SUMMARY OF U.S. OBSERVER SAMPLING OF FOREIGN AND JOINT VENTURE FISHERIES IN THE NORTHEAST PACIFIC OCEAN AND EASTERN BERING SEA, 1988

by

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ABSTRACT

This report summarizes the 1988 foreign and joint venture groundfish activities in the eastern Bering Sea, the Gulf of Alaska, and off the Washington-Oregon-California coast. Tables contained herein provide estimates of the foreign and joint venture groundfish catches. Estimates of the rockfish and flatfish catches are shown by species group and also by species. Estimates are made of the catches and averages weights of Pacific salmon (Oncorhynchus spp.), Pacific halibut (Hippoglossus stenolepis), snow (Tanner) crab (Chionoecetes spp.), and king crab (Lithodes and Paralithodes spp.).

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INTRODUCTION

In 1988, the foreign nations spent their twelfth year operating in U.S. waters 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 1988, the Alaska Fisheries Science Center sent 284 U.S. fisheries observers to sample aboard vessels of five nations: Japan, Poland, the Republic of Korea (ROK), the People's Republic of China (PRC), and the U.S.S.R. These vessels operated as either foreign fishing vessels or as processors of U.S.-caught fish (joint venture). A description of the various vessel types and a listing of vessel class abbreviations which are used in tables in this paper are presented in Table 1. In 1988, overall observer coverage of the total number of foreign vessel days on fishing grounds (100 x. observer days/foreign vessel days) was 93.9%. This represented 14,892 days during which observers took samples aboard foreign vessels that spent a total of 15,866 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 made while the observer was aboard. In addition, each observer sampled several hauls 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. 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 1988 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. 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 and watched the emptying of nets. They also recorded the incidental catch by number and weight of four species groups which cannot be retained due to U.S. regulations. These designated "prohibited species" are Pacific salmon (Oncorhynchus spp.), Pacific halibut (Hippoglossus stenolepis), snow (Tanner) crab (Chionoecetes spp.), and king crab (Paralithodes and Lithodes spp.). 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. Some observers conducted additional special studies.

METHODS OF CALCULATION

Estimates of Foreign and U.S. Joint Venture Catches

Estimates of the foreign and joint venture 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 order to provide a "best estimate" of the catch, the U.S. catch 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. When those elements did not meet either of the above criteria, catches reported by foreign vessels were used.

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

Observer data provided the following catch estimates. for each of the four prohibited species: 1) the mean incidence or the average number of individuals caught per metric ton (t) of groundfish catch; 2) the total number of individuals caught; 3) the total weight caught. The average number per metric ton and the total number of individuals caught were estimated by multiplying the average weekly incidence rates for each nation, statistical reporting area, and vessel class by the estimated weekly groundfish catches for those same nations, areas, and vessel classes. The total weight caught 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.

Estimates of Rockfish and Flatfish Catch by Species

The catches of individual rockfish and flatfish species were estimated by applying the mean annual species percentages by weight, computed from species composition data collected by U.S. observers, to the total rockfish and flatfish catch. In 1988, specific catch allocations were set for yellowfin sole (Limanda aspera) and Greenland turbot (Reinhardtius hippoglossoides) in the Bering Sea and Aleutian Islands region and for Pacific ocean perch (Sebastes alutus) in all three management regions; therefore, actual catch estimates have already been made for these three species in these regions. It should be noted, that even though all observers were trained in species identification and instructed in the use of fish identification keys, errors in the identification of some species could have been made, and any errors would affect the individual species estimates.

Table l. --Definition of foreign vessel classes used by U.S. observer program in the Bering Sea/Aleutian Islands and North Pacific groundfish fishery in 1988.

Vessel class	Abbreviation	Definition
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.
Large freezer trawler	LFT	Independent stern trawler 1,500 GRT or greater, with capacity to produce frozen products or meal.

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

Observer Coverage of Fishing Fleets

In 1988, the Domestic Annual Harvest (Domestic Annual Processing (DAP - the total amount of groundfish expected to be caught in the fully U.S. groundfish fisheries) and Joint Venture Processing (JVP - the total amount of groundfish alloted to be caught in joint venture groundfish operations)) was expected to account for the entire 2 million t allowed to be taken in the U.S. 200-mile EEZ in the Bering Sea and Aleutian Islands region (Fig. 1). Therefore, no allocations were given to foreign fishing.

When Foreign fishing was eliminated in 1988, the effort of foreign vessels participating in joint ventures increased 24% over that of 1987. Foreign vessels spent 12,964 days in joint venture fishing operations (Table 2). Joint ventures were conducted between. U.S. vessels and processing vessels from the U.S.S.R., Japan, Poland, the ROK, and the PRC. Observers spent 12,116 days sampling aboard the 131 foreign processing vessels in joint venture fisheries, providing a level of observer coverage of 93.5%, a decrease of 2.4% from the 95.9% coverage. level obtained in 1987 (Berger and Weikart 1988).

Estimates of U.S. Joint Venture Catches

In 1988, the increased fish allotments given to fully U.S. domestic operations (DAP operations) not only led to the elimination of the foreign fishing operations, but it also caused extensive changes in joint venture operations. The joint venture allotments (JVP) for walleye pollock (Theragra chalcogramma) and Atka mackerel (Pleurogrammus monopterygius) were reduced substantially (23% and 36%, respectively) while the joint venture allotments for yellowfin sole, other flounders, and Pacific cod (Gadus macrocephalus) increased (17%, 62%, and 19%, respectively). This led to different fishing strategies.

United States vessels delivered 1.301 million t of groundfish or 99.2% of their joint venture allotment (Berger et al. 1989) to foreign processing vessels in the 1988 joint venture fisheries (Table 3). In keeping with the allotments, the joint venture catches of walleye pollock and Atka mackerel decreased (20.9% and 34.9%, respectively) from those taken in 1987, while catches of yellowfin sole, other flounders, and Pacific cod increased (18.8%, 235.9%, and 89.0%, respectively) over those of 1987. Catches were predominantly walleye pollock (63.5%), followed by yellowfin sole (16.4%), other flatfishes (8.8%), Pacific cod (8.4%), and Atka mackerel (1.5%).

Table 4 presents a summary of the foreign and joint venture catches by species For the years 1977 to 1988. The year 1988 was the first year that no foreign fishing occurred, and was also the first year since 1980 that the U.S. joint venture catches did not increase over the previous year. The 1988 joint venture catch of 1.301 million t represents a 4.1% decrease from the 1987 catch of 1.356 million t.

Restrictions

In 1986, the Department of Commerce Secretary 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 and to protect the stocks of these two crab species from further decline. In 1987 and again in 1988, Amendment 10 to the Bering Sea/Aleutian Island Groundfish Management Plan included these regulations (and ones for Pacific halibut) and imposed the following restrictions on the groundfish. fishery:

a) Prohibited all foreign and joint venture trawling in the area between 160 ^{o} and 162 ^{o} W longitude and south of 58 ^{o} N latitude. 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 for the remainder of the year. If the closure was due to reaching the red king crab limit, then the area would also be closed to any foreign fishing for yellowtin sole and other flatfish for the same period;

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 yellowtin sole and other Oatfishes. 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 (this was not applicable in 1988 due to no foreign fishing);

f) In the Bering Sea and Aleutian Islands region, if the yellowfin sole/other flatfish joint ventures exceeded the limit of 828,000 Pacific halibut, then Zone 1 would be closed to these joint ventures for the remainder of the year.

The NMFS Regional Director for Alaska was allowed to use his discretion in reopening any area to limited fishing after a closure due to prohibited species catch. This occurred in December 1988, when Zone 1 was reopened to permit a rock sole (Lepidopsetta bilineata) fishery.

In addition to the above restrictions, The U.S. partners in the joint venture yellowfin sole/other flatfish fishery designed a self-management system (implemented by NMFS). In this system, each company's bycatch was recorded on a daily basis. As each 20% increment of a bycatch species was caught, bycatch rates were calculated for each company. If a company's average catch rate of a prohibited species (no./t of groundfish) in a zone exceeded 1.5 times the industry average for that zone, the company's joint venture partners had to stop receiving fish in that zone for 10 GMT days. If a company's bycatch rate exceeded two times the industry average for that zone, the company's joint venture partners had to stop receiving fish in that zone for the rest of the year.

A further management tool was used to regulate the walleye pollock joint venture operations by issuing portions of the allotment throughout the year rather than all at the beginning of the year. To spread the catch of walleye pollock throughout the year, only a portion of its total allotment was released on 15 January. The remainder was released on 15 April, and supplemental releases of walleye pollock reserves occurred on 9 September and again on 30 November. Refer to Guttormsen and Clancy (1989) for a complete account of the closures which occurred in the Bering Sea and Aleutian Islands region. One result of these closures and releases was that third quarter fishing was limited primarily to operations targeting on other flatfish in Zone 3. Pollock and yellowfin sole operations in the third quarter were closed until 9 September.

Incidence and Incidental Catch of Prohibited Species

Incidence rates of Pacific salmon, halibut, snow (Tanner) crab, and king crab for all the statistical reporting areas were calculated as described in the introduction section. The estimated incidental catches taken by the yellowfin sole/other flatfish fishery and by the "other" (nonflatfish) fishery in each of the three zones have been included in this report. Refer to Guttormsen and Clancy (1989) for information on catches by subarea (i.e., subsections of these zones).

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 1988; no monthly incidence rate exceeded 0.1 salmon/t. The highest annual average incidence rate (0.017 salmon/t) occurred in the U.S.-Poland joint venture in Area I.

The joint venture incidence of salmon by quarter and l/2° latitude by 1° longitude statistical area is illustrated in Figure 3. Salmon incidence rates were generally less than 0.1 salmon/t. There was only one occurrence of rates greater than one salmon/t (in the third quarter at 55° 30'N lat., 164° W long.), and no other locations had incidence rates greater than 0.5 salmon/t.

The estimated joint venture incidental catches of Pacific salmon by nation and area are presented in Table 6. Reduced overall groundfish catches in 1988, coupled with an increased

catch of flatfish species (almost no salmon bycatch) resulted in a reduced catch of Pacific salmon (14% decrease). The 1988 salmon catch (9,380 salmon) was the lowest overall catch (foreign and joint venture combined) since the implementation of the Magnuson Act in 1977 (Table 7).

Table 8 presents the incidental catches of Pacific salmon by zone and joint venture fishery in 1988. The incidental catches of salmon in the yellowfin sole/other flatfish fishery were: 140 salmon in Zone 1, 108 salmon in Zone 2, 192 salmon in Zone 3. The incidental catches of salmon in the "other" (nonflatfish) fishery were: 3,177 salmon in Zone 1, 4,815 salmon in Zone 2, 948 salmon in Zone 3.

The species composition, sex composition, average weight, and average length of the salmon in the incidental catch are given in Table 9. Four species of Pacific salmon were observed in the joint venture catches. Chinook salmon (Oncorhynchus tshawytscha) (59.9%) and chum salmon (O. keta) (39.5%) together accounted for 99.45% of the joint venture salmon catch. Coho salmon (O. kisutch) made up 0.3% of the catch and sockeye salmon (O. nerka) comprised the remaining 0.2% of the catch.

Pacific Halibut

Table 10 lists the incidence rates and average weights of Pacific halibut in joint venture catches by nation, area, and month. As in 1987, almost all observed annual incidence rates of halibut in the 1988 joint venture landings were less than 1.0 fish/t. There were, however, three exceptions. In the U.S.-U.S.S.R. joint venture, high rates in the Pacific cod fishery (all zones and months) and in the yellowfin sole fishery in both Zone 1 from January through April and the eastern portion of Zone 2 in February and April through June resulted in an average annual incidence rate of 5.767 halibut/t in Area I. In Area II, the U.S.-U.S.S.R. annual incidence rate of 4.195 halibut/t was due to high incidence rates in May through July in the other flatfish fishery. The U.S.-ROK roundfish fishery experienced high incidence rates of halibut in Zone 1 and the eastern portion of Zone 2 from February through May and had an annual incidence rate of 1.149 halibut/t in Area I. This fishery targeted Pacific cod during February and March and targeted pollock in April and May.

The incidence of joint venture Pacific halibut catch by quarter and l/2° latitude by 1° longitude areas is illustrated in Figure 4. Along the continental slope and outer continental shelf, incidence rates were Frequently between 1 and 5 halibut/t. Additionally, in the first quarter, there were five occurrences of 5-10 halibut/t (54° 30'N lat., 164° W long.; 54° 30'N lat., 165° W long.; 56°00'N lat., 167°-168° W long.; 57°00'N lat., 169° W long.) and three other locations yielding greater than 10 halibut/t (54°00'N lat., 165°-166° W long.; 56°00'N lat., 169° W long.). In the second quarter, there were eight locations yielding rates of 5-10 halibut/t (54°30'N lat., 164°-165° W long.; 53°30'N lat., 167° W long.; 56°00'N lat., 166°-167° W long.; 58°00'-59°00'N lat., 169° W long.; 52° 00'N lat., 173° W long.) and three locations with rates above 10 halibut/t (54°00'N lat., 165°-166° W long.; 55°00'N lat., 165° W long.). In the third quarter, quota restrictions on yellowfin sole and pollock resulted in fewer locations being fished. Only two locations had rates of 5-10 halibut/t (58°00'N lat., 163° W long.; 56°00'N lat., 167° W long.) and only two other locations had rates above 10 halibut/t (58°00'N lat., 164° W long.;

57°00'N lat., 170° W long.). In the fourth quarter, there were three locations with a rate of 5-10 halibut/t (54°00'N lat., 165° W long.; 58°00'N lat., 164° W long.; 58° 30'N lat., 167° W long.) and four locations with a rate greater than 10 halibut/t (55°00'-56°00'N lat., 162° -163° W long.).

The estimated halibut catch in the 1988 joint venture fishery (1.591 million fish) was the largest since the enactment of the MFCMA in 1976. The catch (in numbers) was almost three times the 1987 catch and was greater than the combined joint venture halibut catch of the previous 3 years (Tables 11 and 12). The total estimated catch of halibut (in numbers) taken incidentally in the joint venture fisheries increased 94% over the combined foreign and joint venture catch in 1987 (Table 12). The weight of the halibut catch did not keep pace with the numbers, however. The average weight of the halibut caught in 1988 was 1.7 kg (49.4 cm). This was far smaller than in 1987 (2.8 kg; 56.2 cm) and was the lowest average weight in the joint, venture fisheries since 1983.

Most of the estimated catches. of halibut in the joint venture fisheries were taken in operations targeting on Pacific cod in Area I. This fishery increased 89% when the pollock allotment was decreased in 1988. Joint venture operations in Area I between the United States and the U.S.S.R. caught an estimated 924,510 halibut in 1988 (a 466% increase over 1987). In this joint venture, roundfish operations (landing about 90% Pacific cod) caught 632,730 halibut, and 291,780 halibut were caught in tows targeting on yellowfin sole/other flatfish. Though they fished in the same general locations and times of the year, annual incidence rates in both the roundfish and flatfish fishery increased threefold over 1987's rates. The U.S.-ROK Area I joint venture took an estimated incidental catch of about 315,900 halibut in 1988, which is a 51.4% increase in catch over the estimated 208,700 halibut landed in 1987. In this joint venture, 217,200 halibut were caught in roundfish operations (primarily targeting Pacific cod) and 98,700 halibut were caught in tows landing yellowfin sole and other flatfish. Annual incidence rates increased twofold in the roundfish fishery, but flatfish operations occurred earlier in the year than in 1987 and decreased about 32%. The U.S.-Japan Area I joint venture caught an estimated 282,800 halibut in 1988, a threefold increase over 1987. Operations targeting on yellowfin sole/other flatfish maintained approximately the same catch rate as in 1987, but the increased flatfish catch yielded 193,200 halibut (a 226% increase). The annual incidence rate in the U.S.-Japan roundfish operations (catching about 90% pollock and 10% Pacific cod) increased ninefold to 0.288 halibut/t and landed 89,600 halibut, a 653% increase. The majority of the halibut catch occurred in February and March, when the pollock fishery was closed and Pacific cod was the target species. In Area II, halibut catches occurred primarily in the U.S.-Japan and U.S.-U.S.S.R. flatfish fisheries and in the U.S.-ROK roundfish fisheries. The incidental catches of halibut in the yellowfin sole/other flatfish joint venture fishery in 1988 were an estimated 178,300 halibut in Zone 1, 389,900 halibut in Zone 2, and 66,900 halibut in Zone 3 (Table 13). The incidental catches of halibut in the "other" nontlatfish fishery were 158,400 halibut in Zone 1, 739,800 halibut in Zone 2, and 57,400 halibut in Zone 3.

Snow (Tanner) Crab

The incidence and average weights of snow (Tanner) crab (Chionoecetes spp.) observed in the joint venture fisheries in- 1988 are summarized in Table 14 by nation, month, and area. The highest annual incidence rate was observed in catches landed in Area II by the

U.S.-U.S.S.R, operations (145 crab/t in about 5,800 t of groundfish caught). Other joint venture operations also experienced months with high incidence rates during the year, but all had annual rates less than 5 crab/t. The high incidence of Tanner crab was generally associated with fisheries targeting on yellowfin sole and other flounders.

In the first quarter, only five locations experienced Tanner crab catches above 10 crab/t (56°00'-57°30'N lat., 167° -169° W long.) and only one of these had rates higher than 25 crab/t (57°30'N lat., 167° W long.) (Fig. 5). In the second quarter, closures in Zone 1 caused operations to move north and west, and 18 locations had rates of 10 crab/t or greater, 15 of them with rates greater than 25 crab/t (57°00'-59°30'N lat., 165°-170° W long.). In the third quarter, fishing locations along the outer continental shelf had rates which increased as latitude increased. Locations below 58°00' N latitude generally had rates below 10 crab/t; locations between 58°00'-59°00' N latitude generally had rates between 10 crab/t and 25 crab/t; locations above 59°00'N latitude all had rates above 25 crab/t. In the fourth quarter, rates between 10 and 25 crab/t (8 occurrences) and greater than 25 crab/t (7 occurrences) were found throughout the slope and outer continental shelf.

The estimated incidental catch of 3.1 million snow (Tanner) crab in the 1988 joint venture groundfish fishery was 56% lower than that taken in 1987 (Tables 15 and 16) but still represented the third largest by numbers and second largest by weight incidental catch of Tanner crab taken by the joint venture fishery since its inception in 1980 (Table 16). The decrease in the incidental catch of Tanner crab in the joint venture fishery came as a result of the various regulations, closures, and an increased effort by industry to reduce their bycatch throughout the year. The early (March 8) closure of Zone 1 due to the catch of C. bairdi coupled with the reduced pollock quota and the effort to reduce bycatch caused the heavy fishing for yellowfin sole to occur in the easternmost portion of Zone 2. Some fishing for other flatfish did occur in the northern waters (Zone 3), and high rates of C. opilio were experienced, but the low level of groundfish catch in this zone kept the numbers of C. opilio down. In December, the NMFS Regional Director for Alaska reopened Zone 1 to rock sole fishing, with an additional allowed bycatch of 50,000 C. bairdi Tanner crab. This resulted in a total C. bairdi Tanner crab catch in Zone 1 of 131,670 crab (Table 17). Chionoecetes bairdi made up 88.4% of the crab catch in the Zone 1 yellowfin sole/flatfish fishery (Table 17), but relatively few crab (149,000 Tanner crab) were caught here. In the Zone 2 yellowfin sole/flatfish fishery, 1.2 million Tanner crab were caught; in the Zone 3 yellowfin sole/flatfish fishery, the catch was 1.3 million Tanner crab. In these zones, C. bairdi made up 26.3% (320,700 crab) and 4.5% (59,600 crab) of the Tanner crab catch, respectively. In the other fish fisheries, C. bairdi made up 89.4% (100,700 crab) of the crab catch in Zone 1, 44.6% (136,900 crab) in Zone 2, and 10.9% (1,100 crab) in Zone 3.

Table 18 gives the species composition, sex composition, average weight, and average carapace width of Tanner crab observed in the joint venture groundfish fisheries. Four species of Tanner crab were observed: Chionoecetes opilio, C. bairdi, C. angulatus, and C. tanneri. Chionoecetes opilio (75.94%) and C. bairdi (24.05%) 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 trawlers fishing for Greenland turbot or sablefish (Anaplopoma fimbria).

King Crab

The incidence of king crab was typically low in the joint venture fisheries in 1988. There were no instances where the average annual incidence was 1.0 king crab/t or greater, and only three cases where the monthly incidence exceeded 1.0 king crab/t (Table 19). The highest average annual incidence rate of king crab was observed in the U.S.-U.S.S.R. joint venture fishery conducted in Area II (0.324 crab/t). 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 resulting 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 "Restrictions," pages 6-7, for further discussion of these regulations).

The observed incidence rates of king crab in catches made by joint venture vessels by quarter and 1/2° latitude by 1° longitude areas are charted in Figure 6. Joint venture operations experienced no catch rates greater than 5 crab/t. They only exceeded 1 crab/t on the continental shelf three times in the first quarter (55°30'N lat., 162° W long.; 57°00'N lat., 162° W long.; 57°00'N lat., 164° W long.), three times in the second quarter (58°00'N lat., 161°-162° W long.; 57°00'N lat., 169° W long.), and four times in the fourth quarter (56°00'-58°00'N lat., 163° W long.; 57°00'N lat., 165° W long.). On the slope, the rate of 5 crab/t was exceeded once in the second quarter (57°00'N lat., 169° W long.) and once in the third quarter (55°30'N lat., 164° W long.).

As a result of the low incidence of king crab in the joint venture fisheries in 1988, the estimated incidental catch of 88,000 crab was 37% lower than the incidental catch in the 1987 joint venture operations (Tables 20 and 21) and was the lowest catch taken since the implementation of the Magnuson Act in 1977. The joint venture fishery targeting on yellowfin sole and other flatfish caught 52,250 red king crab in Zone 1 (Table 22). In Zones 2 and 3, the incidence rates of red king crab in the yellowfin sole and other flatfish fishery were substantially lower and their catch of red king crab was estimated at 8,921 crab in Zone 2 and 11,663 crab in Zone 3. The "other" (nonflatfish) fishery catch of red king crab was 8,753 crab in Zone 1, 993 crab in Zone 2, and 13 crab in Zone 3.

In the Bristol Bay joint venture fishery, red king crab is the primary species of king crab taken incidentally, and even with the varied fishing operations (in time and place) still composed most (93.8%) of the king crab caught by joint venture fisheries in 1988 (Table 23). Blue king crab (P. platypus, 5.7%) and golden king crab (Lithodes aequispina, 0.45%) accounted for the remainder. Males once again dominated the joint venture red king crab catch, but in 1988 the males were larger than they have been in the past (130 mm in 1988, 126 mm in 1987 (Berger and Weikart 1988), 114 mm in 1986 (Berger et al. 1988), and 110 mm in 1985 (Berger et al., 1987)).

