roundfish fisheries remained the same in 1987, but more than doubled in the flatfish fisheries. The U.S.-U.S.S.R. Area I joint venture took an estimated incidental catch of about 163,250 halibut in 1987, which is a 46.0% decrease in catch from the estimated 300,650 halibut landed in 1986. In the U.S.-U.S.S.R. joint venture almost 65,500 halibut were caught in operations targeting on yellowfin sole/other flatfish and 97,800 halibut were caught in tows landing pollock and Pacific cod. Incidence rates decreased about 50% in both the U.S.-U.S.S.R. flatfish and roundfish operations in 1987. The U.S.-Japan Area I joint venture caught an estimated 69,400 halibut in 1987, a 30% reduction from 1986. Operations targeting on yellowfin sole/other flatfish maintained approximately the same catch rate as in 1986 and landed 57,500 halibut. U.S.-Japan roundfish operations reduced their halibut rate to 0.03 halibut/t and landed only 11,900 halibut. In Area II, halibut catches from U.S.-Japan and U.S.-ROK operations occurred in the roundfish fisheries; halibut catches in the U.S.-U.S.S.R. operations occurred in the flatfish fisheries. The incidental catches of halibut in the yellowfin sole/other

flatfish joint venture fishery in 1987 were an estimated 63,672 halibut in Zone 1, 21,524 halibut in Zone 2, and 139,794 halibut in Zone 3.

The total estimated catch of halibut taken incidentally in the foreign and joint venture fisheries decreased 8%, from about 890,000 halibut in 1986 to about 818,000 in 1987 (Table 11). The estimated catch of halibut in the foreign fisheries decreased about 8% (from about 296,400 in 1986 to 273,200 in 1987), and was the lowest catch by the foreign fisheries since the inactment of the MFCMA in 1977. The estimated halibut catch in the joint venture fisheries also decreased 8% (from approximately 593,600 in 1986 to 545,100 in 1987). The overall average size of halibut was 72.5 cm (4.0 kg) in the foreign directed trawl fisheries, 65.7 cm (4.0 kg) in the longline fishery, and 56.2 cm (2.8 kg) in the joint venture fisheries.

#### Snow (Tanner) Crab

The incidence and average weights of snow (Tanner) crab observed in the foreign and joint venture fisheries in 1987 are summarized in Table 12 by nation, vessel class, month, and area. The highest annual incidence rates in the foreign fishery were observed in catches landed in Area I by Japanese small trawlers (63.406 crab/t for about 2,100 t of groundfish caught) and ROK large freezer trawlers (42.104 crab/t for about 1,100 t of groundfish caught). All trawlers had annual incidence rates greater than 5 crab/t in Areas I and II. The highest average rates in the joint venture fisheries were by the U.S.-U.S.S.R. operations in Areas I and II (22.677 crab/t and 220.700 crab/t, respectively). Other joint venture operations also experienced months with high incidence rates during the year. The high incidence of Tanner crab was generally associated with fisheries targeting on yellowfin sole and other flounders.

High rates of incidental Tanner crab catches (10 crab/t or greater) were observed during the third and fourth quarters of 1987 in catches made by small stern trawlers in areas on the continental shelf (56°30'-58°30'N lat. by 166°-170°W long.) (Fig. 8). Through the first three quarters of the year, rates aboard longline vessels (Fig. 9) were generally less than 1 crab/t. In the fourth quarter, almost half of the 1/2° latitude by 1° longitude blocks yielded greater than 1 crab/t, but with only one occurrence of greater than 25 crab/t (in the fourth quarter at 60°30'N lat., 177°W long.), and only one additional occurrence of greater than 10 crab/t (in the fourth quarter at 60°30'N lat., 178°W long.). Incidence rates of Tanner crab greater than 10 crab/t were common in the joint venture fishery (Fig. 10) during second quarter fisheries targeting on yellowfin sole and other flounders on the continental shelf (56°30'-58°30'N lat. by 163°-169°W long.) and during third quarter fisheries on the outer continental shelf (57°00'-62°00'N lat. by 170°-175°W long.) In the first and fourth quarters, however, no incidence rates exceeded 10 crab/t.

The estimated incidental catch of 331,700 snow (Tanner) crab in the 1987 foreign groundfish fishery was 80% lower than that taken in 1986 (Tables 13 and 14) and represented the smallest incidental catch of Tanner crab taken in the foreign fishery during the 11 years of management under MFCMA. The reduced incidental catch of Tanner crab was primarily the result of the 85% reduction in the levels of foreign groundfish catch in 1987 as compared to

1986. Increased catch rates of Tanner crab as well as an increase in the groundfish catch by joint venture operations led to a 27% increase in the incidental catch of Tanner crab by the joint venture fishery in 1987. The estimated catch of 7.065 million Tanner crab in 1987 by the joint venture fishery was the highest catch of Tanner crab taken by the joint venture fishery since its inception in 1980 (Table 14). The combined incidental catch of roughly 7.4 million Tanner crab taken by both the foreign and joint venture groundfish fisheries in 1987 was the highest catch recorded since 1980.

The continued increase in the incidental catch of Tanner crab in the joint venture fishery resulted from the movement of the primary fishing grounds of the yellowfin sole and other flounder fishery northward and westward. The northward shift was in response to restrictions imposed on fishing in Zone 1 to protect the stocks of red king crab and Chionoecetes bairdi Tanner crab which are concentrated in the Bristol Bay region (refer to the section "Incidence and the Incidental Catch of Prohibited Species," pages 6-7, for further discussion of the regulations). The westward shift occurred when the yellowfin sole fishery was closed and operations fishing for other flatfish moved to Area II. These shifts moved the fishery into areas where high abundances and thus high catches of C. opilio were encountered. Chionoecetes bairdi made up 77.7% (98,200 crab) of the crab catch in Zone 1 (Table 15), but relatively few crab (126,500 Tanner crab) were caught here. In Zone 2, 2.741 million Tanner crab were caught; in Zone 3, the catch was 3.708 million Tanner crab. In these zones, C. bairdi made up 2.9% (78,900 crab) and 1.1% (38,600 crab) of the Tanner crab catch, respectively. In Area II, the other flounder fishery caught 2.176 million Tanner crab. Only 14,500 (0.7%) of these were C. bairdi.

Table 16 gives the species composition, sex composition, average weight, and average carapace width of Tanner crab observed in the foreign and joint venture groundfish fisheries. Four species of Tanner crab were observed in the foreign directed fisheries: Chionoecetes opilio, C. bairdi, C. angulatus, and C. tanneri. Chionoecetes opilio made up the largest percentage of the incidental catch, 72.6%; C. bairdi was next in importance, composing 26.8% of the catch by number; and C. angulatus and C. tanneri made up 0.4% and 0.25%, respectively. In the joint venture fishery, C. opilio (91.5%) and C. bairdi (8.5%) together comprised almost the entire incidental Tanner crab catch. Chionoecetes angulatus (<0.01%) and C. tanneri (<0.01%) were found in small numbers. The species C. angulatus and C. tanneri are normally found in deeper water than the other two Chionoecetes species, and are most often encountered in the catches of longline vessels and small stern trawlers fishing for Greenland turbot.

#### King Crab

The incidence of king crab was low in both the foreign and joint venture fisheries in 1987. There were no instances where the average annual incidence was 1.0 king crab/t or greater, and only two cases where the monthly incidence exceeded 1.0 king crab/t (Table 17). The highest average annual incidence rates of king crab were observed on Japanese small stern trawlers in Area I (0.492 crab/t) and in the joint venture fisheries conducted in Area I with Poland (0.627 crab/t) and the PRC (0.574 crab/t). The low incidence of king

crab in the foreign fishery may have resulted from a combination of decreases in the size of the Greenland turbot and yellowfin sole fisheries in 1987. In past years, these fisheries have accounted for the highest proportions of the incidental catch of king crab in the foreign fishery. The low incidence of king crab in the joint venture fishery was the result of efforts by the participants in the yellowfin sole fishery to minimize the incidental catch of red king crab and the impact of the regulations imposed on the fishery for the purpose of protecting the stocks of red king crab and C. bairdi (see the section "Incidence and the Incidental Catch of Prohibited Species," pages 6-7, for further discussion of these regulations).

Figures 11 and 12 chart the observed incidence rates of king crab in catches made by small stern trawlers and joint venture vessels by quarter and 1/20 latitude by 1° longitude areas. Small stern trawlers (Fig. 11) averaged between 1 and 5 crab/t three times in the third quarter (57°00'N lat., 169°W long.; 59°00'N lat., 177°W long.; 59°30'N lat., 178°W long.) and once in the fourth quarter (59°30'N lat., 178°W long.). One location yielded greater than 10 crab/t in the third quarter (56°30'N lat., 169°W long.). In joint venture operations (Fig. 15), king crab catches only exceeded 1 crab/t on the continental shelf in the first quarter (56°00'-57°00'N lat. by 162°-163°W long.) and the second quarter (55°00'-58°00'N lat. by 158°-163°W long.) and on the outer continental shelf (54°30'-55°30'N lat. by 165°W long. and 59°30'-60°30'N lat. by 173°W long.) in the third quarter.

As a result of the low incidence of king crab in both the foreign and joint venture fisheries in 1987, the estimated incidental catches of 7,403 crab in the foreign fishery and 139,983 crab in the joint venture fishery were substantially lower than the incidental catches taken in 1986 (Tables 18 and 19). Overall, the total incidental catch of 147,386 king crab taken in the foreign and joint venture fisheries was the lowest catch taken since the implementation of the Magnuson Act in 1977. The joint venture fishery targeting yellowfin sole landed 64,400 red king crab in Zone 1 (Table 20). In Zones 2 and 3, the incidence rates of red king crab were substantially lower and the catch of red king crab was estimated at 698 crab in Zone 2 and 11,352 crab in Zone 3.

In the Bristol Bay joint venture fishery, red king crab is the species of king crab that is taken incidentally; it composed nearly all (93.8%) of the king crab caught by joint venture fisheries in 1987 (Table 21). Blue king crab (Paralithodes platypus, 5.4%) and golden king crab (Lithodes aequispina, 0.75%) accounted for the remainder.

In the foreign fishing operations, Japanese small trawlers and longliners fishing in Area II caught over 6,000 golden king crab. This caused golden king crab to make up the majority (77.4%) of the foreign catch of king crab. Blue king crab (13.5%) and red king crab (9.15%) accounted for the rest of the foreign king crab catch. Other information found in Table 21 includes the sex composition, average weight, and average carapace length for the king crab observed in the foreign and joint venture fisheries.

### Rockfish Catch by Species

Fourteen species of rockfish were identified by observers as appearing in foreign or joint venture catches in the Bering Sea/Aleutian Islands region during 1987 (Table 22). In Tables 22 and 23, the group "other rockfish" consists of five species which make up a relatively minor percentage of the rockfish catch.

Approximately 12.6 t of rockfish were taken in the foreign fishery in 1987 and 870.8 t were landed in the joint venture fishery (Table 23). The 1987 foreign rockfish catch decreased 65% from the 1986 estimated catch of 35.9 t, and has decreased 99% since 1983. The joint venture catch of rockfish increased 60% from a catch of 544.8 t in 1986, and has increased 258% since 1983.

Four species of rockfish made up the greatest portion (94.7%) of the rockfish catch taken by foreign vessels: Pacific ocean perch, dusky rockfish (Sebastes ciliatus), northern rockfish (S. polyspinis), and roughey rockfish (S. aleutianus). Pacific ocean-perch was the most frequently taken species in both areas, and comprised 42.6% of the total rockfish catch. Dusky rockfish comprised 21.45% of the catch, northern rockfish made up 15.65%, and roughey rockfish accounted for 15.0%.

In the joint venture fisheries, Pacific ocean perch (63.2%) and northern rockfish (34.9%) made up 98.1% of the total rockfish catch. In Area I, 73.7% of the rockfish catch was identified as being northern rockfish. In Areas II (91.6%) and IV (65.6%), the most commonly seen rockfish was Pacific ocean perch.

### Flatfish Catch by Species

Nineteen species of flatfish were identified by observers in groundfish catches made by foreign and joint venture vessels in 1987 (Table 24). Japanese small trawlers caught 80% of the flatfish taken by the 1987 foreign fishery. Yellowfin sole was a target in Area I, accounting for 64.8% of the 2,700 t catch of flatfish (Table 25). In Area II, 4,800 t of flatfish were caught. Arrowtooth flounder (55.2% of the flatfish catch), Greenland turbot (21.1%), and flathead sole (15.1%) were targets in this area.

In 1986, 99.6% of the joint venture flatfish catch occurred in Area I. In 1987, however, the closure of the joint venture yellowfin sole fishery on 29 June forced a shift of targets and areas. This resulted in 4% (8,700 t) of the flatfish catch being landed in Area II in 1987. Yellowfin sole and Alaska plaice (Pleuronectes quadrituberculatus) were the predominant species taken, accounting for 86.7% and 5.8% of the flatfish catch in Area I, and 83.3% and 8.4% of the flatfish catch overall. Rock sole (Lepidopsetta bilineata) was also an important component of the flatfish catch, accounting for 4.8%, 10.3%, and 64.4% of the flatfish catch in Areas I, II, and IV, and 5.2% of the overall flatfish catch.

Table 2.--Annual summary of observer effort, foreign and joint venture effort, and observer coverage (100 x observer days/foreign vessel days) by nation and vessel class in the Bering Sea and Aleutian Islands region, 1987.

Nation	Vessel Class	No. of observers	No. of ships observed <sup>a</sup>	No. of ships in fishery <sup>a</sup>	No. of observer days	No. of vessel days	Percent coverage
Japan	Small stern trawler	30	58	64	716	758	94.5
	Longline	62	21	21	2,159	2,218	97.3
	Snailpot	8	2	2	260	273	95.2
	Total		81	87	3,135	3,249	96.5
Republic of Korea (ROK)	Large surimi trawler	4	4	4	11	11	100.0
	Large freezer trawler	6	5	6	24	26	92.3
	Total		9	10	35	37	94.6
Total - Foreign fishery			90	97	3,170	3,286	96.5
U.S.-Japan	Other SJV		18	18	2,038	2,144	95.1
U.S.-Japan	Other FJV		12	12	207	211	98.1
U.S.-Japan	Yell/Flat SJV		2	2	20	22	90.9
U.S.-Japan	Yell/Flat FJV		13	13	805	826	97.5
U.S.-Japan	Total Joint Venture	67	38	38	3,070	3,203	95.8
U.S.-ROK	Other SJV		7	7	960	1,027	93.5
U.S.-ROK	Other FJV		24	24	1,971	2,034	96.9
U.S.-ROK	Yell/Flat SJV		7	7	141	143	98.6
U.S.-ROK	Yell/Flat FJV		23	23	1,052	1,080	97.4
U.S.-ROK	Total Joint Venture	88	31	31	4,124	4,284	96.3
U.S.-Poland	Other FJV		9	9	179	185	96.8
U.S.-Poland	Yell/Flat FJV		2	2	8	8	100.0
U.S.-Poland	Total Joint Venture	10	9	9	187	193	96.9
U.S.-PRC	Other FJV		5	5	330	334	98.8
U.S.-PRC	Yell/Flat FJV		3	3	40	44	90.9
U.S.-PRC	Total Joint Venture	7	5	5	370	378	97.9
U.S.-U.S.S.R.	Other FJV		14	14	497	520	95.6
U.S.-U.S.S.R.	Yell/Flat FJV		24	24	1,822	1,918	95.0
U.S.-U.S.S.R.	Total Joint Venture	43	24	24	2,319	2,438	95.1
Total - Joint venture fishery <sup>b</sup>			107	107	10,070	10,496	95.9
Grand total		236 <sup>c</sup>	155	155	13,240	13,782	96.1

a Several vessels participated in more than one fishery and so are only counted once in the totals.

b In the joint venture fisheries, only the foreign processing vessels are indicated for the number of ships and vessel days--the U.S. catcher boats are not included.

c This column does not add up because several observers sampled on more than one vessel type.

PRC = People's Republic of China.

SJV = Surimi joint venture.

FJV = Freezer joint venture.

Yell/Flat = Targetting on yellowfin sole/flatfish.

Other = Targetting on roundfish.

Table 3.--Estimated catches of groundfish taken by foreign and joint venture vessels in the Bering Sea and Aleutian Islands region in 1987<sup>a</sup>.

Species	Foreign catches (metric tons)				U.S. Joint ventures <sup>b</sup>	
	Japan	Republic of Korea	Total	Percent	Metric tons	Percent
Squid	96	0	96	0.1	35	<0.1
Yellowfin sole	1,117	694	1,811	2.6	179,613	13.2
Arrowtooth <sup>c</sup>	2,786	3	2,789	4.0	1,676	0.1
Greenland turbot	1,049	0	1,049	1.5	58	<0.1
Other flatfishes	1,528	325	1,853	2.7	34,248	2.5
Walleye pollock	3,324	313	3,637	5.2	1,044,469	77.0
Pacific cod	54,518	228	54,746	78.7	58,157	4.3
Sablefish	33	<1	33	<0.1	123	<0.1
Atka mackerel	<1	0	<1	<0.1	30,062	2.2
Pacific ocean perch <sup>d</sup>	5	<1	5	<0.1	550	<0.1
Other rockfishes	7	0	7	<0.1	321	<0.1
Pacific herring <sup>e</sup>	15	4	19	<0.1	468	<0.1
Other fish	2,622	51	2,673	3.8	6,121	0.5
Snails	882	0	882	1.3	0	0.0
Total	67,982	1,618	69,600		1,355,901	
Percent	97.7	2.3				

<sup>a</sup> See text for description of the technique used to estimate non-U.S. and joint venture catches.

<sup>b</sup> In 1987, joint venture fisheries were conducted between U.S. catcher boats and processing vessels from Japan, the Republic of Korea, Poland, the U.S.S.R., and the People's Republic of China.

<sup>c</sup> Arrowtooth includes arrowtooth flounder (Atheresthes stomias) and Kamchatka flounder (A. evermanni).

<sup>d</sup> Does not include northern rockfish, Sebastes polyspinis; roughey rockfish, S. aleutianus; shortraker rockfish, S. borealis; and sharpchin rockfish, S. zacentrus.

<sup>e</sup> Non-U.S. groundfish vessels were not allowed to retain Pacific herring in 1987.

Table 4,--Estimated catches of groundfish (1,000 metric tons) taken by the foreign and joint venture fisheries in the Bering Sea and Aleutian Islands region, 1977-87<sup>a</sup>.

Fisheries and species group	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
<u>Foreign directed catches</u>											
Walleye pollock	978.4	979.4	944.0	1,006.1	986.9	959.3	891.5	933.0	820.3	352.3	3.6
Pacific cod	35.9	47.4	41.4	37.3	39.1	28.2	41.5	58.5	57.2	39.3	54.7
Sablefish	4.6	2.0	2.2	2.4	3.0	3.8	3.2	1.9	0.3	0.1	<0.1
Atka mackerel	NA	24.2	23.3	20.2	18.1	7.4	1.2	0.1	<0.1	<0.1	<0.1
All rockfish	10.8	7.5	7.2	8.5	7.3	4.9	2.0	0.9	0.1	<0.1	<0.1
Yellowfin sole	0.3 <sup>b</sup>	110.3	101.1	77.8	81.3	76.0	85.9	126.8	100.7	57.2	1.8
Turbots and other flatfish	136.4 <sup>b</sup>	125.5	90.0	88.5	91.9	79.3	80.3	59.3	46.9	20.8	5.7
Pacific herring	19.3	8.4	7.5	0.8	0.3	1.9	1.4	1.3	1.5	0.3	<0.1
Other fish	94.7	71.8	64.7	47.0	39.4	22.3	14.3	7.5	6.3	4.0	2.7
Squid	8.4	9.4	7.0	6.4	5.9	5.0	4.0	3.1	1.6	0.8	0.1
Snails	0.4	2.2	0.5	0.1	0.2	0.2	0.3	0.2	0.1	0.5	0.9
TOTAL	1,289.1	1,385.5	1,288.9	1,295.1	1,273.4	1,188.4	1,125.5	1,192.7	1,035.0	475.9	69.6
<u>Joint venture catches</u>											
Walleye pollock	--	--	--	10.7	42.1	54.6	149.0	237.0	377.5	835.1	1,044.5
Pacific cod	--	--	--	8.5	9.2	13.6	14.4	30.8	41.3	63.9	58.2
Sablefish	--	--	--	<0.1	0.2	0.1	0.1	0.3	0.1	0.4	0.1
Atka mackerel	--	--	--	0.3	1.6	12.5	10.5	35.9	37.9	32.0	30.1
All rockfish	--	--	--	0.1	<0.1	<0.1	0.1	0.6	0.5	0.5	0.9
Yellowfin sole	--	--	--	9.6	16.0	17.4	22.5	32.8	126.4	151.4	179.6
Turbots and other flatfish	--	--	--	2.8	6.0	9.2	11.8	17.4	46.3	65.5	36.0
Pacific herring	--	--	--	0.0	0.0	<0.1	1.1	1.8	3.1	3.8	0.5
Other fish	--	--	--	0.7	3.4	1.1	1.6	2.6	6.3	7.6	6.1
Squid	--	--	--	0.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Snails	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	--	--	--	32.6	78.5	108.6	211.2	359.3	639.4	1,160.2	1,355.9

<sup>a</sup>Statistics for 1977-86 from Berger et al. 1988.

<sup>b</sup> Japan reported yellowfin sole combined with other flounders.

Table S.--Incidence rate (number per metric ton of catch and average weight (kg)) of Pacific salmon taken in the foreign and joint venture groundfish catches in the Bering Sea, 1987.  
Lines indicate areas not fished.

	Area I		Area II		Area III		Area IV		Outside EEZ*	
	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.
<u>Japanese Small Trawler</u>										
Jan.	--	--	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--
July	0.000	0.000	0.001	5.200	--	--	--	--	--	--
Aug.	0.013	4.732	0.001	3.693	--	--	--	--	--	--
Sep.	0.000	0.000	0.025	3.349	--	--	--	--	--	--
Oct.	0.000	0.000	0.149	3.842	--	--	--	--	--	--
Nov.	0.007	4.465	0.299	3.924	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	0.008	4.645	0.125	3.886	--	--	--	--	--	--
<u>Japanese Longliners Fishing &lt;500 m</u>										
Jan.	0.000	0.000	0.000	0.000	--	--	--	--	--	--
Feb.	0.000	0.000	0.000	0.000	--	--	--	--	--	--
March	0.000	0.000	0.000	0.000	--	--	--	--	--	--
April	--	--	0.000	0.000	--	--	--	--	--	--
May	0.000	0.000	0.000	0.000	--	--	--	--	--	--
June	--	--	0.000	0.000	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--
Sep.	0.000	0.000	0.000	0.000	--	--	--	--	--	--
Oct.	0.000	0.000	0.000	0.000	--	--	--	--	--	--
Nov.	0.000	0.000	0.000	0.000	--	--	--	--	--	--
Dec.	--	--	0.000	0.000	--	--	--	--	--	--
Annual	0.000	0.000	0.000	0.000	--	--	--	--	--	--

\*Exclusive Economic Zone.

Table 5.--Incidence rate (number per metric ton of catch and average weight (kg)) of Pacific salmon taken in the foreign and joint venture groundfish catches in the Bering Sea, 1987  
(Continued). Lines indicate areas not fished.

	<u>Area I</u>		<u>Area II</u>		<u>Area III</u>		<u>Area IV</u>		<u>Outside EEZ*</u>	
	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.
<u>Republic of Korea Large Freezer Trawler</u>										
Jan.	--	--	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--	--	--
April	0.000	0.000	--	--	--	--	--	--	0.002	2.750
May	--	--	--	--	--	--	--	--	0.003	1.000
June	0.000	0.000	--	--	--	--	--	--	--	--
July	0.000	0.000	--	--	--	--	--	--	--	--
Aug.	0.000	0.000	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	0.000	0.000	--	--	--	--	--	--	0.002	1.875
<u>Republic of Korea Surimi Large Trawler</u>										
Jan.	--	--	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--
June	0.013	4.500	--	--	--	--	--	--	--	--
July	0.012	2.550	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	0.012	3.524	--	--	--	--	--	--	--	--

\*Exclusive Economic Zone.

Table 5.--Incidence rate (number per metric ton of catch and average weight (kg)) of Pacific salmon taken in the foreign and joint venture groundfish catches in the Bering Sea, 1987  
(Continued). Lines indicate areas not fished.

	<u>Area I</u>		<u>Area II</u>		<u>Area III</u>		<u>Area IV</u>		<u>Outside EEZ*</u>	
	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.
<u>People's Republic of China Large Freezer Trawler</u>										
Jan.	--	--	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--	0.029	6.600
March	--	--	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	--	--	--	--	--	--	--	--	0.029	6.600
<u>U.S.-U.S.S.R. JV Mothership</u>										
Jan.	0.003	5.600	--	--	--	--	--	--	--	--
Feb.	0.003	4.153	--	--	--	--	--	--	--	--
March	0.002	3.631	--	--	--	--	--	--	--	--
April	0.000	0.000	--	--	--	--	--	--	--	--
May	0.000	0.000	--	--	--	--	0.001	6.000	--	--
June	0.005	3.645	--	--	--	--	0.000	0.000	--	--
July	0.000	0.000	0.000	0.000	--	--	0.002	2.128	--	--
Aug.	--	--	NS	NS	--	--	0.000	0.000	--	--
Sep.	0.063	3.028	--	--	--	--	--	--	--	--
Oct.	0.047	3.158	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	0.003	3.563	0.000	0.000	--	--	0.001	3.979	--	--

\*Exclusive Economic Zone.

JV = Joint venture.

NS = Fishing occurred but no sampling by U.S. observers.

Table S.--Incidence rate (number per metric ton of catch and average weight (kg)) of Pacific salmon taken in the foreign and joint venture groundfish catches in the Bering Sea, 1987  
(Continued). Lines indicate areas not fished.

	<u>Area I</u>		<u>Area II</u>		<u>Area III</u>		<u>Area IV</u>		<u>Outside EEZ*</u>	
	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.
<u>U.S.-Republic of Korea JV Mothership</u>										
Jan.	0.026	4.238	--	--	--	--	--	--	--	--
Feb.	0.004	2.916	--	--	--	--	0.001	1.000	--	--
March	0.003	4.227	0.005	4.433	--	--	--	--	--	--
April	0.005	5.769	0.002	7.344	--	--	--	--	--	--
May	0.007	4.046	0.004	4.784	--	--	0.000	0.000	--	--
June	0.006	4.420	0.000	0.000	--	--	0.001	2.993	--	--
July	0.000	0.000	NS	NS	--	--	0.007	2.381	--	--
Aug.	0.000	0.000	--	--	--	--	0.001	1.800	--	--
Sep.	0.040	3.549	0.028	3.276	--	--	0.004	3.503	--	--
Oct.	0.024	3.253	--	--	--	--	0.028	2.331	--	--
Nov.	--	--	--	--	--	--	0.000	0.000	--	--
Dec.	--	--	--	--	0.000	0.000	0.000	0.000	--	--
Annual	0.007	3.866	0.004	5.709	0.000	0.000	0.006	2.412	--	--
<u>U.S.-Japan JV Mothership</u>										
Jan.	0.039	3.806	--	--	--	--	--	--	--	--
Feb.	0.008	3.376	--	--	--	--	0.000	0.000	--	--
March	0.014	3.041	0.011	5.162	--	--	--	--	--	--
April	0.013	4.943	0.009	3.994	--	--	--	--	--	--
May	0.010	4.185	0.002	4.577	--	--	--	--	--	--
June	0.014	3.289	0.002	4.619	--	--	0.000	0.000	--	--
July	0.000	0.000	0.000	0.000	--	--	0.000	0.000	--	--
Aug.	--	--	--	--	--	--	--	--	--	--
Sep.	0.026	3.910	0.018	3.993	--	--	--	--	--	--
Oct.	0.024	3.316	0.067	3.433	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	0.012	3.548	0.008	4.334	--	--	0.000	0.000	--	--

\*Exclusive Economic Zone.

JV = Joint venture.

NS = Fishing occurred but no sampling by U.S. observers.

Table S.--Incidence rate (number per metric ton of catch and average weight (kg)) of Pacific salmon taken in the foreign and joint venture groundfish catches in the Bering Sea, 1987  
(Continued). Lines indicate areas not fished.

	Area I		Area II		Area III		Area IV		Outside EEZ*	
	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.
<u>U.S.-Poland JV Mothership</u>										
Jan.	0.011	7.450	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--	--	--
March	<0.001	4.600	0.008	10.000	--	--	--	--	--	--
April	0.000	0.000	0.003	6.719	--	--	--	--	--	--
May	0.043	1.857	0.003	2.772	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	0.006	2.666	0.003	6.046	--	--	--	--	--	--
<u>U.S.-People's Republic of China JV Mothership</u>										
Jan.	--	--	--	--	--	--	--	--	--	--
Feb.	0.004	2.628	--	--	--	--	--	--	--	--
March	0.006	2.842	--	--	--	--	--	--	--	--
April	0.006	5.421	0.000	0.000	--	--	--	--	--	--
May	0.001	3.650	0.000	0.000	--	--	--	--	--	--
June	0.000	0.000	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	0.105	9.150	--	--
Sep.	0.044	4.744	--	--	--	--	0.045	10.250	--	--
Oct.	0.000	0.000	--	--	--	--	0.017	3.850	--	--
Nov.	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	0.009	4.082	0.000	0.000	--	--	0.031	7.489	--	--

\*Exclusive Economic Zone.

JV = Joint venture.

Table 6.--Estimated incidental catches of Pacific salmon (in numbers of fish and metric tons) by foreign groundfish and joint venture vessels in the Bering Sea and Aleutian Islands region, 1987.

	Number of fish					Weight (metric tons)				
	Area I	Area II	Area III	Area IV	Total all areas	Area I	Area II	Area III	Area IV	Total all areas
<b>Foreign groundfish vessels</b>										
<b>Japan</b>										
SST	15	3,368	-	-	3,383	0.07	13.09	-	-	13.16
LL	0	0	-	-	0	0.00	0.00	-	-	0.00
<b>Republic of Korea (ROK)</b>										
LST	3	-	-	-	3	0.01	-	-	-	0.01
LFT	0	-	-	-	0	0.00	-	-	-	0.00
All nations total	18	3,368	-	-	3,386	0.08	13.09	-	-	13.17
Percent by area	0.53	99.47	-	-		0.61	99.39	-	-	
<b>Joint venture vessels</b>										
U.S.-Japan	5,455	2,098	-	0	7,553	19.35	9.09	-	0.00	28.44
U.S.-ROK	2,383	154	0	258	2,795	9.21	0.88	0.00	0.62	10.71
U.S.-Poland	20	8	-	-	28	0.05	0.05	-	-	0.10
U.S.-PRC	146	2	-	5	153	0.60	<0.01	-	0.04	0.64
U.S.-U.S.S.R.	301	0	-	18	319	1.07	0.00	-	0.07	1.14
Joint venture totals	8,305	2,262	0	281	10,848	30.28	10.02	0.00	0.73	41.03
Percent by area	76.56	20.85	0.00	2.59		73.80	24.42	0.00	1.78	

SST = Small stern trawler.  
LST = Large surimi trawler.  
LFT = Large freezer trawler.  
LL = Longliner.  
PRC = People's Republic of China.

Table 7.--Estimated incidental catches (numbers and metric tons) of Pacific salmon (*Oncorhynchus* spp.) in the foreign and joint venture groundfish fisheries in the Bering Sea and Aleutian Islands region, 1977-87\*.

Year	Foreign		Joint Venture		Total	
	Nos.	t	Nos.	t	Nos.	t
1977	47,840	198	NF	NF	47,840	198
1978	44,548	137	NF	NF	44,548	137
1979	107,706	340	NF	NF	107,706	340
1980	120,104	381	1,898	7	122,002	388
1981	42,337	137	854	3	43,191	140
1982	21,241	85	2,382	8	23,623	92
1983	18,173	66	24,493	54	42,666	120
1984	16,516	51	67,622	160	84,138	211
1985	10,003	33	10,420	30	20,423	63
1986	1,643	5	19,340	66	20,983	71
1987	3,386	13	10,848	41	14,234	54

\* Estimated catches for years 1977-86 from Berger et al. 1988.

NF = No fishing.

Table 8.--Biological data on the incidental catch of Pacific salmon in the foreign and joint venture groundfish fishery in the Bering Sea and Aleutian Islands region, 1987.

Species	Percent by species	Sex	Sex composition	Average weight (kg)	Average length (cm)
<u>Foreign directed fisheries</u>					
Chinook	29.75	Male	47.97	5.42	69.8
		Female	48.33	4.92	68.6
		Unsexed	3.70	5.47	69.2
		Combined		5.18	69.2
Chum	70.25	Male	44.68	3.44	63.2
		Female	49.54	3.20	62.1
		Unsexed	5.78	3.56	64.2
		Combined		3.33	62.7
<u>Joint venture fisheries</u>					
Chinook	77.56	Male	42.29	3.76	61.6
		Female	53.43	4.06	64.1
		Unsexed	4.28	4.24	60.5
		Combined		3.94	62.9
Chum	22.31	Male	53.39	3.47	63.7
		Female	46.30	3.10	60.0
		Unsexed	0.31	2.85	59.4
		Combined		3.29	62.0
Pink	0.09	Male	26.11	1.10	54.5
		Female	73.89	1.27	48.9
		Unsexed	0.00	--	--
		Combined		1.23	50.4
Sockeye	0.04	Male	100.00	3.30	64.0
		Female	0.00	--	--
		Unsexed	0.00	--	--
		Combined		3.30	64.0

Table 9.--Incidence rate (number per metric ton of catch and average weight (kg)) of Pacific halibut taken in the foreign and joint venture groundfish catches in the Bering Sea, 1987.  
Lines indicate areas not fished.

	<u>Area I</u>		<u>Area II</u>		<u>Area III</u>		<u>Area IV</u>		<u>Outside EEZ*</u>	
	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.
<u>Japanese Small Trawler</u>										
Jan.	--	--	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--
July	3.415	5.799	1.182	4.580	--	--	--	--	--	--
Aug.	1.744	6.673	1.286	5.262	--	--	--	--	--	--
Sep.	1.213	6.235	0.945	4.852	--	--	--	--	--	--
Oct.	0.764	5.428	2.372	6.289	--	--	--	--	--	--
Nov.	1.465	5.631	2.276	6.250	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	1.502	6.156	1.889	5.968	--	--	--	--	--	--
<u>Japanese Longliners Fishing &lt;500 m</u>										
Jan.	7.222	4.126	8.796	3.441	--	--	--	--	--	--
Feb.	11.073	3.269	4.937	3.299	--	--	--	--	--	--
March	6.704	2.758	4.359	3.193	--	--	--	--	--	--
April	--	--	8.252	3.502	--	--	--	--	--	--
May	7.061	2.748	3.020	3.175	--	--	--	--	--	--
June	--	--	1.232	3.471	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--
Sep.	9.222	4.441	4.500	4.263	--	--	--	--	--	--
Oct.	6.205	3.985	3.885	4.193	--	--	--	--	--	--
Nov.	5.698	3.581	3.653	4.170	--	--	--	--	--	--
Dec.	--	--	3.933	4.053	--	--	--	--	--	--
Annual	7.695	3.442	4.500	3.723	--	--	--	--	--	--

\* Exclusive Economic Zone.

Table 9.--Incidence rate (number per metric ton of catch and average weight (kg)) of Pacific halibut taken in the foreign and joint venture groundfish catches in the Bering Sea, 1987  
(Continued). Lines indicate areas not fished.

	<u>Area I</u>		<u>Area II</u>		<u>Area III</u>		<u>Area IV</u>		<u>Outside EEZ*</u>	
	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.
<u>Republic of Korea Large Freezer Trawler</u>										
Jan.	--	--	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--	--	--
April	0.101	15.400	--	--	--	--	--	--	0.000	0.000
May	--	--	--	--	--	--	--	--	0.000	0.000
June	3.917	3.958	--	--	--	--	--	--	--	--
July	0.324	5.410	--	--	--	--	--	--	--	--
Aug.	1.148	7.268	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	1.402	5.688	--	--	--	--	--	--	0.000	0.000
<u>Republic of Korea Surimi Large Trawler</u>										
Jan.	--	--	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--
June	2.037	5.238	--	--	--	--	--	--	--	--
July	2.331	5.059	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	2.191	5.138	--	--	--	--	--	--	--	--

\* Exclusive Economic Zone.

Table 9.--Incidence rate (number per metric ton of catch and average weight (kg)) of Pacific halibut taken in the foreign and joint venture groundfish catches in the Bering Sea, 1987  
(Continued). Lines indicate areas not fished.

	<u>Area I</u>		<u>Area II</u>		<u>Area III</u>		<u>Area IV</u>		<u>Outside EEZ*</u>	
	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.
<u>People's Republic of China Large Freezer Trawler</u>										
Jan.	--	--	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--	0.000	0.000
March	--	--	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	--	--	--	--	--	--	--	--	0.000	0.000
<u>U.S.-U.S.S.R. JV Mothership</u>										
Jan.	4.950	1.468	--	--	--	--	--	--	--	--
Feb.	3.722	1.356	--	--	--	--	--	--	--	--
March	2.062	1.503	--	--	--	--	--	--	--	--
April	0.444	3.549	--	--	--	--	--	--	--	--
May	0.059	3.214	--	--	--	--	0.073	6.475	--	--
June	1.195	2.379	--	--	--	--	0.895	6.403	--	--
July	0.703	3.534	1.208	2.259	--	--	0.326	8.882	--	--
Aug.	--	--	NS	NS	--	--	0.196	12.864	--	--
Sep.	0.906	5.021	--	--	--	--	--	--	--	--
Oct.	2.071	3.759	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	1.339	1.786	1.208	2.259	--	--	0.387	6.953	--	--

\*Exclusive Economic Zone.

JV = Joint venture.

NS = Fishing occurred but no sampling by U.S. observers.

Table 9.--Incidence rate (number per metric ton of catch and average weight (kg)) of Pacific halibut taken in the foreign and joint venture groundfish catches in the Bering Sea, 1987  
(Continued). Lines indicate areas not fished.

	<u>Area I</u>		<u>Area II</u>		<u>Area III</u>		<u>Area IV</u>		<u>Outside EEZ*</u>	
	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.
<u>U.S.-Republic of Korea JV Mothership.</u>										
Jan.	0.103	1.911	--	--	--	--	--	--	--	--
Feb.	0.005	2.059	--	--	--	--	0.000	0.000	--	--
March	0.639	2.464	0.021	6.088	--	--	--	--	--	--
April	1.259	2.134	0.230	6.596	--	--	--	--	--	--
May	1.649	2.224	0.237	4.193	--	--	0.253	3.604	--	--
June	1.452	2.216	0.239	6.676	--	--	0.774	3.397	--	--
July	6.890	6.646	--	--	--	--	0.920	5.207	--	--
Aug.	0.907	7.508	--	--	--	--	0.441	6.449	--	--
Sep.	0.939	4.471	1.104	4.294	--	--	0.570	5.625	--	--
Oct.	0.536	4.884	NS	NS	--	--	0.176	5.737	--	--
Nov.	--	--	--	--	--	--	0.000	0.000	--	--
Dec.	--	--	--	--	0.000	0.000	0.000	0.000	--	--
Annual	0.584	2.418	0.251	5.869	0.000	0.000	0.668	4.600	--	--
<u>U.S.-Japan JV Mothership</u>										
Jan.	0.009	2.542	--	--	--	--	--	--	--	--
Feb.	0.008	2.988	--	--	--	--	0.000	0.000	--	--
March	0.122	2.484	0.001	6.655	--	--	--	--	--	--
April	0.350	3.735	0.019	6.102	--	--	--	--	--	--
May	0.184	3.044	0.011	2.679	--	--	--	--	--	--
June	1.492	3.202	0.021	4.579	--	--	0.147	4.595	--	--
July	7.975	2.380	5.768	4.347	--	--	0.787	6.860	--	--
Aug.	--	--	--	--	--	--	--	--	--	--
Sep.	0.759	4.622	0.716	5.236	--	--	--	--	--	--
Oct.	0.467	5.882	1.692	4.853	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	0.181	3.232	0.052	5.198	--	--	0.204	5.644	--	--

\*Exclusive Economic Zone.