Pacific Herring

Pacific herring (Clupea harengus pallasi) was designated a prohibited species for both foreign and joint venture operations in 1980. Table 24 gives the catches and percentage of the groundfish catch since 1977. The foreign catch of Pacific herring dropped to less than 0.1% of

the foreign groundfish catch in 1980, and has consistently stayed at that level. The joint venture rate remained at 0.5% of the joint venture groundfish catch until 1987, and has since been below 0.1% of the joint venture groundfish catch.

Rockfish Catch by Species

Eleven species of rockfish were identified by observers as appearing in joint venture catches in the Bering Sea/Aleutian Islands region during 1988 (Table 25). In Tables 25 and 26, the group "other rockfish" consists of seven species which each make up less than 0.1% of the rockfish catch.

Approximately 2,088 t of rockfish were caught in the 1988 joint venture fishery (Table 26). The joint venture catch of rockfish increased 140% from a catch of 870.8 t in 1987, and has increased 1,345% since 1983.

Two species of rockfish made up the greatest portion (96.4%) of the rockfish catch taken by joint venture vessels: Pacific ocean perch (74.9%) and northern rockfish (Sebastes polyspinis) (21.5%). Pacific ocean perch predominated in all three areas. Area IV yielded 97.0% of the rockfish catch, 1.9% was caught in Area I, and 1.1% was caught in area II.

Flatfish Catch by Species

Sixteen species of flatfish were identified by observers in groundfish catches made by joint venture vessels in 1988 (Table 27). Yellowfin sole was the primary target in Area I, accounting for 65.4% of the 325,685 t catch of flatfish (Table 28). In Area II, 5,228.5 t of flatfish were caught. Rock sole (39.5% of the flatfish catch) and Alaska plaice (Pleuronectes quadrituberculatus) (38.6%) were targets in this area. In Area IV, 113.9 t of flatfish were caught; rock sole made up 74.15% of this catch.

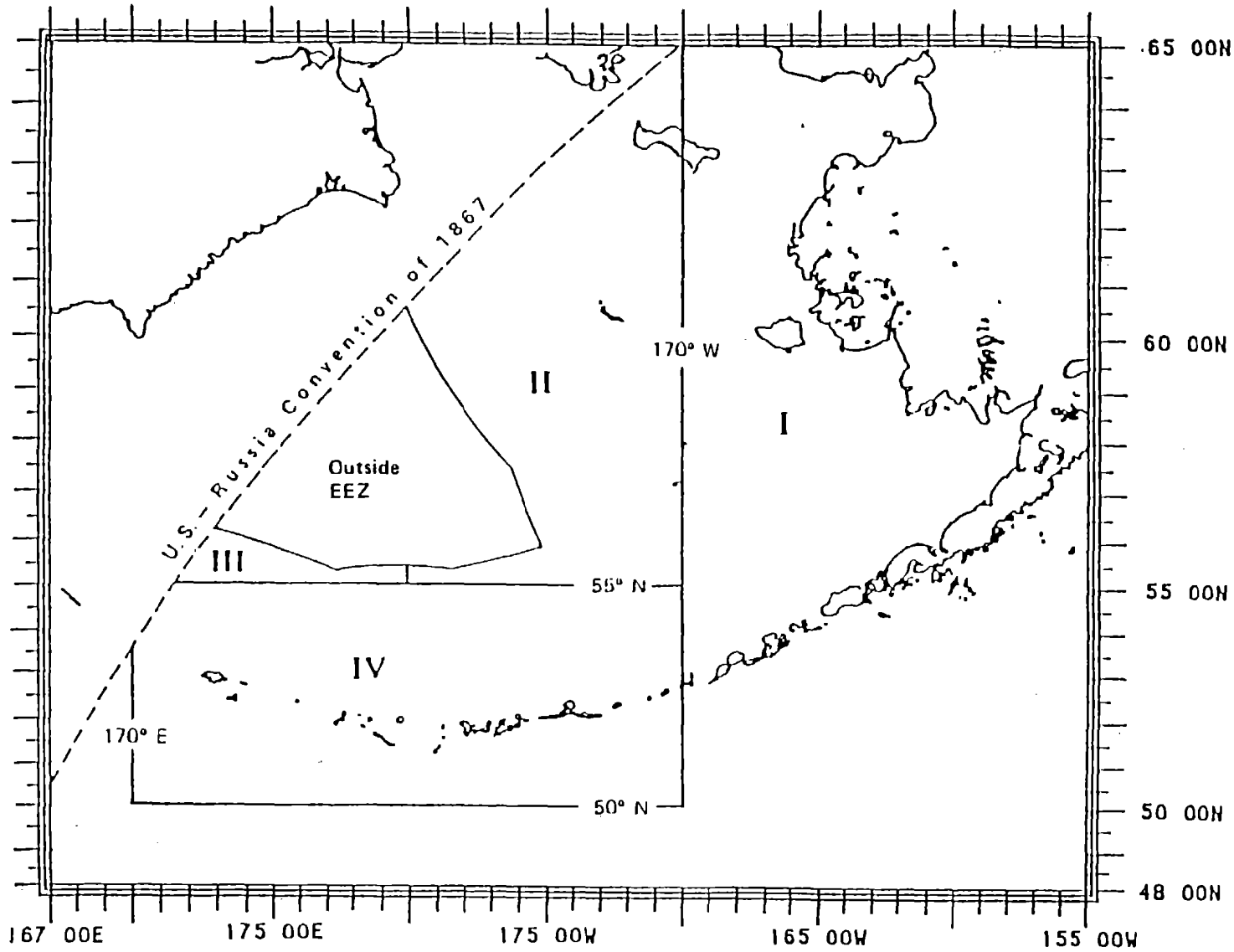


Figure 1.--U.S. statistical areas in the Bering Sea and Aleutian Islands region.

Table 2. --Annual summary of observer effort, joint venture effort, and observer coverage (100 x observer days/joint venture vessel days) by nation and vessel class in the Bering Sea and Aleutian Islands region, 1988.

Nationality	Vessel Class	No. of observers	No. of ships observed[a]	No. of ships in fishery[a]	No. of observer days	No. of vessel days	Percent coverage
U.S.-Japan	Other SJV		16	16	1,252	1,340	93.4
U.S.-Japan	Other FJV		33	34	708	764	92.7
U.S.-Japan	Yell/Flat SJV		7	7	177	185	95.7
U.S.-Japan	Yell/Flat FJV		31	31	2,574	2,742	93.9
U.S.-Japan	Total	106	52	52	4,711	5,031	93.6
U.S.-Poland	Other FJV	17	13	13	320	353	90.7
U.S.-ROK	Other SJV		7	7	665	709	93.8
U.S.-ROK	Other FJV		24	24	1,337	1,440	92.8
U.S.-ROK	Yell/Flat SJV		7	7	287	306	93.8
U.S.-ROK	Yell/Flat FJV		24	24	1,449	1,528	94.8
U.S.-ROK	Total	85	31	31	3,738	3,983	93.8
U.S.-PRC	Other FJV		5	5	116	117	99.1
U.S.-PRC	Yell/Flat FJV		5	5	387	400	96.8
U.S.-PRC	Total	11	5	5	503	517	97.3
U.S.-U.S.S.R.	Other FJV		24	24	1,066	1,162	91.7
U.S.-U.S.S.R.	Yell/Flat FJV		30	30	1,778	1,918	92.7
U.S.-U.S.S.R.	Total	57	30	30	2,844	3,080	92.3
Total[b]		251[c]	131	131	12,116	12,964	93.5

[a] Several vessels participated in more than one fishery and these 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.

ROK = Republic of Korea.
PRC = People's Republic of China.
SJV = Surimi joint venture.
FJV = Freezer joint venture.
Yell/Flat = Targeting on yellowfin sole/flatfish.
Other = Targeting on roundfish.

Table 3. --Estimated groundfish landings taken in joint venture operations' in the Bering Sea and Aleutian Islands region in 1988.

Species	Metric tons	Percent
Squid	171	<0.1
Yellowfin sole	213,322	16.4
Arrowtooth flounder[b]	2,574	0.2
Greenland turbot	88	<0.1
Other flatfishes	115,043	8.8
Walleye pollock	826,413	63.5
Pacific cod	109,892	8.4
Sablefish	14	<0.1
Atka mackerel	19,619	1.5
Pacific ocean perch[c]	1,559	0.1
Other rockfishes	529	<0.1
Pacific herring[d]	351	<0.1
Other fish	11,840	0.9
Snails	0	0.0
Total	1,301,415	

[a] In 1988, 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.

[b] Arrowtooth includes arrowtooth flounder (Atheresthes stomias) and Kamchatka flounder (A. evermanni).

[c] Only includes Pacific ocean perch, Sebastes alutus.

[d] Non-U.S. groundfish vessels were not allowed to retain Pacific herring in 1988.

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, 1977-88[a].

Fisheries and species group	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Foreign directed catches												
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	NF
Pacific cod	35.9	47.4	41.4	37.3	39.1	28.2	41.5	58.5	57.2	39.3	54.7	NF
Sablefish	4.6	2.0	2.2	2.4	3.0	3.8	3.2	1.9	0.3	0.1	<0.1	NF
Atka mackerel	NA	24.2	23.3	20.2	18.1	7.4	1.2	0.1	<0.1	<0.1	<0.1	NF
All rockfish	10.8	7.5	7.2	8.5	7.3	4.9	2.0	0.9	0.1	<0.1	<0.1	NF
Yellowfin sole	0.3[b]	110.3	101.1	77.8	81.3	76.0	85.9	126.8	100.7	57.2	1.8	NF
Turbots and other flatfish	136.4[b]	125.5	90.0	88.5	91.9	79.3	80.3	59.3	46.9	20.8	5.7	NF
Pacific herring	19.3	8.4	7.5	0.8	0.3	1.9	1.4	1.3	1.5	0.3	<0.1	NF
Other fish	94.7	71.8	64.7	47.0	39.4	22.3	14.3	7.5	6.3	4.0	2.7	NF
Squid	8.4	9.4	7.0	6.4	5.9	5.0	4.0	3.1	1.6	0.8	0.1	NF
Snails	0.4	2.2	0.5	0.1	0.2	0.2	0.3	0.2	0.1	0.5	0.9	NF
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	NF
Joint venture catches												
Walleye pollock	NF	NF	NF	10.7	42.1	54.6	149.0	237.0	377.5	835.1	1,044.5	826.4
Pacific cod	NF	NF	NF	8.5	9.2	13.6	14.4	30.8	41.3	63.9	58.2	109.9
Sablefish	NF	NF	NF	<0.1	0.2	0.1	0.1	0.3	0.1	0.4	0.1	<0.1
Atka mackerel	NF	NF	NF	0.3	1.6	12.5	10.5	35.9	37.9	32.0	30.1	19.6
All rockfish	NF	NF	NF	0.1	<0.1	<0.1	0.1	0.6	0.5	0.5	0.9	2.1
Yellowfin sole	NF	NF	NF	9.6	16.0	17.4	22.5	32.8	126.4	151.4	179.6	213.3
Turbots and other flatfish	NF	NF	NF	2.8	6.0	9.2	11.8	17.4	46.3	65.5	36.0	117.7
Pacific herring	NF	NF	NF	0.0	0.0	<0.1	1.1	1.8	3.1	3.8	0.5	0.4
Other fish	NF	NF	NF	0.7	3.4	1.1	1.6	2.6	6.3	7.6	6.1	11.8
Squid	NF	NF	NF	0.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2
Snails	NF	NF	NF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	NF	NF	NF	32.6	78.5	108.6	211.2	359.3	639.4	1,160.2	1,355.9	1,301.4

[a] Statistics for 1977-87 from Berger and Weikart (1988).

[b] Japan reported yellowfin sole combined with other flounders.

NF = No fishing.

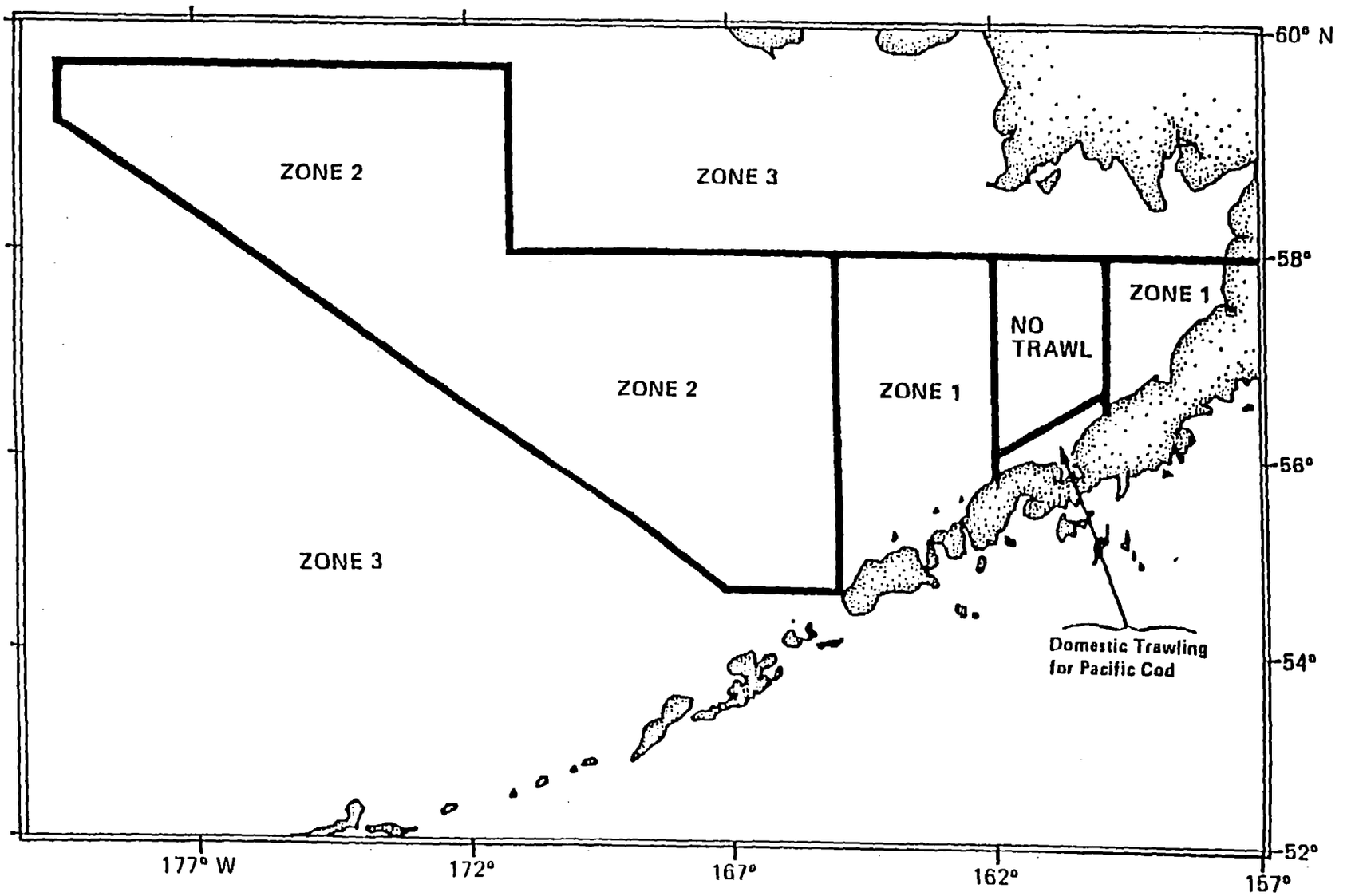


Figure 2. --U.S. zones in the Bering Sea and Aleutian Islands region, 1988.

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 and Aleutian Islands region, 1988. Lines indicate areas not fished.

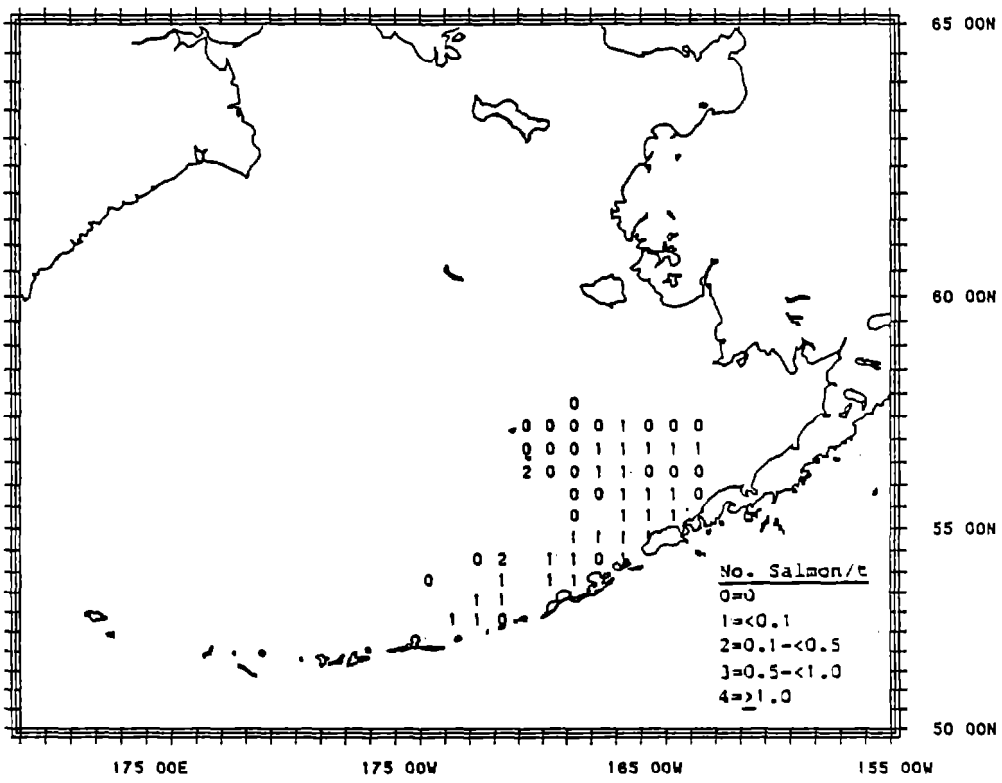
	Area I		Area II		Area IV	
	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.
U.S.-U.S.S.R. Joint Venture Mothership						
Jan.	0.009	3.94	--	--	--	--
Feb.	0.009	4.21	--	--	--	--
March	0.002	3.73	--	--	--	--
April	0.000	0.00	0.014	3.70	--	--
May	0.000	0.00	0.011	2.80	--	--
June	0.000	0.00	0.000	0.00	0.000	0.00
July	0.002	3.40	0.000	0.00	0.000	0.00
Aug.	--	--	0.000	0.00	--	--
Sep.	--	--	--	--	--	--
Oct.	--	--	--	--	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	0.003	4.02	0.001	3.25	0.000	0.00
U.S.-Republic of Korea Joint Venture Mothership						
Jan.	0.013	3.85	--	--	0.000	0.00
Feb.	0.007	3.59	--	--	0.077	1.59
March	0.001	5.37	--	--	--	--
April	0.006	4.72	0.001	4.09	--	--
May	0.002	4.97	0.001	3.49	--	--
June	0.001	2.65	--	--	0.011	1.46
July	--	--	--	--	0.003	2.39
Aug.	--	--	--	--	--	--
Sep.	0.052	3.73	0.007	4.78	--	--
Oct.	0.023	4.14	--	--	--	--
Nov.	0.001	1.60	--	--	--	--
Dec.	0.006	4.13	--	--	--	--
Annual	0.010	3.91	0.002	4.16	0.009	1.58

Table 5. --Continued.

	Area I		Area II		Area IV	
	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.
U.S.-Japan Joint Venture Mothership						
Jan.	0.013	4.26	--	--	--	--
Feb.	0.008	4.65	--	--	0.004	2.55
March	0.001	3.96	-	--	0.001	1.98
April	0.003	5.69	0.001	8.15	--	--
May	0.001	4.87	0.001	5.28	0.001	9.20
June	0.001	3.67	0.000	0.00	0.001	4.31
July	--	--	--	--	0.019	4.52
Aug.	--	--	--	--	--	--
Sep.	0.025	2.94	0.000	0.00	--	--
Oct.	0.014	3.40	--	--	0.001	3.20
Nov.	0.018	2.22	--	--	--	--
Dec.	0.055	2.70	--	--	--	--
Annual	0.011	3.64	0.001	6.15	0.003	3.34
U.S.-Poland Joint Venture Mothership						
Jan.	0.005	4.93	--	--	--	--
Feb.	0.013	2.93	--	--	--	--
March	--	--	--	--	--	--
April	0.019	5.16	0.000	0.00	--	--
May	0.003	4.48	0.000	0.00	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	0.031	2.10	0.000	0.00	--	--
Oct.	0.012	3.11	0.000	0.00	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	0.017	3.05	0.000	0.00	--	--

Table 5. --Continued.