JV = Joint venture.

NS = Fishing occurred but no sampling by U.S. observers.

Table 9.--Incidence rate (number per metric ton of catch and average weight (kg)) of Pacific halibut taken in the foreign and joint venture groundfish catches in the Bering Sea, 1987  
(Continued). Lines indicate areas not fished.

	<u>Area I</u>		<u>Area II</u>		<u>Area III</u>		<u>Area IV</u>		<u>Outside EEZ*</u>	
	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.
<u>U.S.-Poland JV Mothership</u>										
Jan.	0.000	0.000	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--	--	--
March	1.242	1.380	0.008	2.400	--	--	--	--	--	--
April	0.577	2.400	0.340	6.598	--	--	--	--	--	--
May	0.948	2.770	0.000	0.000	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	1.031	1.607	0.230	6.592	--	--	--	--	--	--
<u>U.S.-People's Republic of China JV Mothership</u>										
Jan.	--	--	--	--	--	--	--	--	--	--
Feb.	0.058	1.173	--	--	--	--	--	--	--	--
March	0.524	1.736	--	--	--	--	--	--	--	--
April	1.090	2.271	0.288	4.466	--	--	--	--	--	--
May	1.616	2.281	0.000	0.000	--	--	--	--	--	--
June	1.191	0.753	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	1.889	3.743	--	--
Sep.	0.714	5.047	--	--	--	--	1.218	3.815	--	--
Oct.	0.217	4.615	--	--	--	--	0.333	3.847	--	--
Nov.	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	0.677	2.363	0.285	4.466	--	--	0.663	3.809	--	--

\*Exclusive Economic Zone.

JV = Joint venture.

Table 10.--Estimated incidental catches of Pacific halibut (in numbers of fish and metric tons) by foreign groundfish and joint venture vessels in the Bering Sea and Aleutian Islands region, 1987.

	Number of fish.					Weight (metric tons)				
	Area I	Area II	Area III	Area IV	Total all areas	Area I	Area II	Area III	Area IV	Total all areas
<u>Foreign groundfish vessels</u>										
Japan										
SST	3,304	26,390	-	-	29,694	19.6	158.0	-	-	177.6
LL	20,029	220,840	-	-	240,869	71.5	814.0	-	-	885.5
Republic of Korea (ROK)										
LST	1,141	-	-	-	1,141	5.9	-	-	-	5.9
LFT	1,493	-	-	-	1,493	7.9	-	-	-	7.9
All nations total	25,967	247,230	-	-	273,197	104.9	972.0	-	-	1,076.9
Percent by area	9.50	90.50	-	-		9.74	90.26	-	-	
<u>Joint venture vessels</u>										
U.S.-Japan	69,399	14,368	-	376	84,143	216.7	75.3	-	2.1	294.1
U.S.-ROK	208,652	15,002	0	35,038	258,692	496.1	90.5	0.0	182.9	769.5
U.S.-Poland	3,366	618	-	-	3,984	5.3	3.9	-	-	9.2
U.S.-PRC	11,225	695	-	109	12,029	26.4	2.3	-	0.4	29.1
U.S.-U.S.S.R.	163,249	15,769	-	7,199	186,217	301.4	33.2	-	48.9	383.5
Joint venture totals	455,891	46,452	0	42,722	545,065	1,045.9	205.2	0.0	234.3	1,485.4
Percent by area	83.64	8.52	0.00	7.84		70.41	13.81	0.00	15.78	

SST = Small stern trawler.  
LST = Large surimi trawler,  
LFT = Large freezer trawler,  
LL = Longliner,  
PRC = People's Republic of China.

Table 11 .--Estimated incidental catches (numbers and metric tons) of Pacific halibut (*Hippoglossus stenolepis*) in the foreign and U.S. joint venture groundfish fisheries in the Bering Sea and Aleutian Islands region, 1977-87\*.

Year	Foreign		Joint Venture		Total	
	Nos.	t	Nos.	t	Nos.	t
1977	344,973	1,453	NF	NF	344,973	1,453
1978	599,852	2,853	NF	NF	599,852	2,853
1979	583,811	2,863	NF	NF	583,811	2,863
1980	959,566	4,311	204,948	286	1,164,514	4,597
1981	988,731	2,704	103,616	232	1,092,347	2,936
1982	423,340	1,609	412,115	563	835,455	2,172
1983	515,587	1,872	274,080	438	789,667	2,310
1984	518,327	2,128	254,273	617	772,600	2,745
1985	485,311	1,789	447,370	1,026	932,681	2,815
1986	296,372	1,192	593,597	1,711	889,969	2,903
1987	273,197	1,077	545,065	1,485	818,262	2,562

\*Estimated catches for years 1977-86 from Berger et al. 1988.

NF = no fishing.

Table 12.--Incidence rate (number per metric ton of catch and average weight (kg)) of snow (Tanner) crab taken in the foreign and joint venture groundfish catches in the Bering Sea, 1987.  
Lines indicate areas not fished.

	Area I		Area II		Area III		Area IV		Outside EEZ*	
	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.
<u>Japanese Small Trawler</u>										
Jan.	--	--	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--
July	0.244	0.020	0.297	0.154	--	--	--	--	--	--
Aug.	97.155	0.221	0.794	0.221	--	--	--	--	--	--
Sep.	9.858	0.210	1.759	0.081	--	--	--	--	--	--
Oct.	24.103	0.180	11.778	0.404	--	--	--	--	--	--
Nov.	51.684	0.227	4.748	0.198	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	63.406	0.221	5.622	0.351	--	--	--	--	--	--
<u>Japanese Longliners Fishing &lt;500 m</u>										
Jan.	0.000	0.000	2.946	0.564	--	--	--	--	--	--
Feb.	0.060	0.308	0.876	0.576	--	--	--	--	--	--
March	0.066	0.508	0.197	0.579	--	--	--	--	--	--
April	--	--	0.529	0.574	--	--	--	--	--	--
May	0.243	0.200	0.088	0.373	--	--	--	--	--	--
June	--	--	0.000	0.000	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--
Sep.	0.000	0.000	0.505	0.518	--	--	--	--	--	--
Oct.	0.218	0.915	1.309	0.539	--	--	--	--	--	--
Nov.	0.007	0.500	1.072	0.577	--	--	--	--	--	--
Dec.	--	--	2.132	0.572	--	--	--	--	--	--
Annual	0.091	0.708	1.286	0.567	--	--	--	--	--	--

\*Exclusive Economic Zone.

Table 12.--Incidence rate (number per metric ton of catch and average weight (kg)) of snow (Tanner) crab taken in the foreign and joint venture groundfish catches in the Bering Sea, 1987  
(Continued).. Lines indicate areas not fished.

	Area I		Area II		Area III		Area IV		Outside EEZ*	
	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.
<b>Republic of Korea Large Freezer Trawler</b>										
Jan.	--	--	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--	--	--
April	782.946	0.071	--	--	--	--	--	--	0.000	0.000
May	--	--	--	--	--	--	--	--	0.000	0.000
June	0.000	0.000	--	--	--	--	--	--	--	--
July	2.727	0.155	--	--	--	--	--	--	--	--
Aug.	11.006	0.180	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	42.104	0.089	--	--	--	--	--	--	0.000	0.000
<b>Republic of Korea Surimi Large Trawler</b>										
Jan.	--	--	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--
June	4.338	0.108	--	--	--	--	--	--	--	--
July	5.717	0.112	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	5.061	0.111	--	--	--	--	--	--	--	--

\* Exclusive Economic Zone.

Table 12.--Incidence rate (number per metric ton of catch and average weight (kg)) of snow (Tanner) crab taken in the foreign and joint venture groundfish catches in the Bering Sea, 1987  
(Continued). Lines indicate areas not fished.

	<u>Area I</u>		<u>Area II</u>		<u>Area III</u>		<u>Area IV</u>		<u>Outside EEZ*</u>	
	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.
<u>People's Republic of China Large Freezer Trawler</u>										
Jan.	--	--	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--	0.000	0.000
March	--	--	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	--	--	--	--	--	--	--	--	0.000	0.000
<u>U.S.-U.S.S.R. JV Mothership</u>										
Jan.	5.991	0.260	--	--	--	--	--	--	--	--
Feb.	3.264	0.289	--	--	--	--	--	--	--	--
March	1.496	0.269	--	--	--	--	--	--	--	--
April	118.395	0.064	--	--	--	--	--	--	--	--
May	1.630	0.062	--	--	--	--	0.000	0.000	--	--
June	7.833	0.073	--	--	--	--	0.000	0.000	--	--
July	0.313	0.110	220.700	0.051	--	--	0.000	0.000	--	--
Aug.	--	--	NS	NS	--	--	0.000	0.000	--	--
Sep.	4.789	0.475	--	--	--	--	--	--	--	--
Oct.	30.209	0.406	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	22.677	0.075	220.700	0.051	--	--	0.000	0.000	--	--

\* Exclusive Economic Zone.

JV = Joint venture.

NS = Fishing occurred but no sampling by U.S. observers.

Table 12.--Incidence rate (number per metric ton of catch and average weight (kg)) of snow (Tanner) crab taken in the foreign and joint venture groundfish catches in the Bering Sea, 1987  
(Continued). Lines indicate areas not fished.

	<u>Area I</u>		<u>Area II</u>		<u>Area III</u>		<u>Area IV</u>		<u>Outside EEZ*</u>	
	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.
<u>U.S.-Republic of Korea JV Mothership</u>										
Jan.	0.070	0.593	--	--	--	--	--	--	--	--
Feb.	0.086	0.299	--	--	--	--	0.000	0.000	--	--
March	0.772	0.290	0.000	0.000	--	--	--	--	--	--
April	4.987	0.132	2.363	0.240	--	--	--	--	--	--
May	29.524	0.073	0.224	0.132	--	--	0.000	0.000	--	--
June	0.190	0.231	1.694	0.200	--	--	0.000	0.000	--	--
July	58.186	0.310	--	--	--	--	0.006	0.241	--	--
Aug.	0.000	0.000	--	--	--	--	0.000	0.000	--	--
Sep.	0.598	0.526	0.158	0.226	--	--	0.000	0.000	--	--
Oct.	0.578	0.483	NS	NS	--	--	0.006	0.338	--	--
Nov.	--	--	--	--	--	--	0.000	0.000	--	--
Dec.	--	--	--	--	0.000	0.000	0.000	0.000	--	--
Annual	3.202	0.102	1.797	0.236	0.000	0.000	0.003	0.261	--	--
<u>U.S.-Japan JV Mothership</u>										
Jan.	<0.001	0.475	--	--	--	--	--	--	--	--
Feb.	0.023	0.201	--	--	--	--	0.000	0.000	--	--
March	0.138	0.268	<0.001	0.054	--	--	--	--	--	--
April	25.589	0.074	0.064	0.229	--	--	--	--	--	--
May	2.928	0.062	0.006	0.198	--	--	--	--	--	--
June	0.444	0.387	0.004	0.357	--	--	0.000	0.000	--	--
July	0.861	0.187	149.381	0.159	--	--	0.000	0.000	--	--
Aug.	--	--	--	--	--	--	--	--	--	--
Sep.	0.520	0.586	0.604	0.156	--	--	--	--	--	--
Oct.	0.341	0.668	0.902	0.231	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	2.318	0.081	0.111	0.180	--	--	0.000	0.000	--	--

\*Exclusive Economic Zone.

JV = Joint venture.

NS = Fishing occurred but no sampling by U.S. observers.

Table 12.--Incidence rate (number per metric ton of catch and average weight (kg)) of snow (Tanner) crab taken in the foreign and joint venture groundfish catches in the Bering Sea, 1987 (Continued). Lines indicate areas not fished.

	Area I		Area II		Area III		Area IV		Outside EEZ*	
	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.
<u>U.S.-Poland JV Mothership</u>										
Jan.	0.000	0.000	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--	--	--
March	0.024	0.382	0.000	0.000	--	--	--	--	--	--
April	0.338	0.521	2.077	0.096	--	--	--	--	--	--
May	0.009	0.500	0.000	0.000	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	0.069	0.488	1.404	0.096	--	--	--	--	--	--
<u>U.S.-People's Republic of China JV Mothership</u>										
Jan.	--	--	--	--	--	--	--	--	--	--
Feb.	0.022	0.685	--	--	--	--	--	--	--	--
March	0.020	0.414	--	--	--	--	--	--	--	--
April	9.434	0.079	1.158	0.316	--	--	--	--	--	--
May	8.137	0.141	0.000	0.000	--	--	--	--	--	--
June	0.000	0.000	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	0.000	0.000	--	--
Sep.	1.207	0.571	--	--	--	--	0.000	0.000	--	--
Oct.	0.651	0.660	--	--	--	--	0.000	0.000	--	--
Nov.	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	2.615	0.133	1.144	0.316	--	--	0.000	0.000	--	--

\*Exclusive Economic Zone.

JV = Joint venture.

Table 13.--Estimated incidental catches of snow (Tanner) crab (in numbers of crab and metric tons) by foreign groundfish and joint venture vessels in the Bering Sea and Aleutian Islands region, 1987.

	Number of crab					Weight (metric tons)				
	Area I	Area II	Area III	Area IV	Total all areas	Area I	Area II	Area III	Area IV	Total all areas
<b>Foreign groundfish vessels</b>										
<b>Japan</b>										
SST	133,879	96,098	-	-	229,977	29.59	33.73	-	-	63.32
LL	187	60,146	-	-	60,333	0.13	34.10	-	-	34.23
<b>Republic of Korea (ROK)</b>										
LST	2,615	-	-	-	2,615	0.29	-	-	-	0.29
LFT	38,787	-	-	-	38,787	3.45	-	-	-	3.45
<b>All nations total</b>	<b>175,468</b>	<b>156,244</b>	<b>-</b>	<b>-</b>	<b>331,712</b>	<b>33.46</b>	<b>67.83</b>	<b>-</b>	<b>-</b>	<b>101.29</b>
<b>Percent by area</b>	<b>52.90</b>	<b>47.10</b>	<b>-</b>	<b>-</b>		<b>33.03</b>	<b>66.97</b>	<b>-</b>	<b>-</b>	
<b>Joint venture vessels</b>										
U.S.-Japan	608,582	25,563	-	0	634,145	49.30	4.60	-	0.00	53.90
U.S.-ROK	1,018,110	60,596	0	96	1,078,802	103.85	14.30	0.00	0.03	118.18
U.S.-Poland	301	3,921	-	-	4,222	0.15	0.38	-	-	0.53
U.S.-PRC	251,595	1,284	-	0	252,879	33.46	0.41	-	0.00	33.87
U.S.-U.S.S.R.	2,927,488	2,167,228	-	0	5,094,716	219.56	110.53	-	0.00	330.09
<b>Joint venture totals</b>	<b>4,806,076</b>	<b>2,258,592</b>	<b>0</b>	<b>96</b>	<b>7,064,764</b>	<b>406.32</b>	<b>130.22</b>	<b>0.00</b>	<b>0.03</b>	<b>536.57</b>
<b>Percent by area</b>	<b>68.03</b>	<b>31.97</b>	<b>0.00</b>	<b>&lt;0.01</b>		<b>75.72</b>	<b>24.27</b>	<b>0.00</b>	<b>0.01</b>	

SST = Small stern trawler.  
LST = Large surimi trawler.  
LFT = Large freezer trawler.  
LL = Longliner.  
PRC = People's Republic of China.

Table 14.--Estimated incidental catches (numbers and metric tons) of snow (Tanner) crab (Chionoecetes spp.) in the foreign and joint venture groundfish fisheries in the Bering Sea and Aleutian Islands region, 1977-87\*.

Year	Foreign		Joint Venture		Total	
	Millions of crab	t	Millions of crab	t	Millions of crab	t
1977	17.6	3,728	NF	NF	17.6	3,728
1978	17.3	4,267	NF	NF	17.3	4,267
1979	18.0	3,654	NF	NF	18.0	3,654
1980	11.1	2,058	0.3	56	11.4	2,114
1981	5.6	1,196	0.7	276	6.3	1,472
1982	2.3	425	0.1	24	2.4	448
1983	2.5	501	0.5	171	3.0	672
1984	2.6	527	0.4	119	3.0	646
1985	1.8	263	0.9	134	2.7	397
1986	1.7	280	5.5	370	7.2	650
1987	0.3	101	7.1	537	7.4	638

\* Estimated catches for years 1977-86 from Berger et al. 1988.

NF = no fishing.

Table 15.--Catches of Tanner crab by species and zone made by the yellowfin sole/flatfish joint venture fishery, 1987.

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	<u>Chionoecetes bairdi</u>	Other Tanner crab
Zone 1	98,225	28,269
Zone 2	78,942	2,662,078
Zone 3	38,635	3,669,635

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Table 16.--Biological data on the incidental catch of Tanner crab in the foreign and joint venture groundfish fishery in the Bering Sea and Aleutian Islands region, 1987.

Species	Percent by species	Sex	Sex composition	Average weight (kg)	Average width (mm)
<u>Foreign directed fisheries</u>					
<u>Chionoecetes opilio</u>	72.60	Male	80.51	0.38	92
		Female	11.47	0.10	58
		Unsexed	8.02	0.18	72
		Combined		0.34	87
<u>Chionoecetes bairdi</u>	26.78	Male	63.26	0.26	91
		Female	32.52	0.11	68
		Unsexed	4.22	0.23	85
		Combined		0.21	83
<u>Chionoecetes angulatus</u>	0.37	Male	60.98	0.33	87
		Female	18.41	0.15	61
		Unsexed	20.61	0.21	88
		Combined		0.27	83
<u>Chionoecetes tanneri</u>	0.25	Male	41.58	0.31	96
		Female	26.51	0.14	63
		Unsexed	31.91	0.11	74
		Combined		0.20	80
<u>Joint venture fisheries</u>					
<u>Chionoecetes opilio</u>	91.52	Male	55.47	0.09	63
		Female	40.03	0.05	53
		Unsexed	4.50	0.06	49
		Combined		0.07	58
<u>Chionoecetes bairdi</u>	8.47	Male	62.43	0.21	80
		Female	37.45	0.09	62
		Unsexed	0.12	0.12	64
		Combined		0.17	73
<u>Chionoecetes angulatus</u>	<0.01	Male	95.42	0.43	112
		Female	3.09	0.05	60
		Unsexed	1.49	0.20	86
		Combined		0.42	110
<u>Chionoecetes tanneri</u>	<0.01	Male	100.00	0.09	72
		Female	0.00	--	--
		Unsexed	0.00	--	--
		Combined		0.09	72

Table 17.--Incidence rate (number per metric ton of catch and average weight (kg)) of king crab taken in the foreign and joint venture groundfish catches in the Bering Sea, 1987. Lines indicate areas not fished.

	<u>Area I</u>		<u>Area II</u>		<u>Area III</u>		<u>Area IV</u>		<u>Outside EEZ*</u>	
	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.
<u>Japanese Small Trawler</u>										
Jan.	--	--	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--
July	0.098	1.400	0.930	0.214	--	--	--	--	--	--
Aug.	0.995	1.983	0.349	1.290	--	--	--	--	--	--
Sep.	0.077	2.711	0.167	1.341	--	--	--	--	--	--
Oct.	0.016	2.707	0.557	1.177	--	--	--	--	--	--
Nov.	0.192	1.598	0.054	1.379	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	0.492	1.935	0.385	1.072	--	--	--	--	--	--
<u>Japanese Longliners Fishing &lt;500 (m)</u>										
Jan.	0.000	0.000	0.000	0.000	--	--	--	--	--	--
Feb.	0.000	0.000	0.000	0.000	--	--	--	--	--	--
March	0.000	0.000	0.000	0.000	--	--	--	--	--	--
April	--	--	0.000	0.000	--	--	--	--	--	--
May	0.000	0.000	0.000	0.000	--	--	--	--	--	--
June	--	--	0.000	0.000	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--
Sep.	0.000	0.000	0.000	0.000	--	--	--	--	--	--
Oct.	0.000	0.000	0.003	1.569	--	--	--	--	--	--
Nov.	0.000	0.000	0.004	2.225	--	--	--	--	--	--
Dec.	--	--	0.011	1.335	--	--	--	--	--	--
Annual	0.000	0.000	0.004	1.540	--	--	--	--	--	--

\* Exclusive Economic Zone.

Table 17.--Incidence rate (number per metric ton of catch and average weight (kg)) of king crab taken in the foreign and joint venture groundfish catches in the Bering Sea, 1987 (Continued). Lines indicate areas not fished.

	<u>Area I</u>		<u>Area II</u>		<u>Area III</u>		<u>Area IV</u>		<u>Outside EEZ*</u>	
	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.
<u>Republic of Korea Large Freezer Trawler</u>										
Jan.	--	--	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--	--	--
April	0.203	2.075	--	--	--	--	--	--	0.000	0.000
May	--	--	--	--	--	--	--	--	0.000	0.000
June	0.333	1.332	--	--	--	--	--	--	--	--
July	0.158	1.857	--	--	--	--	--	--	--	--
Aug.	0.078	0.848	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	0.140	1.332	--	--	--	--	--	--	0.000	0.000
<u>Republic of Korea Surimi Large Trawler</u>										
Jan.	--	--	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--
June	0.188	1.836	--	--	--	--	--	--	--	--
July	0.500	1.740	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	0.352	1.764	--	--	--	--	--	--	--	--

\* Exclusive Economic Zone.

Table 17.--Incidence rate (number per metric ton of catch and average weight (kg)) of king crab taken in the foreign and joint venture groundfish catches in the Bering Sea, 1987 (Continued). Lines indicate areas not fished.

	<u>Area I</u>		<u>Area II</u>		<u>Area III</u>		<u>Area IV</u>		<u>Outside EEZ*</u>	
	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.
<u>People's Republic of China Large Freezer Trawler</u>										
Jan.	--	--	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--	0.000	0.000
March	--	--	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	--	--	--	--	--	--	--	--	0.000	0.000
<u>U.S.-U.S.S.R. JV Mothership</u>										
Jan.	0.000	0.000	--	--	--	--	--	--	--	--
Feb.	0.001	1.212	--	--	--	--	--	--	--	--
March	0.029	1.510	--	--	--	--	--	--	--	--
April	1.132	0.986	--	--	--	--	--	--	--	--
May	0.029	0.927	--	--	--	--	0.000	0.000	--	--
June	0.026	1.091	--	--	--	--	0.001	1.918	--	--
July	0.000	0.000	0.435	1.178	--	--	0.000	0.000	--	--
Aug.	--	--	NS	NS	--	--	0.000	0.000	--	--
Sep.	0.003	3.100	--	--	--	--	--	--	--	--
Oct.	0.000	0.000	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	0.207	1.003	0.435	1.178	--	--	<0.001	1.918	--	--

\*Exclusive Economic Zone.

JV = Joint venture.

NS = Fishing occurred but no sampling by U.S. observers.

Table 17.--Incidence rate (number per metric ton of catch and average weight (kg)) of king crab taken in the foreign and joint venture groundfish catches in the Bering Sea, 1987 (Continued). Lines indicate areas not fished.

	<u>Area I</u>		<u>Area II</u>		<u>Area III</u>		<u>Area IV</u>		<u>Outside EEZ*</u>	
	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.
<u>U.S.-Republic of Korea JV Mothership</u>										
Jan.	0.040	1.733	--	--	--	--	--	--	--	--
Feb.	<0.001	2.463	--	--	--	--	0.000	0.000	--	--
March	0.263	1.410	0.000	0.000	--	--	--	--	--	--
April	0.934	1.145	0.002	2.012	--	--	--	--	--	--
May	0.210	1.100	0.000	0.000	--	--	0.000	0.000	--	--
June	0.137	0.945	0.002	2.500	--	--	0.035	0.077	--	--
July	0.000	0.000	--	--	--	--	0.039	1.229	--	--
Aug.	0.000	0.000	--	--	--	--	0.037	2.030	--	--
Sep.	0.291	1.917	0.000	0.000	--	--	0.009	1.700	--	--
Oct.	0.000	0.000	NS	NS	--	--	0.034	0.410	--	--
Nov.	--	--	--	--	--	--	0.000	0.000	--	--
Dec.	--	--	--	--	0.000	0.000	0.000	0.000	--	--
Annual	0.194	1.267	0.002	2.039	0.000	0.000	0.031	0.812	--	--
<u>U.S.-Japan JV Mothership</u>										
Jan.	0.000	0.000	--	--	--	--	--	--	--	--
Feb.	<0.001	1.793	--	--	--	--	0.000	0.000	--	--
March	0.026	1.306	0.000	0.000	--	--	--	--	--	--
April	0.589	1.010	<0.001	0.698	--	--	--	--	--	--
May	0.011	1.665	0.000	0.000	--	--	--	--	--	--
June	0.154	1.342	<0.001	1.710	--	--	0.001	0.870	--	--
July	0.000	0.000	0.000	0.000	--	--	0.000	0.000	--	--
Aug.	--	--	--	--	--	--	--	--	--	--
Sep.	0.025	1.854	0.000	0.000	--	--	--	--	--	--
Oct.	0.000	0.000	0.000	0.000	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	0.059	1.115	<0.001	1.009	--	--	0.001	0.870	--	--

\*Exclusive Economic Zone.

JV = Joint venture.

NS = Fishing occurred but no sampling by U.S. observers.

Table 17.--Incidence rate (number per metric ton of catch and average weight (kg)) of king-crab taken in the foreign and joint venture groundfish catches in the Bering Sea, 1987 (Continued). Lines indicate areas not fished.

	<u>Area I</u>		<u>Area II</u>		<u>Area III</u>		<u>Area IV</u>		<u>Outside EEZ*</u>	
	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.	Rate	Ave. wt.
<u>U.S.-Poland JV Mothership</u>										
Jan.	0.000	0.000	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--	--	--
March	0.818	1.748	0.000	0.000	--	--	--	--	--	--
April	0.480	1.212	0.002	1.933	--	--	--	--	--	--
May	0.003	2.300	0.000	0.000	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	0.627	1.686	0.001	1.933	--	--	--	--	--	--
<u>U.S.-People's Republic of China JV Mothership</u>										
Jan.	--	--	--	--	--	--	--	--	--	--
Feb.	0.001	3.000	--	--	--	--	--	--	--	--
March	0.719	1.268	--	--	--	--	--	--	--	--
April	0.513	1.309	0.000	0.000	--	--	--	--	--	--
May	0.306	1.549	0.000	0.000	--	--	--	--	--	--
June	0.012	0.400	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	0.000	0.000	--	--
Sep.	2.018	1.778	--	--	--	--	0.000	0.000	--	--
Oct.	0.000	0.000	--	--	--	--	0.000	0.000	--	--
Nov.	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--
Annual	0.574	1.477	0.000	0.000	--	--	0.000	0.000	--	--

\*Exclusive Economic Zone.

JV = Joint venture.

Table 1e.--Estimated incidental catches of king crab (in numbers of crab and metric tons) by foreign groundfish and joint venture vessels in the Bering Sea and Aleutian Islands region, 1987.

	Number of crab					Weight (metric tons)				
	Area I	Area II	Area III	Area IV	Total all areas	Area I	Area II	Area III	Area IV	Total all areas
<b>Foreign groundfish vessels</b>										
Japan										
SST	950	5,355	-	-	6,305	1.84	5.74	-	-	7.58
LL	0	799	-	-	799	0.00	1.23	-	-	1.23
Republic of Korea (ROK)										
LST	167	-	-	-	167	0.29	-	-	-	0.29
LFT	132	-	-	-	132	0.18	-	-	-	0.18
All nations total	1,249	6,154	-	-	7,403	2.31	6.97	-	-	9.28
Percent by area	13.37	86.63	-	-		24.89	75.11	-	-	
<b>Joint venture vessels</b>										
U.S.-Japan	22,932	23	-	1	22,956	25.57	0.02	-	<0.01	25.59
U.S.-ROK	72,886	66	0	1,226	74,178	92.35	0.13	0.00	1.00	93.48
U.S.-Poland	1,362	2	-	-	1,364	2.30	<0.01	-	-	2.30
U.S.-PRC	10,344	21	-	0	10,365	15.28	0.03	-	0.00	15.31
U.S.-U.S.S.R.	25,741	5,376	-	3	31,120	25.82	6.33	-	0.01	32.16
Joint venture totals	133,265	5,488	0	1,230	139,983	161.32	6.51	0.00	1.01	168.84
Percent by area	95.20	3.92	0.00	0.88		95.54	3.86	0.00	0.60	

SST = Small stern trawler.  
LST = Large surimi trawler.  
LFT = Large freezer trawler.  
LL = Longliner.  
PRC = People's Republic of China.

Table 19.-- Estimated incidental catches (numbers and metric tons) of king crab (Lithodes and Paralithodes spp.) in the foreign and joint venture groundfish fisheries in the Bering Sea and Aleutian Islands region, 1977-87\*.

Year	Foreign		Joint Venture		Total	
	Nos.	t	Nos.	t	Nos.	t
1977	599,623	641	NF	NF	599,623	641
1978	1,277,931	1,097	NF	NF	1,277,931	1,097
1979	1,007,796	1,008	NF	NF	1,007,796	1,008
1980	858,129	781	289,542	241	1,147,671	1,022
1981	733,026	666	1,084,126	642	1,817,152	1,308
1982	380,004	343	193,915	90	573,919	433
1983	404,013	353	630,144	337	1,034,157	690
1984	292,223	309	398,865	283	691,088	592
1985	219,783	191	1,005,290	678	1,225,073	869
1986	14,631	19	260,435	332	275,066	351
1987	7,403	9	139,983	169	147,386	178

\*Estimated catches for years 1977-86 from Berger et al. 1988.

NF = no fishing.

Table 20.--Catches of king crab by species and zone made by the yellowfin sole/flatfish joint venture fishery, 1987.

	Red king crab	Blue king crab	Other king crab
Zone 1	64,400	7	5
Zone 2	698	457	0
Zone 3	11,352	4,721	496

Table 21 .--Biological data on the incidental catch of king crab in the foreign and joint venture groundfish fishery in the Bering Sea and Aleutian Islands region, 1987.

Species	Percent by species	Sex	Sex composition	Average weight (kg)	Average length (mm)
<u>Foreign directed fisheries</u>					
Red	9.15	Male	87.84	2.21	135
		Female	11.78	1.19	130
		Unsexed	0.38	1.00	116
		Combined		2.09	134
Blue	13.48	Male	47.24	2.39	134
		Female	52.76	1.35	124
		Unsexed	0.00	--	--
		Combined		1.84	129
Golden	77.37	Male	48.94	1.39	130
		Female	50.46	0.86	109
		Unsexed	0.60	1.15	132
		Combined		1.12	119
<u>Joint venture fisheries</u>					
Red	93.81	Male	68.32	1.40	126
		Female	31.35	0.82	100
		Unsexed	0.33	1.35	122
		Combined		1.22	118
Blue	5.44	Male	74.62	1.33	121
		Female	22.09	1.01	105
		Unsexed	3.29	0.72	105
		Combined		1.24	117
Golden	0.75	Male	45.05	0.89	103
		Female	54.23	0.55	74
		Unsexed	0.72	1.81	155
		Combined		0.71	87

Table 22.--The common and scientific names of rockfish identified in the 1987 foreign and joint venture catches in the Bering Sea and Aleutian Islands region.

Common name <sup>a</sup>	Scientific name
Black rockfish	<u>Sebastes melanops</u>
Dusky rockfish	<u>Sebastes ciliatus</u>
Harlequin rockfish	<u>Sebastes variegatus</u>
Northern rockfish	<u>Sebastes polyspinis</u>
Pacific ocean perch	<u>Sebastes alutus</u>
Rougheye rockfish	<u>Sebastes aleutianus</u>
Shortraker rockfish	<u>Sebastes borealis</u>
Shortspine thornyhead	<u>Sebastolobus alascanus</u>
Yellowmouth rockfish	<u>Sebastes reedi</u>
Other rockfish <sup>b</sup>	
Blue rockfish	<u>Sebastes mystinus</u>
Darkblotched rockfish	<u>Sebastes crameri</u>
Redbanded rockfish	<u>Sebastes babcocki</u>
Redstripe rockfish	<u>Sebastes proriger</u>
Silvergray rockfish	<u>Sebastes brevispinis</u>

<sup>a</sup> With all rockfish, the possibility of misidentification exists, and the listing of species not previously reported from the Bering Sea and Aleutian Islands region should be noted with caution.

<sup>b</sup> The 5 species listed under "Other rockfish" each made up less than 0.10% of the rockfish catch by foreign vessels and by joint venture operations.

Table 23.--Estimated catch (in metric tons and percentages) of rockfish by species and area in the Bering Sea and Aleutian Islands region during 1987.

Common name	Area I		Area II		Area IV		Total	
	t	%	t	%	t	%	t	%
<b><u>Foreign directed fisheries</u></b>								
Black rockfish	0.00	0.00	0.16	1.28	0.00	0.00	0.16	1.27
Dusky rockfish	0.01	8.33	2.69	21.57	0.00	0.00	2.70	21.45
Harlequin rockfish	0.00	0.00	0.06	0.48	0.00	0.00	0.06	0.48
Northern rockfish	0.00	0.00	1.97	15.80	0.00	0.00	1.97	15.65
Pacific ocean perch	0.10	83.33	5.26	42.18	0.00	0.00	5.36	42.57
Rougheye rockfish	0.00	0.00	1.89	15.16	0.00	0.00	1.89	15.01
Shortraker rockfish	0.00	0.00	0.28	2.25	0.00	0.00	0.28	2.22
Shortspine thornyhead	0.01	8.33	0.14	1.12	0.00	0.00	0.15	1.19
Other rockfish*	0.00	0.00	0.02	0.16	0.00	0.00	0.02	0.16
Total	0.12		12.47		0.00		12.59	
Percent by area	0.95		99.05		0.00			
<b><u>Joint venture fisheries</u></b>								
Black rockfish	<0.01	<0.01	0.00	0.00	0.06	0.01	0.06	0.01
Dusky rockfish	4.19	6.30	0.25	0.59	3.75	0.49	8.19	0.94
Harlequin rockfish	0.00	0.00	<0.01	<0.01	0.28	0.04	0.28	0.03
Northern rockfish	49.07	73.73	2.24	5.32	252.95	33.19	304.26	34.94
Pacific ocean perch	11.37	17.08	38.55	91.59	500.06	65.61	549.98	63.16
Rougheye rockfish	1.61	2.42	1.04	2.47	3.32	0.44	5.97	0.69
Shortraker rockfish	0.23	0.35	0.00	0.00	0.01	<0.01	0.24	0.03
Shortspine thornyhead	0.01	0.02	0.00	0.00	0.00	0.00	0.01	<0.01
Yellowmouth rockfish	0.00	0.00	0.00	0.00	0.97	0.13	0.97	0.11
Other rockfish*	0.07	0.11	0.01	0.02	0.78	0.10	0.86	0.10
Total	66.55		42.09		762.18		870.82	
Percent by area	7.64		4.83		87.52			

\*Species included in this category are listed in Table 22.

Table 24.--The common and scientific names of flatfish identified in the 1987 foreign and joint venture catches in the Bering Sea and Aleutian and Islands region.

Common name	Scientific name
Alaska plaice	<u>Pleuronectes quadrituberculatus</u>
Arrowtooth flounder (turbot)	<u>Atheresthes stomias</u>
Bering flounder	<u>Hippoglossoides robustus</u>
Butter sole	<u>Isopsetta isolepis</u>
Dover sole	<u>Microstomus pacificus</u>
English sole	<u>Parophrys vetulus</u>
Flathead sole	<u>Hippoglossoides elassodon</u>
Greenland turbot	<u>Reinhardtius hippoglossoides</u>
Hybrid sole	<u>Inopsetta ischyra</u>
Kamchatka flounder	<u>Atheresthes evermanni</u>
Longhead dab	<u>Limanda proboscidea</u>
Pacific sanddab	<u>Citharichthys sordidus</u>
Petrale sole	<u>Eopsetta jordani</u>
Rex sole	<u>Glyptocephalus zachirus</u>
Rock sole	<u>Lepidopsetta bilineata</u>
Sand sole	<u>Psettichthys melanostictus</u>
Sanddab unidentified	<u>Bothidae</u>
Starry flounder	<u>Platichthys stellatus</u>
Yellowfin sole	<u>Limanda Aspera</u>

Table 25.--Estimated catch (in metric tons and percentages) of flatfish by species and area in the Bering Sea and Aleutian Islands region during 1987.

Common name	Area I		Area II		Area IV		Total	
	t	%	t	%	t	%	t	%
<u>Foreign directed fisheries</u>								
Alaska plaice	257.73	9.60	11.40	0.24	0.00	0.00	269.13	3.59
Arrowtooth flounder	51.90	1.93	2,660.09	55.22	0.00	0.00	2,711.99	36.15
Bering flounder	0.00	0.00	0.81	0.02	0.00	0.00	0.81	0.01
Dover sole	0.00	0.00	2.54	0.05	0.00	0.00	2.54	0.03
Flathead sole	47.59	1.77	727.63	15.11	0.00	0.00	775.22	10.33
Greenland turbot	31.23	1.16	1,017.53	21.12	0.00	0.00	1,048.76	13.98
Hybrid sole	0.00	0.00	0.01	<0.01	0.00	0.00	0.01	<0.01
Kamchatka flounder	0.08	<0.01	76.62	1.59	0.00	0.00	76.70	1.02
Longhead dab	1.81	0.07	0.00	0.00	0.00	0.00	1.81	0.02
Petrale sole	0.11	<0.01	0.11	<0.01	0.00	0.00	0.22	<0.01
Rex sole	<0.01	<0.01	18.39	0.38	0.00	0.00	18.39	0.25
Rock sole	546.81	20.37	228.90	4.75	0.00	0.00	775.71	10.34
Sand sole	0.00	0.00	0.07	<0.01	0.00	0.00	0.07	<0.01
Starry flounder	7.24	0.27	1.48	0.03	0.00	0.00	8.72	0.12
Yellowfin sole	1,739.89	64.82	71.30	1.48	0.00	0.00	1,811.19	24.15
Total	2,684.39		4,816.88		0.00		7,501.27	
Percent by area	35.79		64.21		0.00			
<u>Joint venture fisheries</u>								
Alaska plaice	11,896.81	5.76	6,204.36	71.44	0.01	<0.01	18,101.18	8.40
Arrowtooth flounder	1,269.91	0.62	279.67	3.22	110.55	26.11	1,660.13	0.77
Bering flounder	26.79	0.01	182.96	2.11	0.00	0.00	209.75	0.10
Butter sole	18.39	0.01	0.00	0.00	0.00	0.00	18.39	0.01
Dover sole	8.21	<0.01	0.02	<0.01	0.07	0.02	8.30	<0.01
English sole	2.75	<0.01	0.00	0.00	0.00	0.00	2.75	<0.01
Flathead sole	2,329.32	1.13	584.86	6.73	1.06	0.25	2,915.24	1.35
Greenland turbot	8.83	<0.01	15.07	0.17	34.53	8.16	58.43	0.03
Hybrid sole	0.30	<0.01	0.00	0.00	0.00	0.00	0.30	<0.01
Kamchatka flounder	7.32	<0.01	4.44	0.05	3.83	0.90	15.59	0.01
Longhead dab	244.69	0.12	1.31	0.02	0.00	0.00	246.00	0.11
Pacific sanddab	0.38	<0.01	0.00	0.00	0.00	0.00	0.38	<0.01
Petrale sole	9.74	<0.01	0.13	<0.01	0.12	0.03	9.99	<0.01
Rex sole	94.73	0.05	15.98	0.18	0.56	0.13	111.27	0.05
Rock sole	9,965.43	4.83	897.70	10.34	272.55	64.37	11,135.68	5.17
Sand sole	0.12	<0.01	0.00	0.00	0.00	0.00	0.12	<0.01
Sanddab unidentified	1.71	<0.01	0.00	0.00	0.00	0.00	1.71	<0.01
Starry flounder	1,488.16	0.72	0.26	<0.01	0.00	0.00	1,488.42	0.69
Yellowfin sole	179,115.58	86.74	497.52	5.73	0.14	0.03	179,613.24	83.31
Total	206,489.17		8,684.28		423.42		215,596.87	
Percent by area	95.78		4.03		0.20			

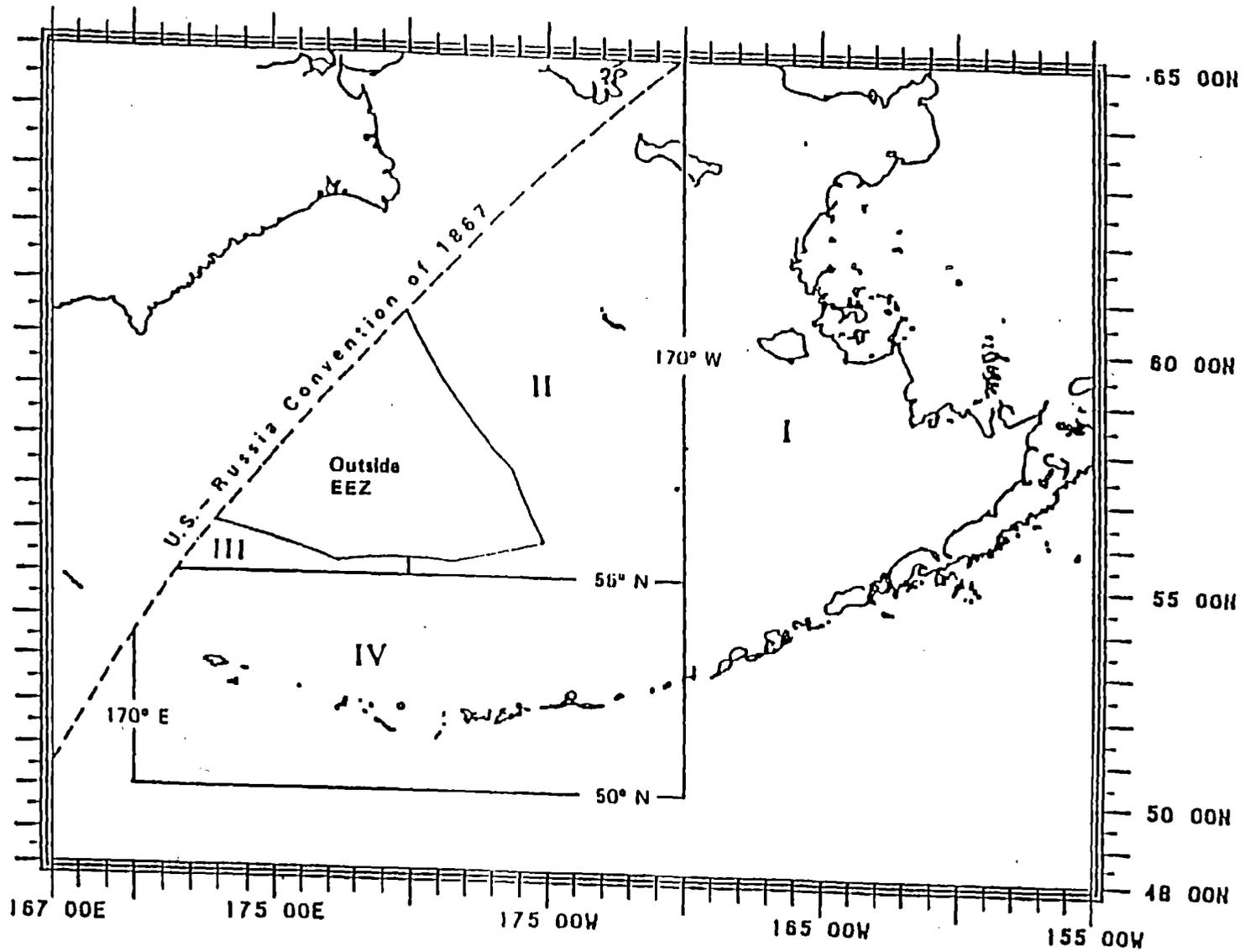


Figure 1.--U.S. statistical areas in the Bering Sea and Aleutian Islands region used to summarize catch and effort data.

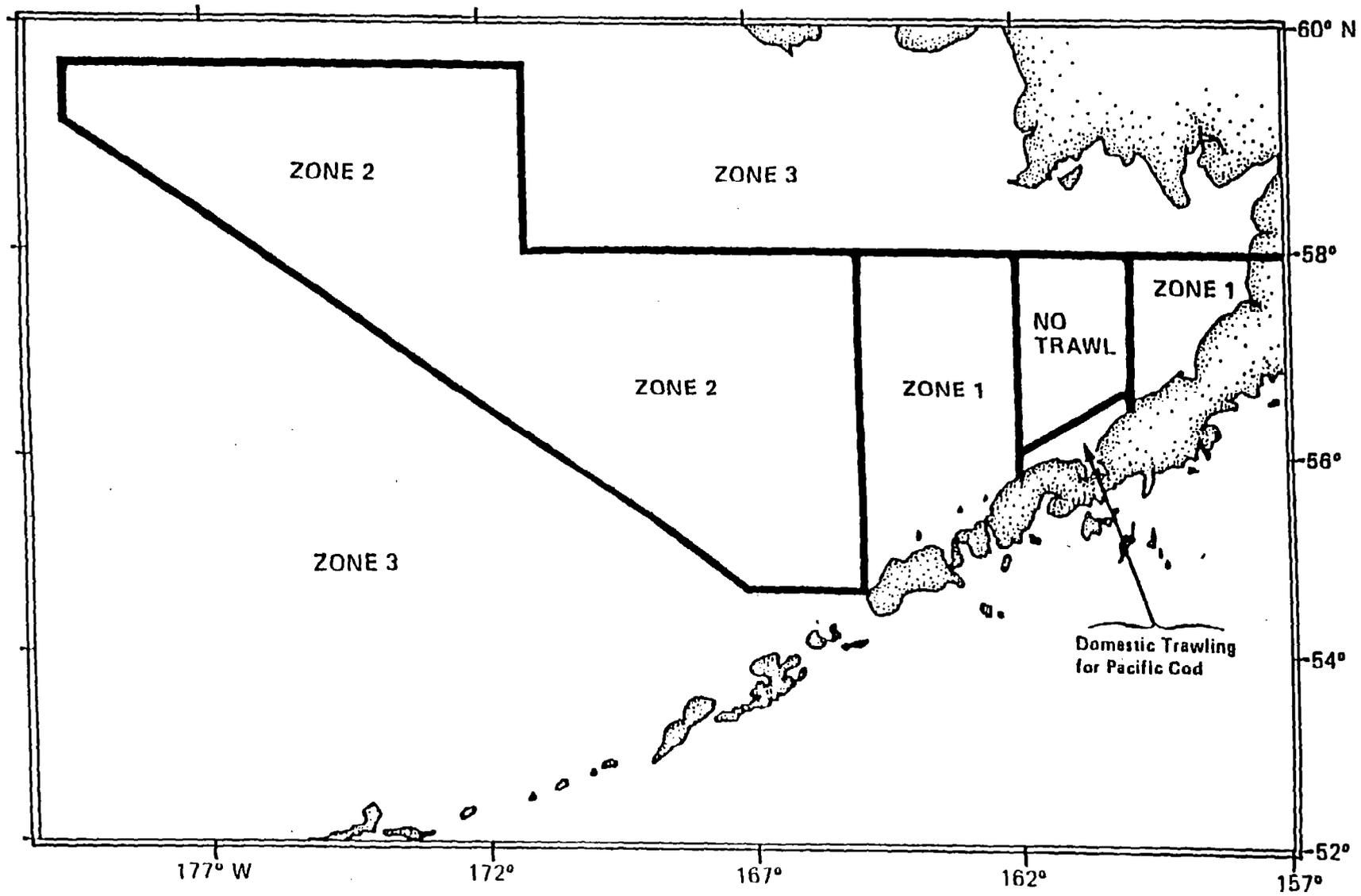
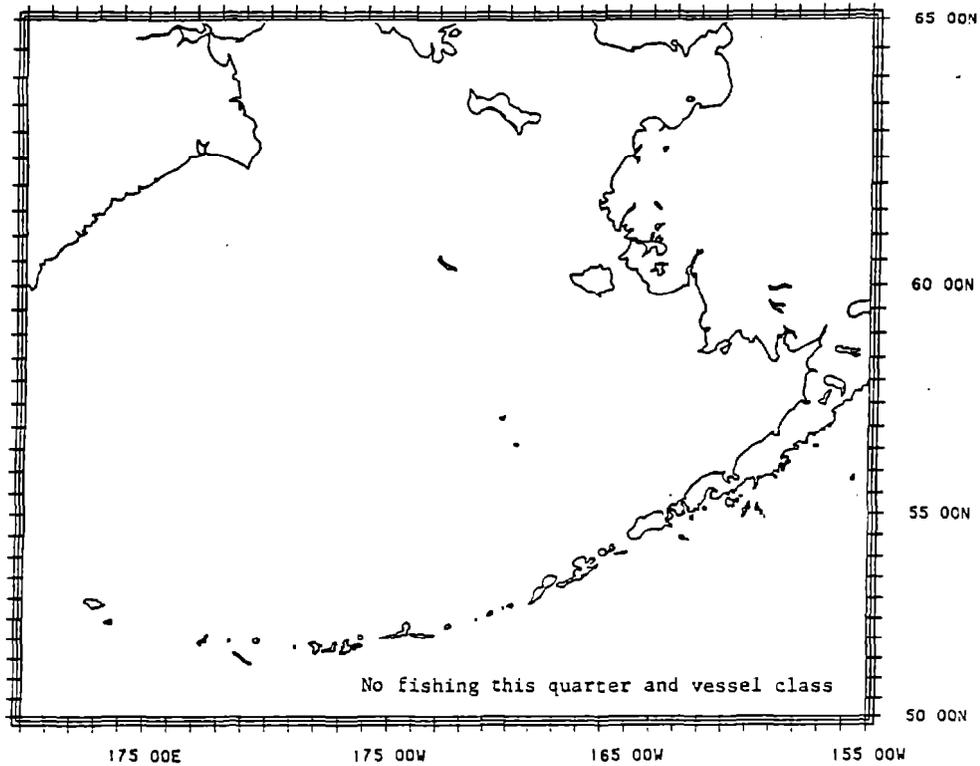
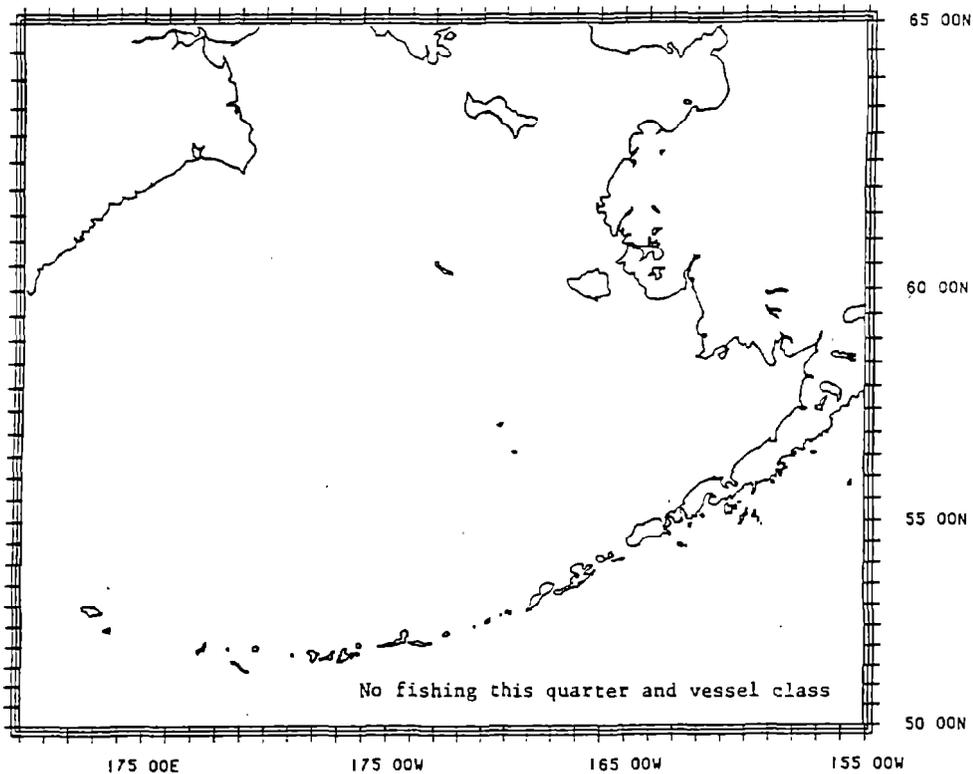


Figure 2. --U.S. zones in the Bering Sea and Aleutian Islands region, 1987.

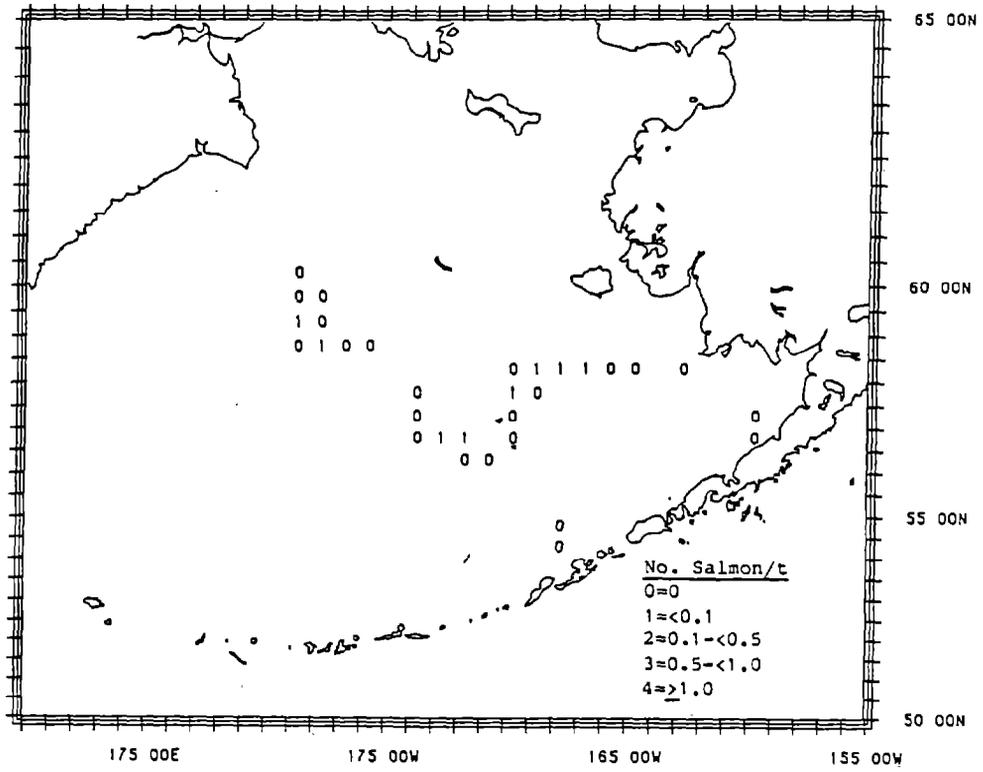


SALMON INCIDENCE 87 FIRST QUARTER SMALL STERN TRAWLERS

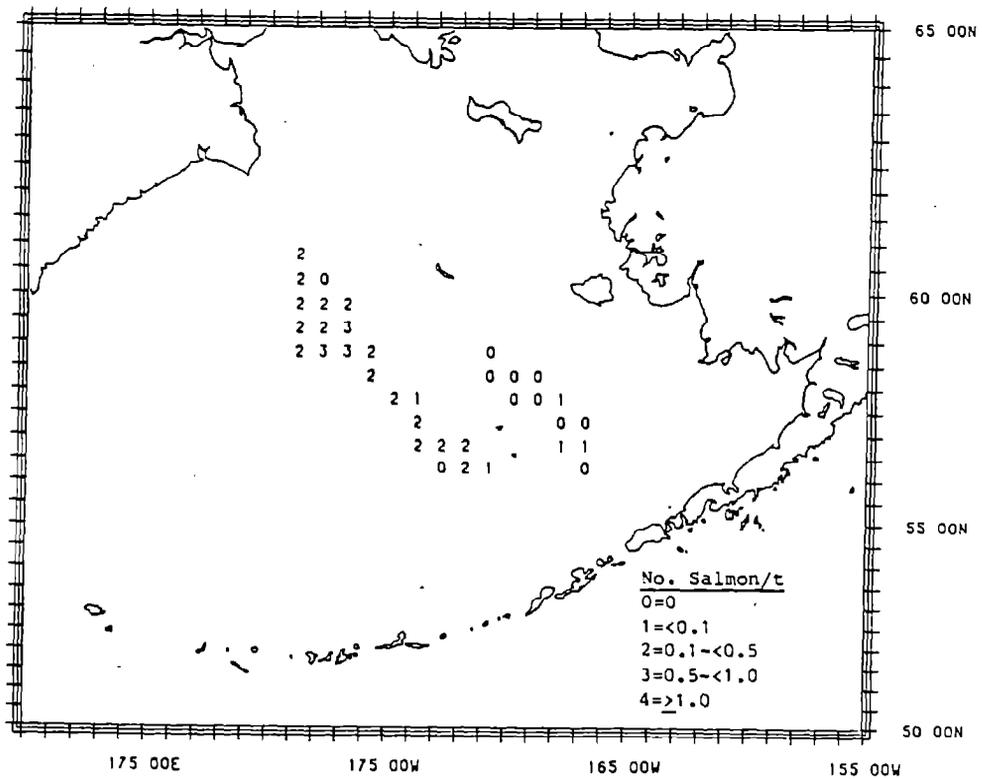


SALMON INCIDENCE 87 SECOND QUARTER SMALL STERN TRAWLERS

Figure 3. --Average incidence (no./t) of Pacific salmon on small stern trawlers by quarter and 1/2° lat. by 1° long. areas, 1987.

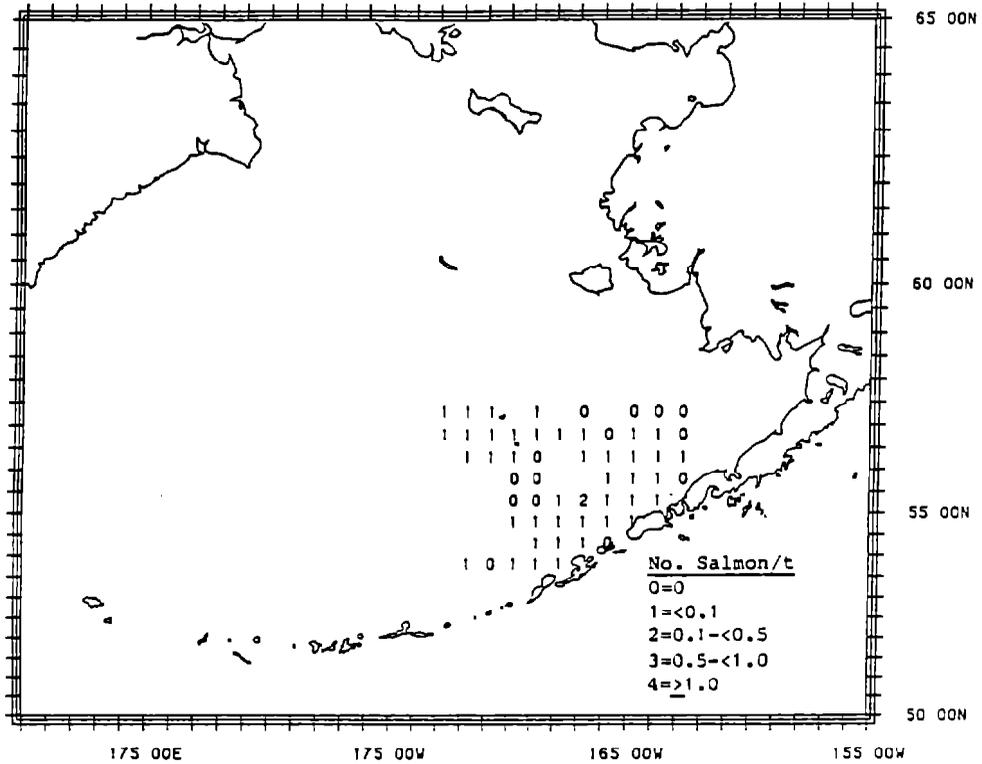


SALMON INCIDENCE 87 THIRD QUARTER SMALL STERN TRAWLERS

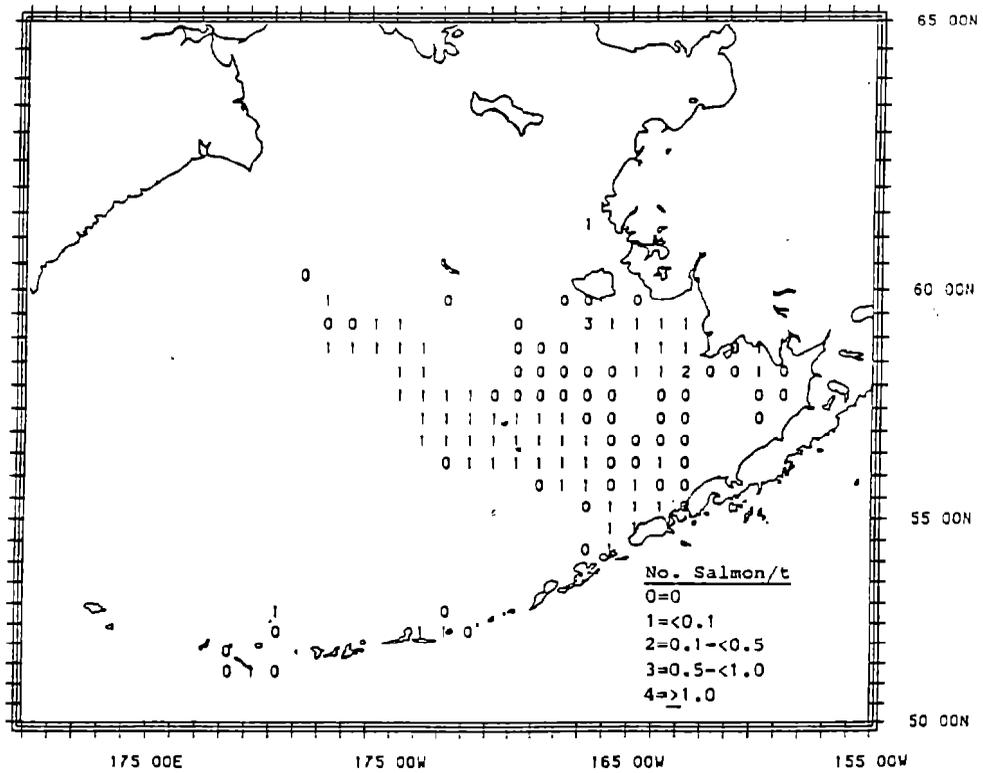


SALMON INCIDENCE 87 FOURTH QUARTER SMALL STERN TRAWLERS

Figure 3. -continued.

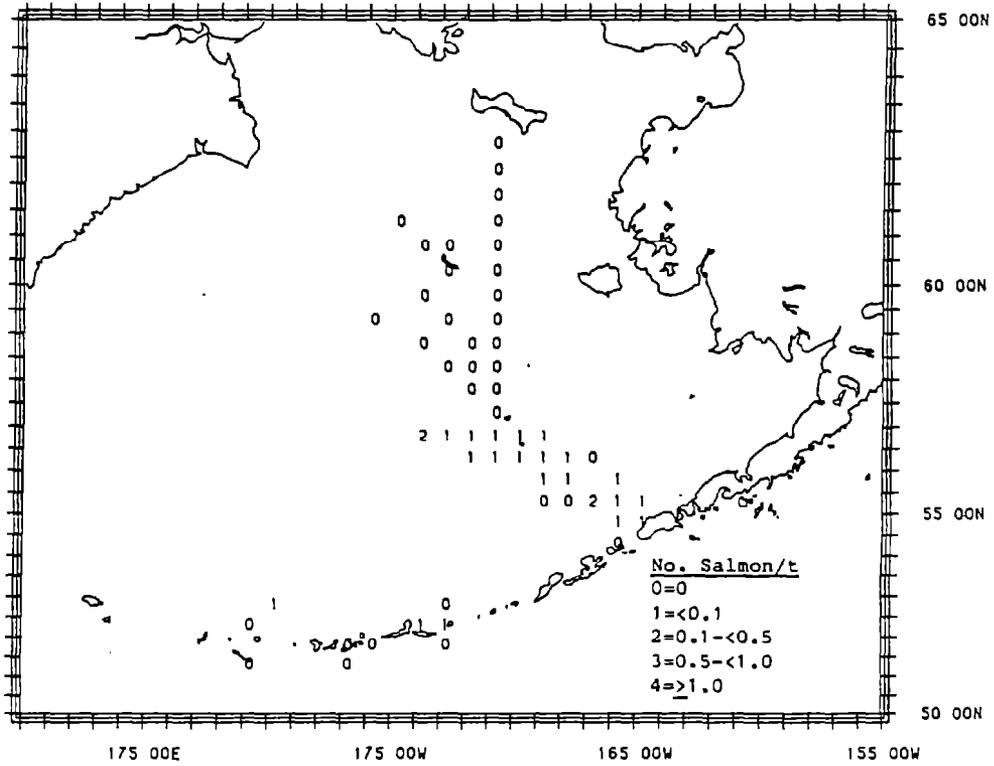


SALMON INCIDENCE 87 FIRST QUARTER JOINT VENTURE VESSELS

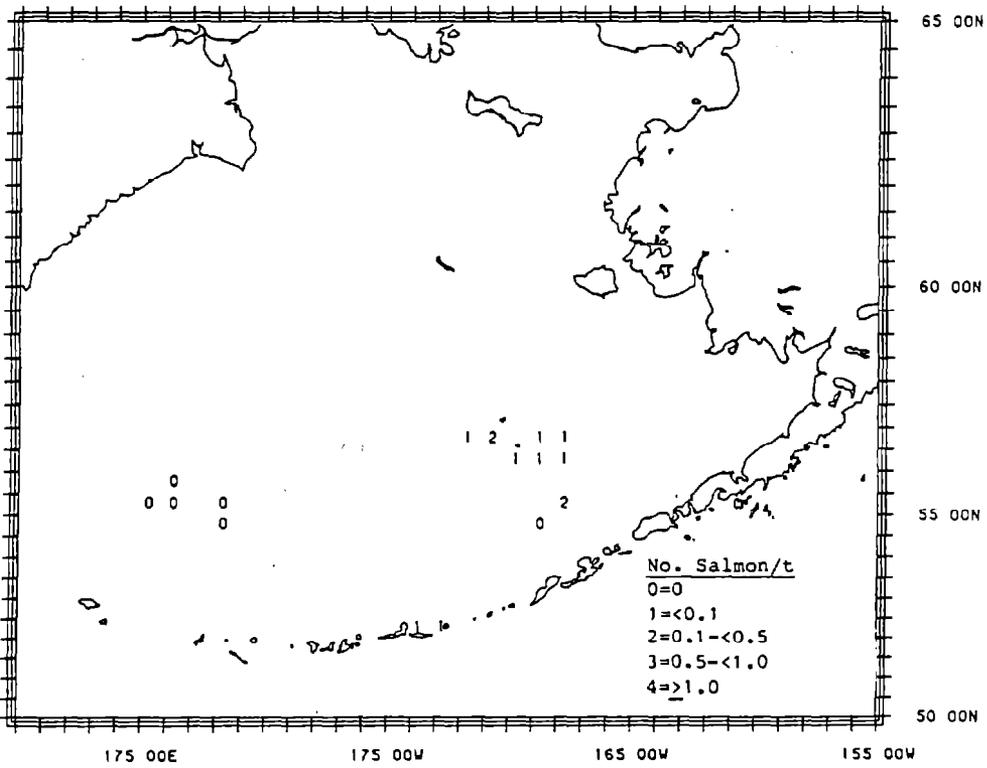


SALMON INCIDENCE 87 SECOND QUARTER JOINT VENTURE VESSELS

Figure 4.--Average incidence (no./t) of Pacific salmon in the joint venture fisheries by quarter and 1/2° lat. by 1° long. areas, 1987.

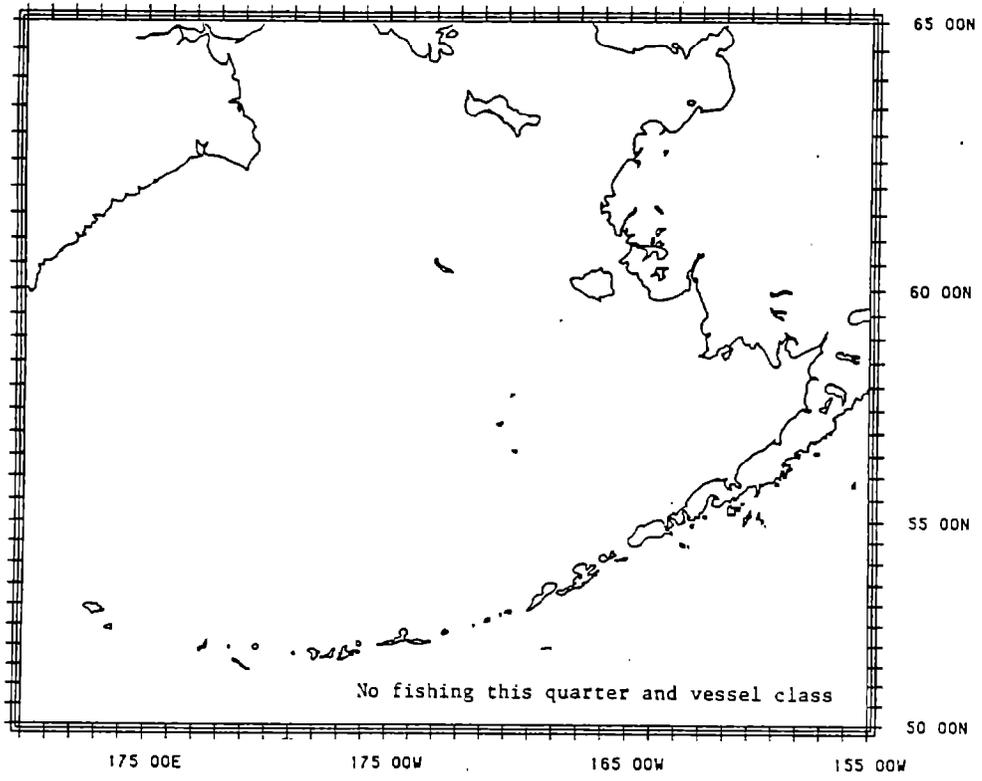


SALMON INCIDENCE 87 THIRD QUARTER JOINT VENTURE VESSELS

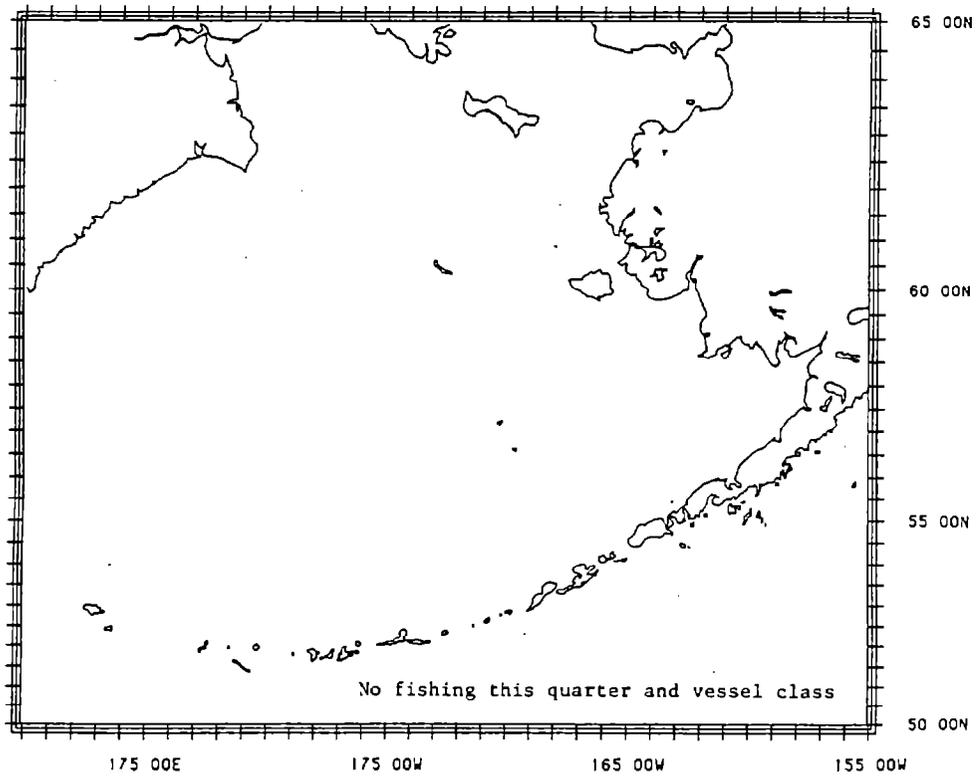


SALMON INCIDENCE 87 FOURTH QUARTER JOINT VENTURE VESSELS

Figure 4. --Continued.

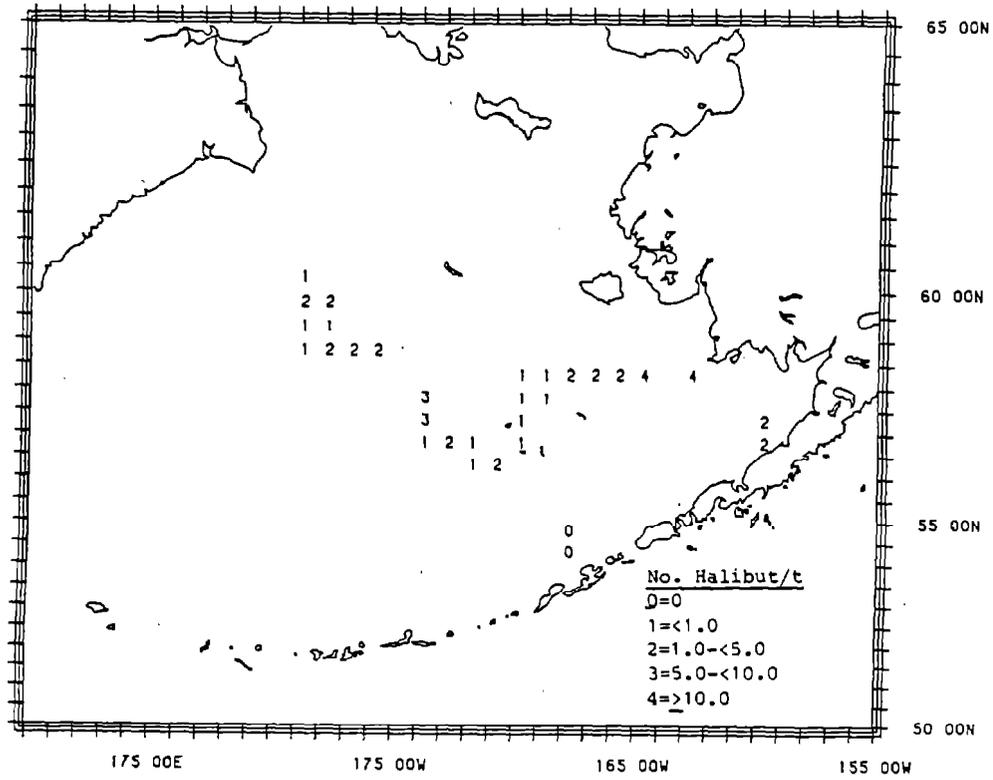


HALIBUT INCIDENCE 87 FIRST QUARTER SMALL STERN TRAWLERS

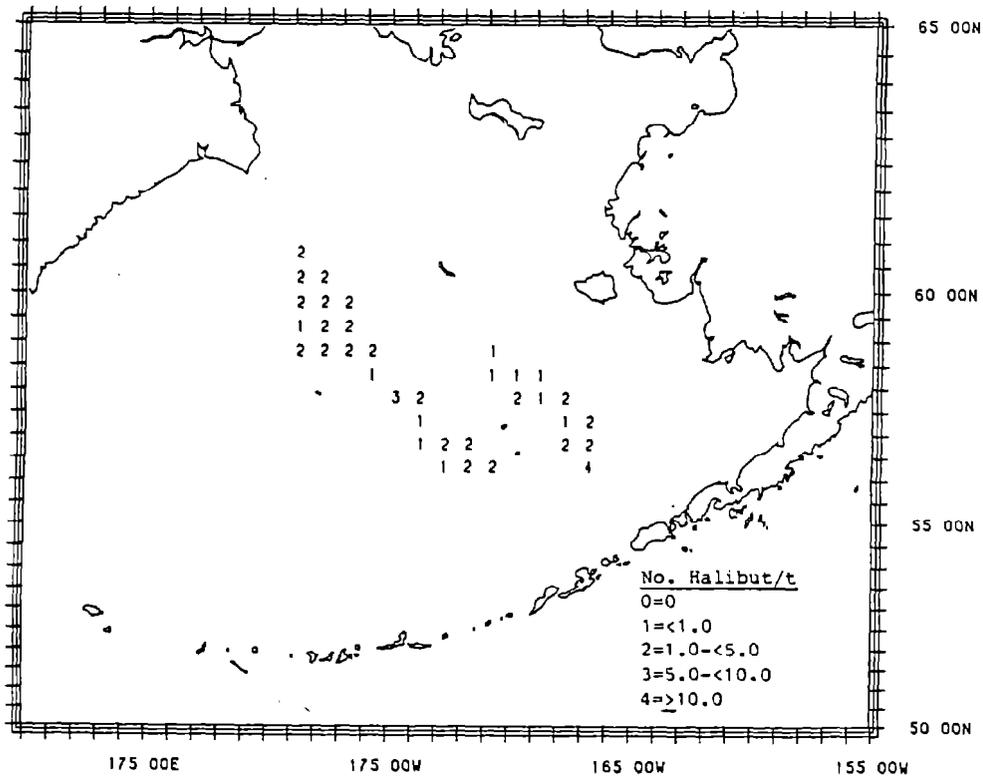


HALIBUT INCIDENCE 87 SECOND QUARTER SMALL STERN TRAWLERS

Figure 5.--Average incidence (no./t) of Pacific halibut on small stern trawlers by quarter and 1/2° lat. by 1° long. areas, 1987.