	Area I		Area II		Area IV	
	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.
U.S. -People's Republic of China Joint Venture Mothership						
Jan.	0.014	4.57	--	--	--	--
Feb.	0.003	3.11	--	--	--	--
March	<0.001	3.90	--	--	--	--
April	0.000	0.00	--	--	--	--
May	0.000	0.00	--	--	--	--
June	0.000	0.00	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	--	--	--	--	--	--
Oct.	--	--	--	--	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	0.004	4.36	--	--	--	--



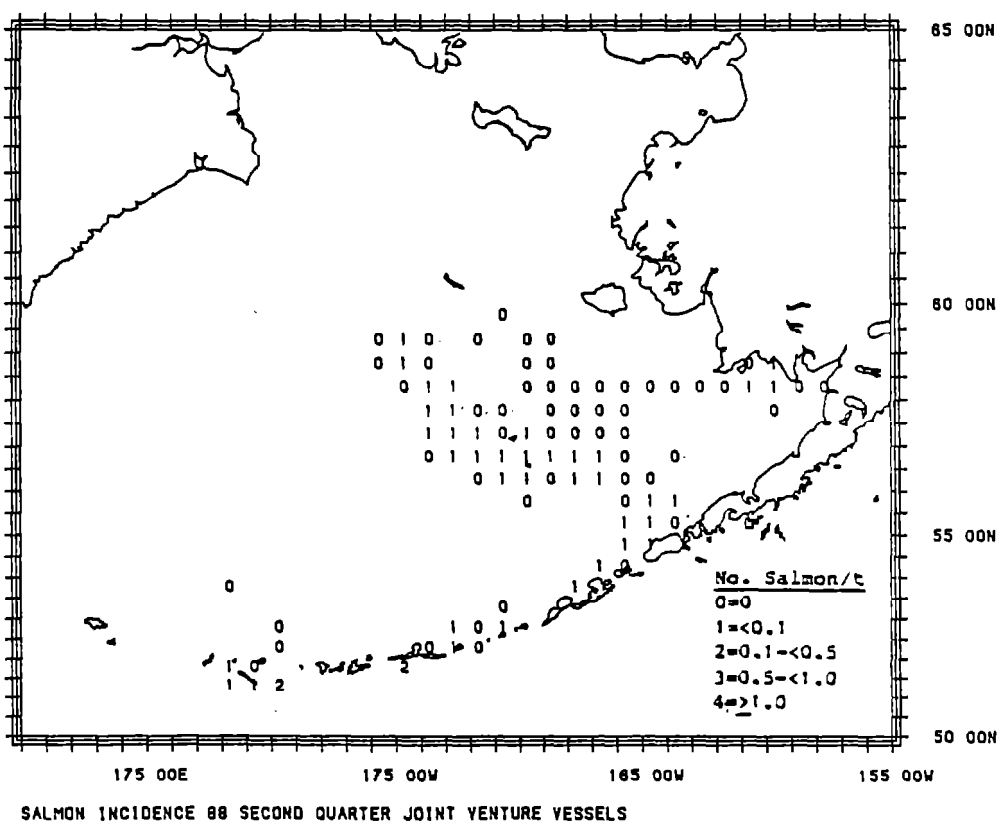
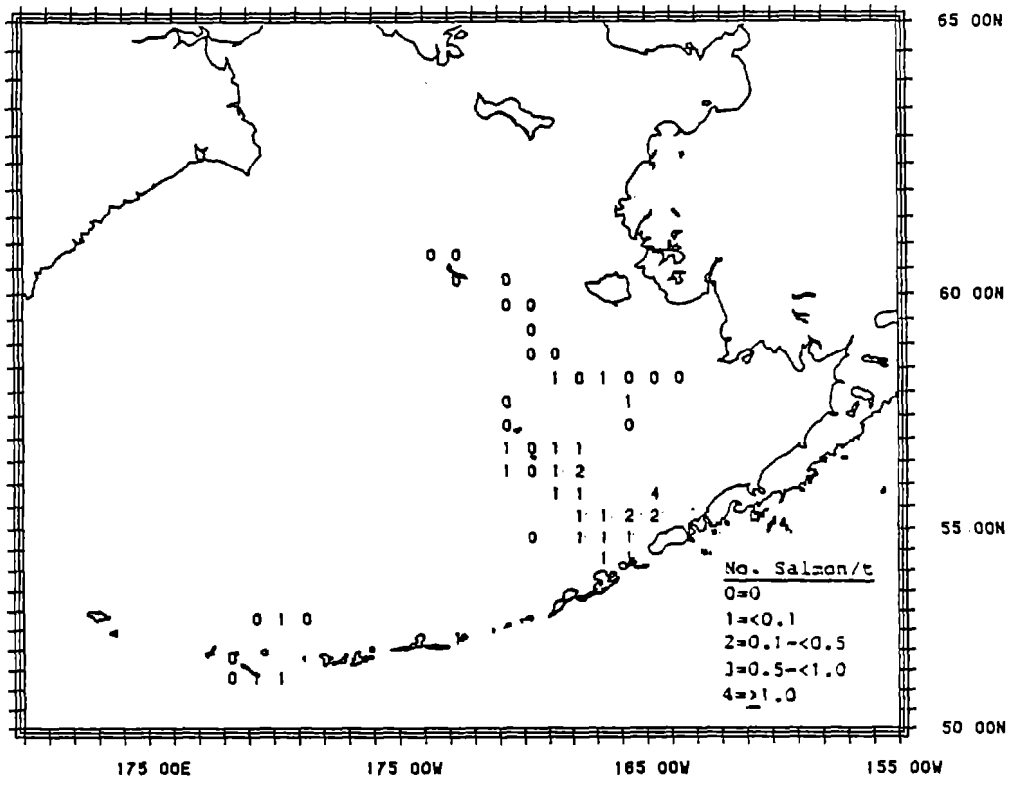
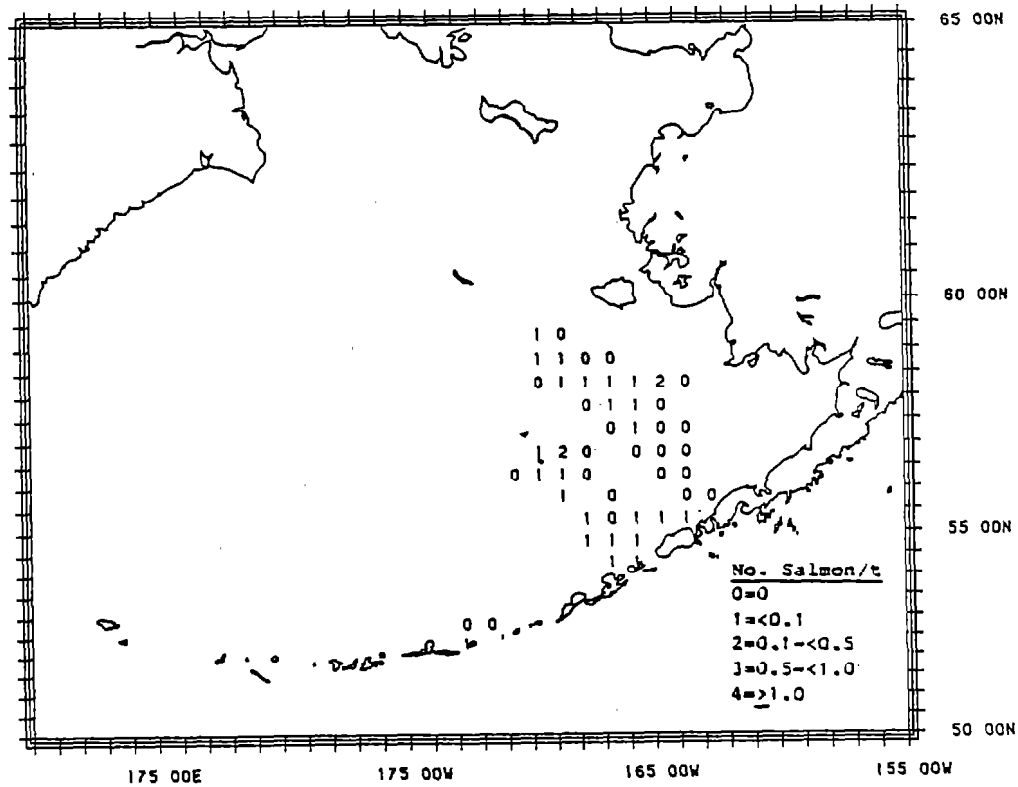


Figure 3. --Average incidence (no./t) of Pacific salmon in the joint venture fisheries by quarter and l/2° lat. by 1° long. areas, 1988.



SALMON INCIDENCE 88 THIRD QUARTER JOINT VENTURE VESSELS



SALMON INCIDENCE 88 FOURTH QUARTER JOINT VENTURE VESSELS

Figure 3. --Continued.

Table 6. --Estimated incidental catches of Pacific salmon (in numbers of fish and metric tons) by joint venture vessels in the Bering Sea and Aleutian Islands region, 1988.

	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.S.-Japan	5,100	155	--	85	5,340	18.56	0.95	--	0.28	19.79
U.S.-ROK	3,227	90	--	144	3,461	12.62	0.38	--	0.23	13.23
U.S.-Poland	136	4	--	0	140	0.41	0.01	--	--	0.42
U.S.-PRC	89	--	--	--	89	0.39	--	--	--	0.39
U.S.-U.S.S.R.	350	0	--	0	350	1.41	0.00	--	0.00	1.41
Total	8,902	249	--	229	9,380	33.39	1.34	--	0.51	35.24
Percent by area	94.90	2.65	--	2.45		94.75	3.80	--	1.45	

ROK = Republic of Korea.
PRC = People's Republic of China.

Lines indicate areas not fished.

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, 1977-88*.

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
1988	NF	NF	9,380	35	9,380	35

* Estimated catches for years 1977-87 from Berger and Weikart 1988.

NF = No fishing.

Table 8. --Groundfish catch (in metric tons) and numbers of Pacific salmon caught in each zone and joint venture fishery, 1988.

Fishery	Zone	Groundfish catch (t)	Chinook salmon	Other salmon
Yellowfin sole and other flatfish	1	106,402.3	129	11
	2	210,870.3	71	37
	3	116,601.5	111	81
Other	1	163,827.9	1,630	1,547
	2	551,370.1	2,885	1,930
	3	161,343.8	794	154

Table 9. --Biological data on the incidental catches of Pacific salmon (Oncorhynchus spp.) in the joint venture groundfish fishery in the Bering Sea and Aleutian Islands region, 1988.

Species	Percent by species	Sex	Sex composition	Average weight (kg)	Average length (cm)
Chinook	59.91	Male	42.97	3.73	62.8
		Female	57.03	4.19	67.2
		Unsexed		3.81	65.4
		Combined		3.98	65.3
Chum	39.54	Male	63.82	3.59	62.5
		Female	36.18	3.12	61.7
		Unsexed		3.31	57.5
		Combined		3.41	61.7
Coho	0.34	Male	19.07	4.90	71.6
		Female	80.93	2.60	67.2
		Combined		3.04	68.0
Sockeye	0.21	Female	100.00	4.82	70.9

Table l0. --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 and Aleutian Islands region, 1988. Lines indicate areas not fished.

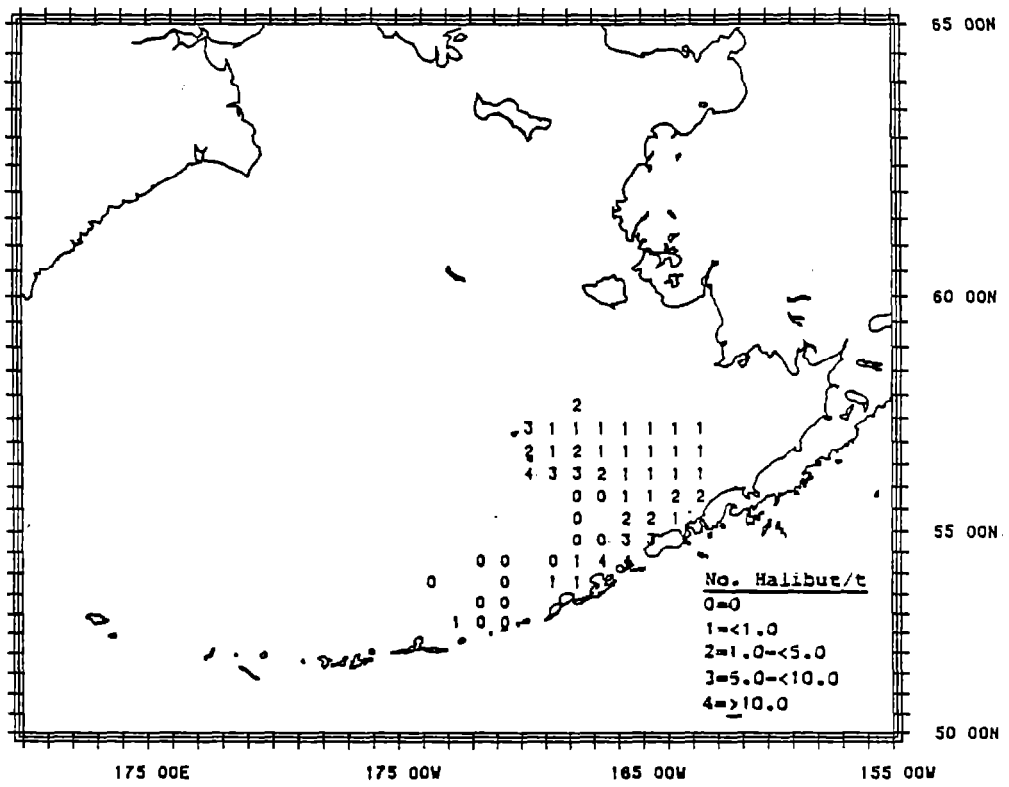
	Area I		Area II		Area IV	
	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.
U.S.-U.S.S.R. Joint Venture Mothership						
Jan.	15.551	1.00	--	--	--	--
Feb.	9.909	0.98	--	--	--	--
March	3.384	1.23	--	--	--	--
April	5.702	1.64	2.811	1.57	--	--
May	0.784	2.41	8.405	1.42	--	--
June	3.115	1.88	6.014	3.12	0.333	8.02
July	1.012	2.28	2.196	3.12	0.187	13.01
Aug.	--	--	2.316	1.29	--	--
Sep.	--	--	--	--	--	--
Oct.	--	--	--	--	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	5.767	1.23	4.195	2.91	0.272	9.47
U.S.-Republic of Korea Joint Venture Mothership						
Jan.	0.105	1.65	--	--	0.000	0.00
Feb.	0.950	1.39	--	--	0.000	0.00
March	0.850	2.32	--	--	--	--
April	2.903	1.79	0.076	6.86	--	--
May	2.378	2.15	0.034	5.77	--	--
June	0.361	3.38	--	--	0.370	5.62
July	--	--	--	--	0.106	14.50
Aug.	--	--	--	--	--	--
Sep.	0.329	5.07	0.449	6.36	--	--
Oct.	0.498	6.80	--	--	--	--
Nov.	0.711	6.37	--	--	--	--
Dec.	0.181	9.44	--	--	--	--
Annual	1.149	2.08	0.083	6.30	0.268	6.87

Table 10. --Continued.

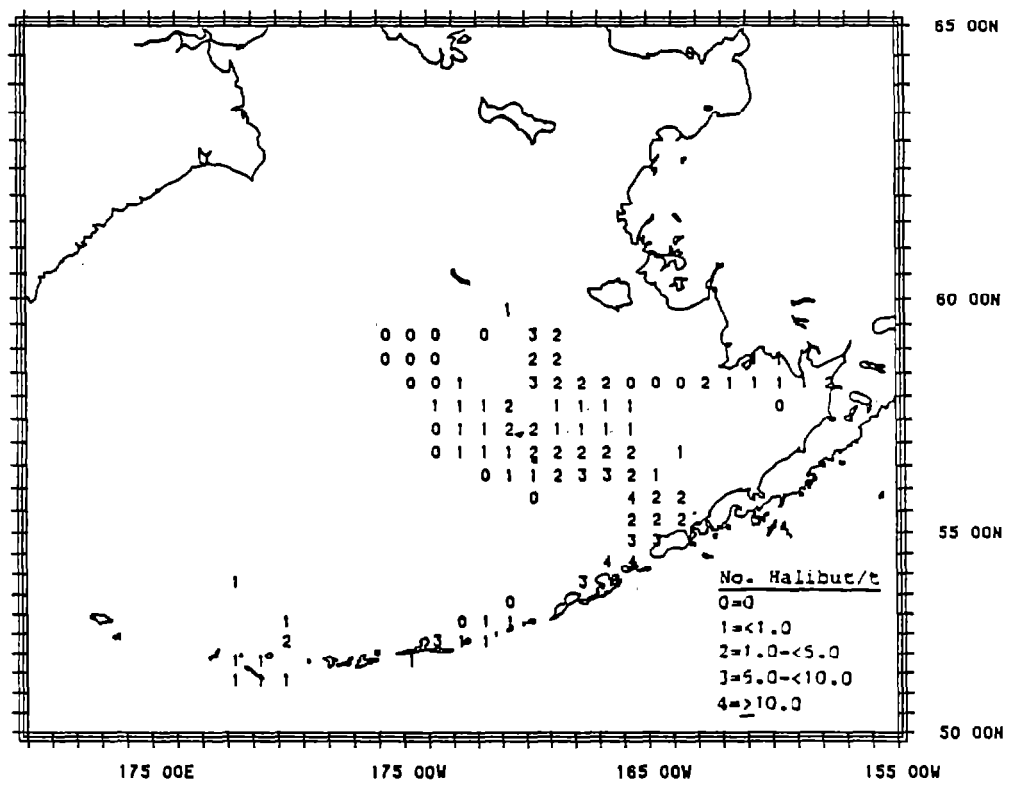
	Area I		Area II		Area IV	
	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.
U.S.-Japan Joint Venture Mothership						
Jan.	0.680	0.70	--	--	--	--
Feb.	0.506	1.18	--	--	<0.001	4.00
March	0.713	2.69	--	--	0.000	0.00
April	2.100	2.04	0.003	3.53	--	--
May	0.251	4.08	<0.001	5.05	0.024	7.33
June	0.878	3.07	4.829	4.36	0.047	6.18
July	--	--	--	--	0.165	10.85
Aug.	--	--	--	--	--	--
Sep.	0.035	7.99	0.883	6.00	--	--
Oct.	1.818	2.71	--	--	0.000	0.00
Nov.	1.700	3.69	--	--	--	--
Dec.	3.342	0.92	--	--	--	--
Annual	0.840	2.00	0.088	4.37	0.024	6.83
U.S.-Poland Joint Venture Mothership						
Jan.	0.083	2.03	--	--	--	--
Feb.	0.000	0.00	--	--	--	--
March	--	--	--	--	--	--
April	0.861	1.81	0.048	2.29	--	--
May	0.107	1.61	0.008	7.34	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	0.007	8.09	0.418	6.18	--	--
Oct.	0.090	8.27	0.576	4.64	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	0.183	2.13	0.040	4.50	--	--

Table 10. --Continued.

	Area I		Area II		Area IV	
	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.
U.S.-People's Republic of China Joint Venture Mothership						
Jan.	0.239	2.26	--	--	--	--
Feb.	0.206	5.11	--	--	--	--
March	0.357	4.49	--	--	--	--
April	3.774	2.07	--	--	--	--
May	0.178	5.47	--	--	--	--
June	0.141	3.48	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	--	--	--	--	--	--
Oct.	--	--	--	--	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	0.798	2.65	--	--	--	--

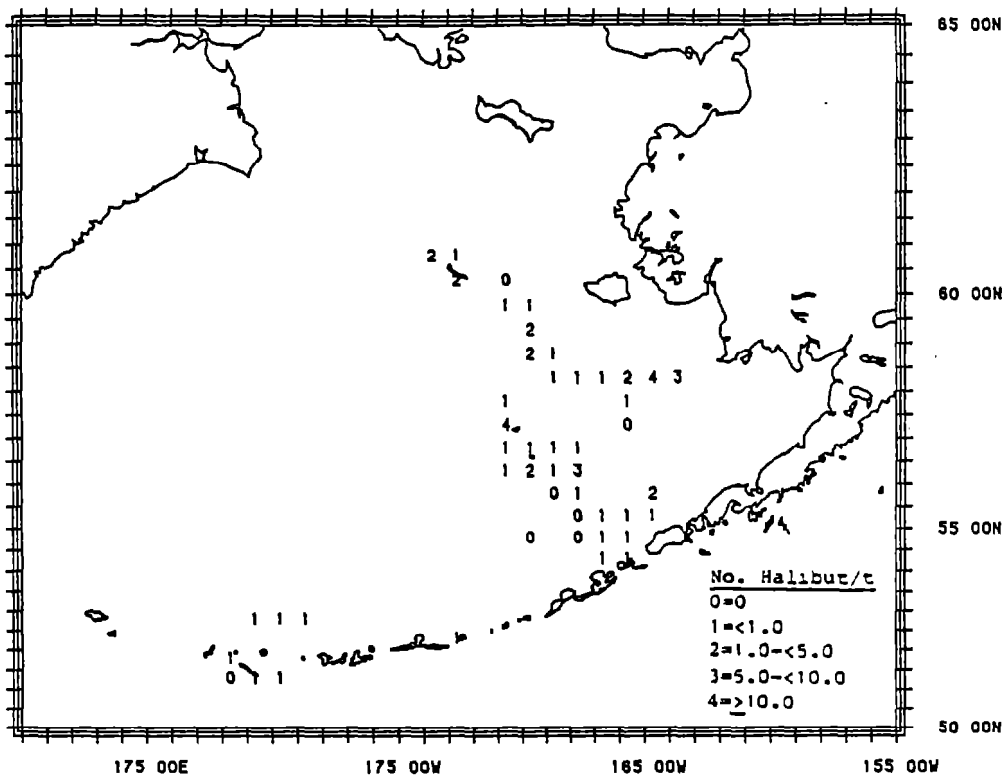


HALIBUT INCIDENCE 88 FIRST QUARTER JOINT VENTURE VESSELS



HALIBUT INCIDENCE 88 SECOND QUARTER JOINT VENTURE VESSELS

Figure 4 .--Average incidence (no/t) of Pacific halibut in the joint venture fisheries by quarter and 112° lat. by 1° long. areas, 1988.



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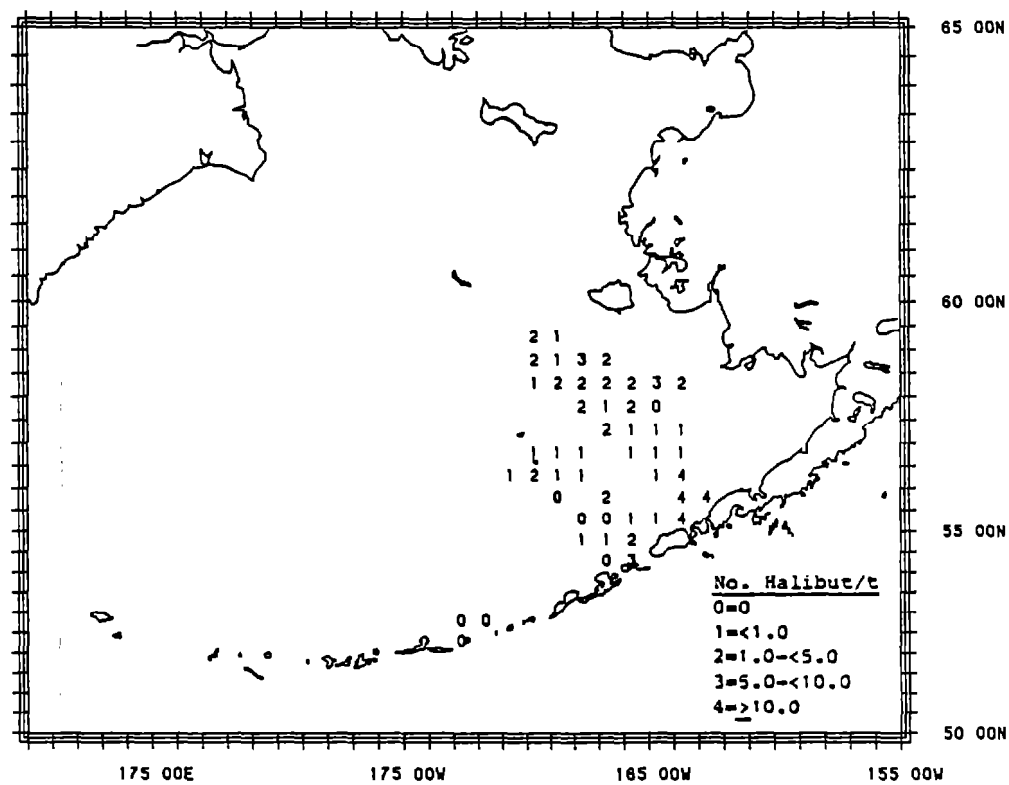


HALIBUT INCIDENCE 88 FOURTH QUARTER JOINT VENTURE VESSELS

Figure 4. --Continued.