HALIBUT INCIDENCE 87 THIRD QUARTER SMALL STERN TRAWLERS



HALIBUT INCIDENCE 87 FOURTH QUARTER SMALL STERN TRAWLERS

Figure 5.--Continued.

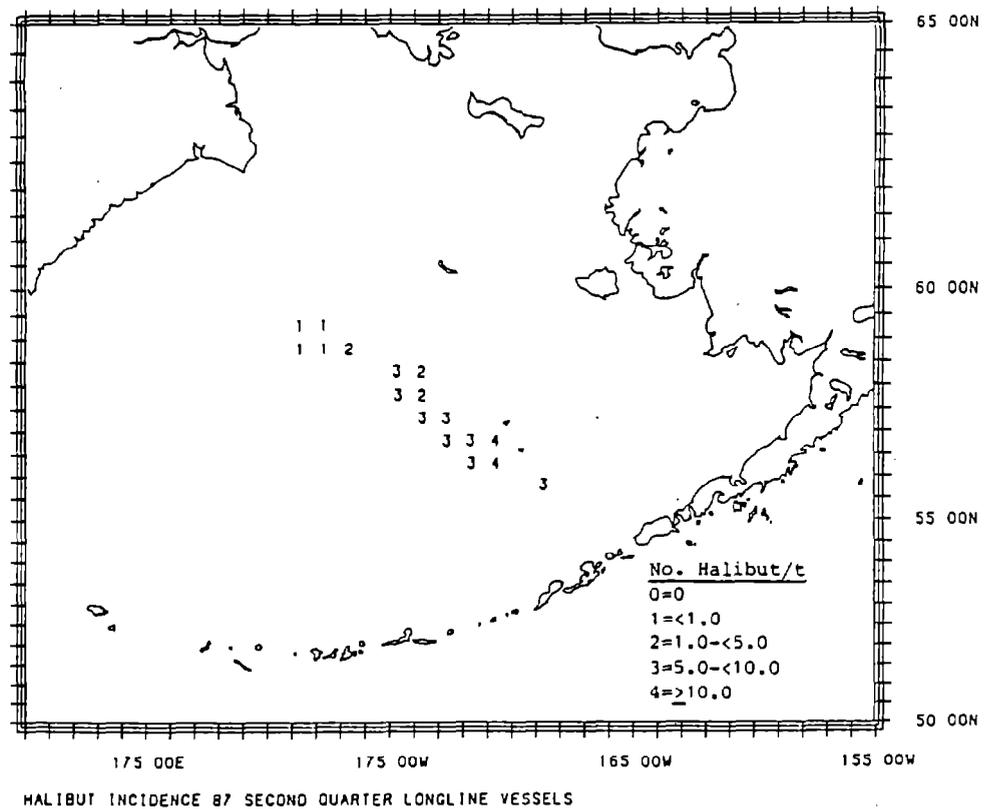
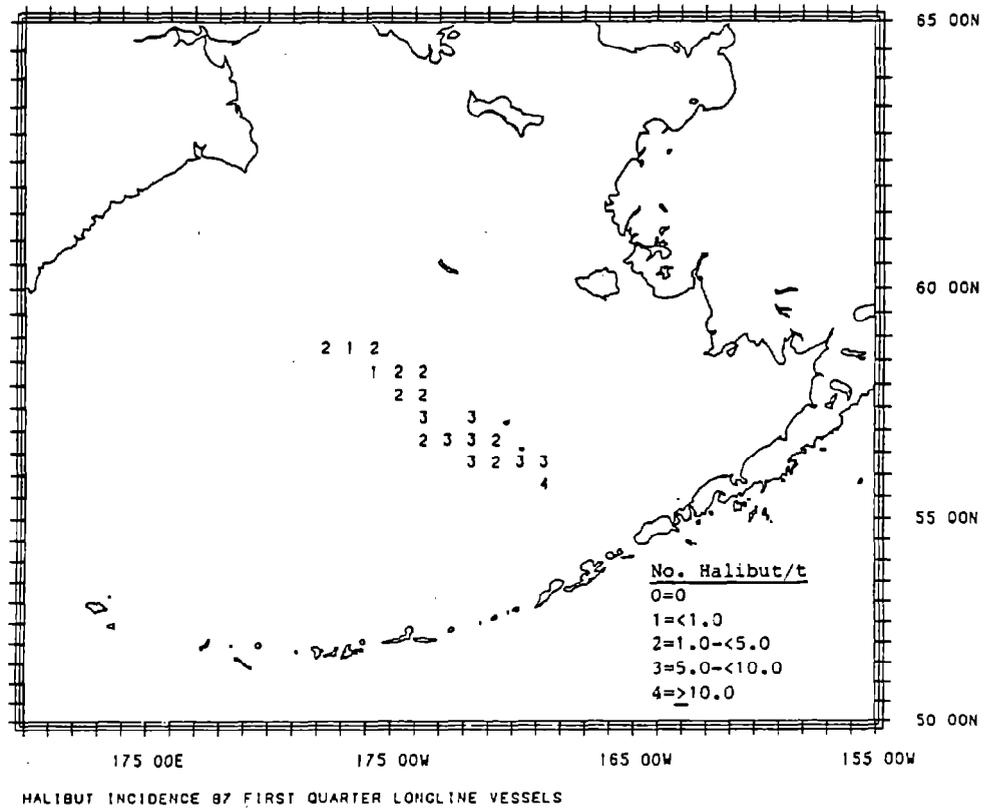
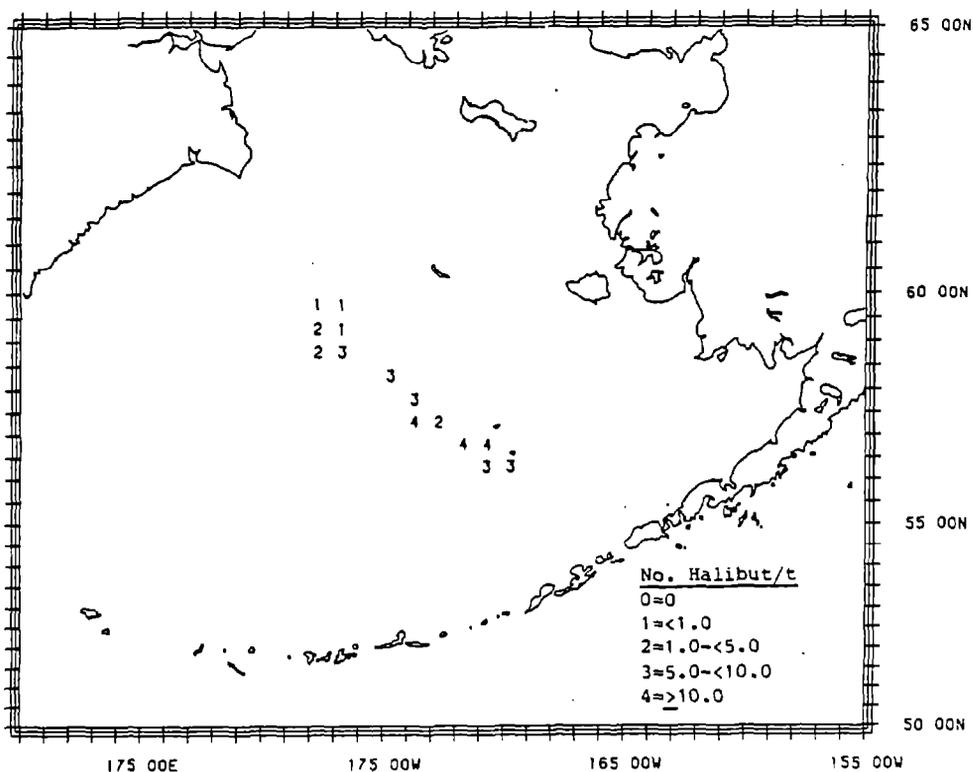
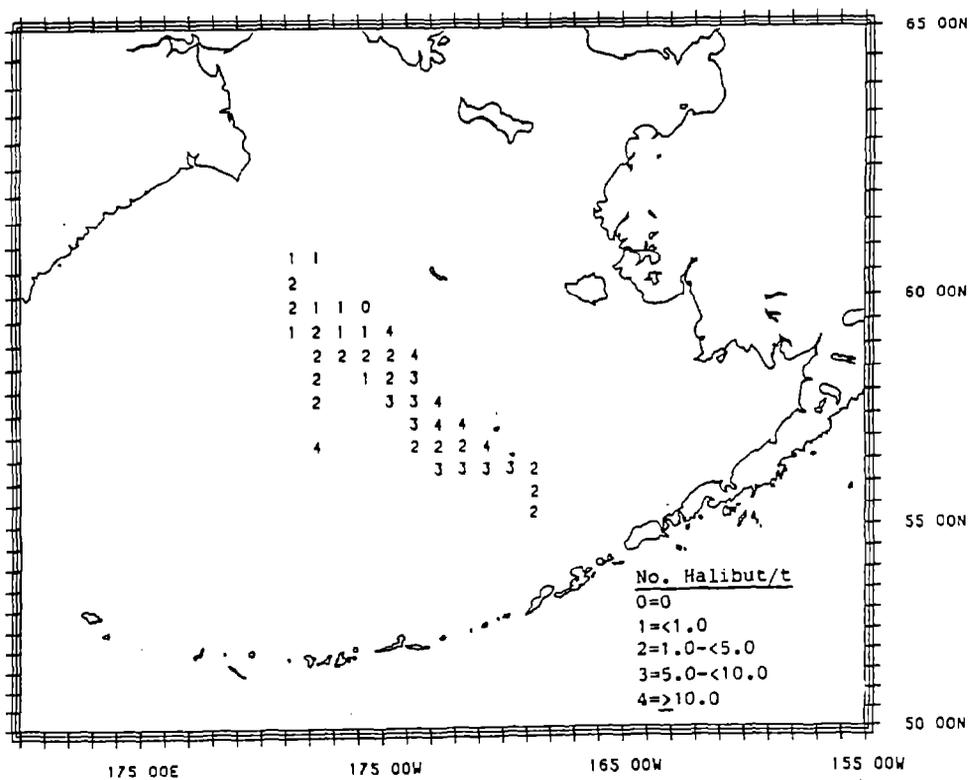


Figure 6.--Average incidence (no./t) of Pacific halibut on longline vessels by quarter and 1/2° lat. by 1° long. areas, 1987.



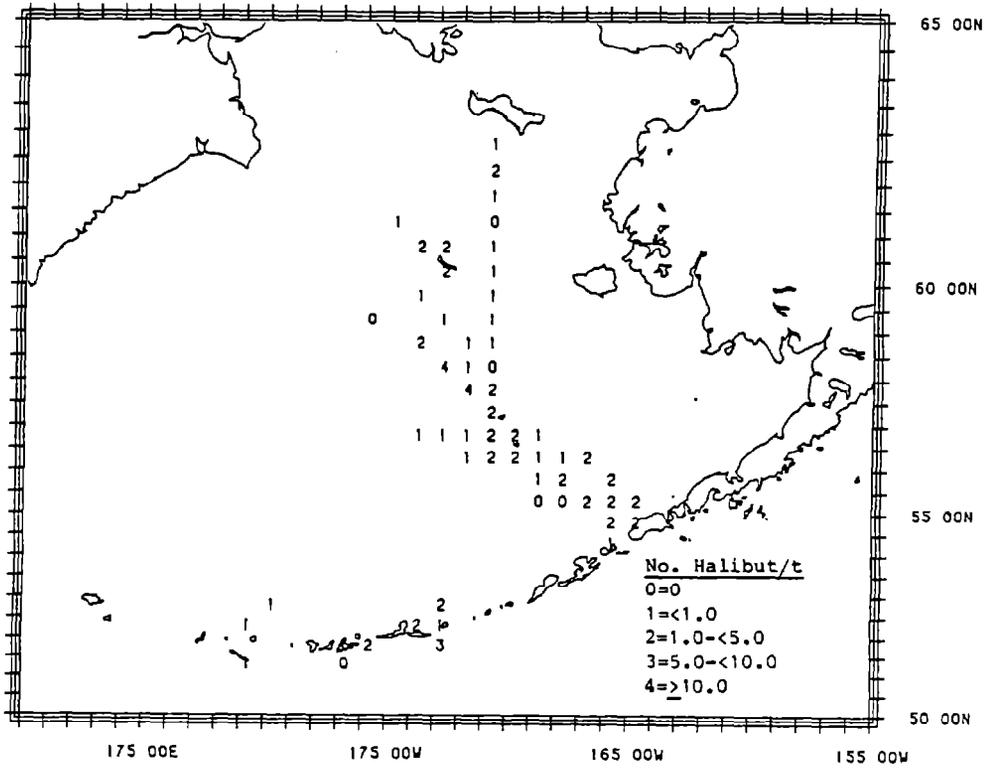
HALIBUT INCIDENCE 87 THIRD QUARTER LONGLINE VESSELS



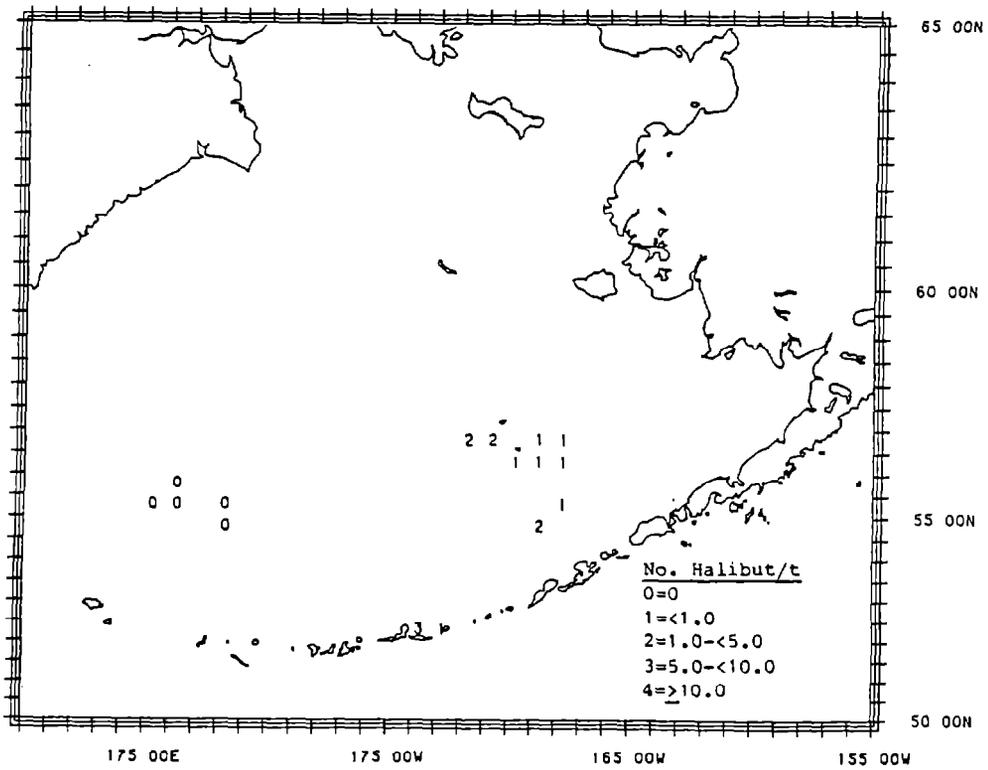
HALIBUT INCIDENCE 87 FOURTH QUARTER LONGLINE VESSELS

Figure 6. --Continued.





HALIBUT INCIDENCE 87 THIRD QUARTER JOINT VENTURE VESSELS



HALIBUT INCIDENCE 87 FOURTH QUARTER JOINT VENTURE VESSELS

Figure 7.-Continued.

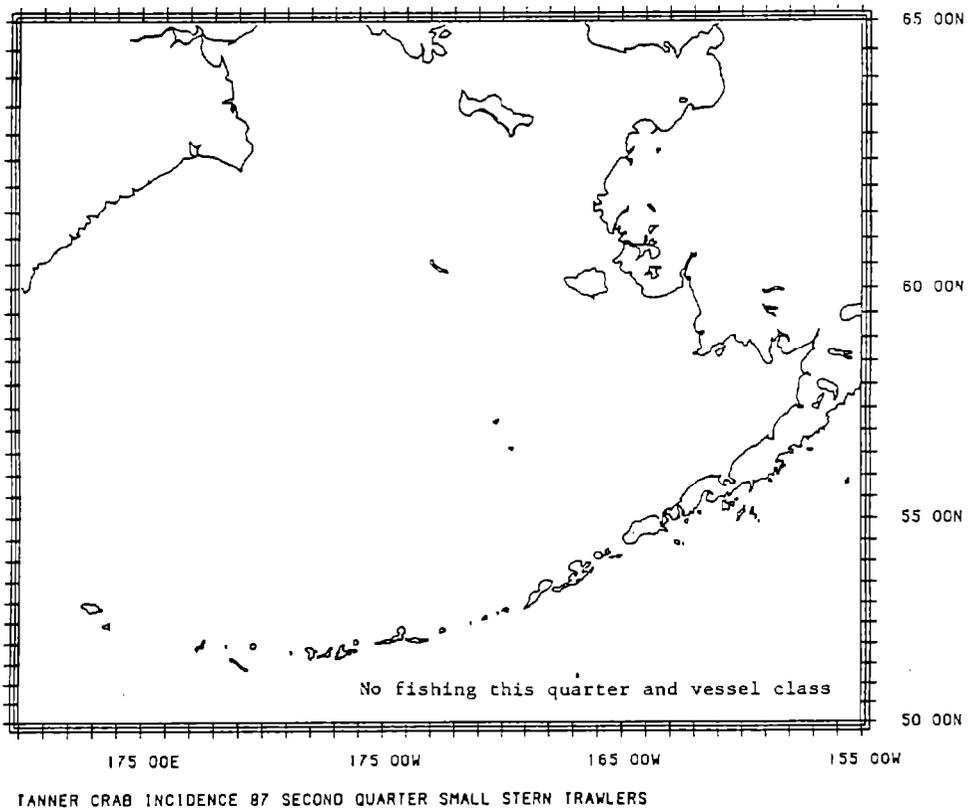
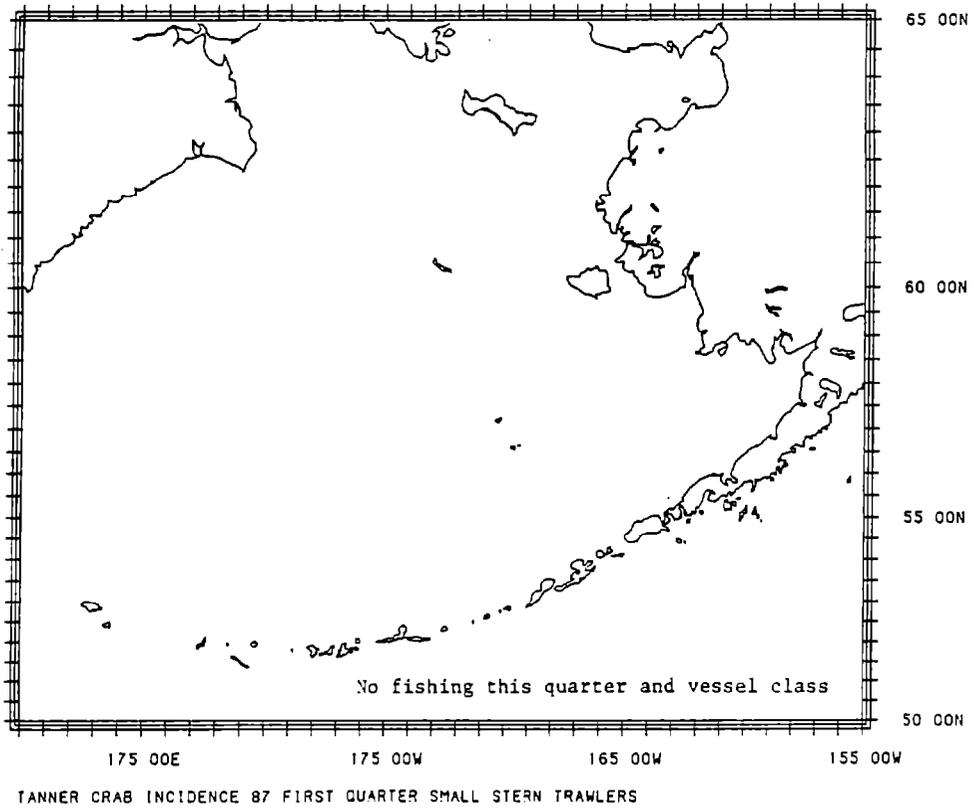


Figure 8.--Average incidence (no./t) of snow (Tanner) crab on small stern trawlers by quarter and 1/2° lat. by 1° long. areas, 1987.

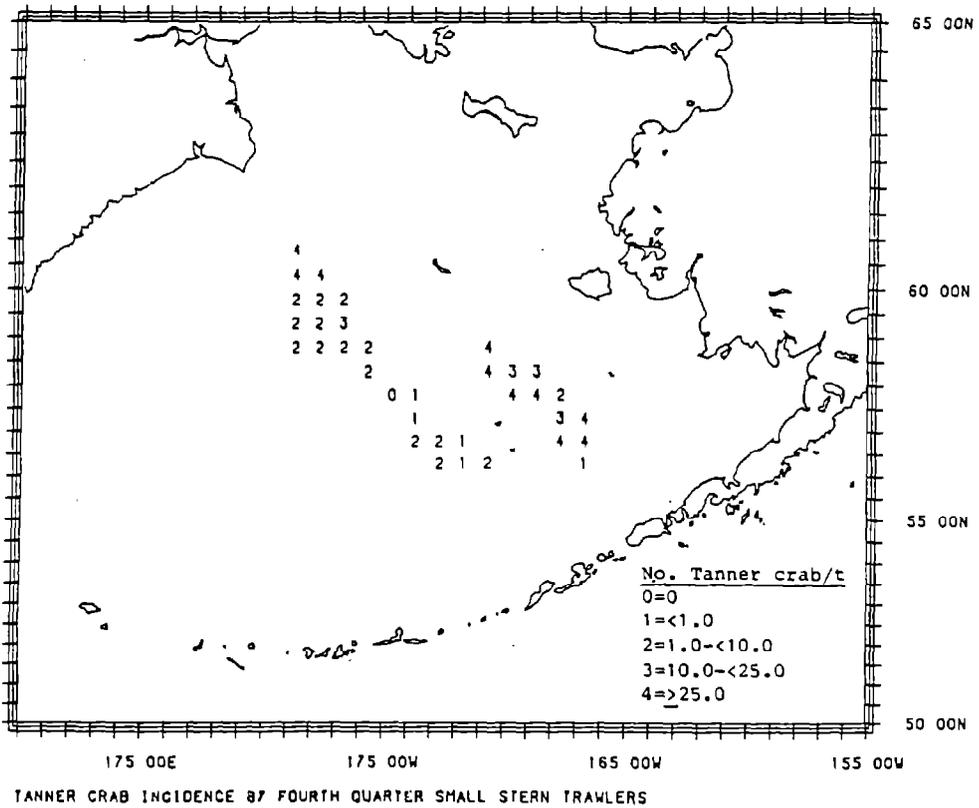
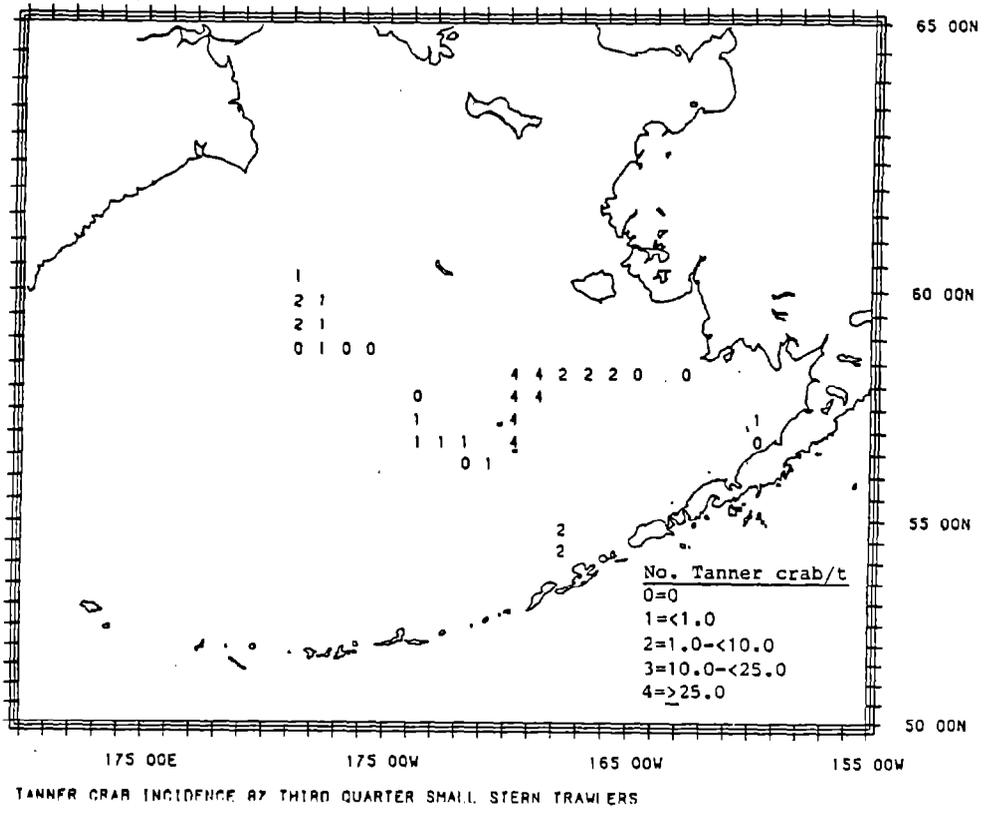
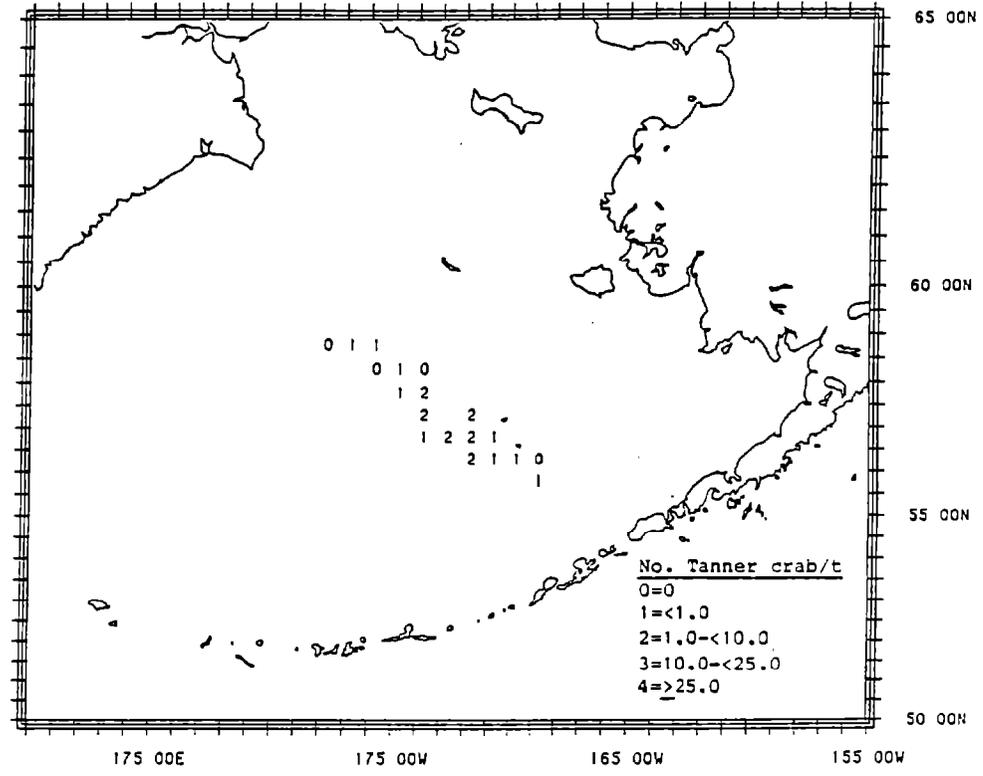
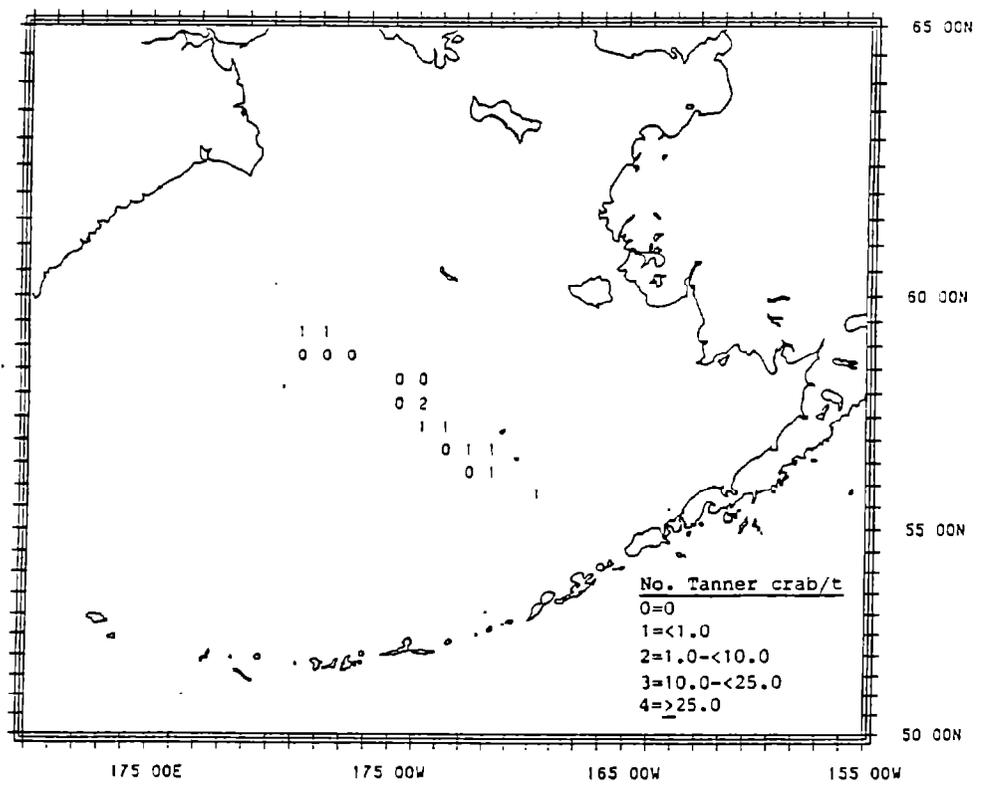


Figure 8. --Continued.

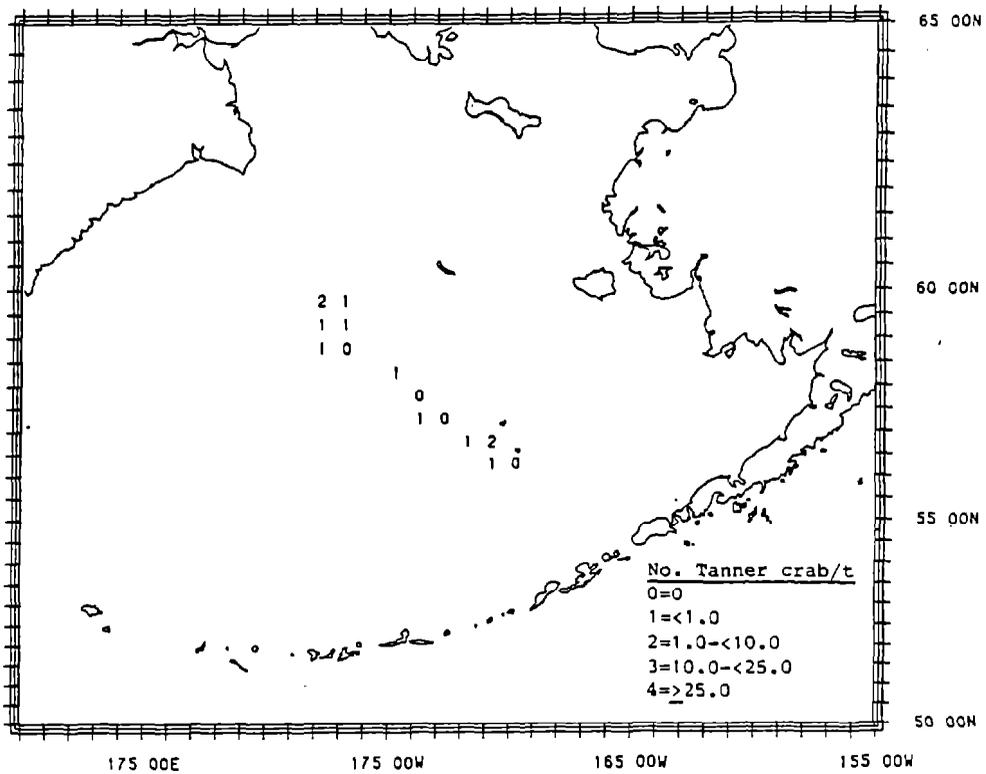


TANNER CRAB INCIDENCE 87 FIRST QUARTER LONGLINE VESSELS

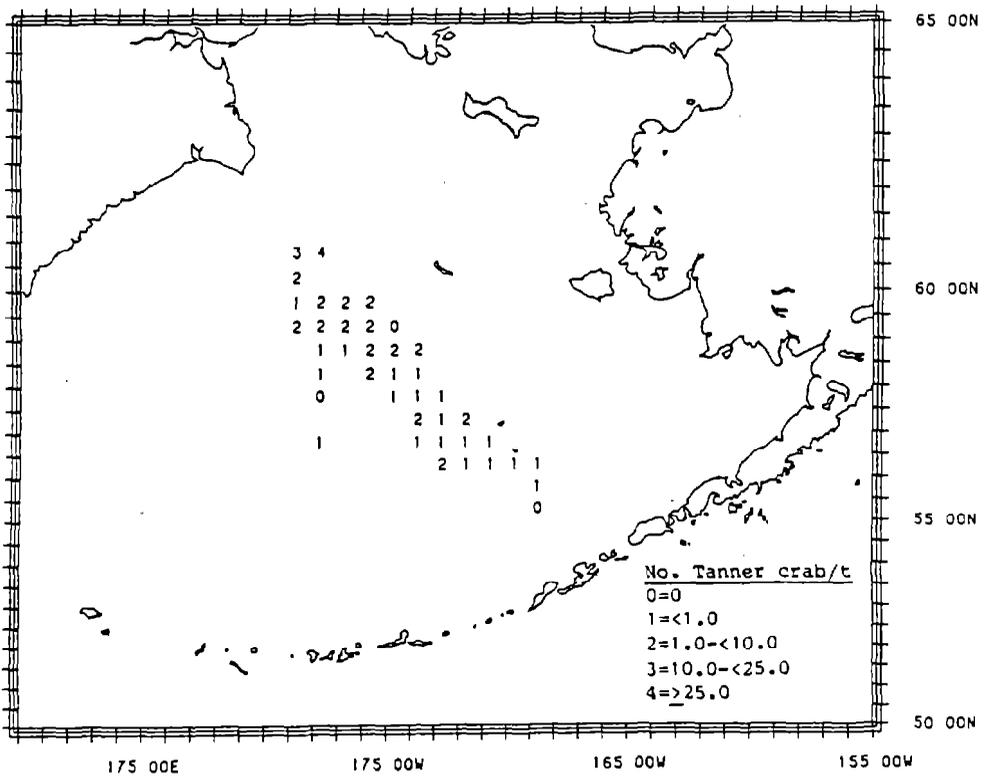


TANNER CRAB INCIDENCE 87 SECOND QUARTER LONGLINE VESSELS

Figure 9. --Average incidence (no./t) of snow (Tanner) crab on longline vessels by quarter and 1/2° lat. by 1° long. areas, 1987.

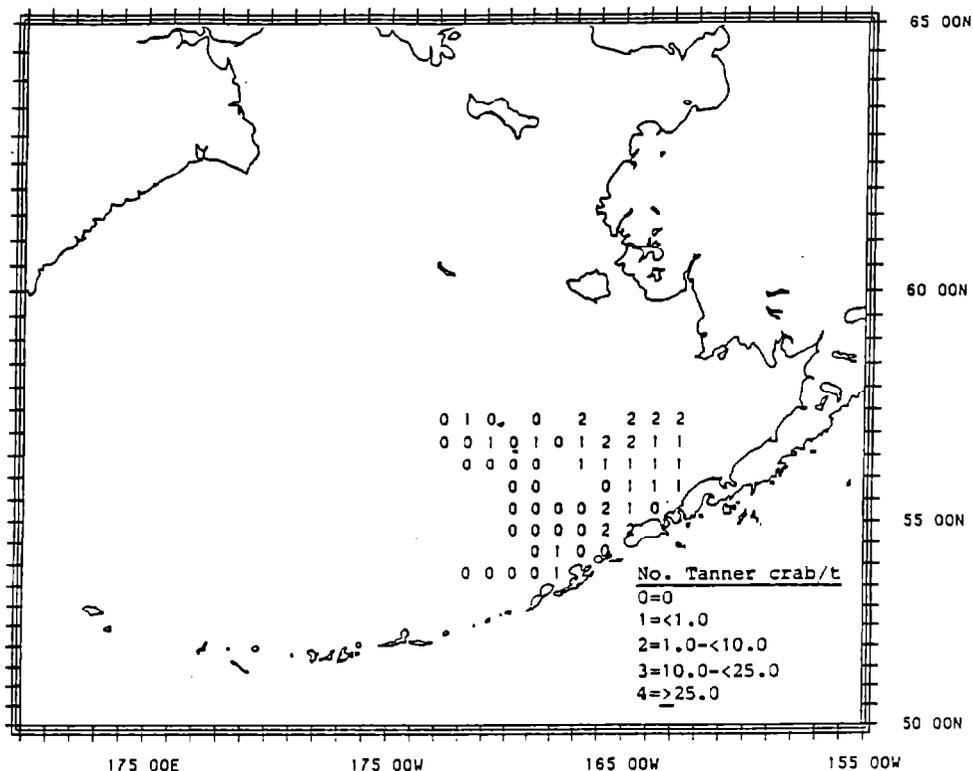


TANNER CRAB INCIDENCE 87 THIRD QUARTER LONGLINE VESSELS

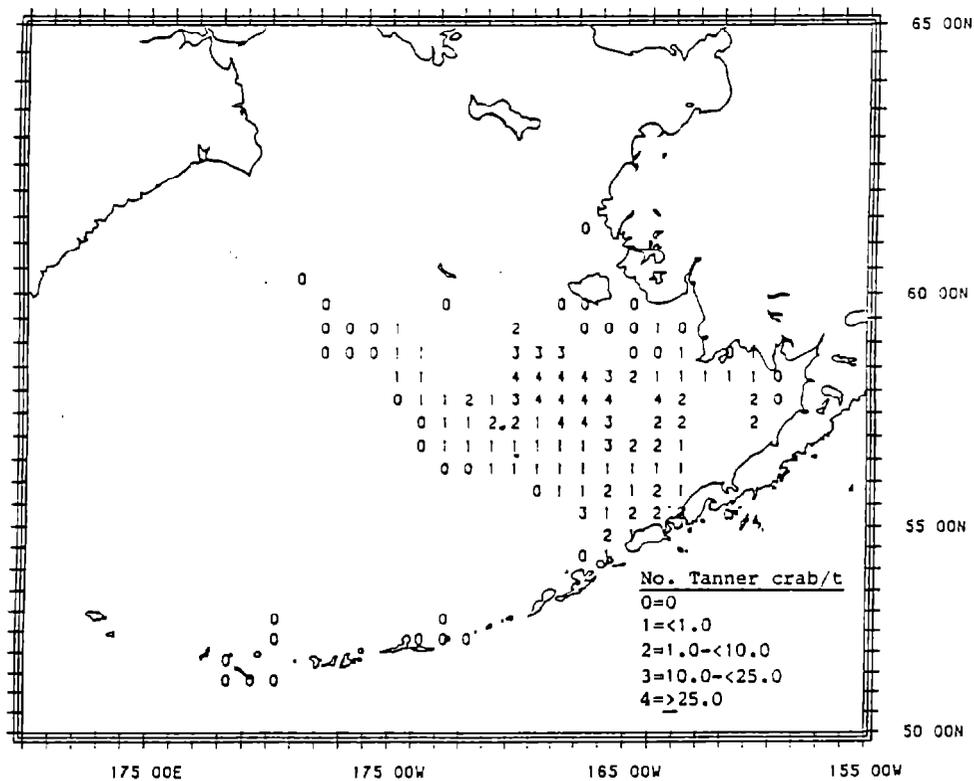


TANNER CRAB INCIDENCE 87 FOURTH QUARTER LONGLINE VESSELS

Figure 9. -Continued.

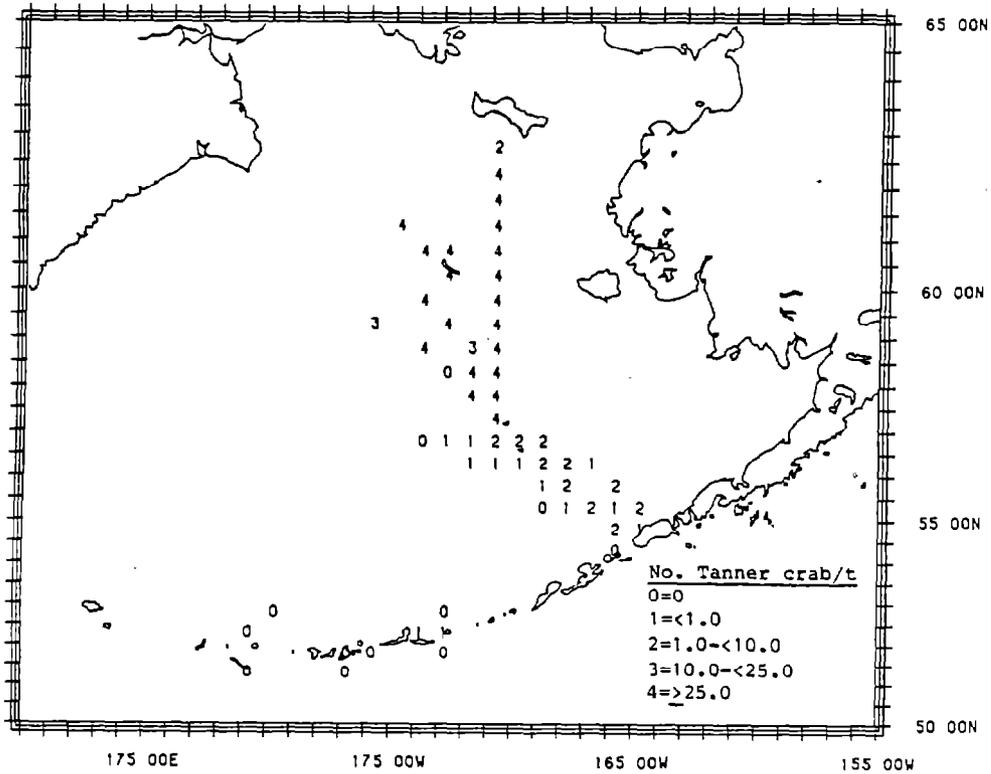


TANNER CRAB INCIDENCE 87 FIRST QUARTER JOINT VENTURE VESSELS

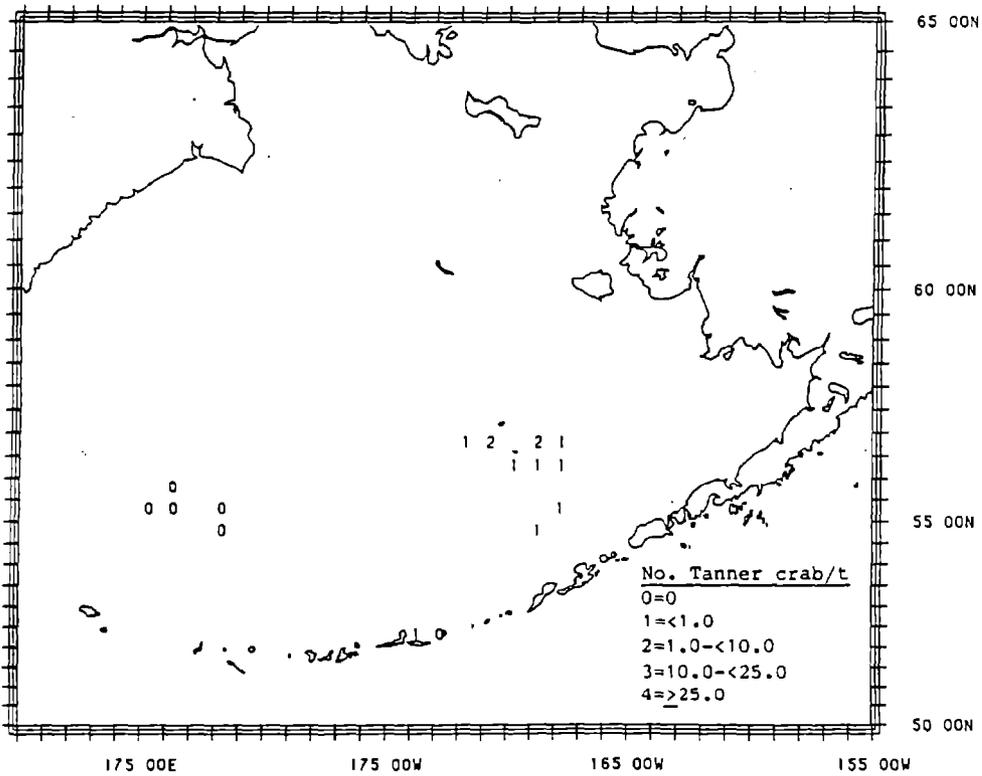


TANNER CRAB INCIDENCE 87 SECOND QUARTER JOINT VENTURE VESSELS

Figure 10.--Average incidence (no./t) of snow (Tanner) crab in the joint venture fisheries by quarter and 1/2° lat. by 1° long. areas, 1987.



TANNER CRAB INCIDENCE 87 THIRD QUARTER JOINT VENTURE VESSELS



TANNER CRAB INCIDENCE 87 FOURTH QUARTER JOINT VENTURE VESSELS

Figure 10.--Continued.

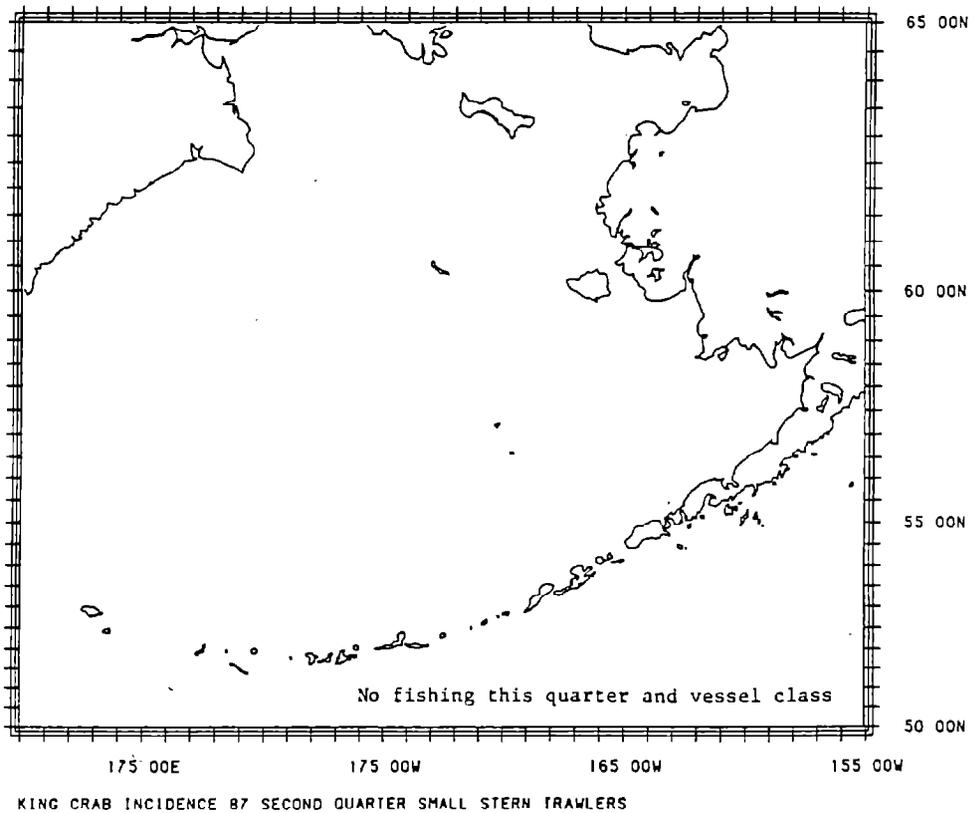
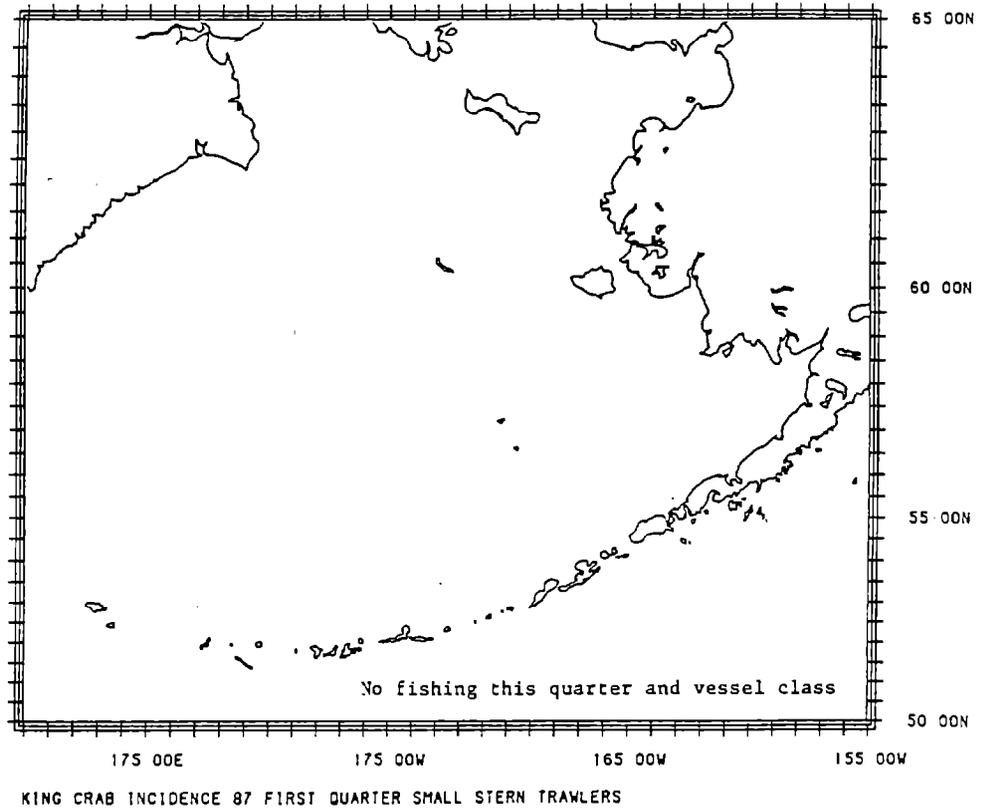
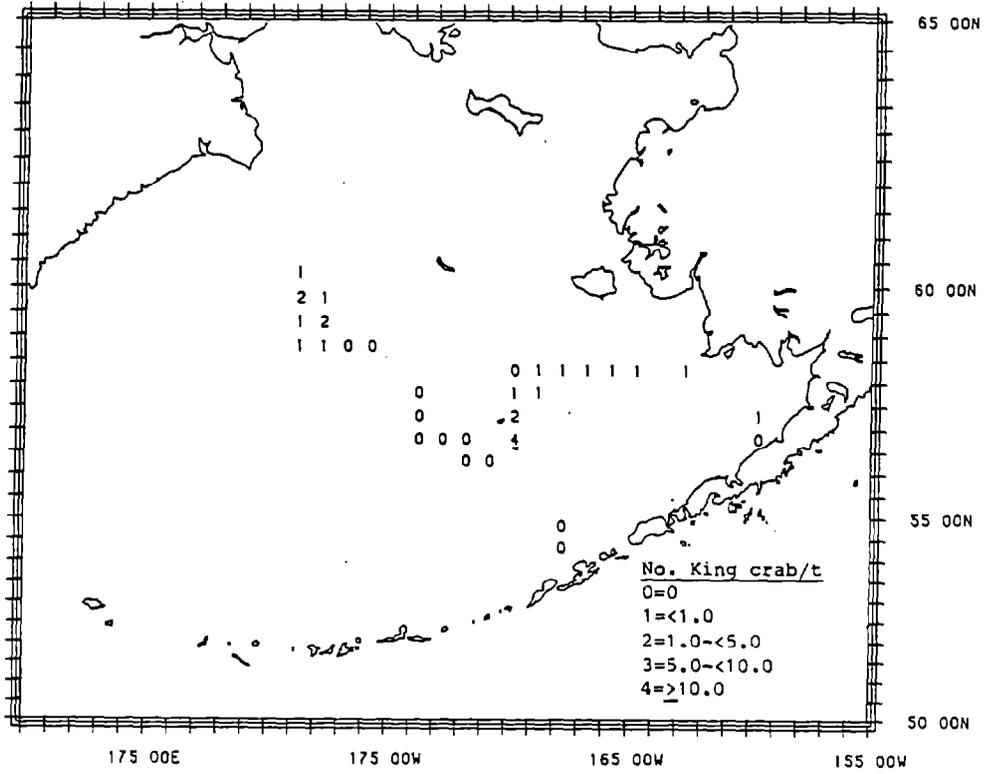
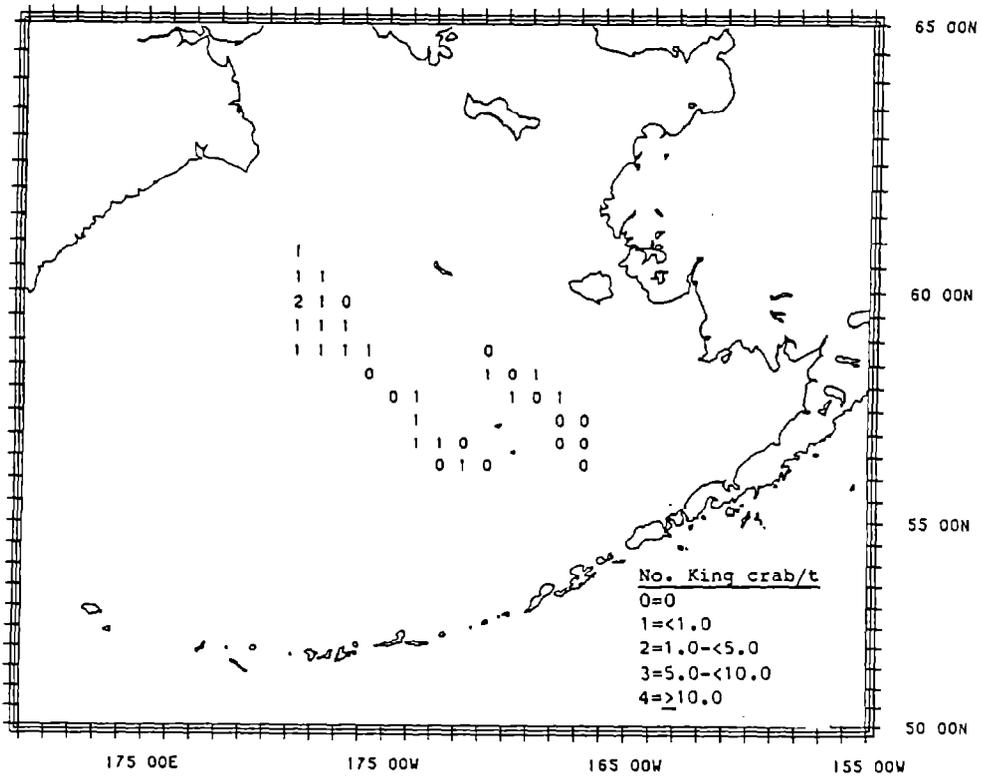


Figure 11 .--Average incidence (no./t) of king crab on small stern trawlers by quarter and  $1/2^\circ$  lat. by  $1^\circ$  long. areas, 1987.

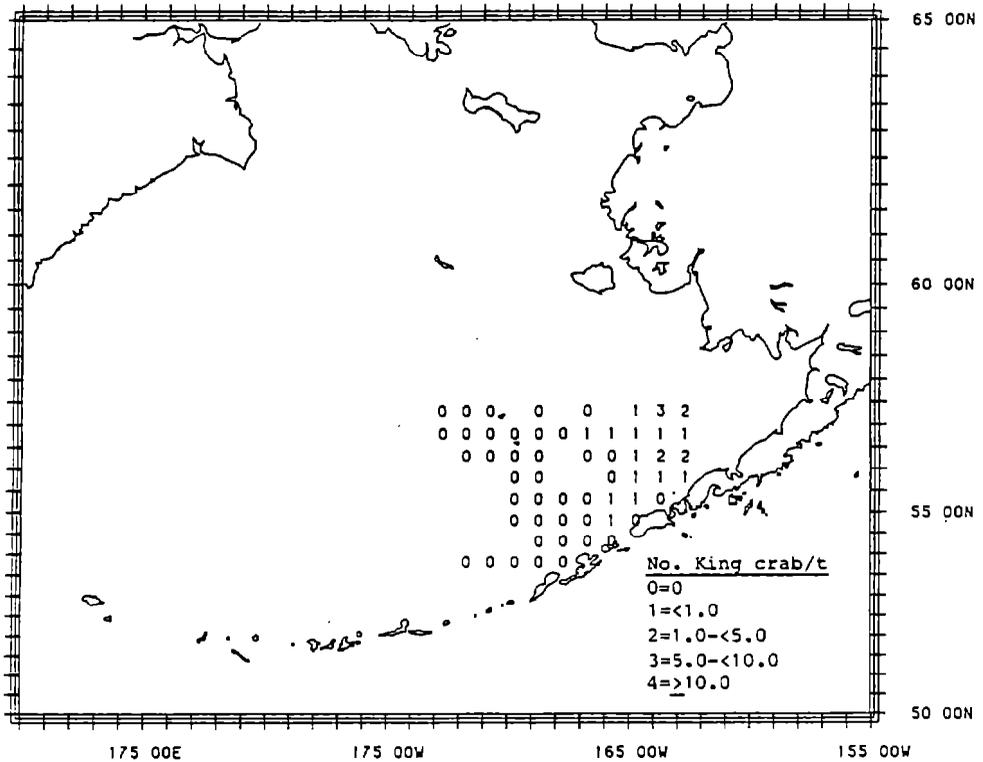


KING CRAB INCIDENCE BY THIRD QUARTER SMALL STERN TRAWLERS

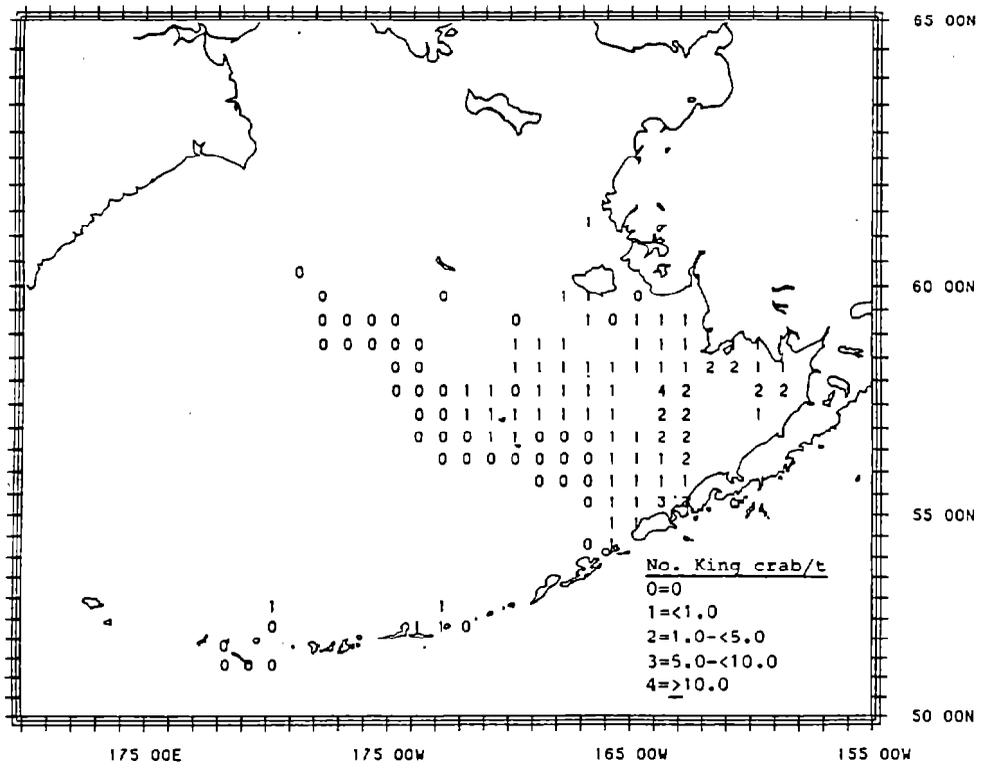


KING CRAB INCIDENCE BY FOURTH QUARTER SMALL STERN TRAWLERS

Figure 11. -Continued.

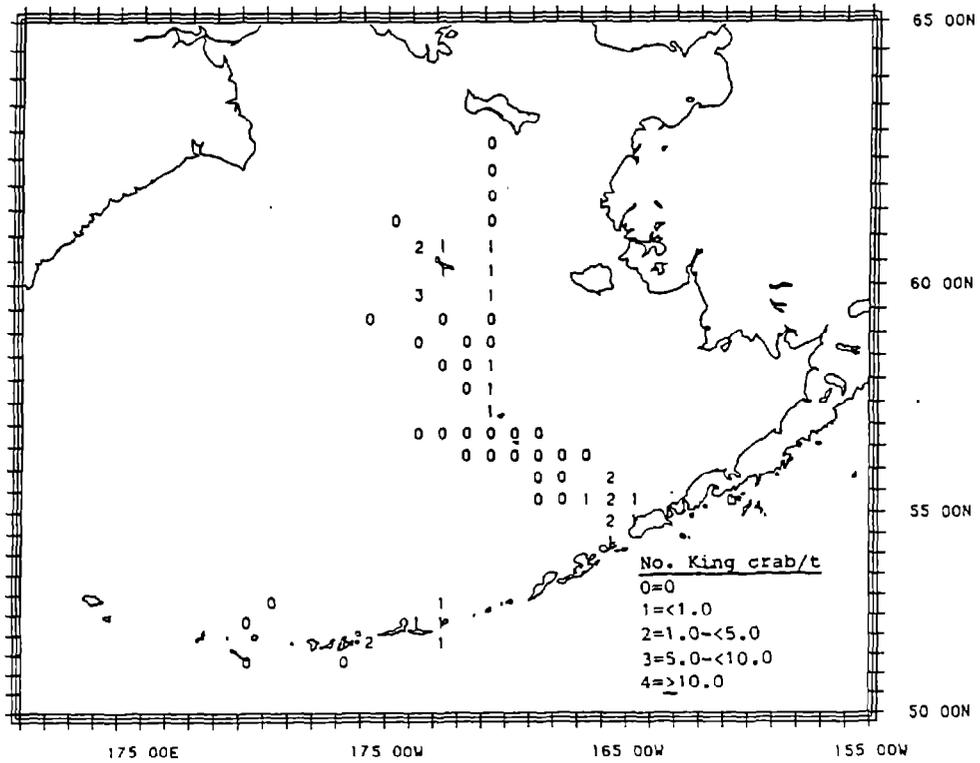


KING CRAB INCIDENCE 87 FIRST QUARTER JOINT VENTURE VESSELS

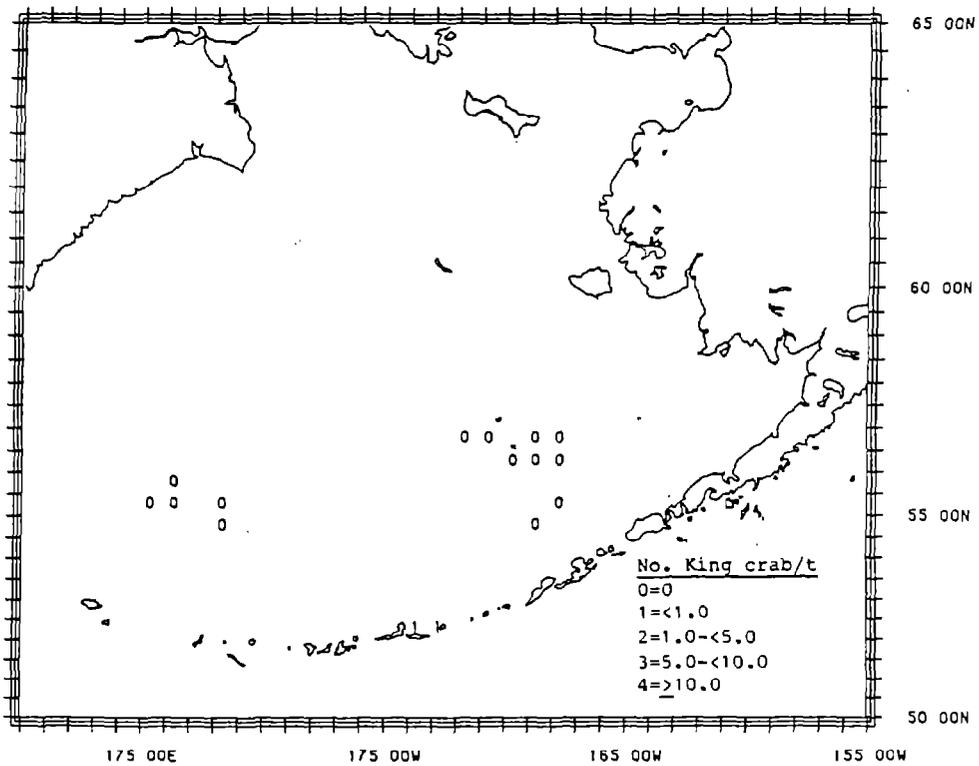


KING CRAB INCIDENCE 87 SECOND QUARTER JOINT VENTURE VESSELS

Figure 12.--Average incidence (no./t) of king crab in the joint Venture fisheries by quarter and 1/2° lat. by 1° long. areas, 1987.



KING CRAB INCIDENCE 87 THIRD QUARTER JOINT VENTURE VESSELS



KING CRAB INCIDENCE 87 FOURTH QUARTER JOINT VENTURE VESSELS

Figure 12. --Continued.

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## SUMMARY OF OBSERVER SAMPLING FOR THE GULF OF ALASKA REGION

## Observer Coverage of Fishing Fleets

During 1987, there were no quotas issued for foreign fishing in the U.S. 200-mile EEZ in the Gulf of Alaska region (Fig. 13). The effort of foreign vessels participating in joint ventures with U.S. catcher boats in 1987 was lower (down 36%) than in 1986. No joint venture operations were permitted to target on walleye pollock in the Shelikof Strait, and this resulted in foreign vessels spending only 374 days in joint venture fishing operations (Table 26). These joint ventures were conducted between U.S. vessels and processing vessels from Japan, the Republic of Korea (ROK), and the People's Republic of China (PRC). Observers spent 373 days sampling aboard these foreign processing vessels, providing an observer coverage (100 x number of, observer days/number of foreign vessel days) of 99.7%. In 1986, the overall percent coverage by observers was 98.1%.

## Estimates of U.S. Joint Venture Catches

In 1987, a total of 32,500 t of groundfish were landed in the U.S. joint venture fisheries (Table 27). Walleye pollock constituted 70.2% of the joint venture catch. The catches of flatfish (22.2%) and Pacific cod (6.1%) composed most of the remaining catch. These species were taken in various fisheries conducted in the Shumagin, Chirikof, and Kodiak areas throughout the second half of the year. The Pacific ocean perch complex, the other rockfish complex, and sablefish (Anoplopoma fimbria) were declared prohibited species for the joint venture fisheries in 1987 since essentially all of the allowable catch was set aside for the U.S. domestic fishery (excluding joint venture fisheries). Prohibited species catch (PSC) limits were established for each of these three management groups and though the catches of these species could not be retained, catches in excess of the PSC limits could close the target fishery. The pollock fishery caught its allotted tonnage of pollock and was closed 18 October. Catches in excess of the PSC limits for Pacific ocean perch and sablefish led to the closure of the remaining joint venture operations 5 November.

Table 28 presents a summary of the foreign and joint venture catches by species for the years 1977 to 1987. The 1987 U.S. joint venture groundfish catch decreased 50.2% from 1986, and was the lowest joint venture catch since 1981. This is in sharp contrast to the rapid growth of joint ventures through 1985, and reflects lower allocations due in part to a reduction in the optimum yield of pollock and also to the increased catches taken by U.S. domestic operations (excluding joint ventures) in the Gulf of Alaska. The 1987 total estimated removal of fish from the Gulf of Alaska by joint venture fisheries amounted to 32,526 t, a 59.8% decrease from the estimated foreign and joint venture removal in 1986 of 80,834 t.

## Incidence and Incidental Catch of Prohibited Species

## Pacific Salmon

Incidental catches of Pacific salmon occurred in groundfish catches made by joint venture vessels in the Shumagin, Chirikof, and Kodiak areas in 1987. The incidence and average weights of salmon taken in catches sampled by observers are listed in Table 29. Monthly salmon catches were generally lower than 0.100 fish/t. Annual salmon incidence rates were all less than 0.05 fish/t.

The incidence of salmon by 1/2° latitude by 1° longitude statistical block is illustrated for joint venture vessels in Figure 14. No occurrences of over one salmon/t were observed on joint venture vessels.-

The estimated incidental catches of salmon, by area and nation, are shown in Table 30. The 1987 estimated catch in the joint venture fishery was 1,221 salmon. Over 77.7% of the salmon were taken in the Shumagin area, 4.1% of the salmon were caught in the Chirikof area, and 18.2% were caught in the Kodiak area. In 1985 and 1986, most of the incidental salmon catch occurred in a pollock fishery conducted in the Kodiak area during the fourth quarter of the year. In 1987, the pollock fishery was conducted in the Shumagin area. The joint venture quota for pollock was approached and the fishery closed 18 October. The incidental catch in the 1987 joint venture operations was 94.1% lower than that taken in 1986 (Table 31). The total catch of 1,221 salmon was the smallest catch since 1977.

The species composition, sex composition, and average weight and length of the salmon species are given in Table 32. Not only has the total number of salmon dropped substantially, but the change in fishing targets has changed the composition of salmon in the catch. In the 1986 joint venture fishery, chinook salmon accounted for 99.7% (about 20,290 fish) of the salmon catch, chum salmon (53 fish), and coho salmon (Oncorhynchus kisutch) (6 fish) made up the remainder. In 1987, chinook salmon (761 fish) made up 62.4% of the salmon catch, chum salmon (456 fish) accounted for 37.3%, and coho salmon (4 fish) comprised 0.3%. Chinook salmon had an average weight of 3.0 kg and an average length of 59.0 cm. Chum salmon had an average weight of 3.1 kg and an average length of 64.5 cm.

## Pacific Halibut

Table 33 lists the incidence of halibut in joint venture catches by nation and areas. Halibut incidence varied widely between areas. Fisheries in the Shumagin area targeted on pollock and had incidence rates between 2 and 7 halibut/t. Fisheries in the Chirikof area targeted on flounders and Pacific cod and averaged 32 halibut/t. Fisheries in the Kodiak area also targeted on flounders and Pacific cod but had rates between 7 and 15 halibut/t.

The incidence of halibut by 1/2° latitude by 1° longitude block is illustrated by quarter of the year for the joint venture fisheries (Fig. 15). No joint venture operations were conducted during the first half of the year. In the third quarter, all fishing operations took place in the vicinity of

Kodiak Island, and incidence rates for the quarter frequently exceeded 10 halibut/t. In the fourth quarter, incidence rates exceeded 10 halibut/t around Kodiak Island, and were between 1 and 5 halibut/t along the Alaskan Peninsula.

The estimated incidental catches of Pacific halibut, by area and nation, are shown in Table 34. In 1987, the joint venture incidental catch of halibut was 196,924 fish, almost half of which were caught in the Shumagin area (46.4%). Table 35 presents a summary of the foreign and joint venture incidental catches of Pacific halibut for the years 1977 to 1987. Increased effort by the joint venture operations outside of the Shelikof Strait in 1987 led to an increase in the joint venture catch of halibut. The 1987 joint venture halibut catch was 196,900 fish (655.9 t), a 6.2-fold increase by number and a 6.3-fold increase by weight from that of 1986. Even so, the total halibut catch by the joint venture fisheries of 196,924 fish was still the second lowest combined (foreign and joint venture) catch by number and third lowest by weight since the MFCMA was implemented in 1977. Halibut taken in the 1987 joint venture fishery averaged 68.0 cm (3.7 kg) in the Shumagin area, 51.2 cm (1.6 kg) in the Chirikof area, and 56.8 cm (3.2 kg) in the Kodiak area.

#### Snow (Tanner) Crab

Table 36 presents the incidence of snow (Tanner) crab in joint venture catches by nation and area. Tanner crab annual incidence exceeded 1.0 crab/t in catches made in the U.S.-Japan joint venture fishery in the Kodiak area (1.033 crab/t). Incidence rates of Tanner crab were less than 0.1 crab/t for all other operations and areas.

The incidence of Tanner crab in joint venture catches is shown by 1/2° latitude and 1° longitude block by quarter in Figure 16. In the third quarter, three locations near Kodiak Island had rates of 1-10 crab/t. In the fourth quarter, four locations around Kodiak Island had rates of 1-10 crab/t. In all other areas, the incidence rates of Tanner crab were below 1 crab/t.

The joint venture fishery caught less than 5,500 Tanner crab in 1987 (Table 37), 96.3% of the catch occurring in the Kodiak area. This level of catch was 53% lower than the foreign and joint venture catch in 1986 (Table 38). The overall decrease was due in part to the ban on foreign fishing, but was mostly due to the decreased effort by joint venture vessels in the Gulf of Alaska and decreased incidence rates in areas outside of the Shelikof Strait. The total catch of Tanner crab (5,496 crab) was the lowest recorded catch for the years 1978-87.

The species composition, sex composition, and average size of the Tanner crab are given in Table 39. As in 1986, only two species of Tanner crab were identified in the 1987 joint venture operations: Chionoecetes bairdi and C. opilio. Chionoecetes bairdi again made up almost all (99.74%) of the total crab catch; C. opilio (0.26%) accounted for the remainder.

## King Crab

Table 40 gives the incidence of king crab in the 1987 joint venture fisheries by nation and area. The mean annual incidence rates were very low and ranged from 0 to 0.030 crab/t. The highest monthly incidence rates were in the U.S.-Japan operation in the Chirikof area in October (0.030 crab/t). No other joint venture operation had a monthly incidence rate higher than 0.006 crab/t.

The estimated incidental catches of king crab, by area and nation, are shown in Table 41. The joint venture fishery only landed an estimated 69 king crab in 1987 compared to 33 caught in 1986. Most of the king crab were taken in the Chirikof area (71.0%). The Shumagin and Kodiak areas each yielded 14.5% of the king crab catch. Table 42 presents a summary of the foreign and joint venture incidental catches of king crab for the years 1978 to 1987. The incidental king crab catch of 69 crab (0.18 t) is the second lowest catch by numbers and weight since the implementation of the MFCMA in 1977.

The species composition, sex ratio, and average size of the king crab are given in Table 43. Two species of king crab were identified in the 1987 joint venture groundfish catches, red king crab and golden king crab. Red king crab (94.4%) predominated, and golden king crab (5.6%) accounted for the rest. No blue king crab were reported caught.

## Rockfish Catch by Species

Table 44 lists the common and scientific names of the 15 species of rockfish that were identified by observers as appearing in joint venture catches in the Gulf of Alaska during 1987. In this table, and in Table 45, the group "other rockfish" consists of five species which each account for less than 0.1% of the rockfish catch.

The rockfish catch data by nation and vessel class were combined for each area and are presented in Table 45. As previously mentioned, the catches of rockfish were limited by the establishment of these species as "prohibited species" for joint venture operations in 1987 and the setting of prohibited species catch limits for these species. However, even with these "prohibited species" restrictions and the elimination of foreign fishing operations, the catches of rockfish increased in 1987. This increase can be directly attributed to the increased pollock fishery in the Shumagin area in October of 1987. This fishery yielded 22,657 t of pollock with a bycatch of 142.52 t (0.63%) of rockfish. In 1986, this operation worked from September through December, landed 6,302 t of pollock, and had a bycatch of 61.10 t (0.97%) of rockfish. Even though the rockfish catch showed an increase in 1987, the total of 154.10 t is far below the 1984 combined foreign and joint venture catch of 5,214.22 t (the last year prior to "prohibited species" restrictions). In 1987, the largest percentage of rockfish (92.49%) was caught in the Shumagin area. The Chirikof and Kodiak areas yielded 0.66% and 6.86%, respectively. Northern rockfish (33.04%), Pacific ocean perch (28.23%), shortspine thornyhead (Sebastolobus alascanus) (13.02%), dusky rockfish (12.54%), and sharpchin rockfish (Sebastes zacentrus) (11.03%) accounted for 97.86% of the rockfish catch.

## Flatfish Catch by Species

Table 46 lists the common and scientific names of the 13 species of flatfish that were identified by observers as appearing in joint venture catches in the Gulf of Alaska in 1987. In 1987, joint venture operations shifted a large portion of their operations to one devoted to flatfish. These operations landed 7,208 t of flatfish (22.2% of the total joint venture catch for the year). Only 960 t of flatfish (1.5% of the total catch) were caught in 1986. In 1987, the Kodiak area accounted for 55.52% of the flatfish catch (Table 47). The Shumagin and Chirikof areas yielded 28.75% and 15.73%, respectively. Historically, arrowtooth flounder has made up the largest percentage of the joint venture flatfish catches in each area. In 1987, however, rock sole emerged as the dominant species in the Chirikof and Kodiak areas and accounted for almost 50% of the total flatfish catch. Arrowtooth flounder made up 85.6% of the flatfish catch in the Shumagin area., and 36.7% overall. Butter sole (Isopsetta isolepis) (6.1%), rex sole (Glyptocephalus zachirus) (3.4%), and flathead sole (Hippoglossoides elassodon) (2.2%) were the other major flatfish components of the catch.