Table 11. --Estimated incidental catches of Pacific halibut (in numbers of fish and metric tons) by joint venture vessels in the Bering Sea and Aleutian Islands region, 1988.

	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.S.-Japan	282,813	8,068	--	672	291,553	526.9	33.5	--	4.4	564.8
U.S.-ROK	315,874	4,984	--	4,721	325,579	678.8	31.7	--	33.4	743.9
U.S.-Poland	1,677	308	--	0	1,985	3.7	1.4	--	0.0	5.1
U.S.-PRC	22,497	--	--	--	22,497	58.9	--	--	--	58.9
U.S.-U.S.S.R.	924,507	22,731	--	1,833	949,071	1,123.0	67.2	--	16.3	1,206.5
Total	1,547,368	36,091	--	7,226	1,590,685	2,391.3	133.8	--	54.1	2,579.2
Percent by area	97.28	2.27	--	0.45		92.71	5.19	--	2.10	

ROK = Republic of Korea.
PRC = People's Republic of China.

Lines indicate areas not fished.

Table 2. --Estimated incidental catches (numbers and metric tons) of Pacific halibut (Hippoglossus stenolepis) in the foreign and joint venture groundfish fisheries in the Bering Sea and Aleutian Islands region, 1977-88*.

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
1988	NF	NF	1,590,685	2,579	1,590,685	2,579

* Estimated catches for years 1977-87 from Berger and Weikart 1988.

NF = No Fishing.

Table 13. --Groundfish catch (in metric tons) and catch of Pacific halibut (numbers and metric tons) caught by each zone and joint venture fishery, 1988.

Fishery	Zone	Groundfish catch (t)	Pacific Halibut nos.	Pacific Halibut t
Yellowfin sole and other flatfish	1	106,402.3	178,322	178.4
	2	210,870.3	389,853	905.7
	3	116,601.5	66,866	274.6
Other	1	163,827.9	158,433	225.5
	2	551,370.1	739,808	872.6
	3	161,343.8	57,403	122.5

Table 14. --Incidence rate (number per metric ton of catch) and average weight (kg) of Tanner crab taken in the foreign and joint venture groundfish catches in the Bering Sea and Aleutian Islands region, 1988. Lines indicate areas not fished.

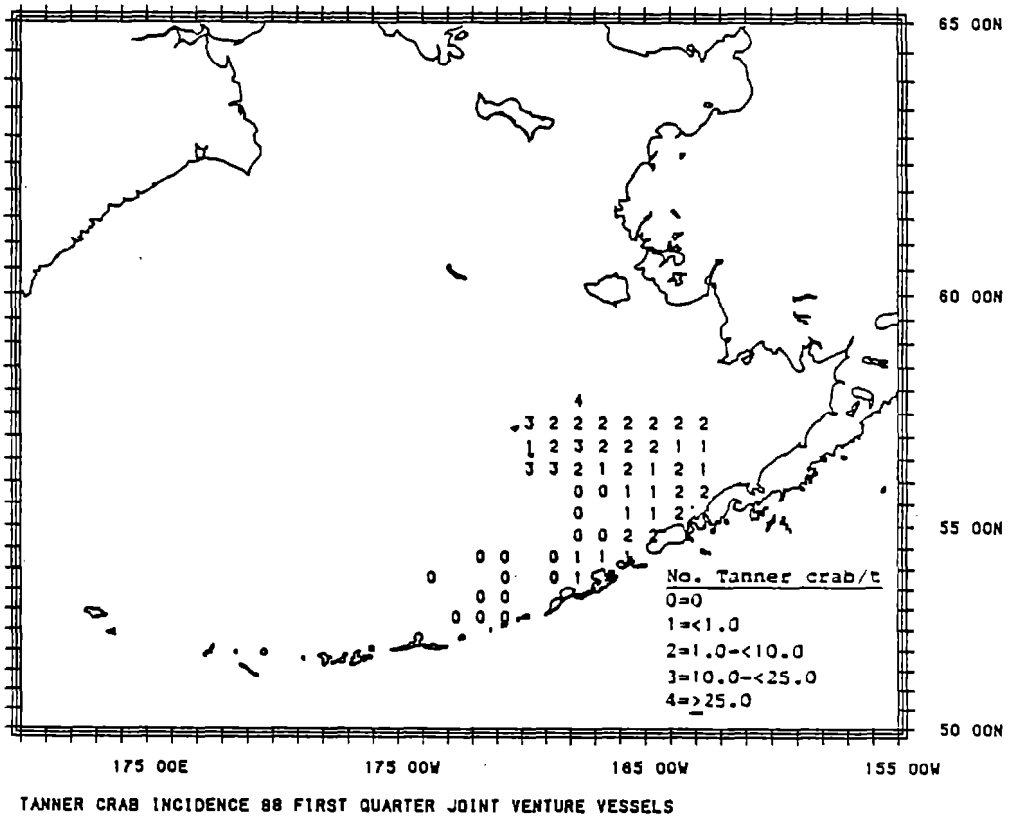
	Area I		Area II		Area IV	
	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.
U.S.-U.S.S.R. Joint Venture Mothership						
Jan.	2.414	0.16	--	--	--	--
Feb.	0.904	0.21	--	--	--	--
March	1.766	0.26	--	--	--	--
April	5.448	0.26	4.151	0.24	--	--
May	3.666	0.14	0.753	0.04	--	--
June	49.528	0.08	18.336	0.15	0.000	0.00
July	23.692	0.06	292.316	0.05	0.000	0.00
Aug.	--	--	216.863	0.07	--	--
Sep.	--	--	--	--	--	--
Oct.	--	--	--	--	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	4.986	0.16	144.748	0.06	0.000	0.00
U.S.-Republic of Korea Joint Venture Mothership						
Jan.	0.014	0.38	--	--	0.000	0.00
Feb.	0.694	0.26	--	--	0.000	0.00
March	3.513	0.22	--	--	--	--
April	6.045	0.22	0.111	0.35	--	--
May	2.621	0.22	0.114	0.29	--	--
June	0.000	0.00	--	--	0.000	0.00
July	--	--	--	--	0.000	0.00
Aug.	--	--	--	--	--	--
Sep.	1.802	0.17	2.659	0.22	--	--
Oct.	7.944	0.12	--	--	--	--
Nov.	6.415	0.16	--	--	--	--
Dec.	5.063	0.25	--	--	--	--
Annual	2.682	0.20	0.357	0.25	0.000	0.00

Table 14.--Continued.

	Area I		Area II		Area IV	
	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.
U.S.-Japan Joint Venture Mothership						
Jan.	0.178	0.14	--	--	--	--
Feb.	0.322	0.25	--	--	0.000	0.00
March	2.836	0.20	--	--	0.000	0.00
April	3.253	0.24	<0.001	0.25	--	--
May	0.067	0.33	0.003	0.10	0.000	0.00
June	10.109	0.28	8.568	0.22	0.000	0.00
July	--	--	--	--	0.000	0.00
Aug.	--	--	--	--	--	--
Sep.	0.103	0.09	1.898	0.40	--	--
Oct.	3.785	0.11	--	--	0.000	0.00
Nov.	5.431	0.08	--	--	--	--
Dec.	3.759	0.14	--	--	--	--
Annual	1.417	0.18	0.157	0.22	0.000	0.00
U.S.-Poland Joint Venture Mothership						
Jan.	0.017	0.59	--	--	--	--
Feb.	0.000	0.00	--	--	--	--
March	--	--	--	--	--	--
April	0.383	0.16	0.026	0.35	--	--
May	0.093	0.15	0.043	0.22	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	0.001	1.00	0.039	0.10	--	--
Oct.	0.709	0.21	0.000	0.00	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	0.136	0.19	0.036	0.25	--	--

Table 14. --Continued.

	Area I		Area II		Area IV	
	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.
U.S.-People's Republic of China Joint Venture Mothership						
Jan.	0.051	0.43	--	--	--	--
Feb.	1.444	0.22	--	--	--	--
March	6.386	0.21	--	--	--	--
April	4.977	0.25	--	--	--	--
May	0.043	0.29	--	--	--	--
June	0.000	0.00	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	--	--	--	--	--	--
Oct.	--	--	--	--	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	2.756	0.22	--	--	--	--



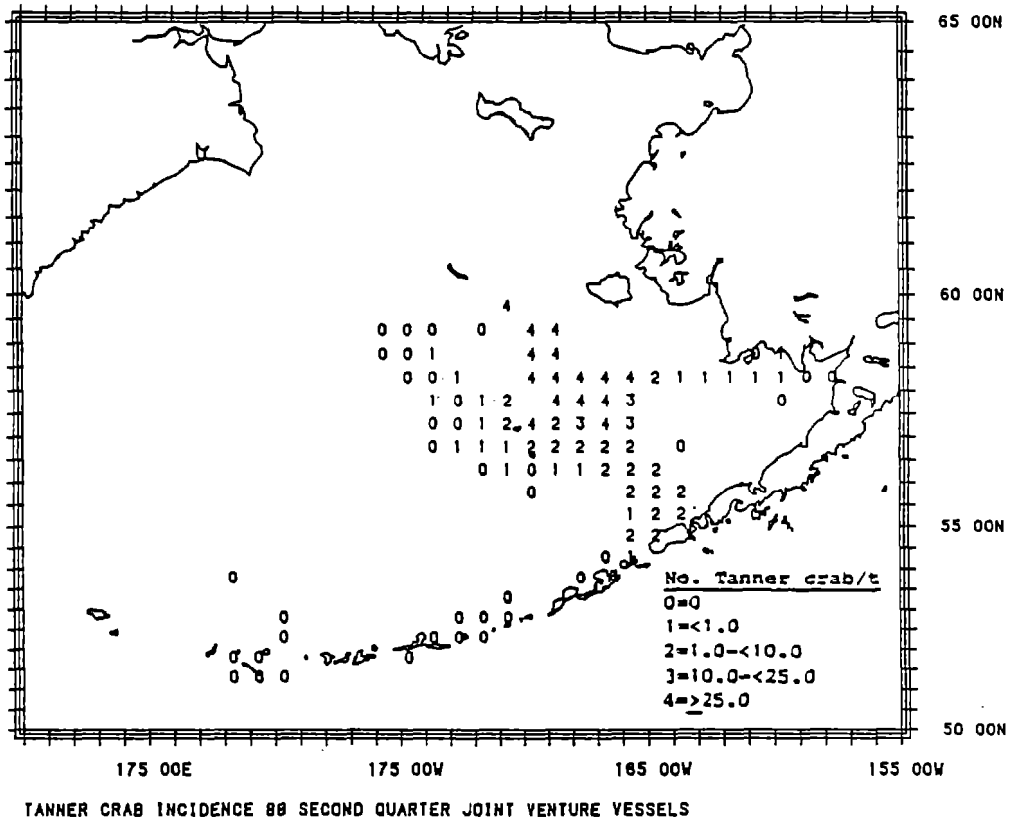
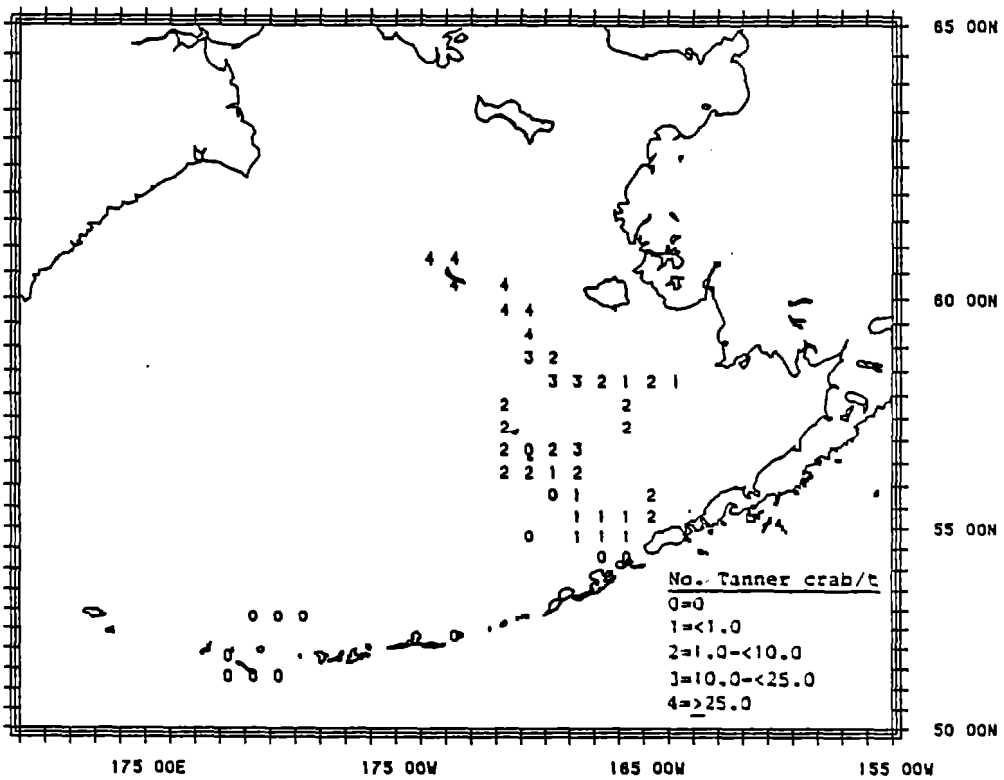
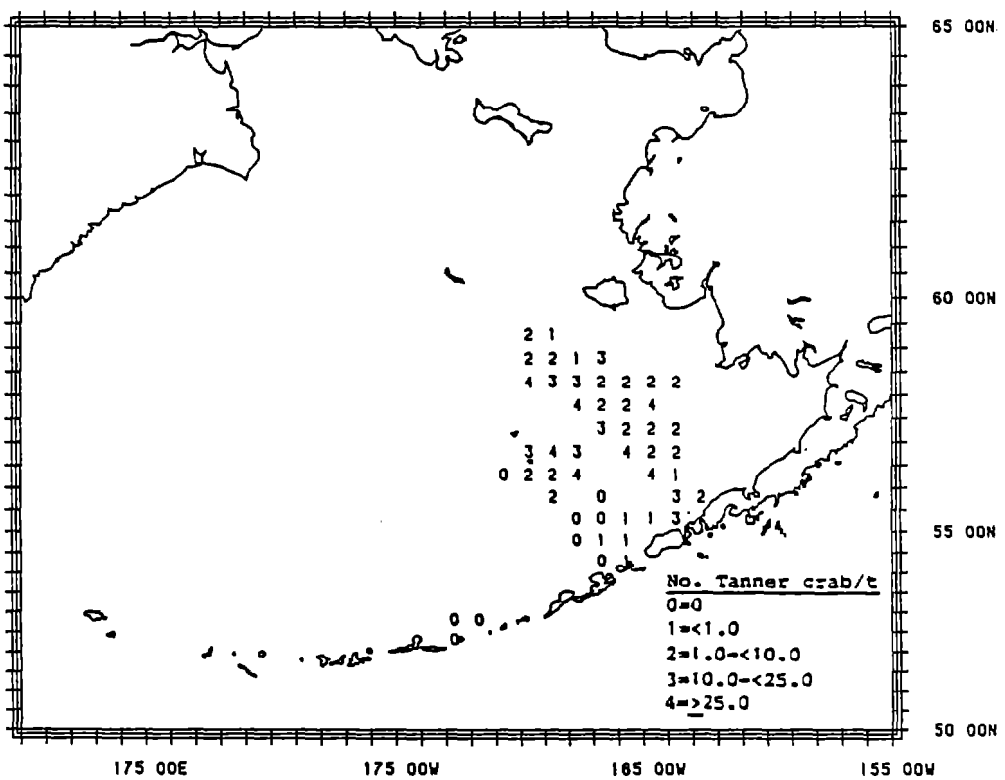


Figure 5. --Average incidence (no/t) of Tanner crab in the joint venture fisheries by quarter and 1/2° lat. by 1° long. areas, 1988.



TANNER CRAB INCIDENCE 88 THIRD QUARTER JOINT VENTURE VESSELS



TANNER CRAB INCIDENCE 88 FOURTH QUARTER JOINT VENTURE VESSELS

Figure 5. --Continued.

Table 15. --Estimated incidental catches of snow (Tanner) crab (in numbers of crab and metric tons) by joint venture vessels in the Bering Sea and Aleutian Islands region, 1988.

	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
U.S.-Japan	459,320	15,934	--	0	475,254	81.30	3.43	--	0.00	84.73
U.S.-ROK	836,956	19,131	--	0	856,087	169.90	4.71	--	0.00	174.61
U.S.-Poland	1,823	498	--	0	2,321	0.35	0.12	--	0.00	0.47
U.S.-PRC	49,344	--	--	--	49,344	10.95	--	--	--	10.95
U.S.-U.S.S.R.	928,746	809,132	--	0	1,737,878	144.88	48.55	--	0.00	193.43
Total	2,276,189	844,695	--	0	3,120,884	407.38	56.81	--	0.00	464.19
Percent by area	72.93	27.07	--	0.00		87.76	12.24	--	0.00	

ROK = Republic of Korea.
PRC = People's Republic of China.

Lines indicate areas not fished.

Table 16. --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, 1977-88*.

	Foreign		Joint Venture		Total	
Year	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
1988	NF	NF	3.1	464	3.1	464

* Estimated catches for years 1977-87 from Berger and Weikart 1988.

NF = no fishing.

Table 17. --Groundfish catch and numbers of Tanner crab by species and zone landed by joint venture fishery, 1988.

Fishery	Zone	Groundfish catch (t)	Chionoecetes bairdi nos.	Other Tanner crab nos.
Yellowfin sole and other flatfish	1	106,402.3	131,670	17,339
	2	201,870.3	320,654	900,826
	3	116,601.5	59,629	1,260,984
Other	1	163,827.9	100,683	11,983
	2	551,370.1	136,861	169,727
	3	161,343.8	1,144	9,384

Table 18. --Biological data on the incidental catches of Tanner crab (Chionoecetes spp.) in the joint venture groundfish fishery in the Bering Sea and Aleutian Islands region, 1988.

Species	Percent by species	Sex	Sex composition	Average weight (kg)	Average width (cm)
Chionoecetes opilio	75.94	Male	60.17	0.15	65.0
		Female	39.83	0.08	55.7
		Unsexed		0.06	63.7
		Combined		0.11	61.6
Chionoecetes bairdi	24.05	Male	61.20	0.29	87.6
		Female	38.80	0.13	67.4
		Unsexed		0.22	79.6
		Combined		0.23	79.7
Chionoecetes angulatus	<0.01	Male	13.32	0.27	97.4
		Female	86.68	0.05	59.9
		Combined		0.08	64.9
Chionoecetes tanneri	<0.01	Female	100.00	0.43	104.7

Table 19. --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 and Aleutian Islands region, 1988. Lines indicate areas not fished.

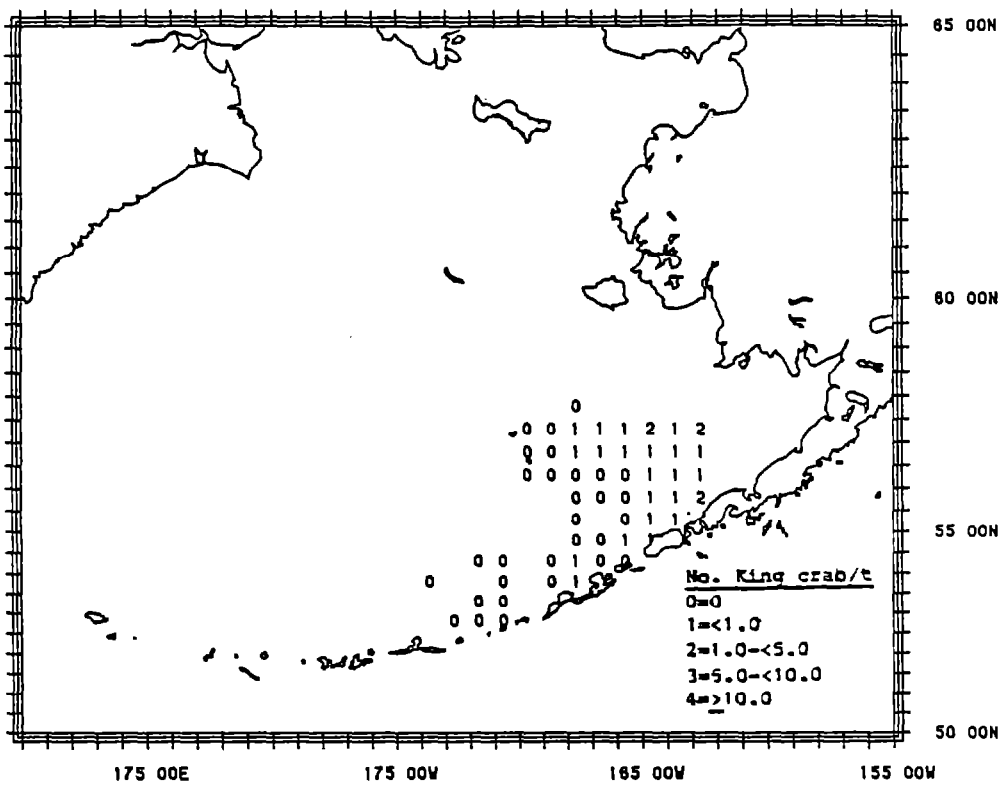
	Area I		Area II		Area IV	
	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.
U.S.-U.S.S.R. Joint Venture Mothership						
Jan.	0.001	1.09	--	--	--	--
Feb.	0.045	1.23	--	--	--	--
March	0.013	1.32	--	--	--	--
April	0.001	0.92	0.000	0.00	--	--
May	0.136	1.12	0.000	0.00	--	--
June	0.118	1.52	0.460	2.04	0.001	2.20
July	0.002	2.40	0.209	0.77	0.000	0.00
Aug.	--	--	0.620	0.82	--	--
Sep.	--	--	--	--	--	--
Oct.	--	--	--	--	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	0.038	1.21	0.324	1.59	<0.001	2.20
U.S.-Republic of Korea Joint Venture Mothership						
Jan.	0.171	1.19	--	--	0.000	0.00
Feb.	0.182	1.27	--	--	0.000	0.00
March	0.237	1.33	--	--	--	--
April	0.059	2.08	0.000	0.00	--	--
May	0.119	1.70	<0.001	2.00	--	--
June	0.050	0.97	--	--	0.003	1.16
July	--	--	--	--	0.000	0.00
Aug.	--	--	--	--	--	--
Sep.	0.028	2.13	0.000	0.00	--	--
Oct.	0.048	1.77	--	--	--	--
Nov.	1.353	1.55	--	--	--	--
Dec.	0.118	1.57	--	--	--	--
Annual	0.157	1.39	<0.001	2.00	0.002	1.16

Table 19. --Continued.

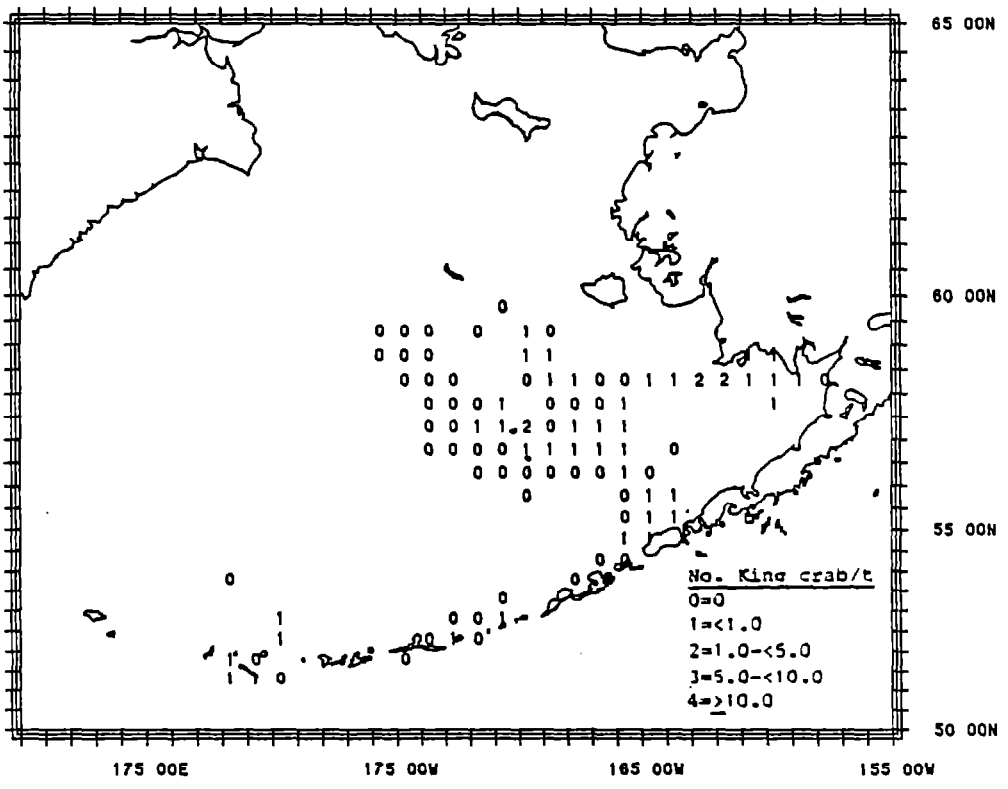
	Area I		Area II		Area IV	
	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.
U.S.-Japan Joint Venture Mothership						
Jan.	0.003	1.69	--	--	--	--
Feb.	0.181	1.27	--	--	0.000	0.00
March	0.091	1.37	--	--	0.000	0.00
April	0.004	0.91	0.000	0.00	--	--
May	0.163	1.04	0.000	0.00	0.001	2.80
June	1.052	1.70	1.034	1.39	0.002	2.04
July	--	--	--	--	0.000	0.00
Aug.	--	--	--	--	--	--
Sep.	0.008	2.06	0.000	0.00	--	--
Oct.	0.026	1.86	--	--	0.000	0.00
Nov.	0.077	1.70	--	--	--	--
Dec.	0.159	2.02	--	--	--	--
Annual	0.087	1.36	0.019	1.39	0.001	2.07
U.S. -Poland Joint Venture Mothership						
Jan.	0.005	2.10	--	--	--	--
Feb.	0.000	0.00	--	--	--	--
March	--	--	--	--	--	--
April	0.017	1.76	0.000	0.00	--	--
May	0.004	2.83	0.000	0.00	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	0.000	0.00	0.000	0.00	--	--
Oct.	0.000	0.00	0.000	0.00	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	0.004	1.98	0.000	0.00	--	--

Table 19. --Continued.

	Area I		Area II		Area IV	
	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.
U.S.-People's Republic of China Joint Venture Mothership						
Jan.	0.013	1.69	--	--	--	--
Feb.	0.301	1.14	--	--	--	--
March	0.142	1.10	--	--	--	--
April	0.005	1.16	--	--	--	--
May	0.246	0.88	--	--	--	--
June	0.035	1.20	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	--	--	--	--	--	--
Oct.	--	--	--	--	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	0.140	1.06	--	--	--	--

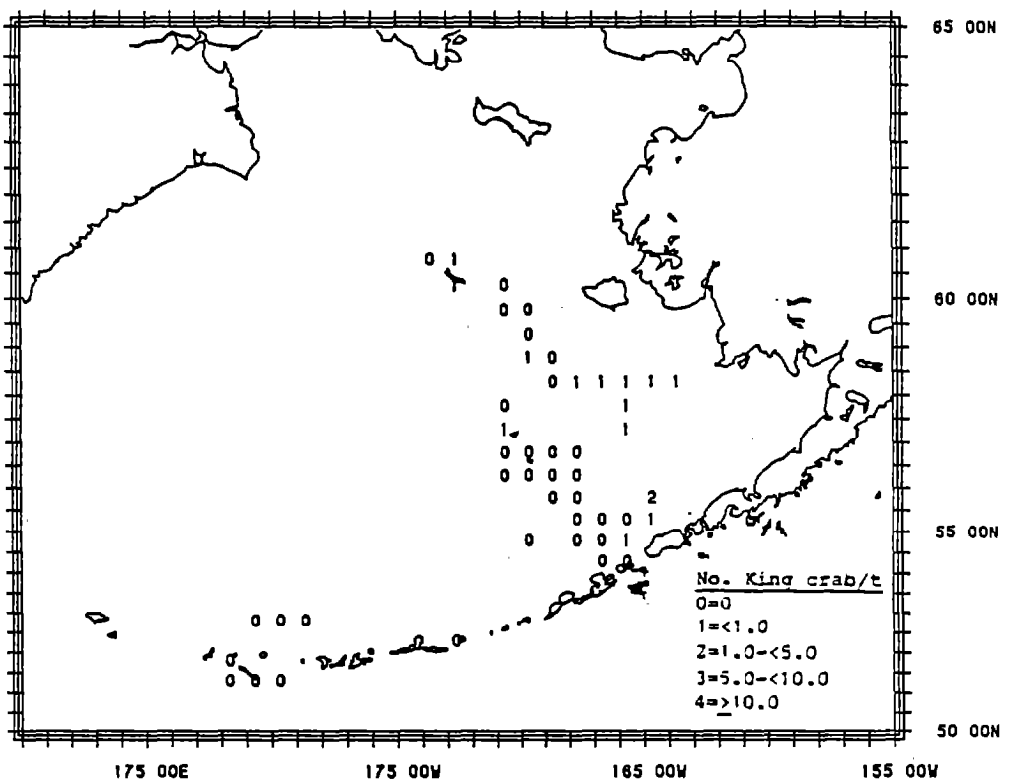


KING CRAB INCIDENCE 88 FIRST QUARTER JOINT VENTURE VESSELS

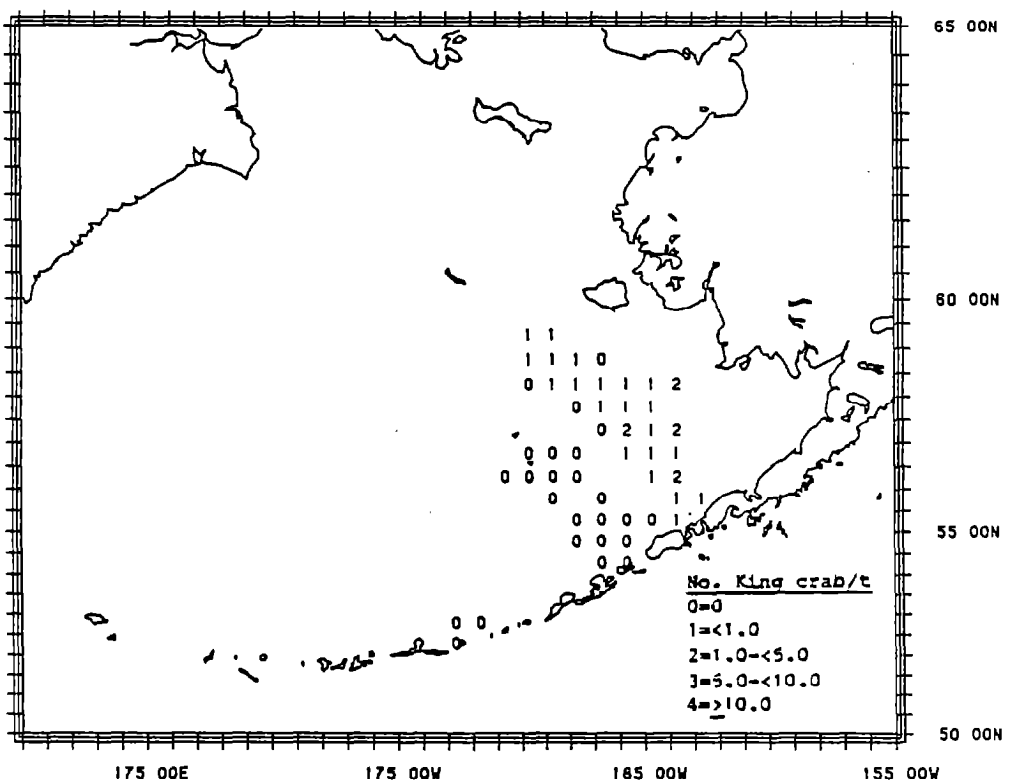


KING CRAB INCIDENCE 88 SECOND QUARTER JOINT VENTURE VESSELS

Figure 6. --Average incidence (no./t) of king crab in the joint venture fisheries by quarter and 1/2° lat. by 1° long. areas, 1988.



KING CRAB INCIDENCE 88 THIRD QUARTER JOINT VENTURE VESSELS



KING CRAB INCIDENCE 88 FOURTH QUARTER JOINT VENTURE VESSELS

Figure 6. --Continued.

Table 20. --Estimated incidental catches of king crab (in numbers of crab and metric tons) by joint venture vessels in the Bering Sea and Aleutian Islands region, 1988.

	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
U.S.-Japan	30,687	1,819	--	25	32,531	41.65	2.52	--	0.05	44.21
U.S.-ROK	43,367	13	--	49	43,429	60.37	0.03	--	0.06	60.46
U.S.-Poland	27	0	--	0	27	0.05	0.00	--	0.00	0.05
U.S.-PRC	3,657	--	--	--	3,657	3.89	--	--	--	3.89
U.S.-U.S.S.R.	6,429	1,958	--	2	8,389	7.75	3.12	--	<0.01	10.87
Total	84,167	3,790	--	76	88,033	113.70	5.62	--	0.11	119.48
Percent by area	95.65	4.31	--	0.09		95.16	4.75	--	0.09	

ROK = Republic of Korea.
PRC = People's Republic of China.

Lines indicate areas not fished.

Table 2 .--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, 1977-88*.

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
1988	NF	NF	88,033	119	88,033	119

* Estimated catches for years 1977-87 from Berger and Weikart (1988).

NF = No fishing.

Table 22. --Groundfish catch (in metric tons) and numbers of king crab by species and zone caught by each joint venture fishery, 1988.

Fishery	Zone	Groundfish catch (t)	Red king crab nos.	Blue king crab nos.	Other king crab nos.
Yellowfin sole	1	106,402.3	52,250	168	111
and other flatfish	2	201,870.3	8,921	3,815	98
	3	116,601.5	11,663	977	17
Other	1	163,827.9	8,753	25	106
	2	551,370.1	993	32	0
	3	161,343.8	13	23	68

Table 23. --Biological data on the incidental catches of king crab (Lithodes and Paralithodes spp.) in the joint venture groundfish fishery in the Bering Sea and Aleutian Islands region, 1988.

Species	Percent by species	Sex	Sex composition	Average weight (kg)	Average length (mm)
Red	93.82	Male	66.41	1.60	129.9
		Female	33.59	0.85	108.1
		Unsexed		1.18	121.6
		Combined		1.33	122.5
Blue	5.73	Male	54.46	2.27	140.7
		Female	45.54	1.53	129.8
		Unsexed		0.53	96.4
		Combined		1.92	135.3
Golden	0.45	Male	74.66	1.68	145.7
		Female	25.34	0.86	121.2
		Unsexed		4.00	202.9
		Combined		1.48	139.6

Table 24. --Pacific herring catch statistics in the Bering Sea and Aleutian Islands groundfish fishery, 1977-88.

	Pacific herring joint venture catch (1,000 t)	% of total joint venture catch	Pacific herring foreign catch (1,000 t)	% of total foreign catch
1977	NF	NF	19.3	1.50
1978	NF	NF	8.4	0.61
1979	NF	NF	7.5	0.58
1980	0	0.00	0.8	0.06
1981	0	0.00	0.3	0.02
1982	<0.1	--	1.9	0.16
1983	1.1	0.52	1.4	0.12
1984	1.8	0.50	1.3	0.11
1985	3.1	0.48	1.5	0.14
1986	3.8	0.33	0.3	0.06
1987	0.5	0.04	<0.01	--
1988	0.4	0.03	NF	NF

NF = No fishing.

Table 25. --The common and scientific names of rockfish identified in the 1988 joint venture catches in the Bering Sea and Aleutian Islands region.

Common name[a]	Scientific name
Dusky rockfish	Sebastes ciliatus
Northern rockfish	Sebastes polyspinis
Pacific ocean perch	Sebastes alutus
Rougheye rockfish	Sebastes aleutianus
Other rockfish[b]	
Black rockfish	Sebastes melanops
Darkblotched rockfish	Sebastes crameri
Harlequin rockfish	Sebastes variegatus
Redstripe rockfish	Sebastes proriger
Shortraker rockfish	Sebastes borealis
Shortspine thornyhead	Sebastolobus alascanus
Yellowmouth rockfish	Sebastes reedi

[a] 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.

[b] The 7 species listed under "Other rockfish" each made up less than 0.10% of the rockfish catch in the joint venture operations.

Table 26. --Estimated joint venture catch (in metric tons and percentages) of rockfish by species and area in the Bering Sea and Aleutian Islands region during 1988.

Common name	Area I		Area II		Area IV		Total	
	t	%	t	%	t	%	t	%
Dusky rockfish	2.61	6.44	0.37	1.66	66.62	3.29	69.60	3.33
Northern rockfish	2.64	6.50	4.16	18.76	441.09	21.78	447.89	21.45
Pacific ocean perch	33.64	82.87	17.65	79.52	1,513.284	74.71	1,564.57	74.92
Rougheye rockfish	1.10	2.70	0.00	0.00	3.84	0.19	4.94	0.24
Other rockfish*	0.60	1.48	0.01	0.05	0.65	0.03	1.26	0.06
Total	40.59		22.19		2,025.48		2,088.26	
Percent by area	1.94		1.06		96.99			

*Species included in this category are listed in Table 25.

Table 27. --The common and scientific names of flatfish identified in the 1988 joint venture catches in the Bering Sea and Aleutian Islands region.

Common name	Scientific name
Alaska plaice	Pleuronectes quadrituberculatus
Arrowtooth flounder (turbot)	Atheresthes stomias
Bering flounder	Hippoglossoides robustus
Butter sole	Isopsetta isolepis
Dover sole	Microstomus pacificus
English sole	Parophrys vetulus
Flathead sole	Hippoglossoides elassodon
Greenland turbot	Reinhardtius hippoglossoides
Kamchatka flounder	Atheresthes evermanni
Longhead dab	Limanda proboscidea
Petrale sole	Eopsetta jordani
Rex sole	Glyptocephalus zachirus
Rock sole	Lepidopsetta bilineata
Sand sole	Psettichthys melanostictus
Starry flounder	Platichthys stellatus
Yellowfin sole	Limanda aspera

Table 28. --Estimated joint venture catch (in metric tons and percentages) of flatfish by species and area in the Bering Sea and Aleutian Islands region during 1988.

Common name	Area I		Area II		Area IV		Total	
	t	%	t	%	t	%	t	%
Alaska plaice	59,611.68	18.30	2,019.30	38.62	0.00	0.00	61,630.97	18.62
Arrowtooth flounder	2,260.25	0.69	245.54	4.69	19.46	17.09	2,525.25	0.76
Bering flounder	66.45	0.02	79.50	1.52	0.00	0.00	145.95	0.04
Butter sole	75.98	0.02	0.00	0.00	0.00	0.00	75.98	0.02
Dover sole	2.30	<0.01	0.00	0.00	0.00	0.00	2.30	<0.01
English sole	12.72	<0.01	0.00	0.00	0.00	0.00	12.72	<0.01
Flathead sole	6,277.59	1.93	357.73	6.84	0.20	0.18	6,635.52	2.00
Greenland turbot	69.87	0.02	12.04	0.23	5.78	5.07	87.69	0.03
Kamchatka flounder	46.29	0.01	1.42	0.03	3.19	2.80	50.90	0.02
Longhead dab	262.04	0.08	0.00	0.00	0.00	0.00	262.04	0.08
Petrale sole	0.43	<0.01	0.00	0.00	0.00	0.00	0.43	<0.01
Rex sole	186.36	0.06	15.69	0.30	0.32	0.28	202.37	0.06
Rock sole	38,682.07	11.88	2,064.32	39.48	84.46	74.15	40,830.84	12.33
Sand sole	0.01	<0.01	0.00	0.00	0.00	0.00	0.01	<0.01
Starry flounder	5,241.55	1.61	0.02	<0.01	0.14	0.12	5,241.71	1.58
Yellowfin sole	212,889.24	65.37	432.94	8.28	0.35	0.31	213,322.46	64.44
Total	325,684.83		5,228.50		113.90		331,027.23	
Percent by area	98.39		1.58		0.03			

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SUMMARY OF OBSERVER SAMPLING FOR THE GULF OF ALASKA REGION

Observer Coverage of Fishing Fleets

During 1988, there were no foreign quotas issued and thus no foreign fishing in the U.S. 200-mile EEZ in the Gulf of Alaska region (Fig. 7). In addition, the effort of foreign vessels participating in joint ventures with U.S. catcher boats in 1988 was down 77% from 1987. No joint venture operations were permitted to target on pollock in the Shelikof Strait or any other areas of the Gulf of Alaska, and this resulted in foreign vessels spending only 86 days in joint venture fishing operations (Table 29). These joint ventures were primarily flatfish operations conducted between U.S. vessels and processing vessels from Japan (one processing vessel from the ROK received catches for one day). Observers spent 79 days sampling aboard these foreign processing vessels, providing an observer coverage (100 x number of observer days/number of foreign vessel days) of 91.9%. In 1987, the overall percent coverage by observers was 99.7%.

Estimates of U.S. Joint Venture Catches

In 1988, a total of 3,800 t of groundfish were landed in the U.S. joint venture fisheries (Table 30). The catches of flatfish (47.2%) and Pacific cod (44.0%) composed most of the catch. These species were taken in operations conducted in the Chirikof and Kodiak areas in the second and third quarters of the year. Pacific ocean perch, the other rockfish complex, and sablefish were again declared prohibited species for the joint venture fisheries in 1988 since 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 flatfish fishery exceeded the PSC limits of 240 t for Pacific halibut and was closed 18 August. No other fishing occurred after this date.

Table 31 presents a summary of the foreign and joint venture catches by species for the years 1977 to 1988. The 1988 U.S. joint venture groundfish catch decreased 88% from 1987, and was the lowest joint venture catch since 1981. The joint ventures had experienced a rapid growth through 1985, but 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) have reduced the Gulf of Alaska joint venture landings by 98.5% in the last three years.

Incidence and Incidental Catch of Prohibited Species

Pacific Salmon

Incidental catches of salmon occurred in groundfish catches made by joint venture vessels in the Shumagin, Chirikof, and Kodiak areas in 1988. The incidence and average

weights of salmon taken in catches sampled by observers are listed in Table 32. Monthly salmon catches were generally lower than 0.100 fish/t. Annual salmon incidence rates were less than 0.05 fish/t in the U.S.-Japan fisheries, and the U.S.-ROK fishery only landed one salmon.

The incidence of salmon by l/2° latitude by l° longitude statistical block is illustrated for joint venture vessels in Figure 8. Only one occurrence of over one salmon/t (in the second quarter at 57°00'N lat., 152° W long.) was observed on joint venture vessels.

The estimated incidental catches of salmon, by area and nation, are shown in Table 33. The 1988 estimated catch in the joint venture fishery was 147 salmon. Almost 72.8% of the salmon were taken in the Kodiak area, 26.5% of the salmon were caught in the Chirikof area, and 1 salmon was caught in the Shumagin area. The incidental catch in the 1988 joint venture operations was 88% lower than that taken in 1987 (Table 34). The total catch of 147 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 35. Not only has the total number of salmon dropped substantially, but the change in fishing targets and the resulting changes in area and time of year fished has changed the composition of salmon in the catch. In the 1986 joint venture fishery, chinook salmon accounted for 99.7% of the salmon catch. In 1987, chinook salmon made up 62.4% of the salmon catch, chum salmon accounted for 37.3%, and coho salmon comprised 0.3%. In 1988, chinook salmon made up 59.6% of the catch and chum salmon accounted for the remaining 40.4%. The chinook salmon had an average weight of 4.0 kg and an average length of 62.6 cm. The chum salmon had an average weight of 4.3 kg and an average length of 66.6 cm.

Pacific Halibut

Table 36 lists the incidence of halibut in joint venture catches by nation and area. No halibut were caught in the Shumagin area. Incidence rates were about the same in both the Chirikof (15.3 halibut/t) and Kodiak (14.0 halibut/t) areas.

The incidence of halibut by l/2° latitude by 1° longitude block is illustrated by quarter of the year for the joint venture fisheries (Fig. 9). No joint venture operations were conducted during the first and fourth quarters of the year. In the second and third quarters, all U.S.-Japan fishing operations took place in the vicinity of Kodiak Island, and incidence rates generally exceeded 10 halibut/t.