Table 26.--Percent of observer coverage of the joint venture fisheries in the Gulf of Alaska, 1987.

Nation	Vessel class	No. of observers	No. of ships observed	No. of ships in fishery	No. of observer days	No. of vessel days	Percent coverage <sup>a</sup>
U.S.-Japan	Other SJV		5	5	62	62	100.0
U.S.-Japan	Yell/Flat FJV		3	3	222	222	100.0
U.S.-Japan	Total Joint Venture	7	8	8	284	284	100.0
U.S.-ROK	Other FJV	6	5	5	63	64	98.4
U.S.-PRC	Other FJV	1	2	2	26	26	100.0
Total <sup>b</sup>		14	15	15	373	374	99.7

<sup>a</sup> Percent coverage = 100 x (observer days/vessel days).

<sup>b</sup> In the joint venture fisheries, only the foreign processing vessels are indicated for the number of ships and vessel days--the U.S. catcher boats are not included.

SJV = Surimi joint venture.

FJV = Freezer joint venture.

Yell/Flat = Targetting on yellowfin sole/flatfish.

Other = Targetting on roundfish.

ROK = Republic of Korea.

PRC = People's Republic of China.

Table 27.--Estimated foreign and joint venture catch  
in the Gulf of Alaska groundfish fishery,  
1987<sup>a</sup>.

Species groups	U.S. Joint ventures	
	Metric tons	Percent
Squid	3.8	<0.1
All flounders	7,207.6	22.2
Walleye pollock	22,822.5	70.2
Pacific cod	1,978.0	6.1
Sablefish	180.3	0.6
Atka mackerel	1.3	<0.1
Ocean perch species <sup>b</sup>	112.3	0.3
Thornyhead rockfish	20.1	0.1
Other rockfish <sup>b</sup>	21.8	0.1
Other fish	178.0	0.5
Total	32,525.7	

<sup>a</sup> No foreign fishery in 1987.

<sup>b</sup> Catches of rougheye, shortraker, northern, and sharpchin rockfish were reported combined with Pacific ocean perch in 1987.

Table 28.--Estimated foreign and joint venture catches by species group in the Gulf of Alaska, 1917-07<sup>a</sup>.

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
<b>Foreign directed catches (metric tons)</b>											
Squid	NA	322	425	841	1,135	278	267	120	6	0	
Flounders	16,038	14,314	13,474	15,497	14,443	8,986	9,531	3,033	170	71	
Pollock	117,834	96,392	103,187	112,997	130,324	92,612	81,358	99,260	31,587	114	
Pacific cod	1,988	11,371	13,174	34,245	34,969	26,936	29,777	15,897	9,086	15,211	
Sablefish	15,957	7,128	6,885	6,139	7,975	5,645	4,965	1,108	38	1	
Atka mackerel	19,455	19,588	10,948	13,163	18,727	6,760	11,470	537	2	<1	
All rockfish <sup>b</sup>	23,578	10,070	12,286	16,647	17,857	10,468	7,846	3,177	14	4	
Other fish <sup>c</sup>	4,642	5,989	2,971	8,515	7,112	2,049	2,255	576	97	146	
Total	199,492	165,174	163,350	208,044	232,542	153,734	147,469	123,708	41,000	15,547	d
<b>Joint-venture catches (metric tons)</b>											
Squid		0	<1	0	<1	16	4	5	7	7	4
Flounders		5	70	209	18	18	2,692	3,449	2,447	961	7,208
Walleye pollock		34	566	1,136	16,857	73,917	134,131	207,104	237,860	62,591	22,823
Pacific cod		7	713	466	58	193	2,426	4,649	2,266	1,357	1,978
Sablefish		0	18	20	<1	1	275	528	226	45	180
Atka mackerel		<1	1	3	0	0	790	585	1,846	4	1
All rockfish <sup>b</sup>		1	90	28	1	3	2,276	2,037	307	67	154
Other fish <sup>c</sup>		1	34	49	33	301	391	1,268	2,246	255	178
Total	e	48	1,492	1,911	16,967	74,449	142,985	219,625	247,205	65,287	32,526

<sup>a</sup> Estimates for years 1977-86 are from Berger et al. 1988.

<sup>b</sup> As rockfish reporting requirements have changed over the years, for comparison purposes, all rockfish are combined into a Single group.

<sup>c</sup> Reporting requirements of rattails, *Coryphaenoides* spp., have changed. In 1978, rattails were included in the "other fish" category. In 1980, rattails were reported in a separate category, and in this table, rattails make up 2,960 t of the 1980 foreign catches of "other fish". No rattails were estimated to have been taken in the 1980 joint venture fishery. In the other years, foreign nations were not required to report them unless they were utilized.

<sup>d</sup> No foreign fishery in 1907.

<sup>e</sup> Joint venture activity did not begin until 1978.

Table 29.--Incidence rate (number per metric ton of catch) and average weight (kg) of Pacific salmon taken in the joint venture groundfish catches in the Gulf of Alaska, 1987\*. Lines indicate areas not fished.

	<u>Shumagin</u>		<u>Chirikof</u>		<u>Kodiak</u>	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
<u>U.S.-Republic of Korea JV Mothership</u>						
Jan.	--	--	--	--	--	--
Feb.	--	--	--	--	--	--
March	--	--	--	--	--	--
April	--	--	--	--	--	--
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	--	--	--	--	--	--
Oct.	0.036	2.873	--	--	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	0.036	2.873	--	--	--	--
<u>U.S.-Japan JV Mothership</u>						
Jan.	--	--	--	--	--	--
Feb.	--	--	--	--	--	--
March	--	--	--	--	--	--
April	--	--	--	--	--	--
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	0.020	3.413
Sep.	--	--	NS	NS	0.046	2.599
Oct.	0.037	3.177	0.034	4.392	0.060	2.717
Nov.	--	--	0.333	3.150	0.084	2.159
Dec.	--	--	--	--	--	--
Annual	0.037	3.177	0.036	4.338	0.046	2.640

\* There was no foreign fishing in the Gulf of Alaska and no joint venture fishing in the Yakutat or Southeastern INPFC areas in 1987.

JV = Joint venture.

NS = Fishing occurred but no sampling by U.S. observers.

Table 29.--Incidence rate (number per metric ton of catch) and average weight (kg) of Pacific salmon taken in the joint venture groundfish catches in the Gulf of Alaska, 1987 (Continued)\*. Lines indicate areas not fished.

	Shumagin		Chirikof		Kodiak	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
<u>U.S.-People's Republic of China JV Mothership</u>						
Jan.	--	--	--	--	--	--
Feb.	--	--	--	--	--	--
March	--	--	--	--	--	--
April	--	--	--	--	--	--
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	--	--	--	--	--	--
Oct.	0.047	3.357	--	--	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	0.047	3.357	--	--	--	--

\* There was no foreign fishing in the Gulf of Alaska and no joint venture fishing in the Yakutat or Southeastern INPFC areas in 1987.

JV = Joint venture.

Table 30.--Estimated incidental catches of Pacific salmon (in numbers of fish and metric tons) by joint venture vessels in the Gulf of Alaska, 1987.

	Number of fish				Weight (metric tons)			
	Shumagin	Chirikof	Kodiak	Total all areas	Shumagin	Chirikof	Kodiak	Total all areas
<u>Joint venture vessels</u>								
U.S.-Japan	504	50	222	776	1.60	0.22	0.59	2.41
U.S.-ROK	381	-	-	381	1.09	-	-	1.09
U.S.-PRC	64	-	-	64	0.21	-	-	0.21
Total	949	50	222	1,221	2.90	0.22	0.59	3.71
Percent by area	77.72	4.10	18.18		78.17	5.93	15.90	

ROK = Republic of Korea.

PRC = People's Republic of China.

Table 31 .--The estimated incidental catch (numbers and metric tons) of Pacific salmon in the foreign and joint venture groundfish fisheries in the Gulf of Alaska, 1977-87a.

Year	Foreign		Joint venture		Total	
	Nos.	t	Nos.	t	Nos.	t
1977	5,272	19.30	NF	NF	5,272	19.30
1978	45,603	131.27	b	b	45,603	131.27
1979	20,410	68.69	1,050	2.31	21,460	71.00
1980	35,901	106.90	168	1.07	36,069	107.97
1981	30,860	95.89	0	0.00	30,860	95.89
1982	5,556	18.89	1,411	2.77	6,967	21.66
1983	9,621	31.76	4,253	11.98	13,874	43.74
1984	12,001	36.13	63,845	168.97	75,846	205.10
1985	365	1.64	13,737	38.86	14,102	40.50
1986	0	0.00	20,820	53.72	20,820	53.72
1987	NF	NF	1,221	3.71	1,221	3.71

<sup>a</sup> Estimates for years 1977-86 are from Berger et al. 1988.

<sup>b</sup> No estimates of incidental catch were made of the limited joint venture fishery in 1978.

NF = No fishing.

Table 32.--Biological data on the incidental catch of Pacific salmon in the joint venture groundfish fishery in the Gulf of Alaska, 1987.

Species	Percent by species	Sex	Sex composition	Average weight (kg)	Average length (cm)
Chinook	62.36	Male	49.35	3.03	59.3
		Female	50.51	3.02	58.7
		Unsexed	0.14	3.40	63.9
		Combined		3.03	59.0
Chum	37.33	Male	74.96	2.92	64.7
		Female	24.80	3.55	64.1
		Unsexed	0.24	4.20	68.4
		Combined		3.08	64.5
Coho	0.31	Male	68.37	2.12	53.3
		Female	31.63	1.40	49.0
		Unsexed	0.00	--	--
		Combined		1.89	52.0

Table 33.--Incidence rate (number per metric ton of catch) and average weight (kg) of Pacific halibut taken in the joint venture groundfish catches in the Gulf of Alaska, 1987\*. Lines indicate areas not fished.

	Shumagin		Chirikof		Kodiak	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
<u>U.S.-Republic of Korea JV Mothership</u>						
Jan.	--	--	--	--	--	--
Feb.	--	--	--	--	--	--
March	--	--	--	--	--	--
April	--	--	--	--	--	--
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	--	--	--	--	--	--
Oct.	4.051	4.178	--	--	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	4.051	4.178	--	--	--	--
<u>U.S.-Japan JV Mothership</u>						
Jan.	--	--	--	--	--	--
Feb.	--	--	--	--	--	--
March	--	--	--	--	--	--
April	--	--	--	--	--	--
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	7.470	3.425
Sep.	--	--	NS	NS	12.013	2.726
Oct.	2.593	4.214	31.798	1.573	14.904	3.920
Nov.	--	--	84.667	1.530	14.950	4.025
Dec.	--	--	--	--	--	--
Annual	2.593	4.214	32.044	1.572	11.738	3.193

\*There was no foreign fishing in the Gulf of Alaska and no joint venture fishing in the Yakutat or Southeastern INPFC areas in 1987.

JV = Joint venture.

NS = Fishing occurred but no sampling by U.S. observers.

Table 33.--Incidence rate (number per metric ton of catch) and average weight (kg) of Pacific halibut taken in the joint venture groundfish catches in the Gulf of Alaska, 1987 (Continued)\*. Lines indicate areas not fished.

	<u>Shumagin</u>		<u>Chirikof</u>		<u>Kodiak</u>	
	<u>Incidence</u>	<u>Average weight</u>	<u>Incidence</u>	<u>Average weight</u>	<u>Incidence</u>	<u>Average weight</u>
<u>U.S.-People's Republic of China JV Mothership</u>						
Jan.	--	--	--	--	--	--
Feb.	--	--	--	--	--	--
March	--	--	--	--	--	--
April	--	--	--	--	--	--
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	--	--	--	--	--	--
Oct.	6.814	4.255	--	--	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	6.814	4.255	--	--	--	--

\* There was no foreign fishing in the Gulf of Alaska and no joint venture fishing in the Yakutat or Southeastern INPFC areas in 1987.

JV = Joint venture.

Table 34.--Estimated incidental catches of Pacific halibut (in numbers of fish and metric tons) by joint venture vessels in the Gulf of Alaska, 1987.

	Number of fish				Weight (metric tons)			
	Shumagin	Chirikof	Kodiak	Total all areas	Shumagin	Chirikof	Kodiak	Total all areas
<u>Joint venture vessels</u>								
U.S.-Japan	37,178	49,582	55,955	142,715	163.6	78.0	187.3	428.9
U.S.-ROK	43,756	-	-	43,756	182.4	-	-	182.4
U.S.-PRC	10,453	-	-	10,453	44.6	-	-	44.6
Total	91,387	49,582	55,955	196,924	390.6	78.0	187.3	655.9
Percent by area	46.41	25.18	28.41		59.55	11.89	28.56	

ROK = Republic of Korea.

PRC = People's Republic of China.

Table 35. --The estimated incidental catch (numbers and metric tons) of Pacific halibut in the foreign and joint venture groundfish fisheries in the Gulf of Alaska, 1977-87a.

Year	Foreign		Joint venture		Total	
	Nos.	t	Nos.	t	Nos.	t
1977	413,009	2,200	NF	NF	413,009	2,200
1978	293,374	1,289	b	b	293,374	1,289
1979	249,641	2,576	5,127	21.5	254,768	2,597
1980	511,521	3,205	19,318	48.5	530,839	3,254
1981	417,311	2,499	274	4.8	417,585	2,504
1982	562,196	2,690	2,371	3.6	564,567	2,694
1983	689,688	3,235	98,571	356.5	788,259	3,592
1984	361,913	1,506	165,721	589.7	527,634	2,096
1985	124,786	241	78,484	300.3	203,270	541
1986	116,220	384	27,432	89.3	143,652	473
1987	NF	NF	196,924	655.9	196,924	656

<sup>a</sup> Estimates for years 1977-86 are from Berger et al. 1988.

<sup>b</sup> No estimates of incidental catch were made of the limited joint venture fishery in 1978.

NF = No fishing.

Table 36.--Incidence rate (number per metric ton of catch) and average weight (kg) of snow (Tanner) crab taken in the joint venture groundfish catches in the Gulf of Alaska, 1987\*. Lines indicate areas not fished.

	<u>Shumagin</u>		<u>Chirikof</u>		<u>Kodiak</u>	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
<u>U.S.-Republic of Korea JV Mothership</u>						
Jan.	--	--	--	--	--	--
Feb.	--	--	--	--	--	--
March	--	--	--	--	--	--
April	--	--	--	--	--	--
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	--	--	--	--	--	--
Oct.	0.001	0.384	--	--	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	0.001	0.384	--	--	--	--
<u>U.S.-Japan JV Mothership</u>						
Jan.	--	--	--	--	--	--
Feb.	--	--	--	--	--	--
March	--	--	--	--	--	--
April	--	--	--	--	--	--
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	1.178	0.648
Sep.	--	--	NS	NS	1.226	0.249
Oct.	0.007	0.445	0.055	0.726	0.674	0.179
Nov.	--	--	0.000	0.000	0.003	0.200
Dec.	--	--	--	--	--	--
Annual	0.007	0.445	0.054	0.726	1.033	0.338

\* There was no foreign fishing in the Gulf of Alaska and no joint venture fishing in the Yakutat or Southeastern INPFC areas in 1987.

JV = Joint venture.

NS = Fishing occurred but no sampling by U.S. observers.

Table 36.--Incidence rate (number per metric ton of catch) and average weight (kg) of Tanner crab taken in the joint venture groundfish catches in the Gulf of Alaska, 1987 (Continued)\*. Lines indicate areas not fished.

	<u>Shumagin</u>		<u>Chirikof</u>		<u>Kodiak</u>	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
<u>U.S.-People's Republic of China JV Mothership</u>						
Jan.	--	--	--	--	--	--
Feb.	--	--	--	--	--	--
March	--	--	--	--	--	--
April	--	--	--	--	--	--
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	--	--	--	--	--	--
Oct.	0.000	0.000	--	--	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	0.000	0.000	--	--	--	--

\* There was no foreign fishing in the Gulf of Alaska and no joint venture fishing in the Yakutat or Southeastern INPFC areas in 1987.

JV = Joint venture.

Table 37.--Estimated incidental catches of snow (Tanner) crab (in numbers of crab and metric tons by joint venture vessels in the Gulf of Alaska, 1987.

	Number of crab				Weight (metric tons)			
	Shumagin	Chirikof	Kodiak	Total all areas	Shumagin	Chirikof	Kodiak	Total all areas
<u>Joint venture vessels</u>								
U.S.-Japan	94	102	5,292	5,488	0.04	0.07	1.79	1.90
U.S.-ROK	8	-	-	8	<0.01	-	-	<0.01
U.S.-PRC	0	-	-	0	0.00	-	-	0.00
Total	102	102	5,292	5,496	0.04	0.07	1.79	1.90
Percent by area	1.86	1.86	96.28		2.11	3.68	94.21	

ROK = Republic of Korea.

PRC = People's Republic of China.

Table 38.--Estimated incidental catches (numbers and metric tons) of snow (Tanner), crab in the foreign and joint venture groundfish fisheries in the Gulf of Alaska, 1978-87a.

Year	Foreign		Joint venture		Total	
	Nos.	t	Nos.	t	Nos.	t
1978	23,969	14.16	b	b	23,969	14.16
1979	16,992	11.30	626	0.25	17,618	11.55
1980	27,844	16.62	58,022	14.43	85,866	31.05
1981	96,662	70.19	0	0	96,662	70.19
1982	63,293	35.33	364	0.17	63,657	35.50
1983	30,609	22.42	102,840	54.87	133,449	77.29
1984	8,885	5.69	41,663	27.36	50,548	33.05
1985	509	0.28	64,640	16.61	65,149	16.89
1986	1,425	1.17	11,762	4.76	13,187	5.93
1987	c	c	5,496	1.90	5,496	1.90

<sup>a</sup> Estimates for years 1978-86 are from Berger et al. 1988.

<sup>b</sup> No estimates of incidental catch were made of the limited joint venture fishery in 1978.

<sup>c</sup> No foreign fishery in 1987.

Table 39.--Biological data on the incidental catch of Tanner crab in the joint venture groundfish fishery in the Gulf of Alaska, 1987.

Species	Percent by species	Sex	Sex composition	Average weight (kg)	Average width (mm)
<u>Chionoecetes</u> <u>bairdi</u>	99.74	Male	53.21	0.50	103
		Female	46.79	0.20	78
		Unsexed	0.00	--	--
		Combined		0.36	91
<u>Chionoecetes</u> <u>opilio</u>	0.26	Male	100.00	0.70	115
		Female	0.00	--	--
		Unsexed	0.00	--	--
		Combined		0.70	115

Table 40.--Incidence rate (number per metric ton of catch) and average weight (kg) of king crab taken in the joint venture groundfish catches in the Gulf of Alaska, 1987\*. Lines indicate areas not fished.

	<u>Shumagin</u>		<u>Chirikof</u>		<u>Kodiak</u>	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
<u>U.S.-Republic of Korea JV Mothership</u>						
Jan.	--	--	--	--	--	--
Feb.	--	--	--	--	--	--
March	--	--	--	--	--	--
April	--	--	--	--	--	--
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	--	--	--	--	--	--
Oct.	<0.001	2.500	--	--	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	<0.001	2.500	--	--	--	--
<u>U.S.-Japan JV Mothership</u>						
Jan.	--	--	--	--	--	--
Feb.	--	--	--	--	--	--
March	--	--	--	--	--	--
April	--	--	--	--	--	--
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	0.001	1.700
Sep.	--	--	NS	NS	0.002	1.075
Oct.	<0.001	1.940	0.030	3.075	0.006	0.613
Nov.	--	--	0.000	0.000	0.000	0.000
Dec.	--	--	--	--	--	--
Annual	<0.001	1.940	0.030	3.075	0.002	0.939

\*There was no foreign fishing in the Gulf of Alaska and no joint venture fishing in the Yakutat or Southeastern INPFC areas in 1987.

JV = Joint venture.

NS = Fishing occurred but no sampling by U.S. observers.

Table 40.--Incidence rate (number per metric ton of catch) and average weight (kg) of king crab taken in the joint venture groundfish catches in the Gulf of Alaska, 1987 (Continued)\*. Lines indicate areas not fished.

	<u>Shumagin</u>		<u>Chirikof</u>		<u>Kodiak</u>	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
<u>U.S.-People's Republic of China JV Mothership</u>						
Jan.	--	--	--	--	--	--
Feb.	--	--	--	--	--	--
March	--	--	--	--	--	--
April	--	--	--	--	--	--
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	--	--	--	--	--	--
Oct.	0.000	0.000	--	--	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	0.000	0.000	--	--	--	--

\*There was no foreign fishing in the Gulf of Alaska and no joint venture fishing in the Yakutat or Southeastern INPFC areas in 1987.

JV = Joint venture.

Table 41.--Estimated incidental catches of king crab (in numbers of crab and metric tons) by joint venture vessels in the Gulf of Alaska, 1987.

	Number of crab				Weight (metric tons)			
	Shumagin	Chirikof	Kodiak	Total all areas	Shumagin	Chirikof	Kodiak	Total all areas
<u>Joint venture vessels</u>								
U.S.-Japan	7	49	10	66	0.01	0.15	0.01	0.17
U.S.-ROK	3	-	-	3	0.01	-	-	0.01
U.S.-PRC	0	-	-	0	0.00	-	-	0.00
Total	10	49	10	69	0.02	0.15	0.01	0.18
Percent by area	14.49	71.02	14.49		11.11	83.33	5.56	

ROK = Republic of Korea.

PRC = People's Republic of China.

Table 42.--The estimated incidental catch (numbers and metric tons) of king crab in the foreign and joint venture groundfish fisheries in the Gulf of Alaska, 1978-87a.

Year	Foreign		Joint venture		Total	
	Nos.	t	Nos.	t	Nos.	t
1978	93,875	135.31	b	b	93,875	135.31
1979	24,094	40.30	466	0.83	24,560	41.13
1980	6,395	8.95	6,285	13.03	12,680	21.98
1981	6,619	8.01	0	0.00	6,619	8.01
1982	3,464	5.60	11	0.03	3,475	5.63
1983	2,124	3.00	4,454	15.01	6,578	18.01
1984	1,465	4.89	5,482	20.15	6,947	25.04
1985	10	0.01	2,427	7.69	2,437	7.70
1986	0	0.00	33	0.08	33	0.08
1987	c	c	69	0.18	69	0.18

<sup>a</sup> Estimates for 1978-86 are from Berger et al. 1988.

<sup>b</sup> No estimates of incidental catch were made of the limited joint venture fishery in 1978.

<sup>c</sup> No foreign fishery in 1987.

Table 43.--Biological data on the incidental catch of king crab in the joint venture groundfish fishery in the Gulf of Alaska, 1987.

Species	Percent by species	Sex	Sex composition	Average weight (kg)	Average length (mm)
Red	94.37	Male	52.44	3.63	161
		Female	47.56	1.46	125
		Unsexed	0.00	--	--
		Combined		2.60	144
Golden	5.63	Male	100.00	3.00	177
		Female	0.00	--	--
		Unsexed	0.00	--	--
		Combined		3.00	177

Table 44.--The common and scientific names of rockfish identified in the 1987 joint venture catches in the Gulf of Alaska region.

Common name <sup>a</sup>	Scientific name
Black rockfish	<u>Sebastes melanops</u>
Blue rockfish	<u>Sebastes mystinus</u>
Darkblotched rockfish	<u>Sebastes crameri</u>
Dusky rockfish	<u>Sebastes ciliatus</u>
Northern rockfish	<u>Sebastes polyspinis</u>
Pacific ocean perch	<u>Sebastes alutus</u>
Rougheye rockfish	<u>Sebastes aleutianus</u>
Sharpchin rockfish	<u>Sebastes zacentrus</u>
Shortspine thornyhead	<u>Sebastolobus alascanus</u>
Yelloweye rockfish	<u>Sebastes ruberrimus</u>
Other rockfish <sup>b</sup>	
Harlequin rockfish	<u>Sebastes variegatus</u>
Pygmy rockfish	<u>Sebastes wilsoni</u>
Redbanded rockfish	<u>Sebastes babcocki</u>
Shortraker rockfish	<u>Sebastes borealis</u>
Tiger rockfish	<u>Sebastes nigrocinctus</u>

<sup>a</sup> With all rockfish, the possibility of misidentification exists, and the listing of species not previously reported from the Gulf of Alaska region should be noted with caution.

<sup>b</sup> The five species listed under "Other rockfish" each accounted for less than 0.10% of the rockfish catch by joint venture operations.

Table 45.--Estimated catch (in metric tons and percentages) of rockfish by species and area in the Gulf of Alaska during 1987.

Common name	Shumagin		Chirikof		Kodiak		Total	
	t	%	t	%	t	%	t	%
<u>Joint venture fisheries</u>								
Black rockfish	1.51	1.06	0.00	0.00	0.23	2.18	1.74	1.13
Blue rockfish	0.07	0.05	0.00	0.00	0.15	1.42	0.22	0.14
Darkblotched rockfish	0.00	0.00	0.00	0.00	0.16	1.51	0.16	0.10
Dusky rockfish	12.49	8.76	0.76	75.25	6.08	57.52	19.33	12.54
Northern rockfish	47.18	33.10	0.17	16.83	3.56	33.68	50.91	33.04
Pacific ocean perch	43.36	30.42	0.01	0.99	0.14	1.32	43.51	28.23
Rougheye rockfish	0.82	0.58	0.00	0.00	0.00	0.00	0.82	0.53
Sharpchin rockfish	16.93	11.88	0.00	0.00	0.06	0.57	16.99	11.03
Shortspine thornyhead	20.06	14.08	0.00	0.00	0.00	0.00	20.06	13.02
Yelloweye rockfish	0.07	0.05	0.00	0.00	0.09	0.85	0.16	0.10
Other rockfish*	0.03	0.02	0.07	6.93	0.10	0.95	0.20	0.13
Total	142.52		1.01		10.57		154.10	
Percent by area	92.49		0.66		6.86			

\*Species included in this category are listed in Table 44.

Table 46.--Common and scientific names of flatfish identified in the 1987 joint venture catches in the Gulf of Alaska region.

Common name	Scientific name
Alaska plaice	<u>Pleuronectes quadrituberculatus</u>
Arrowtooth flounder (turbot)	<u>Atheresthes stomias</u>
Butter sole	<u>Isopsetta isolepis</u>
Dover sole	<u>Microstomus pacificus</u>
English sole	<u>Parophrys vetulus</u>
Flathead sole	<u>Hippoglossoides elassodon</u>
Kamchatka flounder	<u>Atheresthes evermanni</u>
Longhead dab	<u>Limanda proboscidea</u>
Rex sole	<u>Glyptocephalus zachirus</u>
Rock sole	<u>Lepidopsetta bilineata</u>
Sand sole	<u>Psettichthys melanostictus</u>
Starry flounder	<u>Platichthys stellatus</u>
Yellowfin sole	<u>Limanda aspera</u>

Table 47.--Estimated catch (in metric tons and percentages) of flatfish by species and area in the Gulf of Alaska during 1987.

Common name	Shumagin		Chirikof		Kodiak		Total	
	t	%	t	%	t	%	t	%
<u>Joint venture fisheries</u>								
Alaska plaice	0.00	0.00	0.04	<0.01	1.28	0.03	1.32	0.02
Arrowtooth flounder	1,774.74	85.63	201.43	17.77	668.67	16.71	2,644.84	36.69
Butter sole	0.00	0.00	94.11	8.30	345.73	8.64	439.84	6.10
Dover sole	0.53	0.03	10.47	0.92	22.73	0.57	33.73	0.47
English sole	0.37	0.02	0.18	0.02	64.26	1.61	64.81	0.90
Flathead sole	54.90	2.65	18.47	1.63	82.29	2.06	155.66	2.16
Kamchatka flounder	0.10	<0.01	0.00	0.00	0.00	0.00	0.10	<0.01
Longhead dab	0.12	0.01	0.00	0.00	0.00	0.00	0.12	<0.01
Rex sole	201.10	9.70	10.39	0.92	35.37	0.88	246.86	3.42
Rock sole	40.67	1.96	798.44	70.42	2,740.85	68.49	3,579.96	49.67
Sand sole	0.00	0.00	0.00	0.00	0.05	<0.01	0.05	<0.01
Starry flounder	0.00	0.00	0.32	0.03	23.32	0.58	23.64	0.33
Yellowfin sole	0.00	0.00	0.00	0.00	17.07	0.43	17.07	0.24
Total	2,072.53		1,133.85		4,001.62		7,208.00	
Percent by area	28.75		15.73		55.52			

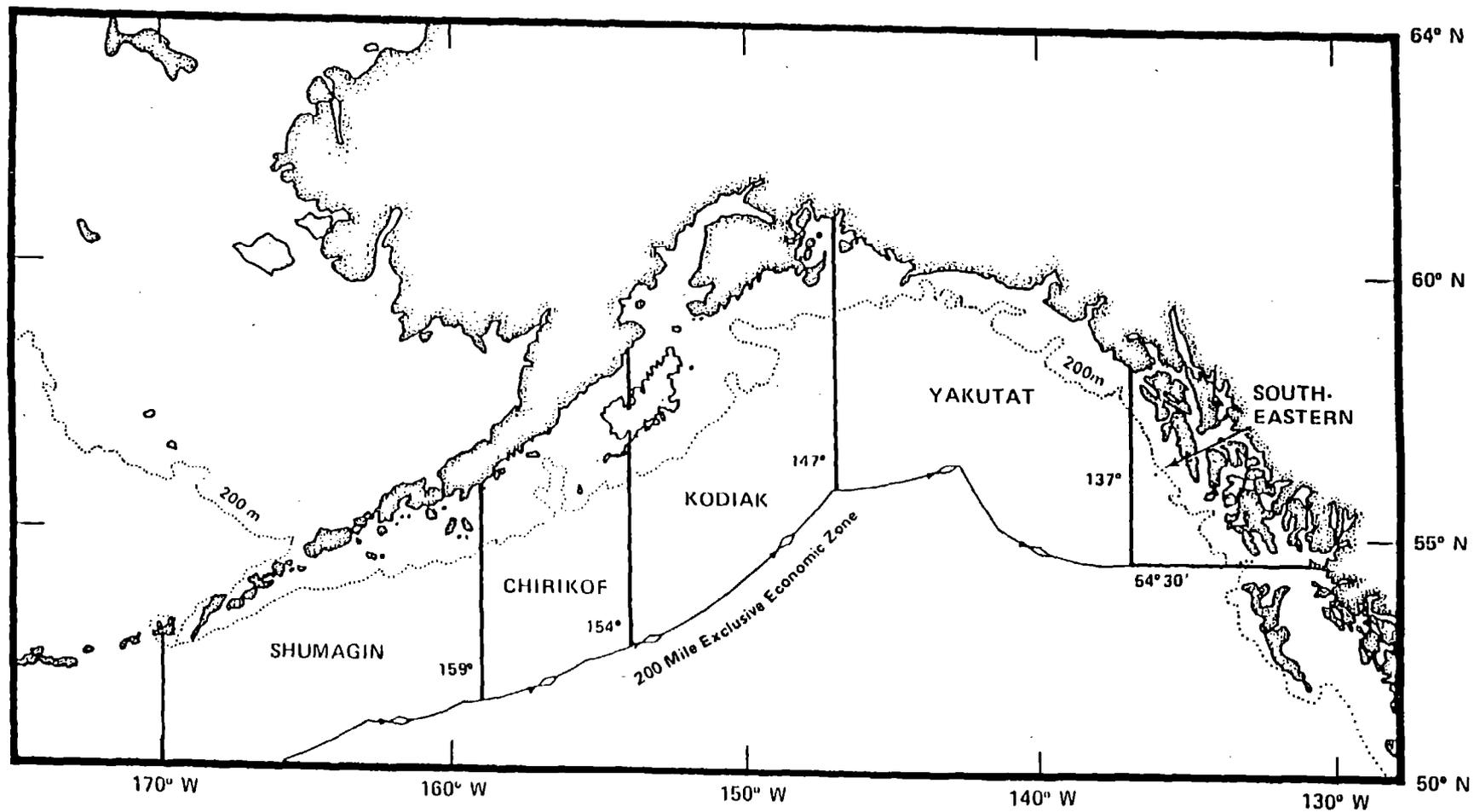


Figure 13.--U.S. statistical areas in the Gulf of Alaska region used to summarize catch and effort data.

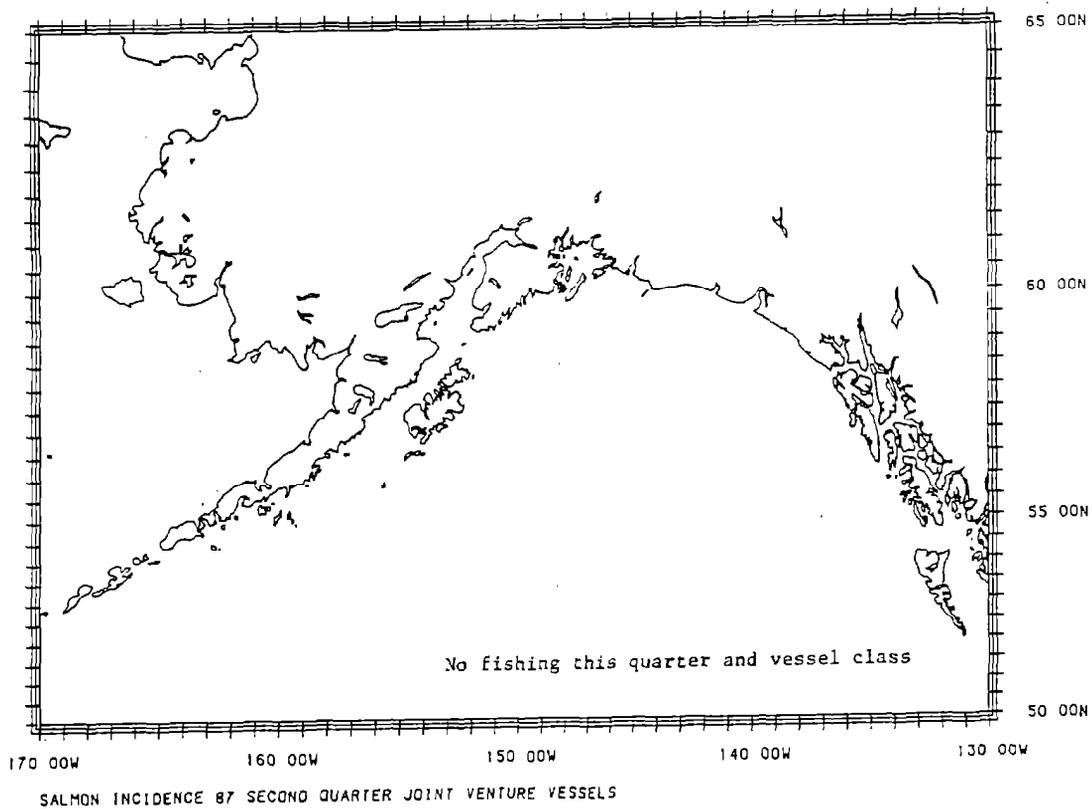
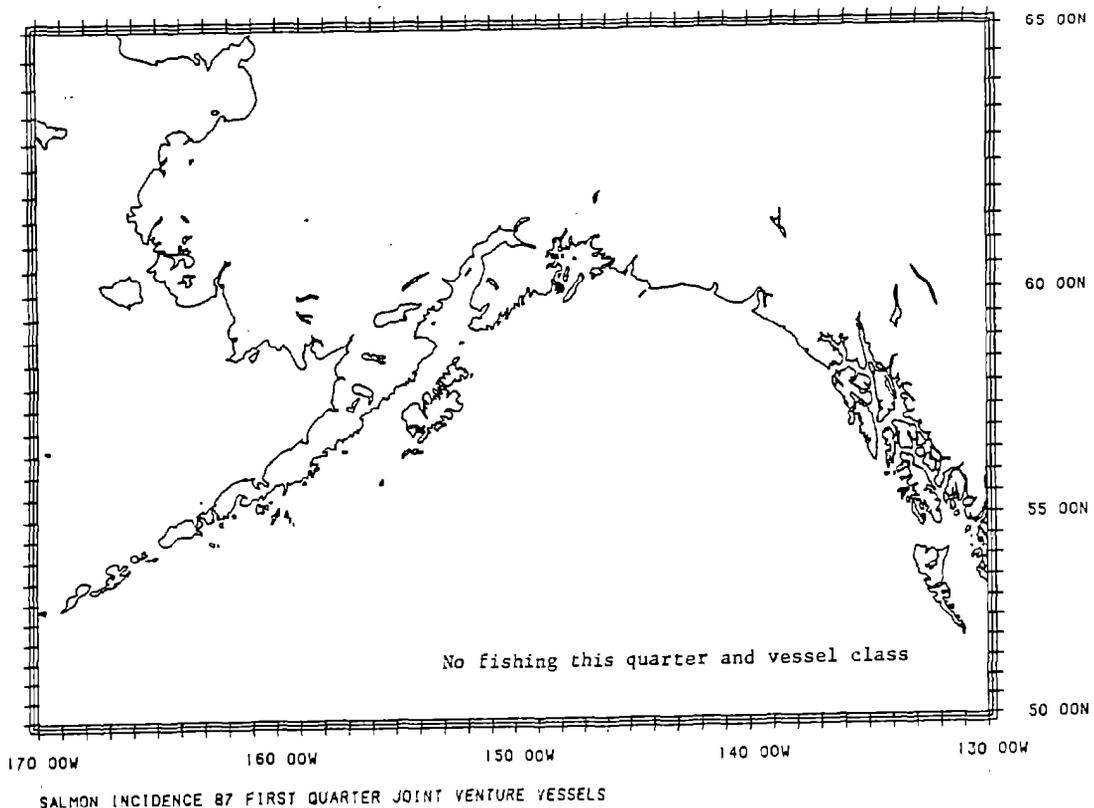


Figure 14. --Average incidence (no./t) of Pacific salmon in the joint venture fisheries by quarter and 1/2° lat. by 1° long. areas, 1987