The estimated incidental catches of Pacific halibut, by area and joint venture nation, are shown in Table 37. In 1988, the joint venture incidental catch of halibut was 56,445 fish or 244.7 t. The Kodiak area accounted for 67.9%, the Chirikof area 32.1%. Table 38 presents a summary of the foreign and joint venture incidental catches of Pacific halibut for the years 1977 to 1988. Decreased effort by the joint venture operations in 1988 led to a decrease in the joint venture catch of halibut. The groundfish catch dropped 88% in 1988, but because most of this decrease was in the catch of walleye pollock (low halibut catch rates) the overall catch of halibut only dropped 71%. Even so, the total halibut catch by the joint venture fisheries of

56,445 fish was the lowest combined (foreign and joint venture) catch since the MFCMA was implemented' in 1977. Halibut taken in the 1988 joint venture fishery averaged 66.6 cm (4.5 kg).

Snow (Tanner) Crab

Table 39 presents the incidence of Tanner crab in joint venture catches by nation and area. The monthly incidence rate of Tanner crab only exceeded 1.0 crab/t in catches made in the U.S.-Japan joint venture fishery in the Kodiak area in July (8.368 crab/t). This led to a high annual incidence rate (3.303 crab/t) for the Kodiak area.

The incidence of Tanner crab in joint venture catches is shown by 1/2° latitude and 1° longitude block by quarter in Figure 10. In the second quarter, one location (55°30'N lat., 156° W long.) had rates of l-10 crab/t. In the third quarter, three locations around Kodiak Island (56°00'-57°00'N lat., 152° -153° W long.) had rates of l-10 crab/t. In all other areas, the incidence rates of Tanner crab were below 1 crab/t.

The joint venture fishery caught more than 10,600 Tanner crab in 1988 (Table 40) 97.1% of the catch occurring in the Kodiak area. This level of catch was a 94% increase over the joint venture catch in 1987 (Table 41). The 1988 joint venture fishery occurred earlier in the year than in 1987 and experienced higher incidence rates. The total catch of Tanner crab (10,643 crab) was still the second lowest recorded catch for the years 1978-88.

The species composition, sex composition, and average size of the Tanner crab are given in Table 42. As is typically the case,. only two species of Tanner crab were identified in the 1988 joint venture operations: Chionoecetes bairdi and C. opilio. Chionoecetes bairdi again made up almost all (99.98%) of the total crab catch; C. opilio (0.02%) accounted for the remainder.

King Crab

Table 43 gives the incidence of king crab in the 1988 joint venture fisheries by nation and area. The mean annual incidence rates were very low and ranged from 0 to 0.087 crab/t. The highest monthly incidence rate was in the U.S.-Japan operation in the Chirikof area in June (0.394 crab/t). No other joint venture operation had a monthly incidence rate higher than 0.025 crab/t.

The estimated incidental catches of king crab, by area and nation, are shown in Table 44. The joint venture fishery only landed an estimated 131 king crab in 1988 compared to 69 caught in 1987. Most of the king crab were taken in the Chirikof area (93.1%). The Kodiak area yielded the remainder (6.9%). Table 45 presents a summary of the foreign and joint venture incidental catches of king crab for the years 1978 to 1988. The incidental king crab catch of 131 crab (0.50 t) is the third 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 46. Red king crab was the only species identified in the 1988 joint venture groundfish catches.

Rockfish Catch by Species

Table 47 lists the common and scientific names of the eight species of rockfish that were identified by observers as appearing in joint venture catches in the Gulf of Alaska during 1988. Approximately 11.0 t of rockfish were caught in 1988 (Table 48), down 93% from the 1987 catch.

As previously mentioned, the catches of rockfish were limited- by the continuance of their treatment as "prohibited species" for joint venture operationsin 1988 and by the setting of prohibited species catch limits for these species. These "prohibited species" restrictions, the 77% reduction in fishing effort, and the elimination of the pollock allotment, all were factors leading to this decrease. Pacific ocean perch (34.4%), sharpchin rockfish (S. zacentrus) 31.8%), yelloweye rockfish (S. ruberrimus) (17.3%), and dusky rockfish (S. ciliatus) (8.5%) accounted for 92.0% of the catch. The Shumagin area yielded 52.9% of the catch; 41.7% came from the Kodiak area and the rest (5.5%) were caught in the Chirikof area.

Flatfish Catch by Species

Table 49 lists the common and scientific names of the 12 species of flatfish that were identified by observers as appearing in joint venture catches in the Gulf of Alaska in 1988. In 1988, joint venture operations targeted primarily on flatfish, landing 1,781 t (47.2% of the total joint venture catch for the year). This catch represents a 75% reduction from 1987. As mentioned earlier, these operations were closed down early due to exceeding the "prohibited species" limit set on Pacific halibut. In 1988, the Kodiak area accounted for 58.84% of the flatfish catch (Table 50). The Chirikof and Shumagin areas yielded 41.14% and 0.02%, respectively. Arrowtooth flounder (Atheresthes stomias) (47.8%), rock sole (31.6%), butter sole (Isopsetta isolepis) (11.5%), and flathead sole (Hippoglossoides elassodon) (4.4%) were the major flatfish components of the catch.

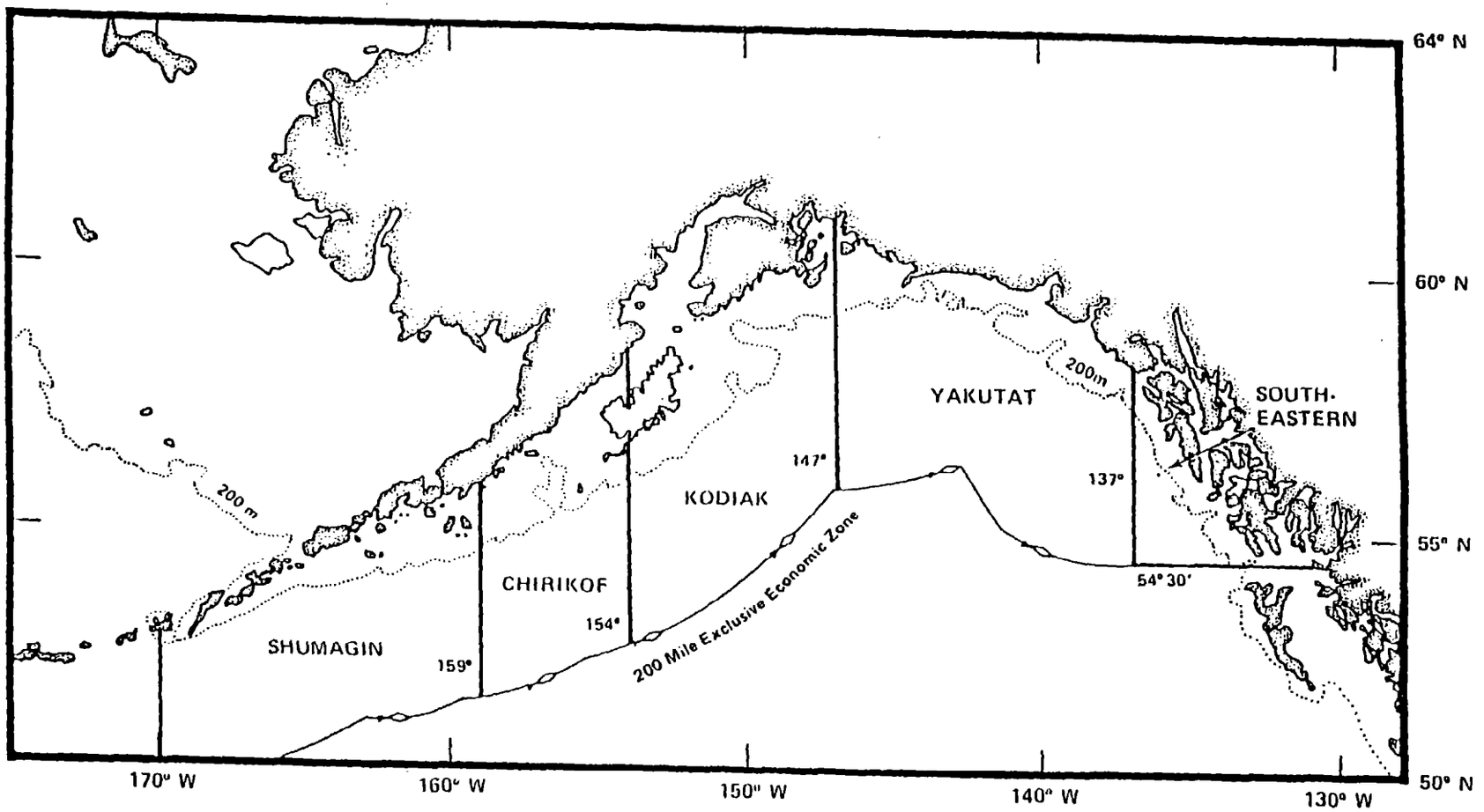


Figure 7. --U.S. statistical areas in the Gulf of Alaska region.

Table 29. --Annual summary of observer effort, joint venture effort, and observer coverage (100 x observer days/joint venture vessel days) by nation and vessel class in the Gulf of Alaska region, 1988.

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
U.S.-Japan	Yell/Flat FJV	7	4	4	78	85	91.8
U.S.-ROK	Other FJV	1	1	1	1	1	100.0
Total*		8	5	5	79	86	91.9

* 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.

FJV = Freezer joint venture.
Yell/Flat = Targeting on yellowfin sole/flat&h.
Other = Targeting on roundfish.
ROK = Republic of Korea.

Table 30. --Estimated groundfish landings taken in joint venture operations in the Gulf of Alaska region in 1988[a].

Species	Metric tons	Percent
Squid	0.0	0.0
All flounders	1,780.6	47.2
Walleye pollock	152.1	4.0
Pacific cod	1,660.8	44.0
Sablefish	36.6	1.0
Atka mackerel	0.2	<0.1
Pacific ocean perch[b]	3.8	0.1
Thornyhead rockfish	0.1	<0.1
Slope rockfishes	4.2	0.1
Demersal rockfishes	1.9	<0.1
Pelagic rockfishes	1.0	<0.1
Other fish	129.3	3.4
Total	3,770.6	

[a] In 1988, joint venture fisheries were conducted between U.S. catcher boats and processing vessels from Japan, and the Republic of Korea.

[b] Only includes Pacific ocean perch (Sebastes alutus).

Table 31. --Estimated catches of groundfish taken by the foreign and joint venture fisheries in the Gulf of Alaska region, 1977-88[a].

Fisheries and species group	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Foreign directed catches (metric tons)												
Squid	NA	322	425	841	1,135	278	267	120	6	0	NF	NF
Flounders	16,038	14,314	13,474	15,497	14,443	8,986	9,531	3,033	170	71	NF	NF
Pollock	117,834	96,392	103,187	112,997	130,324	92,612	81,358	99,260	31,587	114	NF	NF
Pacific cod	1,988	11,371	13,174	34,245	34,969	26,936	29,777	15,897	9,086	15,211	NF	NF
Sablefish	15,957	7,128	6,885	6,139	7,975	5,645	4,965	1,108	38	1	NF	NF
Atka mackerel	19,455	19,588	10,948	13,163	18,727	6,760	11,470	537	2	<1	NF	NF
All rockfish[b]	23,578	10,070	12,286	16,647	17,857	10,468	7,846	3,177	14	4	NF	NF
Other fish[c]	4,642	5,989	2,971	8,515	7,112	2,049	2,255	576	97	146	NF	NF
Total	199,492	165,174	163,350	208,044	232,542	153,734	147,469	123,708	41,000	15,547	NF	NF
Joint venture catches (metric tons)												
Squid	NF	0	<1	0	<1	16	4	5	7	7	4	0
Flounders	NF	5	70	209	18	18	2,692	3,449	2,447	961	7,208	1,781
Walleye pollock	NF	34	566	1,136	16,857	73,917	134,131	207,104	237,860	62,591	22,823	152
Pacific cod	NF	7	713	466	58	193	2,426	4,649	2,266	1,357	1,978	1,661
Sablefish	NF	0	18	20	<1	1	275	528	226	45	180	37
Atka mackerel	NF	<1	1	3	0	0	790	585	1,846	4	1	<1
All rockfish[b]	NF	1	90	28	1	3	2,276	2,037	307	67	154	11
Other fish[c]	NF	1	34	49	33	301	391	1,268	2,246	255	178	129
Total	NF	48	1,492	1,911	16,967	74,449	142,985	219,625	247,205	65,287	32,526	3,771

[a] Estimates for years 1977-87 are from Berger and Weikart 1988.

[b] As rockfish reporting requirements have changed over the years, for comparison purposes, all rockfish are combined into a single group.

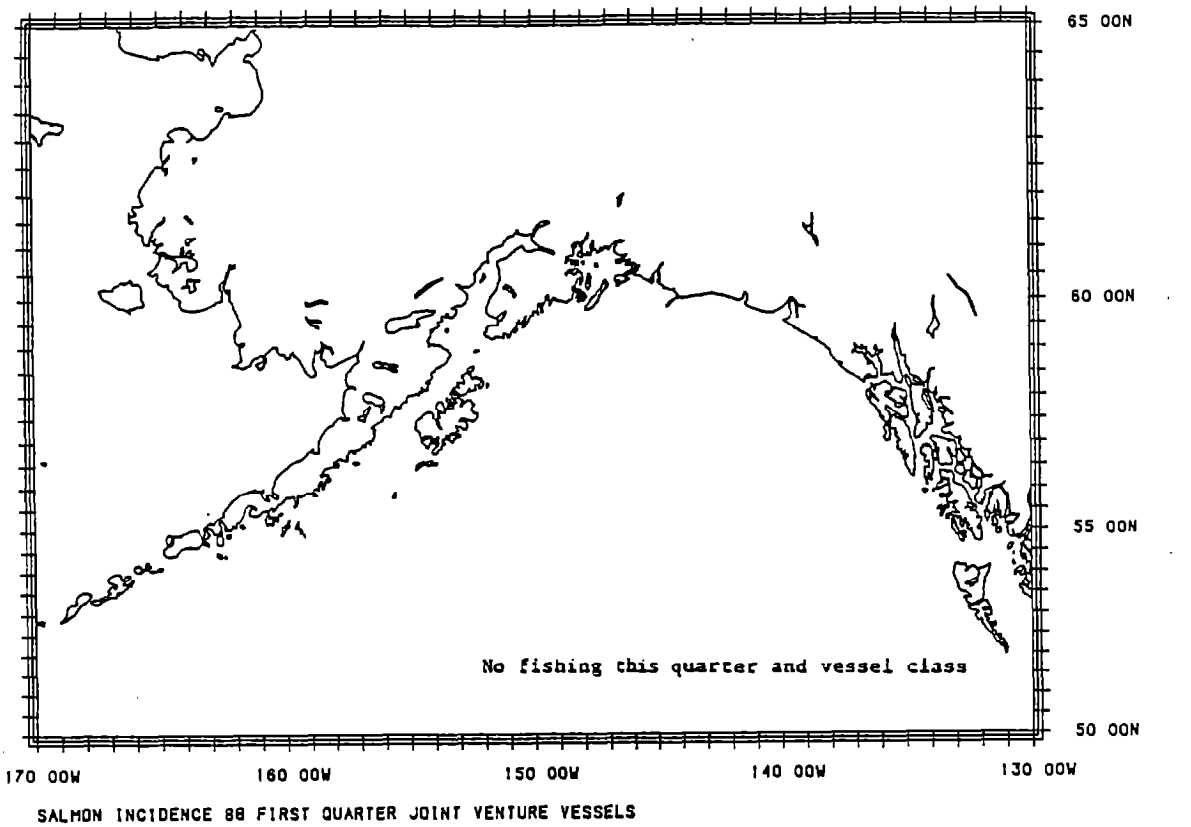
[c] Reporting requirements of rattails, Coryphaenoides spp., have changed. In 1978, rattails were included in the "other fish" category. In 1980, rattails were reported in a separate category, and in this table, rattails make up 2,960 of the 1980 foreign catches of "other fish". No rattails were estimated 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.

NA = Not available.
NF = No fishing.

Table 32.--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, 1988*. Lines indicate areas not fished.

	Shumagin		Chirikof		Kodiak	
	Rate	Average weight	Rate	Average weight	Rate	Average weight
U.S.-Republic of Korea Joint Venture Mothership						
Jan.	--	--	--	--	--	--
Feb.	--	--	--	--	--	--
March	--	--	--	--	--	--
April	--	--	--	--	--	--
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	0.154	1.60	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	--	--	--	--	--	--
Oct.	--	--	--	--	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	0.154	1.60	--	--	--	--
U.S.-Japan Joint Venture Mothership						
Jan.	--	--	--	--	--	--
Feb.	--	--	--	--	--	--
March	--	--	--	--	--	--
April	--	--	--	--	--	--
May	--	--	--	--	--	--
June	--	--	0.080	3.19	0.134	3.54
July	--	--	--	--	0.032	4.50
Aug.	--	--	0.026	5.48	0.025	4.07
Sep.	--	--	--	--	--	--
Oct.	--	--	--	--	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	--	--	0.035	4.58	0.033	4.12

* No fishing occurred in the Yakutat and Southeastern areas.



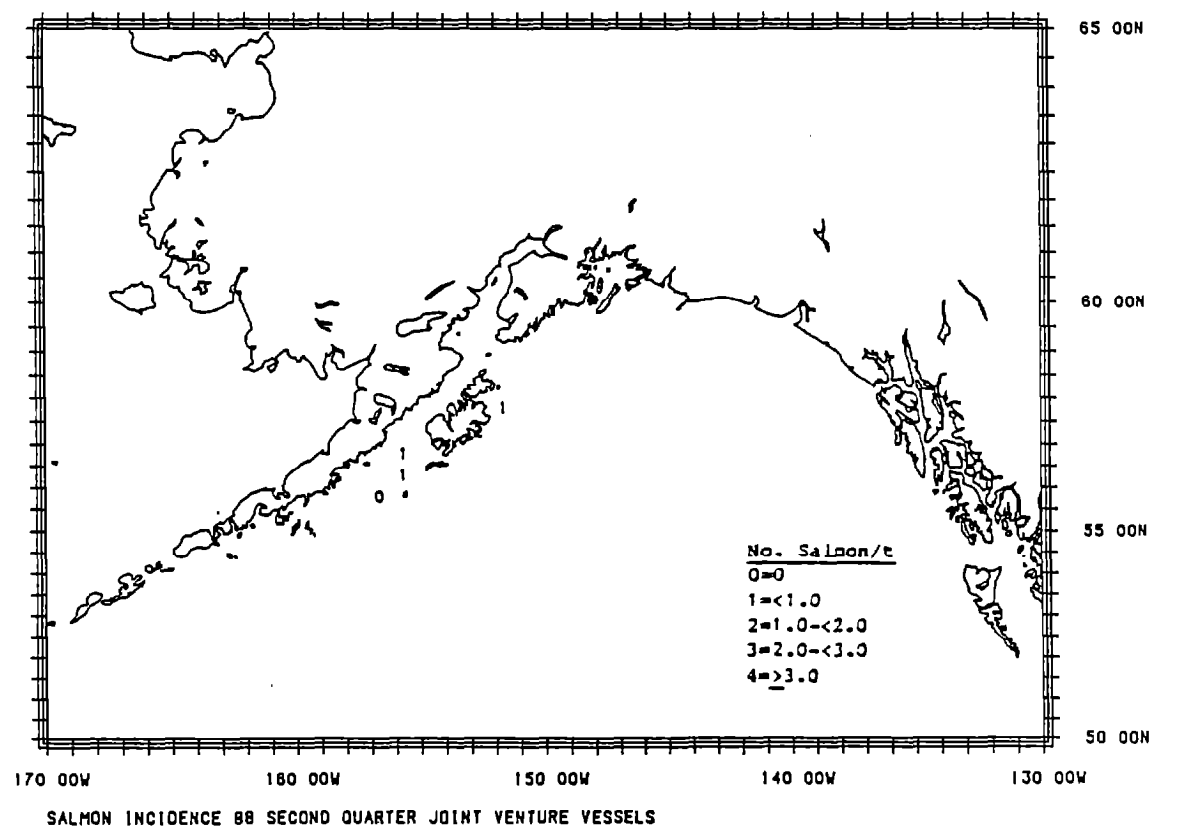
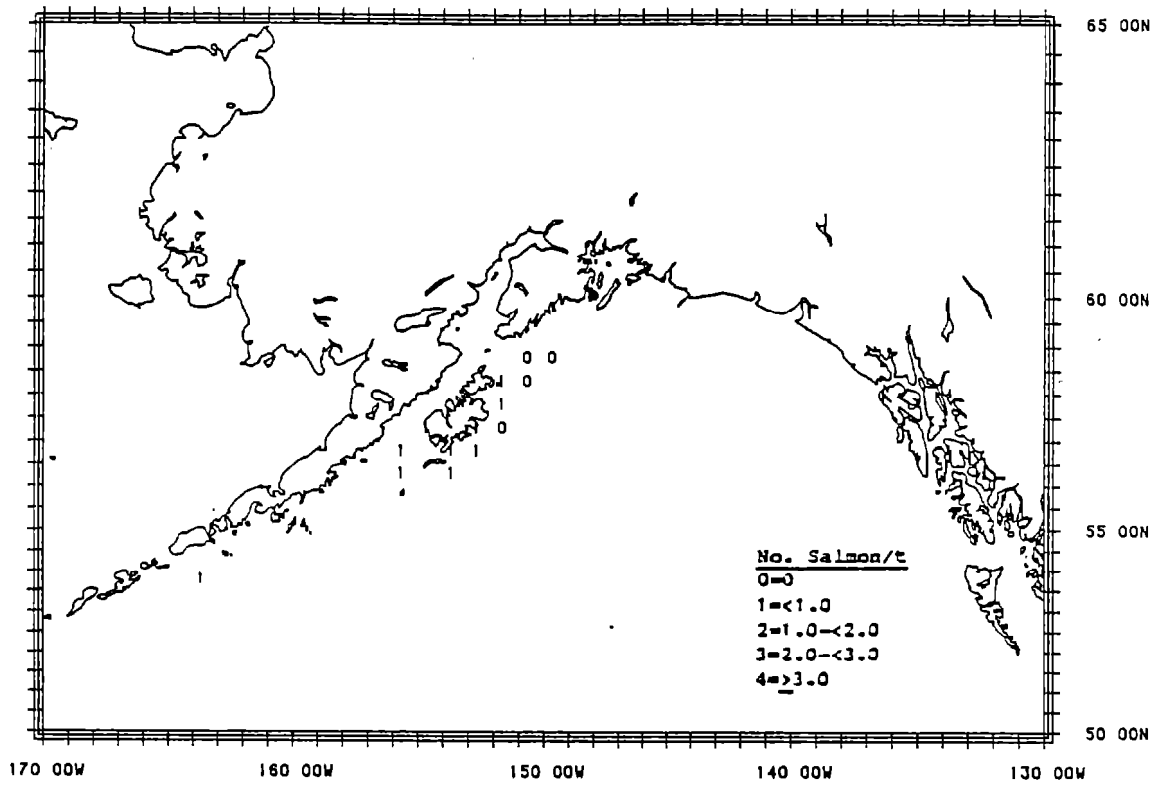
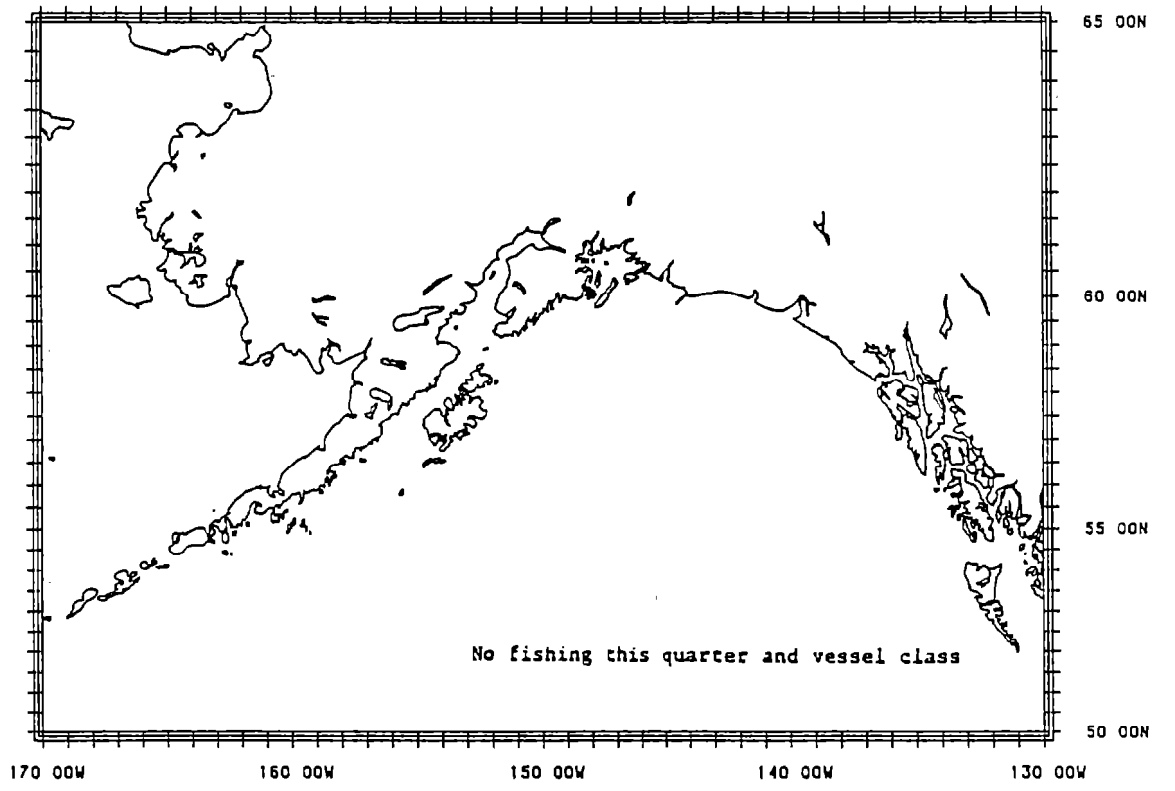


Figure 8. --Average incidence (no./t) of Pacific salmon in the joint venture fisheries by quarter and 1/2° lat. by 1° long. areas, 1958.



SALMON INCIDENCE 88 THIRD QUARTER JOINT VENTURE VESSELS



SALMON INCIDENCE 88 FOURTH QUARTER JOINT VENTURE VESSELS

Figure S.--Continued.

Table 33. --Estimated incidental catches of Pacific salmon (in numbers of fish and metric tons) by joint venture vessels in the Gulf of Alaska, 1988.

	Number of fish				Weight (metric tons)			
	Shumagin	Chirikof	Kodiak	Total all areas	Shumagin	Chirikof	Kodiak	Total all areas
Joint venture vessels								
U.S.-Japan	--	39	107	146	--	0.18	0.44	0.62
U.S.-ROK	1	--	--	1	<0.01	--	--	<0.01
Total	1	39	107	147	<0.01	0.18	0.44	0.62
Percent by area	0.68	26.53	72.79		0.26	28.96	70.79	

ROK = Republic of Korea.

Lines indicate areas not fished.

Table 34. --Estimated incidental catches (numbers and metric tons) of Pacific salmon (Oncorhynchus spp.) in the foreign and joint venture groundfish fisheries in the Gulf of Alaska, 1977-88[a].

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
1988	NF	NF	147	0.62	147	0.62

[a] Estimates for years 1977-87 are From Berger and Weikart 1988.

[b] No estimates of incidental catch were made of the limited joint venture fishery in 1978.

NF = No fishing.

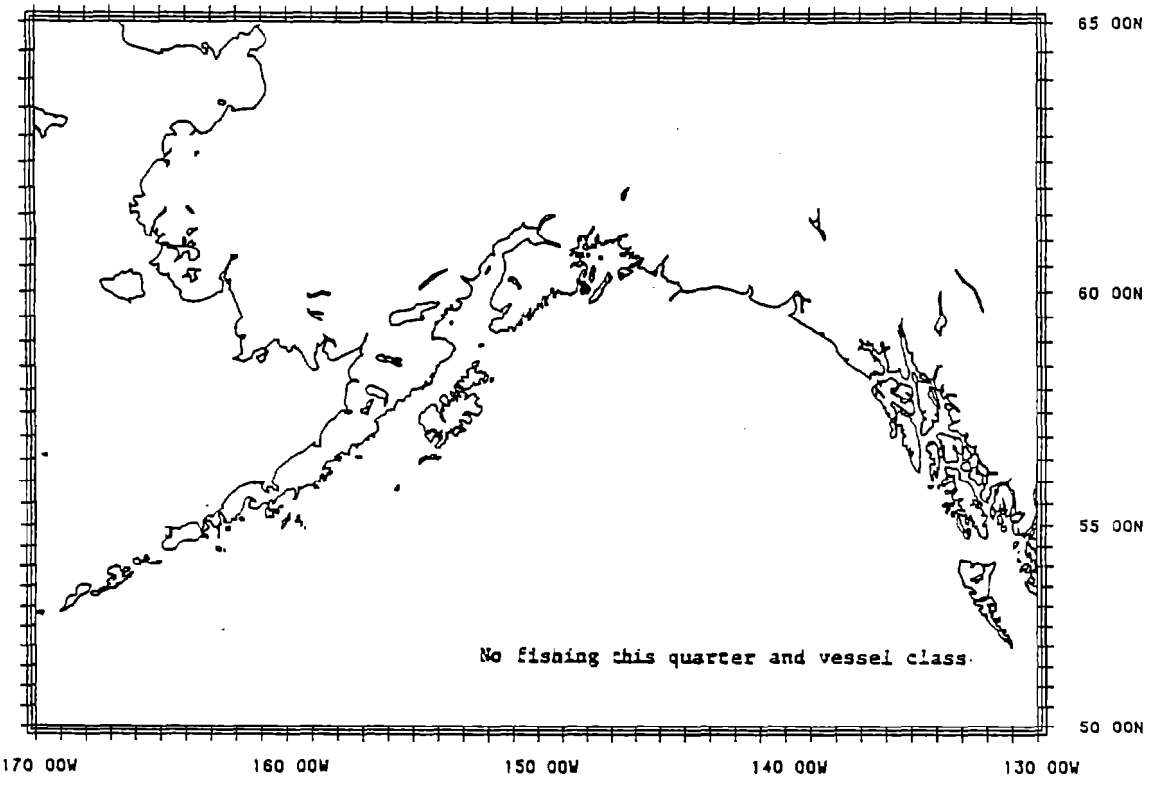
Table 35. --Biological data on the incidental catches of Pacific salmon (Oncorhynchus spp.) in the joint venture groundfish fishery in the Gulf of Alaska region, 1988.

Species	Percent by species	Sex	Sex composition	Average weight (kg)	Average length (cm)
Chinook	59.62	Male	50.45	3.90	61.5
		Female	49.55	4.09	63.8
		Combined		3.99	62.6
Chum	40.38	Male	45.15	3.88	65.0
		Female	54.85	4.70	68.0
		Combined		4.33	66.6

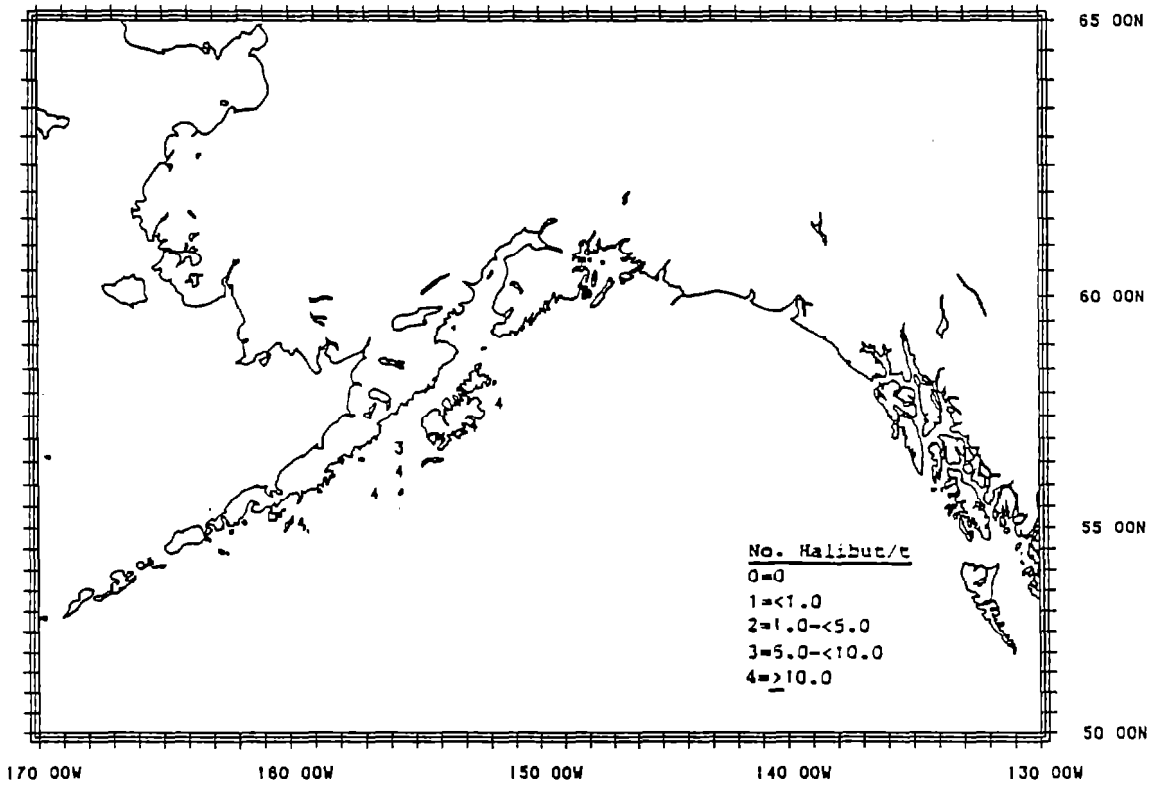
Table 36.--Incidence rate (number per metric ton of catch) and average weight (kg) of Pacific halibut taken in the joint venture groundfish catches in the Gulf of Alaska, 1988*. Lines indicate areas not fished.

	Shumagin		Chirikof		Kodiak	
	Rate	Average weight	Rate	Average weight	Rate	Average weight
U.S.-Republic of Korea Joint Venture Mothership						
Jan.	--	--	--	--	--	--
Feb.	--	--	--	--	--	--
March	--	--	--	--	--	--
April	--	--	--	--	--	--
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	0.000	0.00	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	--	--	--	--	--	--
Oct.	--	--	--	--	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	0.000	0.00	--	--	--	--
U.S.-Japan Joint Venture Mothership						
Jan.	--	--	--	--	--	--
Feb.	--	--	--	--	--	--
March	--	--	--	--	--	--
April	--	--	--	--	--	--
May	--	--	--	--	--	--
June	--	--	18.863	3.16	30.451	2.88
July	--	--	--	--	8.782	5.49
Aug.	--	--	14.633	3.84	15.863	5.38
Sep.	--	--	--	--	--	--
Oct.	--	--	--	--	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	--	--	15.348	3.70	13.952	5.14

* No fishing occurred in the Yakutat and Southeastern areas.

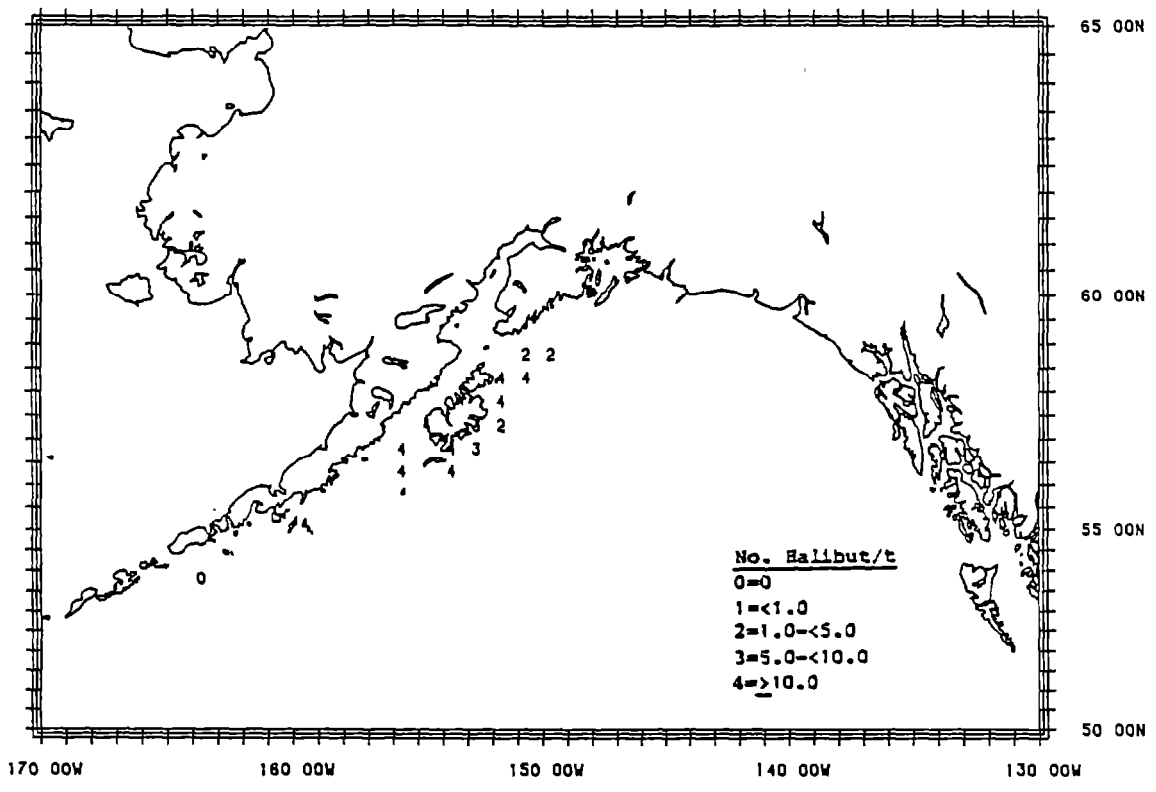


HALIBUT INCIDENCE 88 FIRST QUARTER JOINT VENTURE VESSELS



HALIBUT INCIDENCE 88 SECOND QUARTER JOINT VENTURE VESSELS

Figure 9. --Average incidence (no./t) of Pacific halibut in the joint venture fisheries by quarter and 1/2° lat. by 1° long. areas, 1988.



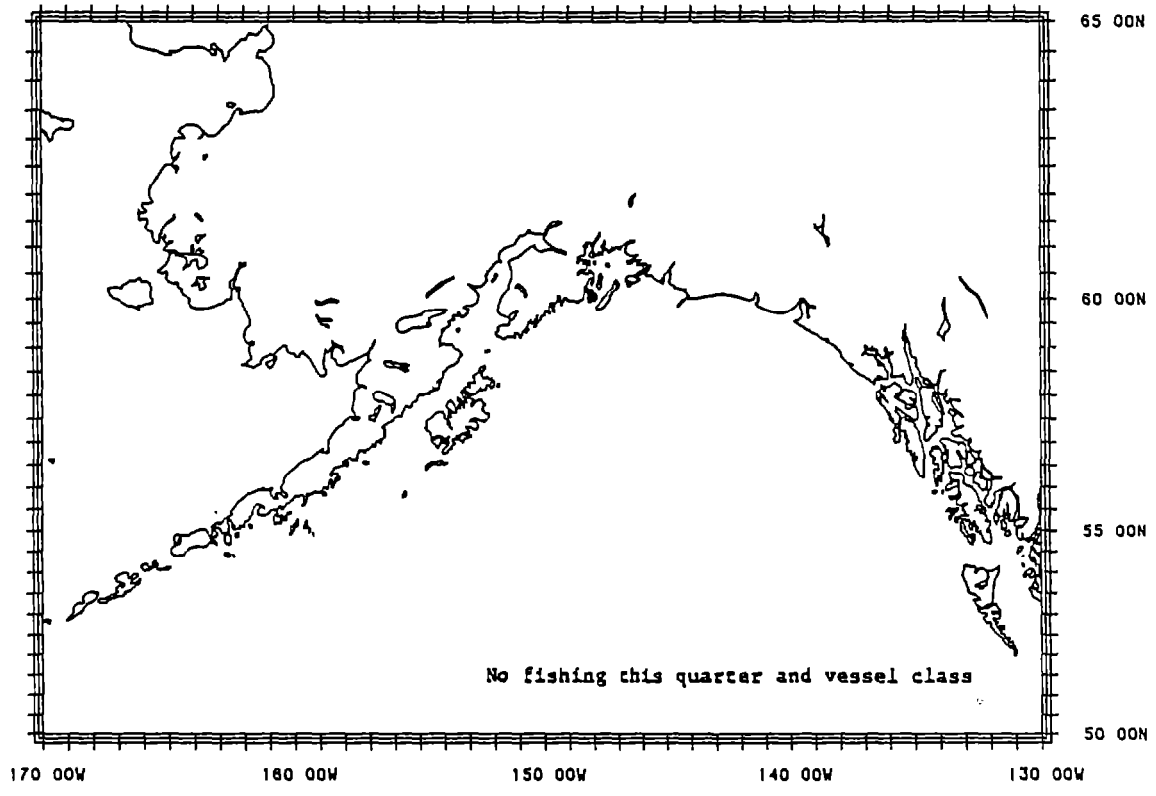


Figure 9. --Continued.

Table 37. --Estimated incidental catches of Pacific halibut (in numbers of fish and metric tons) by joint venture vessels in the Gulf of Alaska, 1988.

	Number of fish				Weight (metric tons)			
	Shumagin	Chirikof	Kodiak	Total all areas	Shumagin	Chirikof	Kodiak	Total all areas
Joint venture vessels								
U.S.-Japan	--	18,106	38,339	56,445	--	65.7	179.0	244.7
U.S.-ROK	0	--	--	0	0.0	--	--	0.00
Total	0	18,106	38,339	56,445	0.0	65.7	179.0	244.7
Percent by area	0.00	32.08	67.92		0.00	26.85	73.15	

ROK = Republic of Korea.

Lines indicate areas not fished.

Table 38. --Estimated incidental catches (numbers and metric tons) of Pacific halibut (Hippoglossus stenolepis) in the foreign and joint venture groundfish fisheries in the Gulf of Alaska region, 1977-88[a].

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
1988	NF	NF	56,445	244.7	56,445	245

[a] Estimates for years 1977-87 are from Berger and Weikart 1988.

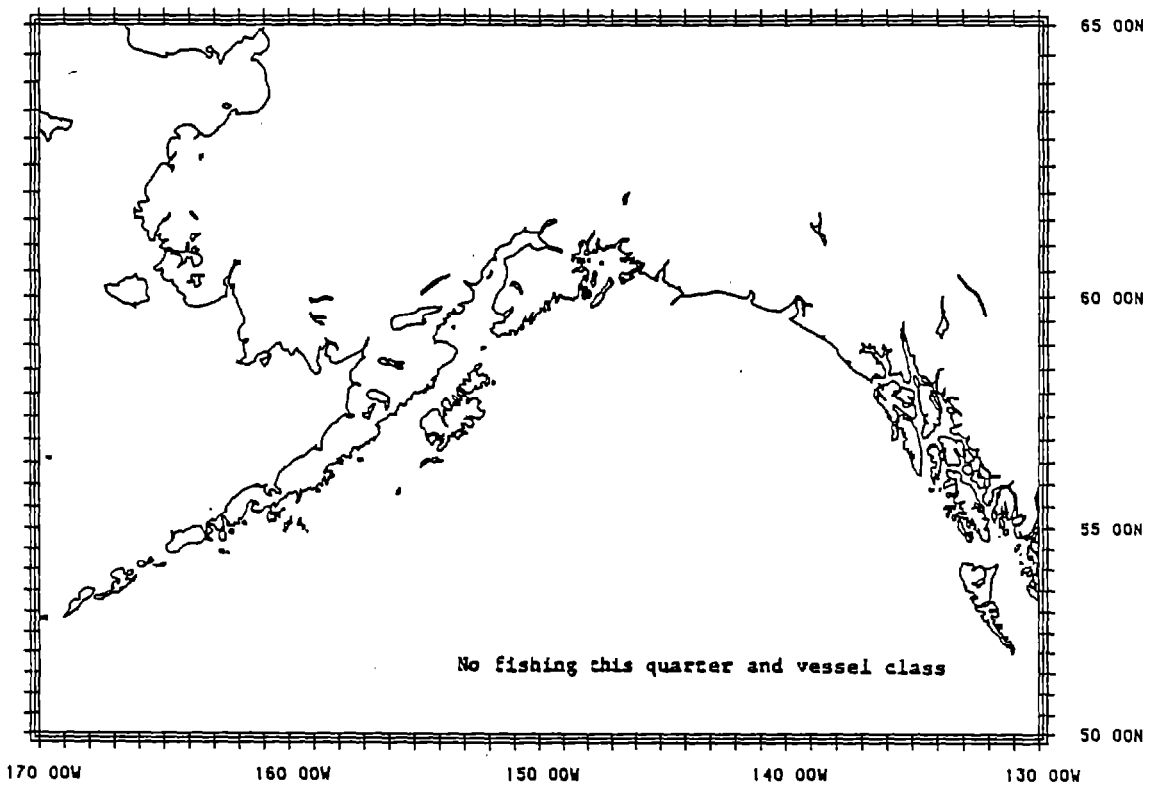
[b] No estimates of incidental catch were made of the limited joint venture fishery in 1978.

NF = No fishing.