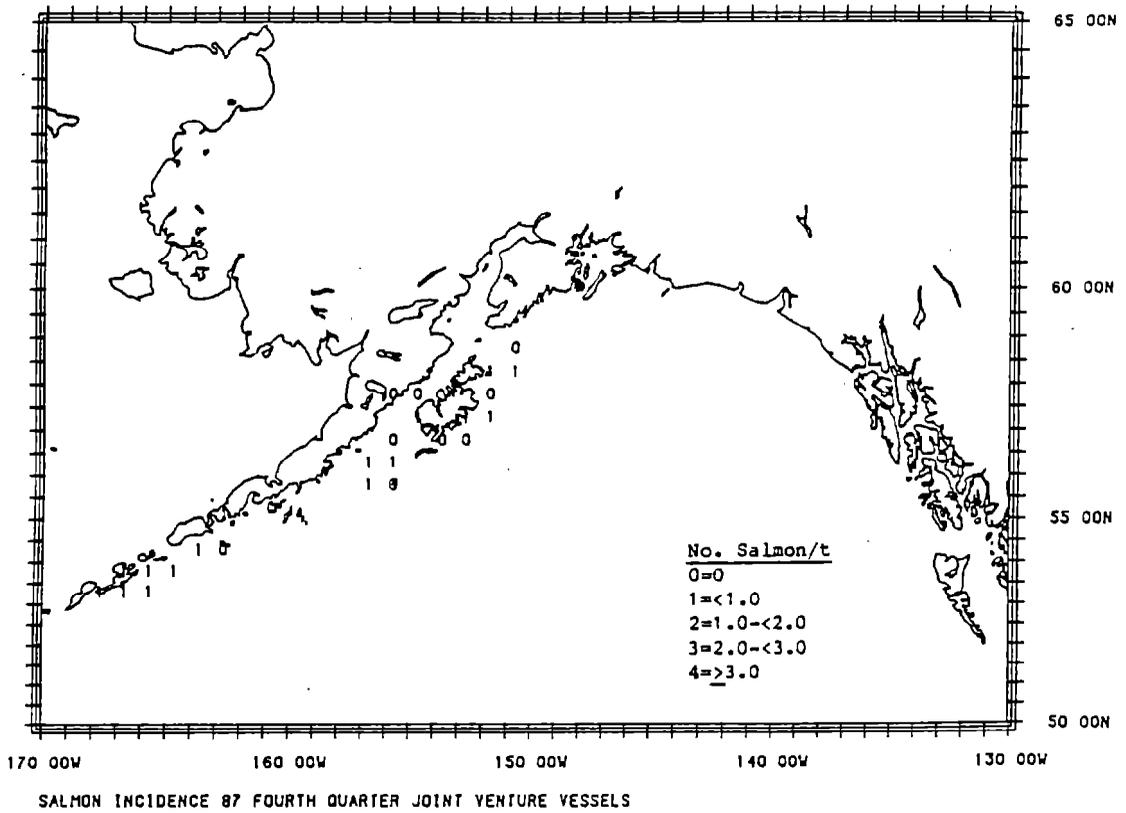
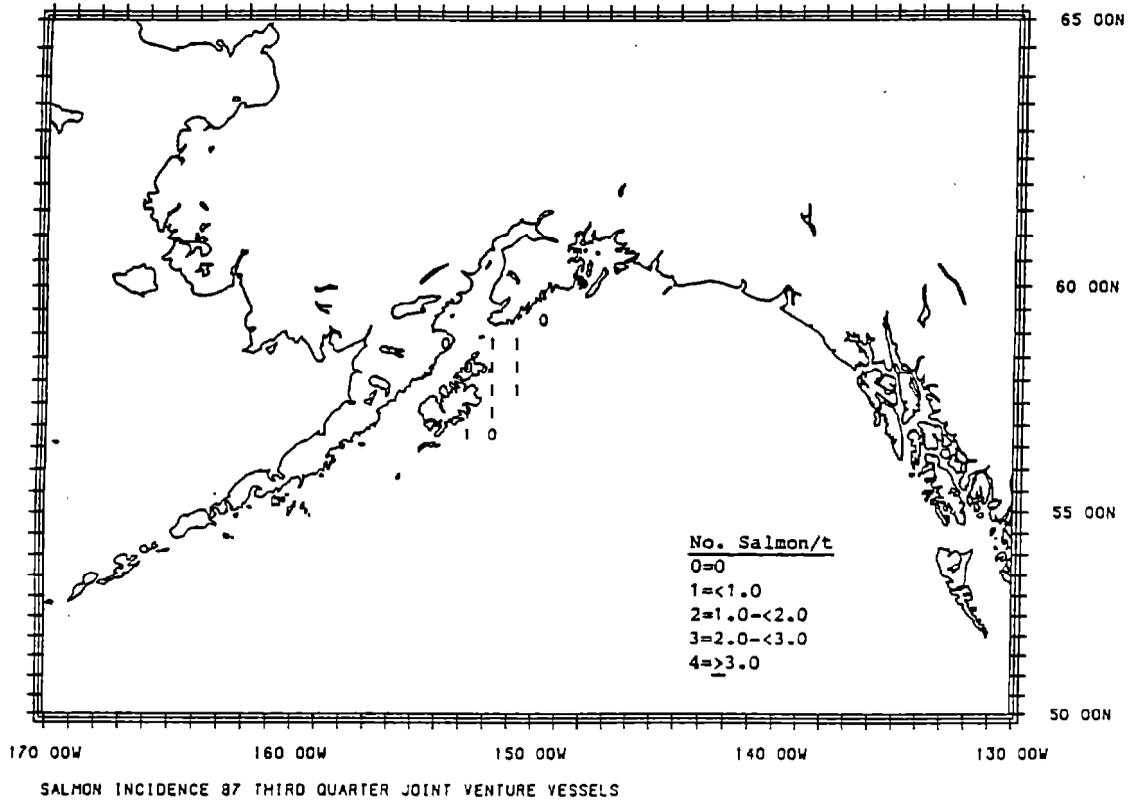
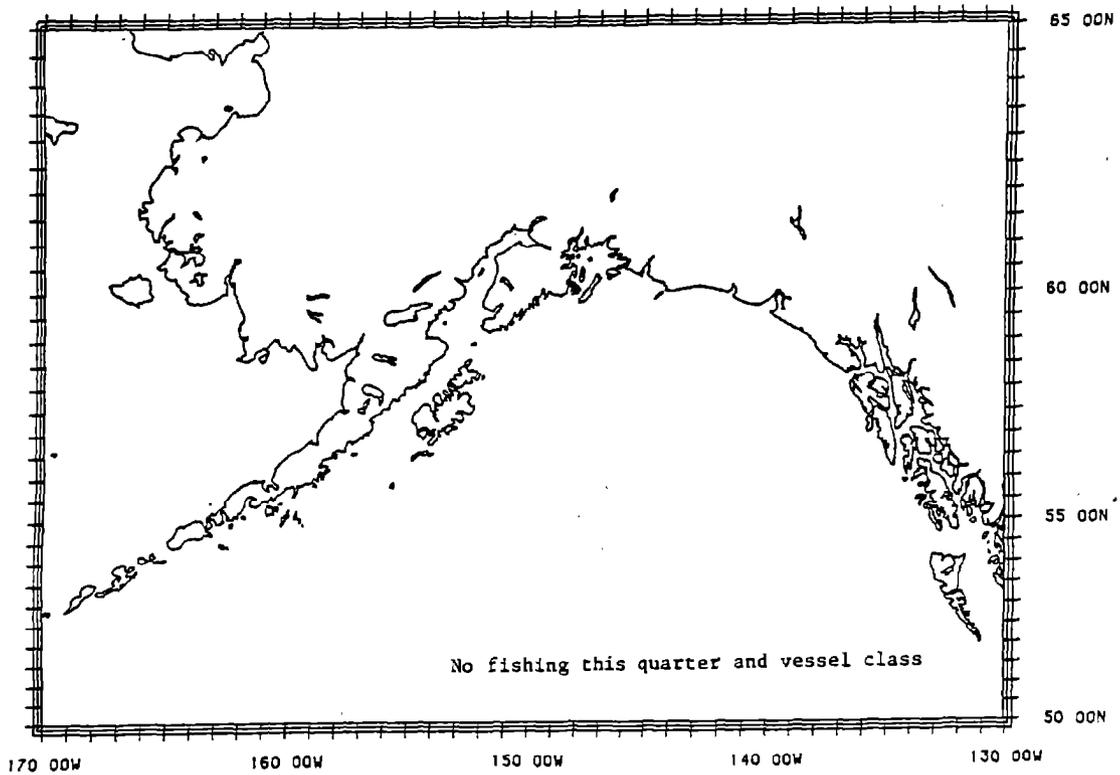
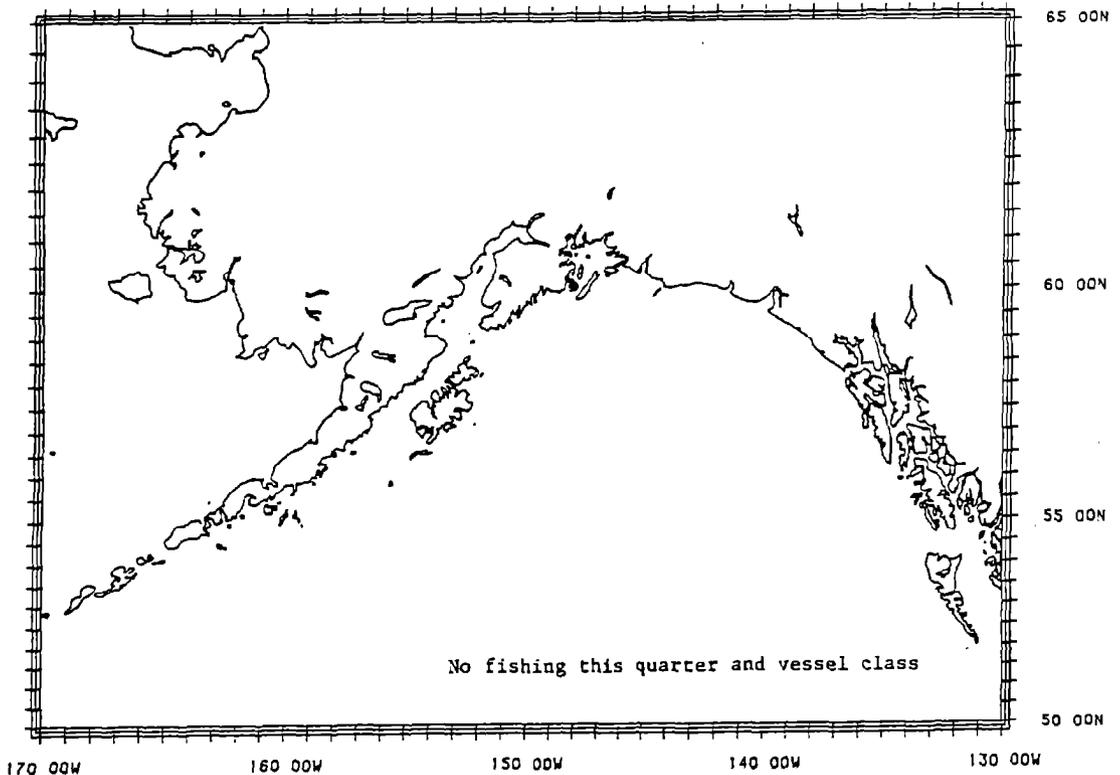


Figure 14.-Continued.



HALIBUT INCIDENCE 87 FIRST QUARTER JOINT VENTURE VESSELS



HALIBUT INCIDENCE 87 SECOND QUARTER JOINT VENTURE VESSELS

Figure 15.--Average incidence (no./t) of Pacific halibut in the joint venture fisheries by quarter and 1/2° lat. by 1° long. areas, 1987.

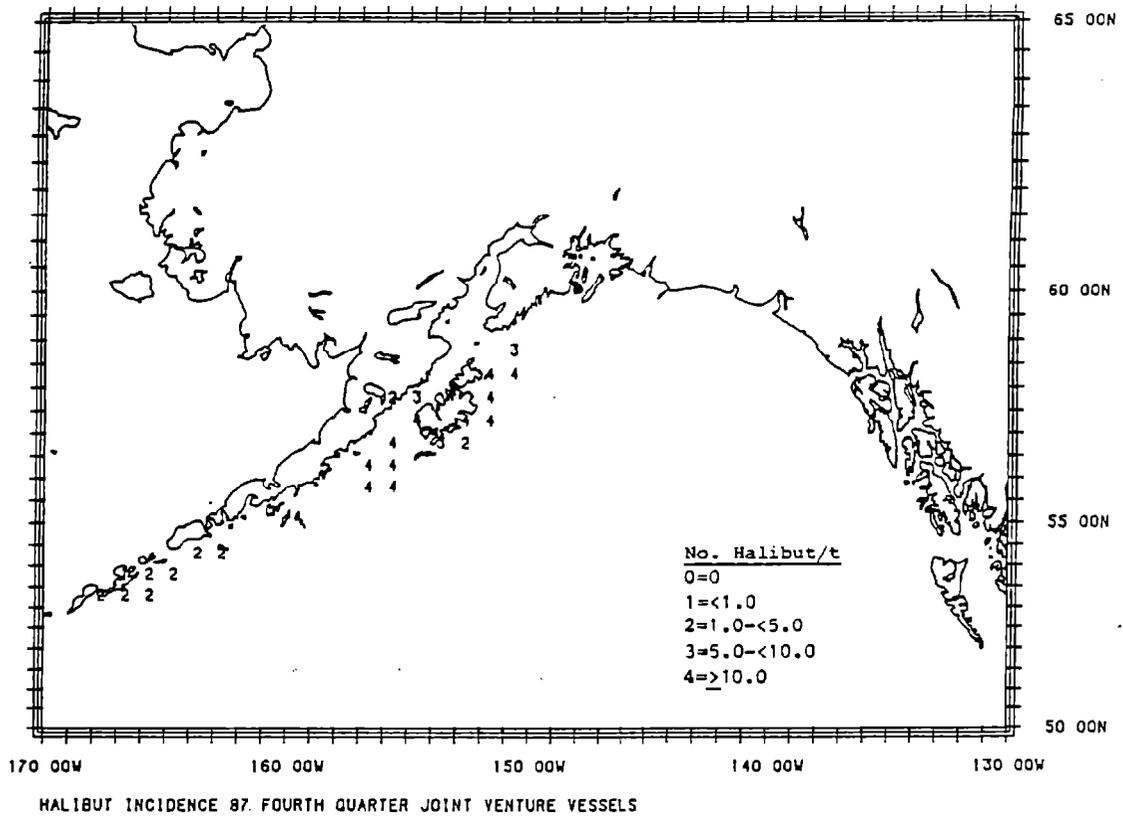
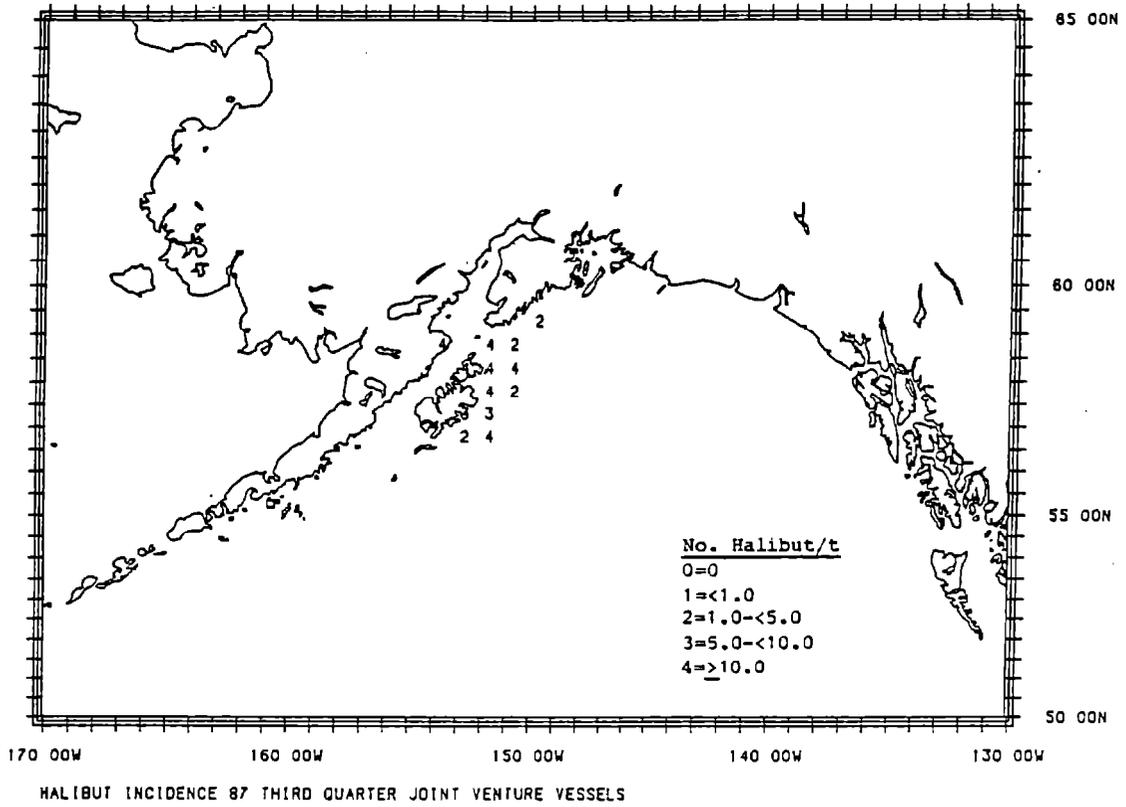


Figure 15. -Continued.

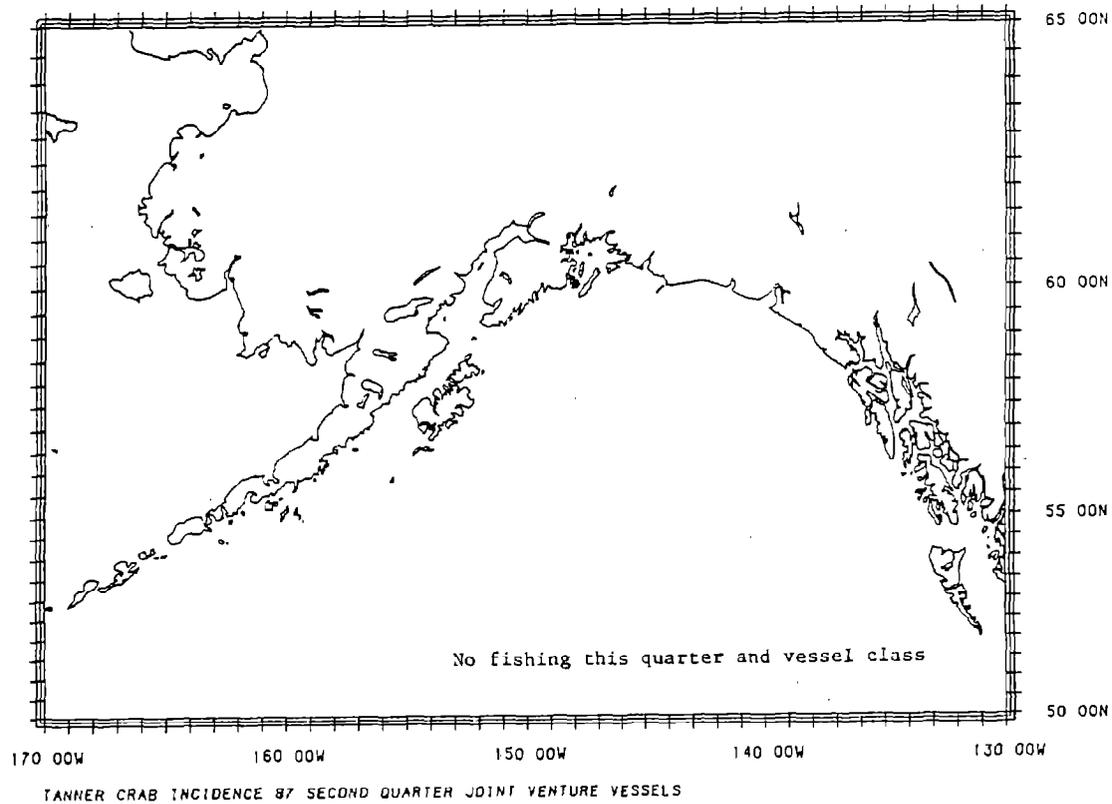
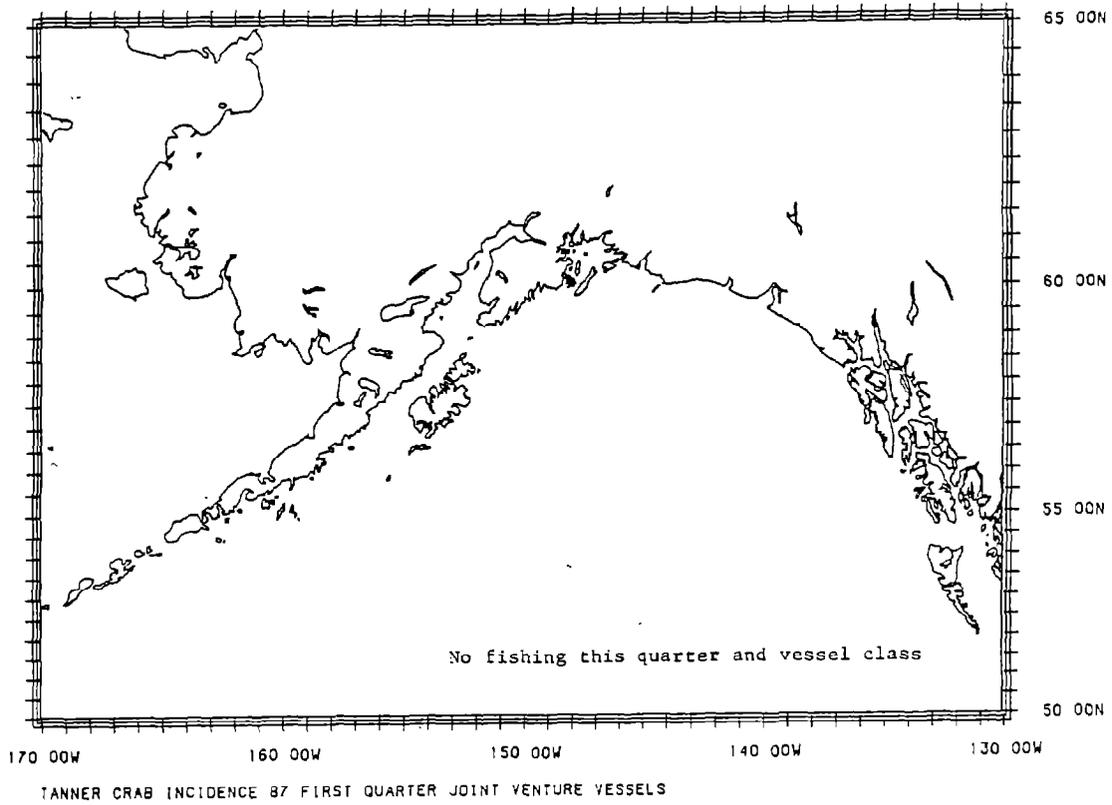


Figure 16. --Average incidence (no./t) of snow (Tanner) crab in the joint venture fisheries by quarter and 1/2° lat by 1° long. areas, 1987.

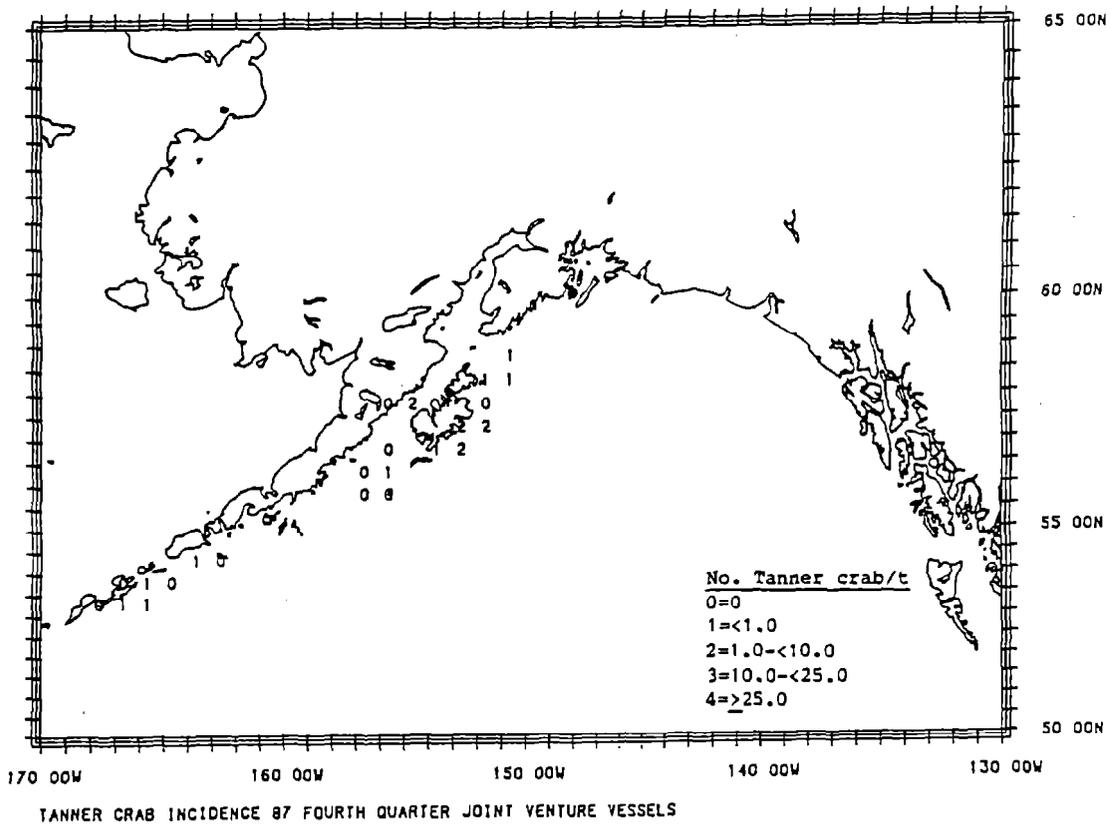
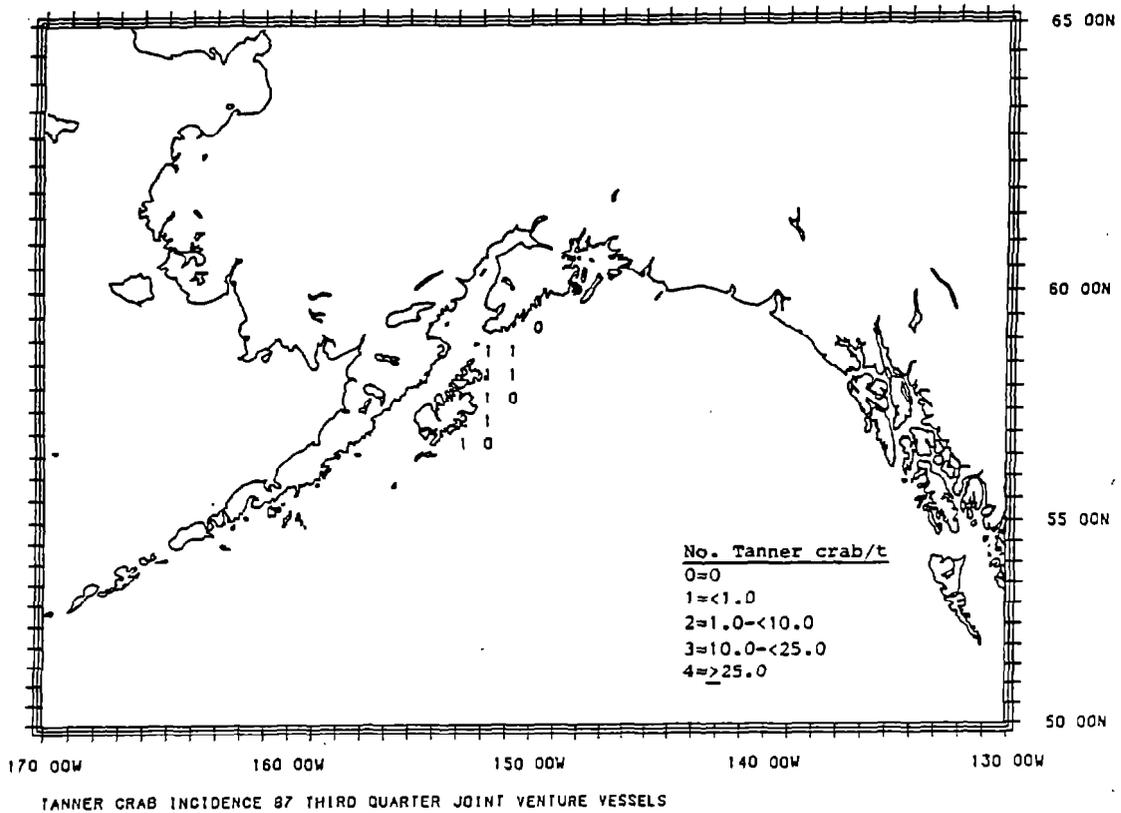


Figure 16.--Continued.

SUMMARY OF OBSERVER SAMPLING OFF THE COASTS OF  
WASHINGTON, OREGON, AND CALIFORNIA

Observer Coverage of Fishing Fleets

Joint venture fishing operations for Pacific whiting off the Washington-Oregon-California coast (Fig. 17) in 1987 occurred between 24 April and 19 October, and were conducted by U.S. fishermen and processing vessels from Poland, the U.S.S.R., the Republic of Korea (ROK), and the People's Republic of China (PRC). (See Table 1 for the definition of a joint venture mothership). Foreign fishing operations for Pacific whiting (Merluccius productus) were performed by large freezer trawlers from Poland, the ROK, and the PRC from 11 June to 31 October. In the foreign fishery, observers sampled 1,033 days out of a possible 1,070 days (96.5%) in 1987. In 1986, observers sampled 94.8% of the foreign fishing days. In the joint venture fishery, the observer sampling effort of 1,776 days accounted for 95.0% of the total joint venture vessel effort of 1,870 days expended in the WOC region in 1987 (Table 48). The level of coverage for the 1986 joint venture fishery was 95.4%. The overall observer effort of 2,809 days provided an observer coverage of 95.5% of the entire Pacific whiting fishery.

Estimates of Foreign and U.S. Joint Venture Catches

Within U.S. waters, the total allowable level of foreign fishing (quota) was set for Pacific whiting. Catches of other species were limited to a percentage of the Pacific whiting quota. The percentages assigned to these other species in 1987 were as follows:

<u>Species</u>	<u>Percentage of Pacific whiting quota</u>
Flounders	0.1
Jack mackerel ( <u>Trachurus symmetricus</u> )	3.0
Pacific ocean perch	0.062
Rockfishes (excluding Pacific ocean perch)	0.738
Sablefish	0.173
Other species	0.500

For the joint venture fishery, the above percentage limitations were placed on the retention of species other than Pacific whiting and were applied to each 5,000 t of Pacific whiting received in the EEZ from U.S. vessels. If the retention limit of a species was reached prior to the foreign nations' receipt of 5,000 t of Pacific whiting, additional catches of that species were required to be discarded until 5,000 t of Pacific whiting were received and an additional 5,000 t allocation of Pacific whiting was authorized. The percentage limitation on retention of a species applied to each succeeding 5,000 t of Pacific whiting received. The reason for retention limits was the desire by U.S. fishery managers to maintain some control over the by-catch of other important commercial groundfish species taken in the Pacific whiting joint venture.

Approximately 157,500 t of groundfish were landed in 1987 in the foreign and joint venture Pacific whiting fishery (Table 49). About 155,650 t (98.8%) of the catch was Pacific whiting. Vessels fishing on a foreign allocation harvested 49,700 t of whiting (48,300 t by Poland, 1,400 t by the ROK, and 4.9 t by the PRC). The joint venture fisheries landed 106,000 t of whiting. In the foreign fishery, jack mackerel, the rockfish group (excluding Pacific ocean perch), and the species complex classified as "other fish" composed the highest portions of catch other than Pacific whiting. In the joint venture, the secondary species were the group of rockfish and jack mackerel. The majority of the by-catch taken in the joint venture fishery was discarded from the processing vessels.

The overall catch of Pacific whiting by the foreign and joint venture fisheries in 1987 was 2.7% greater than in 1986 (Table 50). The total catch of Pacific whiting by the foreign fishery in 1987 was 28.9% smaller than that of 1986; the catch by joint venture fisheries in 1987 was 29.8% larger than the catch of Pacific whiting made in 1986. The 1987 Pacific whiting catch was the highest catch since the inception of the MFCMA in 1987.

#### Incidence and Incidental Catch of Prohibited Species

##### Pacific Salmon

The incidence and average weights of Pacific salmon taken in the Pacific whiting fishery in 1987 are shown in Table 51 by nation, statistical area, and month. Incidence rates aboard Polish large freezer trawlers were slightly higher in 1987 than in 1986, but rates in the 1987 joint venture operations were substantially reduced from 1986 levels. The highest incidence of salmon occurred in the U.S.-Poland joint venture in the Vancouver area in August (1.639 fish/t) and in the PRC foreign fishing in the Columbia area in September (0.926 salmon/t). No other monthly incidence rate exceeded 0.4 fish/t and most monthly incidence rates were less than 0.1 fish/t.

Figures 18 and 19 provide a summary by 1/20 latitude and 1° longitude blocks of the incidence of salmon in the 1987 foreign and joint venture Pacific whiting fishery. In the foreign fishery (Fig. 18), incidence rates were generally low except for one location off the Oregon coast (45°00'N lat., 124°W long.). The joint venture fishery (Fig. 19) had much lower incidence rates than last year. No fishing occurred in the perennially high rate locations off northern California and southern Oregon, and even the highest rate in 1987 of 0.35 salmon/t (located at 47°30'N lat., 124°W long.) was less than half of last year's rate (0.71 salmon/t) at the same location.

The total estimated incidental catch of salmon in the Pacific whiting fishery in 1987 was 13,300 fish or 34.3 t (Table 52). This was only about one-third (35.7%) of the salmon by-catch of 1986, but it was still the third highest catch of salmon since 1977 (Table 53). In 1987, 89% of the salmon catch came from the Columbia area, 11% were caught in the Vancouver area, and no salmon were caught in the Eureka area. Salmon catches were fairly uniform throughout the whole season, but were highest in July and October.

In the foreign fishery, five species of salmon were identified by observers. Chinook salmon composed 90.1% of the incidental catch and had an average fork length of 61.1 cm (Table 54). Coho salmon averaging 56.7 cm in fork length accounted for 8.2% of the catch. Pink salmon (51.8 cm average length) made up 1.5% of the catch, chum salmon comprised 0.1% of the catch, and sockeye salmon (0.05%) accounted for the remainder. In the joint venture fishery, four species of salmon occurred. Chinook salmon made up 92.4% of the incidental catch and had an average fork length of 55.1 cm. Coho salmon averaged 53.2 cm and accounted for 6.8% of the incidental salmon catch. The remaining incidental salmon catch was composed of pink salmon (0.6%) and sockeye salmon (0.2%). No steelhead were caught in 1987.

#### Pacific Halibut

As in previous years, the incidence of halibut in the 1987 Pacific whiting fishery was extremely low. The annual incidence of halibut in the Vancouver area was between 0.000 and <0.001 fish/t (Table 55). In the Columbia area, the incidence rate was between 0.000 and 0.003 fish/t (with the exception of the small PRC fishery). No halibut was observed in the Eureka area. The total estimated incidental catch of halibut in 1987 was 69 fish, or 0.6 t (Table 56). Table 57 provides a summary of halibut catches since 1977. The 69 halibut caught in 1987 is slightly below the 10-year average catch of 79 fish per year.

#### Rockfish Catch by Species

Observers identified 30 species of rockfish in catches landed in the foreign and joint venture Pacific whiting fisheries in 1987 (Table 58). The catch of yellowtail rockfish (Sebastes flavidus) composed 65.2% of the overall rockfish catch and catches of widow rockfish (S. entomelas) composed 21.7% of the rockfish catch (Table 59). Yellowtail rockfish was the dominant rockfish species caught in both the Vancouver and Columbia areas. No rockfish were caught in the Eureka area.

In 1987, a total of about 868 t of rockfish were taken by the foreign and joint venture fisheries targeting on Pacific whiting in the Washington-Oregon-California region (Table 59). (This total includes catches of rockfish retained and discarded in the joint venture fishery.) The Columbia area yielded 91.4% of the rockfish catch, the Vancouver area accounted for 8.6%.

#### Flatfish Catch by Species

The catch of 11 different species of flatfish (Table 60) accounted for 19.06 t in the Pacific whiting fishery (Table 61). The Columbia area accounted for 99.5% of the flatfish catch; the Vancouver area made up 0.5%. There was no flatfish catch reported from the Eureka area. The primary species of flatfish identified in the catch were Pacific sanddab (Citharichthys sordidus) (82.8%), arrowtooth flounder (7.1%), and rex sole (6.1%).

Table 48.--Annual summary of observer effort, joint venture effort, and observer coverage (observer days x 100/foreign vessel days) by nation and vessel class in the foreign and joint venture fisheries off Washington, Oregon, and California, 1987.

Nation	Vessel class	No. of observers	No. of ships observed	No. of ships in fishery	No. of observer days	No. of vessel days	Percent coverage
Poland	Large freezer trawler	37	31	31	1,015	1,051	96.6
ROK	Large freezer trawler	1	1	1	16	17	94.1
PRC	Large freezer trawler	1	1	1	2	2	100.0
U.S.-Poland	Joint venture	35	22	22	944	1,009	93.6
U.S.-U.S.S.R.	Joint venture	11	6	6	726	750	96.8
U.S.-ROK	Joint venture	1	1	1	35	39	89.7
U.S.-PRC	Joint venture	1	1	1	71	72	98.6
<b>TOTAL</b>		<b>54<sup>a</sup></b>	<b>40<sup>b</sup></b>	<b>40<sup>b</sup></b>	<b>2,809</b>	<b>2,940</b>	<b>95.5</b>

<sup>a</sup> This column does not add up because several observers sampled on more than one vessel type.

<sup>b</sup> Several vessels participated in both the directed and joint venture fisheries and were, therefore, only counted once within the total.

ROK = Republic of Korea.

PRC = People's Republic of China.

Table 49.--Estimated catches of groundfish taken by foreign and joint venture vessels operating in the Pacific whiting fishery off Washington, Oregon, and California, 1987.

Species group	Foreign fishery					Joint venture fishery <sup>a</sup>			All fisheries	
	Poland catch (t)	ROK catch (t)	PRC catch (t)	Total catch (t)	Whiting quota (%)	Retained (t)	Discarded (t)	Total (t)	Whiting catch (%)	Total (t)
Pacific whiting	48,277.6	1,373.2	4.9	49,655.7	--	105,996.6	--	105,996.6	--	155,652.3
Jack mackerel	308.7	11.8	0.1	320.6	0.54	16.2	394.3	410.5	0.39	731.1
Rockfish (excluding Pacific ocean perch)	202.4	16.4	0.0	218.8	0.37	75.8	567.4	643.2	0.61	862.0
Pacific ocean perch	3.3	0.0	0.0	3.3	0.01	0.4	2.5	2.9	<0.01	6.2
Sablefish	29.7	0.0	0.0	29.7	0.05	2.5	11.1	13.6	0.01	43.3
Flounders	1.0	0.6	0.0	1.6	<0.01	0.1	17.3	17.4	0.02	19.0
Other fish	152.7	10.7	0.0	163.4	0.27	3.8	63.0	66.8	0.06	230.2
<b>Total</b>	<b>48,975.4</b>	<b>1,412.7</b>	<b>5.0</b>	<b>50,393.1</b>		<b>106,095.4</b>	<b>1,055.6</b>	<b>107,151.0</b>		<b>157,544.1</b>

a See text for description of regulations pertaining to retention and discarding of joint venture catch.

b The Pacific whiting quota in 1987 was 53,800 t for Poland, 2,500 t for ROK, and 3,200 t for PRC, for a total of 59,500 t. See text description of by-catch levels in relation to the Pacific whiting quota.

ROK = Republic of Korea.

PRC = People's Republic of China.

Table 50.--Estimated catch of Pacific whiting by foreign and joint venture fisheries off Washington, Oregon, and California, 1977-87\*.

Year	Foreign t	Joint venture t	Total t
1977	127,013	NF	127,013
1978	93,332	856	94,188
1979	114,910	8,834	123,744
1980	44,023	27,537	71,560
1981	70,365	43,557	113,922
1982	7,089	67,465	74,554
1983	NF	72,100	72,100
1984	14,772	78,889	93,661
1985	49,853	31,692	81,545
1986	69,861	81,640	151,501
1987	49,656	105,997	155,653

\* Estimates for years 1977-86 are from Berger et al. 1988.

NF = No fishing.

Table 51 .--Incidence rate (number per metric ton of catch) and average weight (kg) of Pacific Salmon taken in the foreign and joint venture groundfish catches on the Pacific Coast, 1987. Lines indicate areas not fished.

	<u>Vancouver</u>		<u>Columbia</u>		<u>Eureka</u>		<u>Monterey</u>	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
<u>Polish Large Freezer Trawler</u>								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	0.067	2.612	--	--	--	--
July	--	--	0.056	3.236	0.000	0.000	--	--
Aug.	--	--	0.036	3.122	--	--	--	--
Sep.	--	--	0.099	3.218	--	--	--	--
Oct.	--	--	0.391	3.201	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	--	--	0.226	3.198	0.000	0.000	--	--
<u>Republic of Korea Large Freezer Trawler</u>								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	--	--	0.112	3.339	--	--	--	--
Sep.	--	--	0.306	2.754	--	--	--	--
Oct.	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	--	--	0.282	2.783	--	--	--	--

Table 51.--Incidence rate (number per metric ton of catch) and average weight (kg) of Pacific salmon taken in the foreign and joint venture groundfish catches on the Pacific Coast, 1987  
(Continued). Lines indicate areas not fished.

	<u>Vancouver</u>		<u>Columbia</u>		<u>Eureka</u>		<u>Monterey</u>	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
<u>People's Republic of China Large Freezer Trawler</u>								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	--	--	0.000	0.000	--	--	--	--
Sep.	--	--	0.926	3.300	--	--	--	--
Oct.	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	--	--	0.783	3.300	--	--	--	--
<u>U.S.-U.S.S.R. JV Mothership</u>								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	0.020	1.702	--	--	--	--
May	--	--	0.105	1.855	--	--	--	--
June	0.089	2.398	0.109	2.456	--	--	--	--
July	--	--	0.092	2.389	--	--	--	--
Aug.	--	--	0.039	2.484	--	--	--	--
Sep.	--	--	0.021	2.277	--	--	--	--
Oct.	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.089	2.398	0.083	2.241	--	--	--	--

JV = Joint venture.

Table 51.--Incidence rate (number per metric ton of catch) and average weight (kg) of Pacific salmon taken in the foreign and joint venture groundfish catches on the Pacific Coast, 1987 (Continued). Lines indicate areas not fished.

	<u>Vancouver</u>		<u>Columbia</u>		<u>Eureka</u>		<u>Monterey</u>	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
<u>U.S.-Republic of Korea JV Mothership</u>								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	0.166	2.309	0.038	3.996	--	--	--	--
Sep.	NS	NS	0.125	1.934	--	--	--	--
Oct.	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.166	2.309	0.064	2.809	--	--	--	--
<u>U.S.-Poland JV Mothership</u>								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	0.035	1.546	--	--	--	--
June	0.061	3.013	0.062	2.770	--	--	--	--
July	0.277	2.074	0.085	2.526	--	--	--	--
Aug.	1.639	1.863	0.046	2.499	--	--	--	--
Sep.	--	--	0.069	1.635	--	--	--	--
Oct.	--	--	0.134	2.263	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.238	2.119	0.067	2.398	--	--	--	--

NS = Fishing occurred but no sampling by U.S. observers.  
 JV = Joint venture.

Table 51.--Incidence rate (number per metric ton of catch) and average weight (kg) of Pacific salmon taken in the foreign and joint venture groundfish catches on the Pacific Coast, 1987  
(Continued).. Lines indicate areas not fished.

	<u>Vancouver</u>		<u>Columbia</u>		<u>Eureka</u>		<u>Monterey</u>	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
<b>U.S.-People's Republic of China JV Mothership</b>								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	0.309	2.030	0.086	2.267	--	--	--	--
Sep.	NS	NS	0.087	2.213	--	--	--	--
Oct.	--	--	0.185	2.390	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.309	2.030	0.105	2.285	--	--	--	--

NS = Fishing occurred but no sampling by U.S. observers.  
JV = Joint venture.

Table 52.--Estimated incidental catch of Pacific salmon (numbers and tons) in the foreign and joint venture Pacific whiting fisheries off Washington, Oregon, and California, 1987<sup>a</sup>.

Month	Vancouver <sup>b</sup>		Columbia		Eureka		All areas	
	Nos.	t	Nos.	t	Nos.	t	Nos.	t
<b>Foreign fishery--Poland</b>								
June	--	--	82	0.2	--	--	82	0.2
July	--	--	485	1.6	0	0.0	485	1.6
August	--	--	272	0.8	--	--	272	0.8
September	--	--	358	1.2	--	--	358	1.2
October	--	--	3,050	9.8	--	--	3,050	9.8
TOTAL	--	--	4,247	13.6	0	0.0	4,247	13.6
<b>Foreign fishery--Republic of Korea (ROK)</b>								
August	--	--	19	0.1	--	--	19	0.1
September	--	--	379	1.0	--	--	379	1.0
TOTAL	--	--	398	1.1	--	--	398	1.1
<b>Foreign fishery--People's Republic of China (PRC)</b>								
August	--	--	0	0.0	--	--	0	0.0
September	--	--	4	<0.1	--	--	4	<0.1
TOTAL	--	--	4	<0.1	--	--	4	<0.1
<b>Joint venture fishery--U.S.-Poland</b>								
May	--	--	24	<0.1	--	--	24	<0.1
June	99	0.3	444	1.2	--	--	543	1.5
July	706	1.5	1,201	3.0	--	--	1,907	4.5
August	217	0.4	884	2.2	--	--	1,101	2.6
September	--	--	474	0.8	--	--	474	0.8
October	--	--	136	0.3	--	--	136	0.3
TOTAL	1,022	2.2	3,163	7.5	--	--	4,185	9.7
<b>Joint venture fishery--U.S.-U.S.S.R.</b>								
April	--	--	2	<0.1	--	--	2	<0.1
May	--	--	1,187	2.2	--	--	1,187	2.2
June	185	0.4	861	2.1	--	--	1,046	2.5
July	--	--	1,000	2.4	--	--	1,000	2.4
August	--	--	494	1.2	--	--	494	1.2
September	--	--	9	<0.1	--	--	9	<0.1
TOTAL	185	0.4	3,553	7.9	--	--	3,738	8.3
<b>Joint venture fishery--U.S.-ROK</b>								
August	83	0.2	56	0.2	--	--	139	0.4
September	0	0.0	66	0.1	--	--	66	0.1
TOTAL	83	0.2	122	0.3	--	--	205	0.5
<b>Joint venture fishery--U.S.-PRC</b>								
August	109	0.2	102	0.2	--	--	211	0.4
September	0	0.0	147	0.3	--	--	147	0.3
October	--	--	150	0.4	--	--	150	0.4
TOTAL	109	0.2	399	0.9	--	--	508	1.1
<b>All fisheries--TOTAL</b>								
April	--	--	2	<0.1	--	--	2	<0.1
May	--	--	1,211	2.2	--	--	1,211	2.2
June	284	0.7	1,387	3.5	--	--	1,671	4.2
July	706	1.5	2,686	7.0	0	0.0	3,392	8.5
August	409	0.8	1,827	4.7	--	--	2,236	5.5
September	--	--	1,437	3.4	--	--	1,437	3.4
October	--	--	3,336	10.5	--	--	3,336	10.5
TOTAL	1,399	3.0	11,886	31.3	0	0.0	13,285	34.3

<sup>a</sup> Fishing did not occur in the Monterey area in 1987.

<sup>b</sup> The foreign fishery is prohibited from fishing in the Vancouver area.

Table 53.--Estimated catch of Pacific salmon (numbers and metric tons) in the foreign and joint venture Pacific whiting fishery off Washington, Oregon, and California, 1977-87\*.

Year	Foreign		Joint Venture		Total	
	Nos.	t	Nos.	t	Nos.	t
1977	14,627	49.1	NF	NF	14,627	49.1
1978	5,905	19.1	19	<0.1	5,924	19.1
1979	7,043	29.8	1,623	4.1	8,666	33.9
1980	4,831	17.1	3,602	8.6	8,433	25.7
1981	5,052	17.7	6,422	13.6	11,474	31.3
1982	104	0.8	11,694	33.1	11,798	33.9
1983	NF	NF	5,143	10.8	5,143	10.8
1984	63	0.3	10,192	18.5	10,255	18.8
1985	713	3.8	1,575	4.0	2,288	7.8
1986	10,178	23.1	26,999	42.9	37,177	66.0
1987	4,649	14.7	8,636	19.6	13,285	34.3

\* Estimated catches for years 1977-86 from Berger et al. 1988.

NF=No fishing.

Table 54. --Biological data on the incidental catch of Pacific salmon in the foreign and joint venture groundfish fishery off Washington, Oregon, and California, 1987.

Species	Percent by species	Sex	Sex composition	Average weight (kg)	Average length (cm)
<u>Foreign directed fisheries</u>					
Chinook	90.14	Male	40.31	3.05	60.2
		Female	58.76	3.42	61.6
		Unsexed	0.93	3.46	64.0
		Combined		3.27	61.1
Coho	8.23	Male	52.48	2.19	55.5
		Female	46.12	2.34	57.7
		Unsexed	1.40	4.36	67.8
		Combined		2.29	56.7
Chum	0.12	Male	30.15	2.49	58.2
		Female	69.85	5.89	71.7
		Unsexed	0.00	--	--
		Combined		4.86	67.6
Pink	1.46	Male	61.24	2.13	53.5
		Female	38.76	1.62	49.1
		Unsexed	0.00	--	--
		Combined		1.94	51.8
Sockeye	0.05	Male	56.94	4.13	67.3
		Female	43.06	3.33	63.3
		Unsexed	0.00	--	--
		Combined		3.78	65.6
<u>Joint venture fisheries</u>					
Chinook	92.40	Male	47.18	2.25	54.7
		Female	51.82	2.38	55.5
		Unsexed	1.00	1.98	51.8
		Combined		2.32	55.1
Coho	6.83	Male	48.03	1.98	52.6
		Female	51.41	2.03	53.7
		Unsexed	0.56	1.87	52.6
		Combined		2.00	53.2
Chum	0.19	Male	74.96	5.78	77.9
		Female	25.04	4.97	72.4
		Unsexed	0.00	--	--
		Combined		5.58	76.5
Pink	0.58	Male	56.48	2.02	52.2
		Female	43.52	2.00	54.3
		Unsexed	0.00	--	--
		Combined		2.01	53.1

Table 55.--Incidence rate (number per metric ton of catch) and average weight (kg) of Pacific halibut taken in the foreign and joint venture groundfish catches on the Pacific Coast, 1987. Lines indicate areas not fished.

	<u>Vancouver</u>		<u>Columbia</u>		<u>Eureka</u>		<u>Monterey</u>	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
<u>Polish Large Freezer Trawler</u>								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	0.000	0.000	--	--	--	--
July	--	--	<0.001	5.148	0.000	0.000	--	--
Aug.	--	--	0.001	14.942	--	--	--	--
Sep.	--	--	<0.001	0.467	--	--	--	--
Oct.	--	--	<0.001	0.300	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	--	--	<0.001	6.308	0.000	0.000	--	--
<u>Republic of Korea Large Freezer Trawler</u>								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	--	--	0.000	0.000	--	--	--	--
Sep.	--	--	0.004	10.000	--	--	--	--
Oct.	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	--	--	0.003	10.000	--	--	--	--

Table 55.--Incidence rate (number per metric ton of catch) and average weight (kg) of Pacific halibut taken in the foreign and joint venture groundfish catches on the Pacific Coast, 1987 (Continued). Lines indicate areas not fished.

	<u>Vancouver</u>		<u>Columbia</u>		<u>Eureka</u>		<u>Monterey</u>	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
<u>People's Republic of China Large Freezer Trawler</u>								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	--	--	2.326	0.350	--	--	--	--
Sep.	--	--	0.000	0.000	--	--	--	--
Oct.	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	--	--	0.358	0.350	--	--	--	--
<u>U.S.-U.S.S.R. JV Mothership</u>								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	0.000	0.000	--	--	--	--
May	--	--	0.001	15.217	--	--	--	--
June	0.000	0.000	0.000	0.000	--	--	--	--
July	--	--	0.001	5.188	--	--	--	--
Aug.	--	--	<0.001	8.356	--	--	--	--
Sep.	--	--	0.000	0.000	--	--	--	--
Oct.	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.000	0.000	<0.001	10.634	--	--	--	--

JV = Joint venture.

Table 55.--Incidence rate (number per metric ton of catch) and average weight (kg) of Pacific halibut taken in the foreign and joint venture groundfish catches on the Pacific Coast, 1987  
(Continued). Lines indicate areas not fished.

	<u>Vancouver</u>		<u>Columbia</u>		<u>Eureka</u>		<u>Monterey</u>	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
<u>U.S.-Republic of Korea JV Mothership</u>								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	0.000	0.000	0.000	0.000	--	--	--	--
Sep.	NS	NS	0.000	0.000	--	--	--	--
Oct.	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.000	0.000	0.000	0.000	--	--	--	--
<u>U.S.-Poland JV Mothership</u>								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	0.000	0.000	--	--	--	--
June	0.000	0.000	0.001	6.626	--	--	--	--
July	0.000	0.000	<0.001	4.890	--	--	--	--
Aug.	0.010	3.360	<0.001	6.810	--	--	--	--
Sep.	--	--	0.000	0.000	--	--	--	--
Oct.	--	--	0.000	0.000	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	<0.001	3.360	<0.001	6.194	--	--	--	--

NS = Fishing occurred but no sampling by U.S. observers.  
JV = Joint venture.

Table 55.--Incidence rate (number per metric ton of catch) and average weight (kg) of Pacific halibut taken in the foreign and joint venture groundfish catches on the Pacific Coast, 1987 (Continued). Lines indicate areas not fished.

	<u>Vancouver</u>		<u>Columbia</u>		<u>Eureka</u>		<u>Monterey</u>	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
<b>U.S.-People's Republic of China JV Mothership</b>								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	0.000	0.000	0.001	5.100	--	--	--	--
Sep.	NS	NS	0.000	0.000	--	--	--	--
Oct.	--	--	0.000	0.000	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.000	0.000	<0.001	5.100	--	--	--	--

NS = Fishing occurred but no sampling by U.S. observers.

JV = Joint venture.

Table 56.--Estimated incidental catch of Pacific halibut (numbers and metric tons) in the foreign and joint venture Pacific whiting fishery off Washington, Oregon, and California, 1987<sup>a</sup>.

Month	Vancouver <sup>b</sup>		Columbia		Eureka		All Areas	
	Nos.	t	Nos.	t	Nos.	t	Nos.	t
<u>Foreign fishery--Poland</u>								
June	--	--	0	0.0	--	--	0	0.0
July	--	--	3	<0.1	0	0.0	3	<0.1
August	--	--	5	0.1	--	--	5	0.1
September	--	--	3	<0.1	--	--	3	<0.1
October	--	--	3	<0.1	--	--	3	<0.1
TOTAL	--	--	14	0.1	0	0.0	14	0.1
<u>Foreign fishery--Republic of Korea (ROK)</u>								
August	--	--	0	0.0	--	--	0	0.0
September	--	--	5	0.1	--	--	5	0.1
TOTAL	--	--	5	0.1	--	--	5	0.1
<u>Foreign fishery--People's Republic of China (PRC)</u>								
August	--	--	1	<0.1	--	--	1	<0.1
September	--	--	0	0.0	--	--	0	0.0
TOTAL	--	--	1	<0.1	--	--	1	<0.1
<u>Joint venture fishery--U.S.-Poland</u>								
May	--	--	0	0.0	--	--	0	0.0
June	0	0.0	7	0.1	--	--	7	0.1
July	0	0.0	6	<0.1	--	--	6	<0.1
August	1	<0.1	7	0.1	--	--	8	0.1
September	--	--	0	0.0	--	--	0	0.0
October	--	--	0	0.0	--	--	0	0.0
TOTAL	1	<0.1	20	0.2	--	--	21	0.2
<u>Joint venture fishery--U.S.-U.S.S.R.</u>								
April	--	--	0	0.0	--	--	0	0.0
May	--	--	9	0.1	--	--	9	0.1
June	0	0.0	0	0.0	--	--	0	0.0
July	--	--	7	<0.1	--	--	7	<0.1
August	--	--	11	0.1	--	--	11	0.1
September	--	--	0	0.0	--	--	0	0.0
TOTAL	0	0.0	27	0.2	--	--	27	0.2
<u>Joint venture fishery--U.S.-ROK</u>								
August	0	0.0	0	0.0	--	--	0	0.0
September	0	0.0	0	0.0	--	--	0	0.0
TOTAL	0	0.0	0	0.0	--	--	0	0.0
<u>Joint venture fishery--U.S.-PRC</u>								
August	0	0.0	1	<0.1	--	--	1	<0.1
September	0	0.0	0	0.0	--	--	0	0.0
October	--	--	0	0.0	--	--	0	0.0
TOTAL	0	0.0	1	<0.1	--	--	1	<0.1
<u>All fisheries--TOTAL</u>								
April	--	--	0	0.0	--	--	0	0.0
May	--	--	9	0.1	--	--	9	0.1
June	0	0.0	7	0.1	--	--	7	0.1
July	0	0.0	16	<0.1	0	0.0	16	<0.1
August	1	<0.1	25	0.3	--	--	26	0.3
September	--	--	8	0.1	--	--	8	0.1
October	--	--	3	<0.1	--	--	3	<0.1
TOTAL	1	<0.1	68	0.6	0	0.0	69	0.6

<sup>a</sup> Fishing did not occur in the Monterey area in 1987.

<sup>b</sup> The foreign fishery is prohibited from fishing in the Vancouver area.

Table 57.--Estimated catch of halibut (numbers and metric tons) in the foreign and joint venture Pacific whiting fishery off Washington, Oregon, and California, 1977-87.

Year	Foreign		Joint venture		Total	
	Nos.	t	Nos.	t	Nos.	t
1977	86	1.6	NF	NF	86	1.6
1978	240	1.4	0	0.0	240	1.4
1979	40	0.5	0	0.0	40	0.5
1980	135	0.9	0	0.0	135	0.9
1981	22	0.1	0	0.0	22	0.1
1982	1	<0.1	43	0.2	44	0.2
1983	NF	NF	46	0.5	46	0.5
1984	0	0.0	26	0.2	26	0.2
1985	4	0.1	31	0.2	35	0.3
1986	20	0.1	96	0.6	116	0.7
1987	20	0.2	49	0.4	69	0.6

NF = No fishing.

Table 58.--The common and scientific names of rockfish identified in the 1987 foreign and joint venture catches in the Washington, Oregon, and California region.

Common name <sup>a</sup>	Scientific name
Black rockfish	<u>Sebastes melanops</u>
Blackgill rockfish	<u>Sebastes melanostomus</u>
Bocaccio	<u>Sebastes paucispinis</u>
Canary rockfish	<u>Sebastes pinniger</u>
Chilipepper	<u>Sebastes goodei</u>
Darkblotched rockfish	<u>Sebastes crameri</u>
Pacific ocean perch	<u>Sebastes alutus</u>
Redstripe rockfish	<u>Sebastes proriger</u>
Rougheye rockfish	<u>Sebastes aleutianus</u>
Shortbelly rockfish	<u>Sebastes jordani</u>
Shortraker rockfish	<u>Sebastes borealis</u>
Shortspine thornyhead	<u>Sebastes alascanus</u>
Splitnose rockfish	<u>Sebastes diploproa</u>
Vermilion rockfish	<u>Sebastes miniatus</u>
Widow rockfish	<u>Sebastes entomelas</u>
Yellowmouth rockfish	<u>Sebastes reedi</u>
Yellowtail rockfish	<u>Sebastes flavidus</u>
Other rockfish <sup>b</sup>	
Aurora rockfish	<u>Sebastes aurora</u>
Blue rockfish	<u>Sebastes mystinus</u>
Copper rockfish	<u>Sebastes caurinus</u>
Dusky rockfish	<u>Sebastes ciliatus</u>
Greenspotted rockfish	<u>Sebastes chlorostictus</u>
Greenstriped rockfish	<u>Sebastes elongatus</u>
Quillback rockfish	<u>Sebastes maliger</u>
Redbanded rockfish	<u>Sebastes babcocki</u>
Sharpchin rockfish	<u>Sebastes zacentrus</u>
Silvergray rockfish	<u>Sebastes brevispinis</u>
Stripetail rockfish	<u>Sebastes saxicola</u>
Tiger rockfish	<u>Sebastes nigrocinctus</u>
Yelloweye rockfish	<u>Sebastes ruberrimus</u>

<sup>a</sup> With all rockfish, the possibility of misidentification exists, and the listing of species not previously reported from the Washington-Oregon-California region should be noted with caution.

<sup>b</sup> The 13 species listed under "Other rockfish" each made up less than 0.10% of the rockfish catch by foreign Vessels and by joint venture operations.

Table 59.--Estimated catch of rockfish by species and area in the Washington, Oregon, and California region during 1987.

Common name	Vancouver		Columbia		Eureka		Total	
	t	%	t	%	t	%	t	%
<u>Foreign directed fisheries</u>								
Black rockfish	--	--	0.77	0.35	0.00	0.00	0.77	0.35
Blackgill rockfish	--	--	0.72	0.32	0.00	0.00	0.72	0.32
Bocaccio	--	--	2.65	1.19	0.00	0.00	2.65	1.19
Canary rockfish	--	--	3.80	1.71	0.00	0.00	3.80	1.71
Chilipepper	--	--	0.57	0.26	0.00	0.00	0.57	0.26
Darkblotched rockfish	--	--	8.59	3.87	0.00	0.00	8.59	3.87
Pacific ocean perch	--	--	3.31	1.49	0.00	0.00	3.31	1.49
Redstripe rockfish	--	--	6.98	3.14	0.00	0.00	6.98	3.14
Rougheye rockfish	--	--	7.68	3.46	0.00	0.00	7.68	3.46
Shortbelly rockfish	--	--	9.43	4.24	0.00	0.00	9.43	4.24
Shortraker rockfish	--	--	0.60	0.27	0.00	0.00	0.60	0.27
Shortspine thornyhead	--	--	7.39	3.33	0.00	0.00	7.39	3.33
Splitnose rockfish	--	--	7.21	3.25	0.00	0.00	7.21	3.25
Vermilion rockfish	--	--	0.31	0.14	0.00	0.00	0.31	0.14
Widow rockfish	--	--	78.30	35.24	0.00	0.00	78.30	35.24
Yellowmouth rockfish	--	--	1.83	0.82	0.00	0.00	1.83	0.82
Yellowtail rockfish	--	--	81.39	36.63	0.00	0.00	81.39	36.63
Other rockfish*	--	--	0.64	0.29	0.00	0.00	0.64	0.29
Total	--	--	222.17		0.00		222.17	
Percent by area	--	--	100.00		0.00			
<u>Joint venture fisheries</u>								
Black rockfish	0.32	0.43	0.83	0.15	--	--	1.15	0.18
Bocaccio	0.69	0.93	1.53	0.27	--	--	2.22	0.34
Canary rockfish	1.00	1.34	4.93	0.86	--	--	5.93	0.92
Chilipepper	0.03	0.04	0.17	0.03	--	--	0.20	0.03
Darkblotched rockfish	1.55	2.08	7.31	1.28	--	--	8.86	1.37
Pacific ocean perch	1.06	1.42	1.78	0.31	--	--	2.84	0.44
Redstripe rockfish	0.01	0.01	13.30	2.33	--	--	13.31	2.06
Rougheye rockfish	0.02	0.03	0.05	0.01	--	--	0.07	0.01
Shortbelly rockfish	0.00	0.00	13.95	2.44	--	--	13.95	2.16
Shortraker rockfish	<0.01	<0.01	0.08	0.01	--	--	0.08	0.01
Shortspine thornyhead	0.00	0.00	<0.01	<0.01	--	--	<0.01	<0.01
Splitnose rockfish	<0.01	<0.01	0.04	0.01	--	--	0.04	0.01
Vermilion rockfish	0.00	0.00	0.05	0.01	--	--	0.05	0.01
Widow rockfish	8.69	11.66	101.59	17.78	--	--	110.28	17.07
Yellowmouth rockfish	0.01	0.01	0.35	0.06	--	--	0.36	0.06
Yellowtail rockfish	60.99	81.84	423.42	74.09	--	--	484.41	74.99
Other rockfish*	0.15	0.20	2.08	0.36	--	--	2.23	0.35
Total	74.52		571.46		--	--	645.98	
Percent by area	11.54		88.46		--	--		

\*Species included in this category are listed in Table 58.

Table 60.-Common and scientific names of flatfish identified in the 1987 foreign and joint venture catches in the Washington, Oregon, and California region.

Common name	Scientific name
Arrowtooth flounder (turbot)	<u>Atheresthes stomias</u>
Dover sole	<u>Microstomus pacificus</u>
English sole	<u>Parophrys vetulus</u>
Flathead sole	<u>Hippoglossoides elassodon</u>
Pacific sanddab	<u>Citharichthys sordidus</u>
Petrale sole	<u>Eopsetta jordani</u>
Rex sole	<u>Glyptocephalus zachirus</u>
Rock sole	<u>Lepidopsetta bilineata</u>
Sanddab unident.	<u>Bothidae</u>
Slender sole	<u>Lyopsetta exilis</u>
Yellowfin sole	<u>Limanda aspera</u>

Table 61.--Estimated catch of flatfish by species and area in the Washington, Oregon, and California region during 1987.

Common name	Vancouver		Columbia		Eureka		Total	
	t	%	t	%	t	%	t	%
<u>Foreign directed fisheries</u>								
Arrowtooth flounder	--	--	0.54	32.93	0.00	0.00	0.54	32.93
Dover sole	--	--	0.04	2.44	0.00	0.00	0.04	2.44
English sole	--	--	0.02	1.22	0.00	0.00	0.02	1.22
Flathead sole	--	--	<0.01	<0.01	0.00	0.00	<0.01	<0.01
Pacific sanddab	--	--	0.01	0.61	0.00	0.00	0.01	0.61
Petrале sole	--	--	<0.01	<0.01	0.00	0.00	<0.01	<0.01
Rex sole	--	--	0.89	54.27	0.00	0.00	0.89	54.27
Rock sole	--	--	0.14	8.54	0.00	0.00	0.14	8.54
Slender sole	--	--	<0.01	<0.01	0.00	0.00	<0.01	<0.01
Total	--	--	1.64		0.00		1.64	
Percent by area	--	--	100.00		0.00			
<u>Joint venture fisheries</u>								
Arrowtooth flounder	0.08	80.00	0.73	4.21	--	--	0.81	4.65
Dover sole	<0.01	<0.01	0.16	0.92	--	--	0.16	0.92
English sole	<0.01	<0.01	0.15	0.87	--	--	0.15	0.86
Flathead sole	0.00	0.00	0.06	0.35	--	--	0.06	0.34
Pacific sanddab	0.01	10.00	15.77	91.05	--	--	15.78	90.59
Petrале sole	<0.01	<0.01	0.01	0.06	--	--	0.01	0.06
Rex sole	0.01	10.00	0.26	1.50	--	--	0.27	1.55
Rock sole	0.00	0.00	<0.01	<0.01	--	--	<0.01	<0.01
Sanddab unidentified	0.00	0.00	0.16	0.92	--	--	0.16	0.92
Slender sole	0.00	0.00	0.02	0.12	--	--	0.02	0.11
Yellowfin sole	<0.01	<0.01	0.00	0.00	--	--	<0.01	<0.01
Total	0.10		17.32		--		17.42	
Percent by area	0.57		99.43		--			

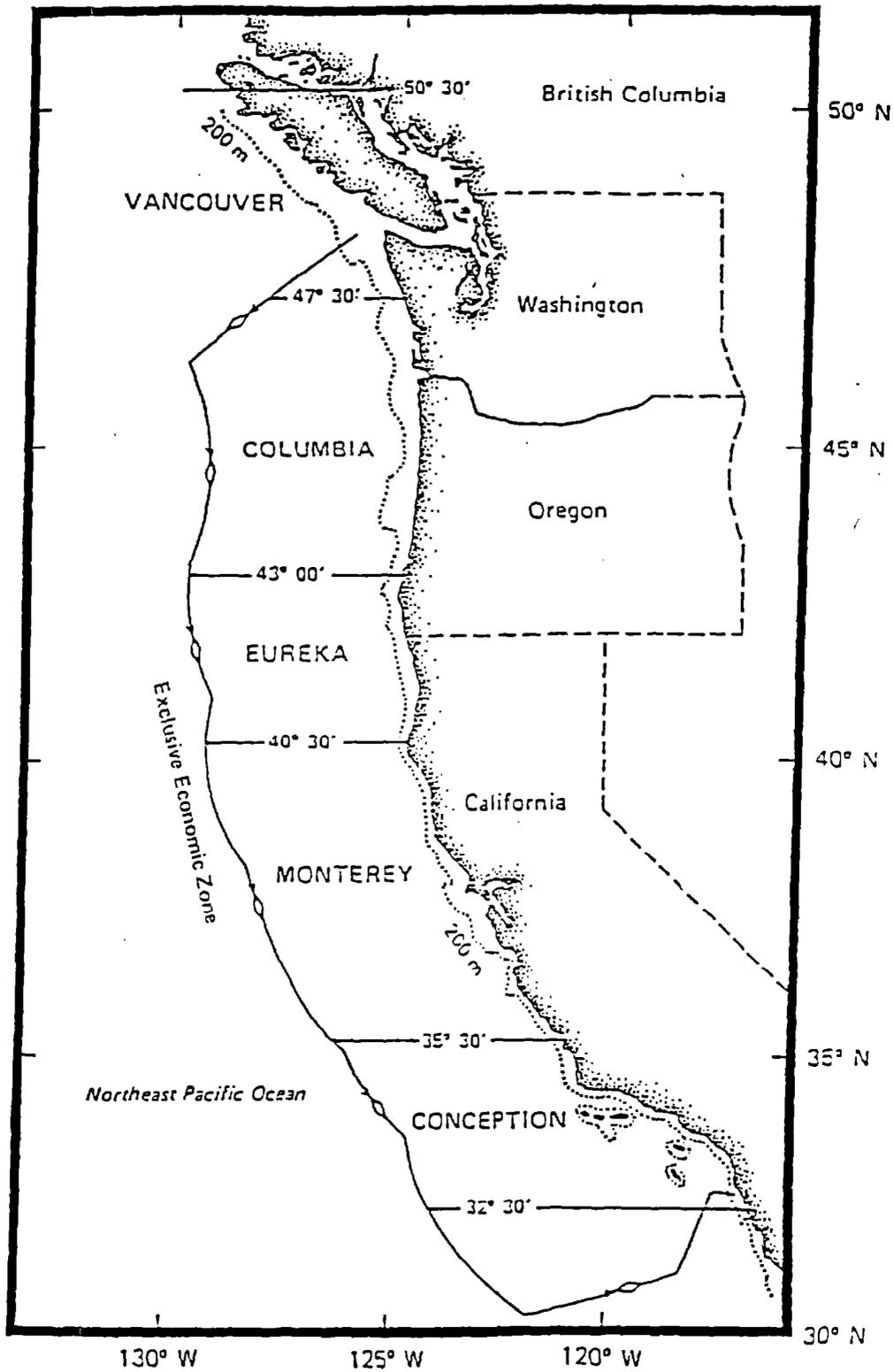


Figure 17.--U.S. statistical areas in the Washington-Oregon-California region used to summarize catch and effort data.

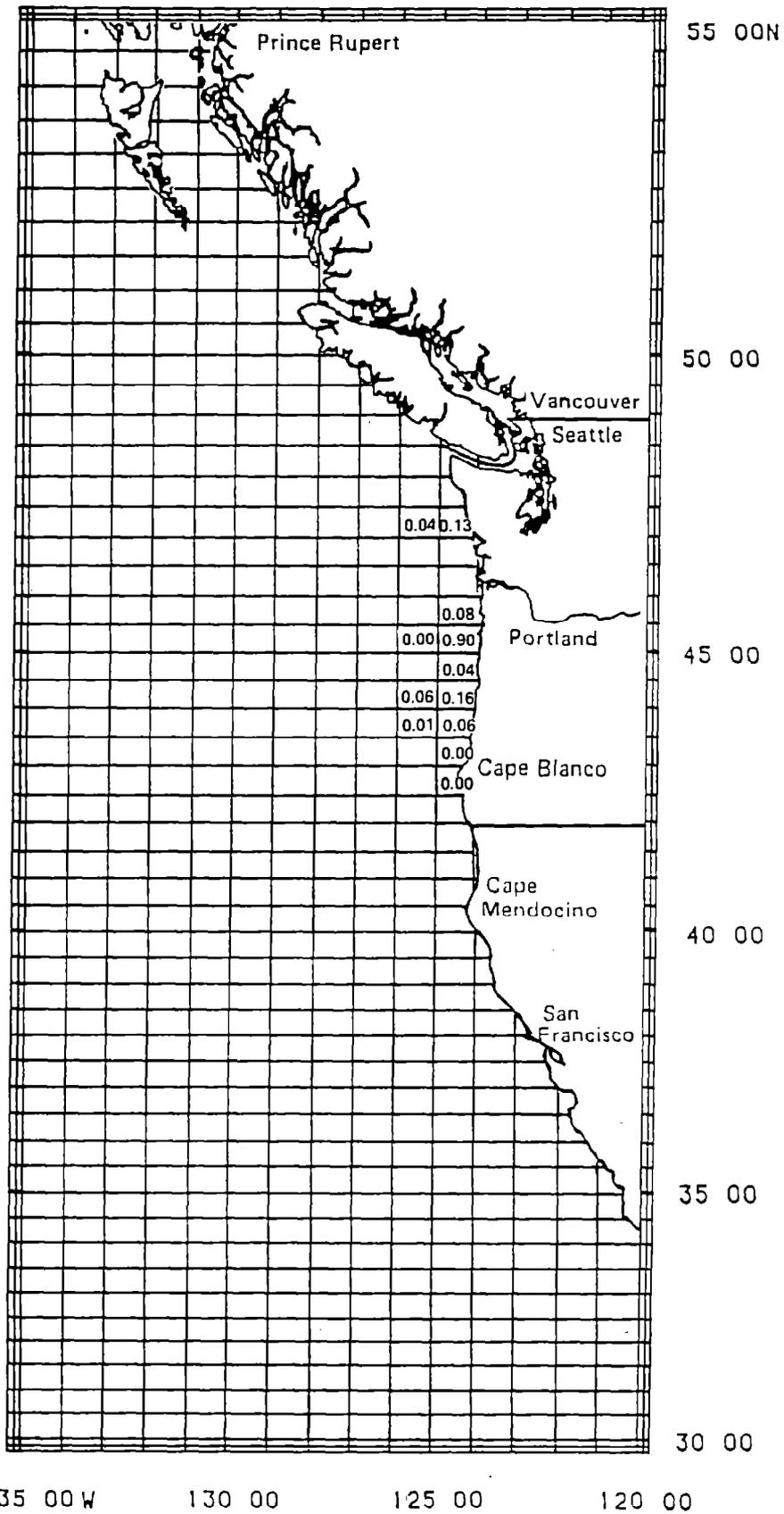


Figure 18. --Average incidence of salmonids (no. of salmonids/t of groundfish) in the foreign Pacific whiting fishery off Washington, Oregon, and California, 1987.

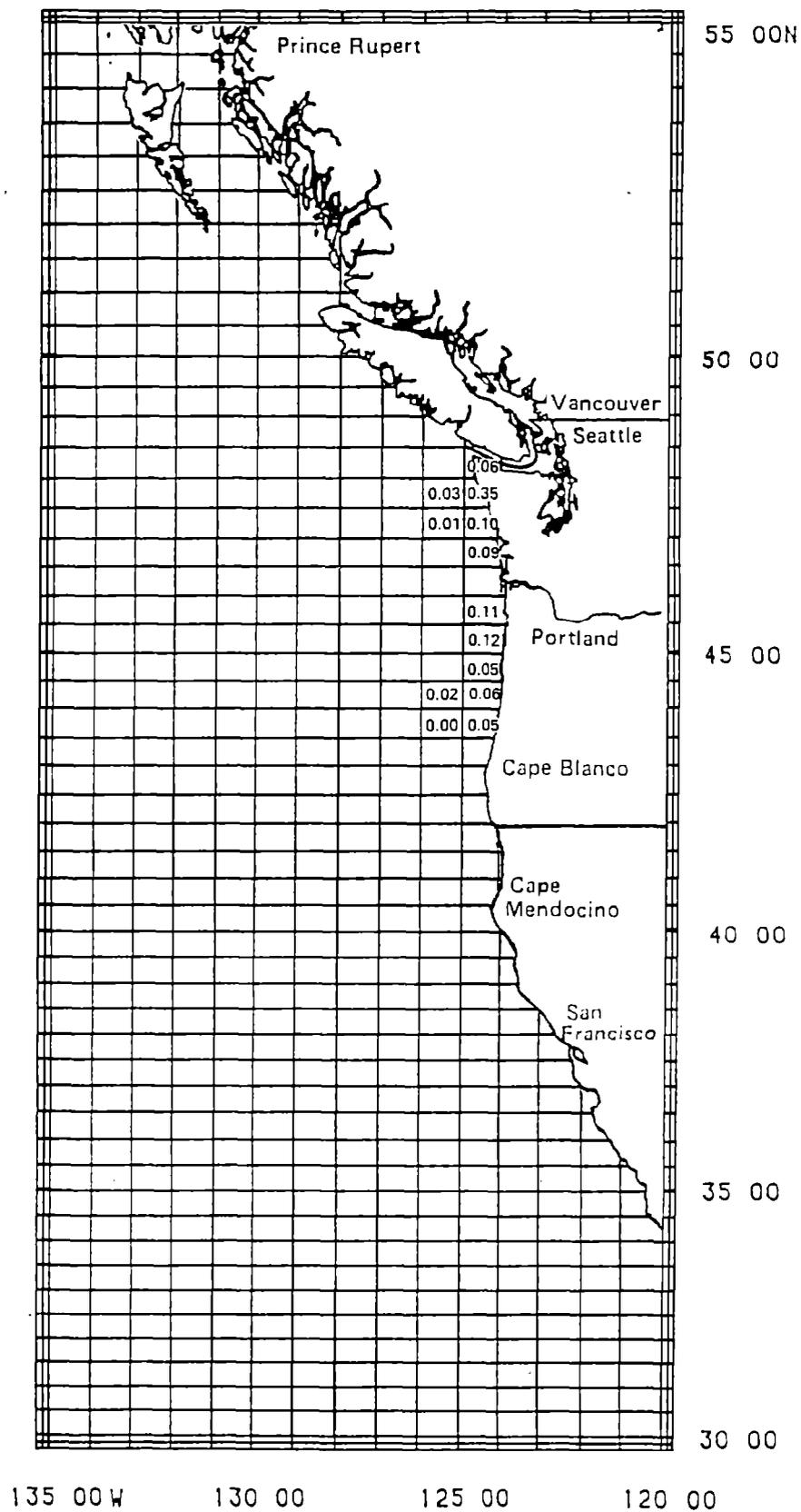


Figure 19.--Average incidence of salmonids (no. of salmonids/t of groundfish) in the joint venture Pacific whiting fishery off Washington, Oregon, and California, 1987.

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