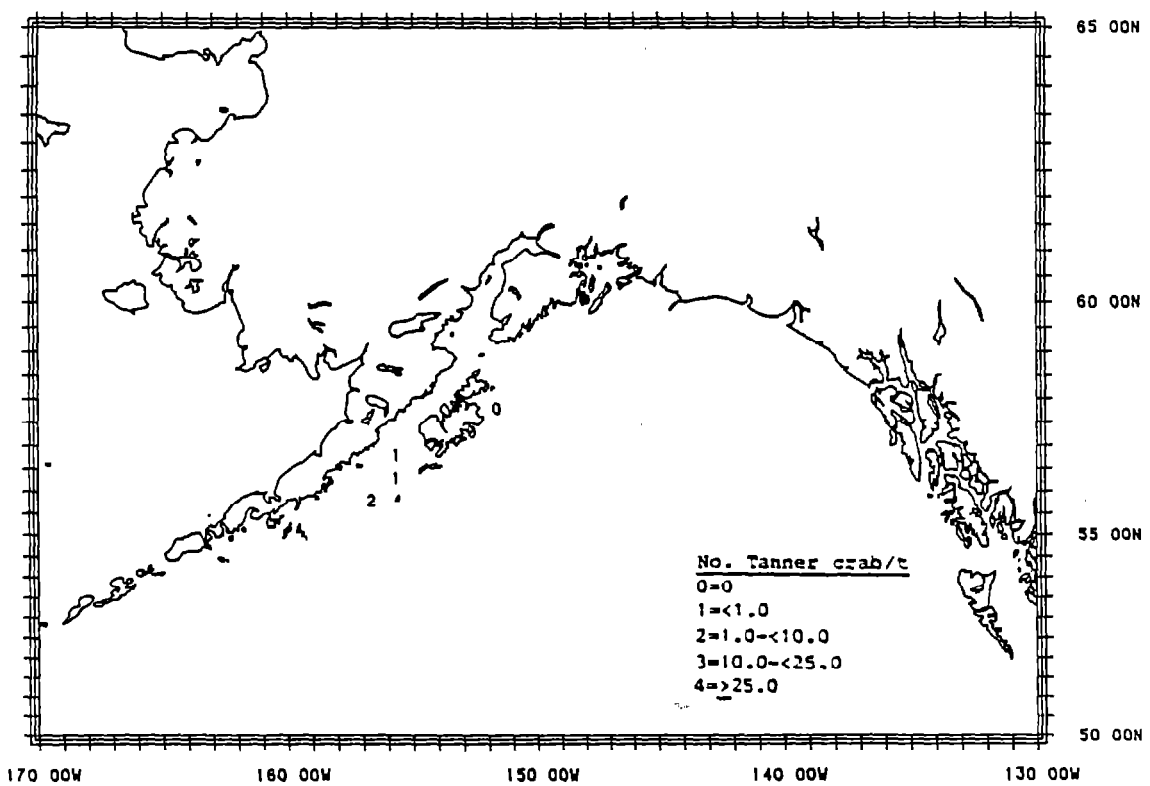
Table 39.--Incidence rate (number per metric ton of catch) and average weight (kg) of Tanner crab, taken in the joint venture groundfish catches in the Gulf of Alaska, 1988*. Lines indicate areas not fished.

	Shumagin		Chirikof		Kodiak	
	Rate	Average weight	Rate	Average weight	Rate	Average weight
U.S.-Republic of Korea Joint Venture Mothership						
Jan.	--	--	--	--	--	--
Feb.	--	--	--	--	--	--
March	--	--	--	--	--	--
April	--	--	--	--	--	--
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	0.000	0.00	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	--	--	--	--	--	--
Oct.	--	--	--	--	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	0.000	0.00	--	--	--	--
U.S.-Japan Joint Venture Mothership						
Jan.	--	--	--	--	--	--
Feb.	--	--	--	--	--	--
March	--	--	--	--	--	--
April	--	--	--	--	--	--
May	--	--	--	--	--	--
June	--	--	0.943	0.84	0.000	0.00
July	--	--	--	--	8.368	0.35
Aug.	--	--	0.084	0.85	0.364	0.33
Sep.	--	--	--	--	--	--
Oct.	--	--	--	--	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	--	--	0.229	0.85	3.303	0.35

* No fishing occurred in the Yakutat and Southeastern areas.

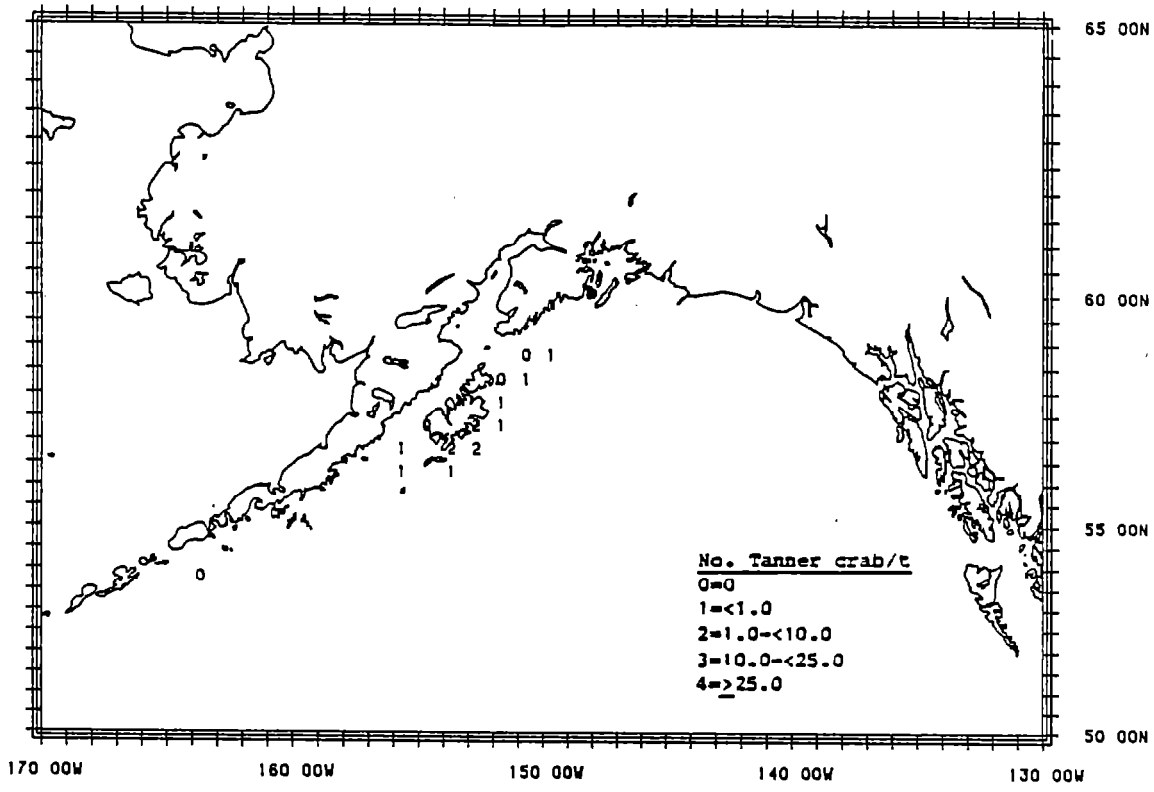


TANNER CRAB INCIDENCE 88 FIRST QUARTER JOINT VENTURE VESSELS

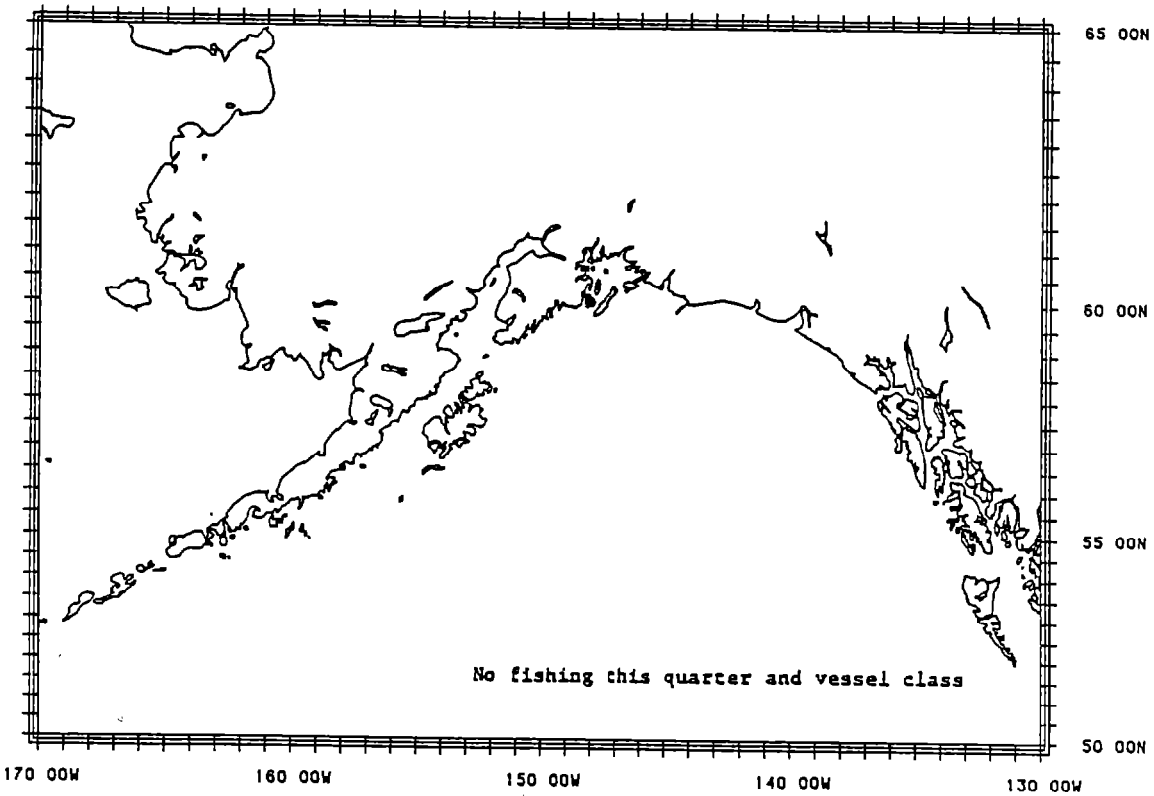


TANNER CRAB INCIDENCE 88 SECOND QUARTER JOINT VENTURE VESSELS

Figure 10. --Average incidence (no./t) of Tanner crab in the joint venture fisheries by quarter and 1/2° lat. by 1° long. areas, 1985.



TANNER CRAB INCIDENCE 88 THIRD QUARTER JOINT VENTURE VESSELS



TANNER CRAB INCIDENCE 88 FOURTH QUARTER JOINT VENTURE VESSELS

Figure 10. --Continued.

Table 40. --Estimated incidental catches of snow (Tanner) crab (in numbers of crab and metric tons) by joint venture vessels in the Gulf of Alaska, 1988.

	Number of crab				Weight (metric tons)			
	Shumagin	Chirikof	Kodiak	Total all areas	Shumagin	Chirikof	Kodiak	Total all areas
Joint venture vessels								
U.S.-Japan	--	304	10,339	10,643	--	0.26	3.59	3.85
U.S.-ROK	0	--	--	0	0.00	--	--	0.00
Total	0	304	10,339	10,643	0.00	0.26	3.59	3.85
Percent by area	0.00	2.86	97.14		0.00	6.75	93.25	

ROK = Republic of Korea.

Lines indicate areas not fished.

Table 41. --Estimated incidental catches (numbers and metric tons) of snow (Tanner) crab Chionoecetes spp.) in the foreign and joint venture groundfish fisheries in the Gulf of Alaska region, 1977-88[a].

Year	Foreign		Joint Venture		Total	
	Millions of crab	t	Millions of crab	t	Millions of crab	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	NF	NF	5,496	1.90	5,496	1.90
1988	NF	NF	10,643	3.85	10,643	3.85

[a] Estimates for years 1978-87 are from Berger and Weikart 1988.

[b] No estimates of incidental catch were made of the limited joint venture fishery in 1978.

NF = No fishing.

Table 42. --Biological data on the incidental landings of Tanner crab (Chionoecetes spp.) in the joint venture groundfish fishery in the Gulf of Alaska region, 1988.

Species	Percent by species	Sex	Sex composition	Average weight (kg)	Average width (mm)
Chionoecetes bairdi	99.98	Male	55.95	0.44	84.7
		Female	44.05	0.26	77.0
		Combined		0.36	81.3
Chionoecetes opilio	0.02	Female	100.00	0.10	59.7

Table 43. --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, 1988*. Lines indicate areas not fished.

	Shumagin		Chirikof		Kodiak	
	Rate	Average weight	Rate	Average weight	Rate	Average weight
U.S.-Republic of Korea Joint Venture Mothership						
Jan.	--	--	--	--	--	--
Feb.	--	--	--	--	--	--
March	--	--	--	--	--	--
April	--	--	--	--	--	--
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	0.000	0.00	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	--	--	--	--	--	--
Oct.	--	--	--	--	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	0.000	0.00	--	--	--	--
U.S.-Japan Joint Venture Mothership						
Jan.	--	--	--	--	--	--
Feb.	--	--	--	--	--	--
March	--	--	--	--	--	--
April	--	--	--	--	--	--
May	--	--	--	--	--	--
June	--	--	0.394	3.61	0.000	0.00
July	--	--	--	--	0.006	2.00
Aug.	--	--	0.025	5.35	0.001	0.40
Sep.	--	--	--	--	--	--
Oct.	--	--	--	--	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	--	--	0.087	4.02	0.003	1.65

* No fishing occurred in the Yakutat and Southeastern areas.

Table 44. --Estimated incidental catches of king crab (in numbers of crab and metric tons) by joint venture vessels in the Gulf of Alaska, 1988.

	Number of crab				Weight (metric tons)			
	Shumagin	Chirikof	Kodiak	Total all areas	Shumagin	Chirikof	Kodiak	Total all areas
Joint venture vessels								
U.S.-Japan	--	122	9	131	--	0.49	0.01	0.50
U.S.-ROK	0	--	--	0	0.00	--	--	0.00
Total	0	122	9	131	0.00	0.49	0.01	0.50
Percent by area	0.00	93.13	6.87		0.00	98.00	2.00	

ROK = Republic of Korea.

Lines indicate areas not fished.

Table 45. --Estimated incidental catches (numbers and metric tons) of king crab Lithodes and Paralithodes spp.) in the foreign and joint venture groundfish fisheries in the Gulf of Alaska region, 1977-88[a].

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	NF	NF	69	0.18	69	0.18
1988	NF	NF	131	0.50	131	0.50

[a] Estimates for 1978-87 are from Berger and Weikart 1988.

[b] No estimates of incidental catch were made of the limited joint venture fishery in 1978.

NF = No fishing.

Table 46. --Biological data on the incidental landings of king crab (Lithades and Paralithodes spp.) in the joint venture groundfish fishery in the Gulf of Alaska region, 1988.

Species	Percent by species	Sex	Sex composition	Average weight (kg)	Average width (mm)
Red	100.00	Male	71.44	3.95	178.3
		Female	28.56	3.47	174.0
		Combined		3.81	177.1

Table 47. --The common and scientific names of rockfish identified in the 1988 joint venture catches in the Gulf of Alaska region.

Common name	Scientific name
Dusky rockfish	Sebastes ciliatus
Northern rockfish	Sebastes polyspinis
Pacific ocean perch	Sebastes alutus
Rougheye rockfish	Sebastes aleutianus
Sharpchin rockfish	Sebastes zacentrus
Shortspine thornyhead	Sebastolobus alascanus
Yelloweye rockfish	Sebastes ruberrimus
Yellowtail rockfish	Sebastes flavidus

Table 48. --Estimated joint venture catch (in metric tons and percentages) of rockfish by species and area in the Gulf of Alaska during 1988.

Common name	Shumagin		Chirikof		Kodiak		Total	
	t	%	t	%	t	%	t	%
Dusky rockfish	0.23	3.96	0.60	100.00	0.10	2.18	0.93	8.46
Northern rockfish	0.00	0.00	0.00	0.00	0.16	3.49	0.16	1.46
Pacific ocean perch	<0.01	<0.01	0.00	0.00	3.78	82.53	3.78	34.39
Rougheye rockfish	0.00	0.00	0.00	0.00	0.54	11.79	0.54	4.91
Sharpchin rockfish	3.50	60.24	0.00	0.00	0.00	0.00	3.50	31.85
Shortspine thornyhead	0.11	1.89	0.00	0.00	0.00	0.00	0.11	1.00
Yelloweye rockfish	1.90	32.70	0.00	0.00	0.00	0.00	1.90	17.29
Yellowtail rockfish	0.07	1.20	0.00	0.00	0.00	0.00	0.07	0.64
Total	5.81		0.60		4.58		10.99	
Percent by area	52.87		5.46		41.67			

Table 49. --Common and scientific names of flatfish identified in the 1988 joint venture catches in the Gulf of Alaska region.

Common name	Scientific name
Alaska plaice	Pleuronectes quadrituberculatus
Arrowtooth flounder (turbot)	Atheresthes stomias
Butter. sole	Isopsetta isolepis
Dover sole	Microstomus pacificus
English sole	Parophrys vetulus
Flathead sole	Hippoglossoides elassodon
Kamchatka flounder	Atheresthes evermanni
Petrale sole	Eopsetta jordani
Rex sole	Glyptocephalus zachirus
Rock sole	Lepidopsetta bilineata
Starry flounder	Platichthys stellatus
Yellowfin sole	Limanda aspera

Table 50. --Estimated joint venture catch (in metric tons and percentages) of flatfish by species and area in the Gulf of Alaska during 1988.

Common name	Shumagin		Chirikof		Kodiak		Total	
	t	%	t	%	t	%	t	%
Alaska plaice	0.00	0.00	2.71	0.37	0.07	0.01	2.78	0.16
Arrowtooth flounder	0.23	76.67	243.18	33.20	606.97	57.93	850.38	47.76
Butter sole	0.00	0.00	171.43	23.40	33.69	3.22	205.12	11.52
Dover sole	0.00	0.00	4.73	0.65	3.45	0.33	8.18	0.46
English sole	0.00	0.00	0.47	0.06	12.64	1.21	13.11	0.74
Flathead sole	0.00	0.00	27.71	3.78	50.28	4.80	77.99	4.38
Kamchatka flounder	0.02	6.67	0.00	0.00	0.00	0.00	0.02	<0.01
Petrale sole	0.00	0.00	7.50	1.02	3.74	0.36	11.24	0.63
Rex sole	0.05	16.67	15.44	2.11	11.09	1.06	26.58	1.49
Rock sole	0.00	0.00	239.24	32.66	323.12	30.84	562.36	31.58
Starry flounder	0.00	0.00	20.02	2.73	2.39	0.23	22.41	1.26
Yellowfin sole	0.00	0.00	0.13	0.02	0.32	0.03	0.45	0.03
Total	0.30		732.56		1,047.76		1,780.62	
Percent by area	0.02		41.14		58.84			

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

Observer Coverage of Fishing Fleets

Foreign fishing operations for Pacific whiting (Merluccius productus) off the Washington-Oregon-California (WOC) coast (Fig. 11) in 1988 were performed by Polish large freezer trawlers from 1 June to 31 October. In the foreign fishery, observers sampled 458 days out of a possible 461 days (99.3%) in 1988. In 1987, observers sampled 96.5% of the foreign fishing days. Joint venture fishing operations for Pacific whiting occurred between 20 April and 22 October, and were conducted by U.S. fishermen and processing vessels from Poland, Japan, 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). In the joint venture fishery, the observer sampling effort of 2,239 days accounted for 95.1% of the total joint venture vessel effort of 2,355 days expended in the WOC region in 1988 (Table 51). The level of coverage for the 1987 joint venture fishery was 95.0%. The overall 1988 observer effort of 2,697 days provided an observer coverage of 95.8% of the entire Pacific whiting fishery.

Estimates of Foreign and U.S. Joint Venture Catches

Within the fisheries for Pacific whiting, 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 1988 were as follows:

Species	Percentage of Pacific whiting quota
Flounders	0.1
Jack mackerel (Trachurus symmetricus)	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 155,200 t of groundfish were landed in 1988 in the foreign and joint venture Pacific whiting fishery (Table 52). About 153,800 t (99.1%) of the catch was Pacific whiting. Polish vessels fishing on a foreign allocation harvested 18,000 t of whiting. The joint venture fisheries landed 135,800 t of whiting. In the foreign fishery, the rockfish group (excluding Pacific ocean perch), the species complex classified as "other fish," and jack mackerel composed the highest portions of catch other than Pacific whiting. In the joint venture, the other species caught were the group of rockfish (excluding Pacific ocean perch), jack mackerel, and the group of species classified as "other fish." 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 1988 was 1.2% smaller than in 1987 (Table 53). The total catch of Pacific whiting by the foreign fishery in 1988 was 63.7% smaller than that of 1987; the catch by joint venture fisheries in 1988 was 28.1% larger than the catch of Pacific whiting made in 1987. The 1988 Pacific whiting catch was the second highest catch since the inception of the MFCMA in 1987. The 1978 Pacific whiting catch shown in Table 53 reflects a correction from the 1981-87 reports.

Incidence and Incidental Catch of Prohibited Species

Pacific Salmon and Steelhead

The incidence and average weights of salmon taken in the Pacific whiting fishery in 1988 are shown in Table 54 by nation, statistical area, and month. With the exception of the U.S.-ROM operation in Vancouver in August (7.598 salmon/t in a catch of 106.7 t of groundfish), incidence rates were about the same in 1988 as in 1987. Only one other monthly rate exceeded 0.4 salmon/t (in the U.S.-U.S.S.R. fishery, also in the Vancouver area in August (0.922 salmon/t)), and no other annual rate exceeded 0.4 salmon/t. Most monthly incidence rates were less than 0.1 fish/t.

Figures 12 and 13 provide a summary by 1/2° latitude and 1° longitude blocks of the incidence of salmon in the 1988 foreign and joint venture Pacific whiting fishery. In the foreign fishery (Fig. 12), incidence rates were less than 0.1 salmon/t except at three locations off the Oregon coast (43° 30'-44° 30'N lat., 124° W long.). The joint venture fishery (Fig. 13) experienced incidence rates similar to last year. Fishing did occur in the perennially high rate locations off northern California and southern Oregon, but with much lower rates than in previous years. The highest rates were found off the Washington coast at 47°30'N latitude by 124° W longitude (0.62 salmon/t) and at 47°00' N latitude by 125° W longitude (0.32 salmon/t).

The total estimated incidental catch of salmon in the Pacific whiting fishery in 1988 was 16,200 fish or 36.1 t (Table 55). This was a 22% increase over 1987's salmon bycatch and was the second highest catch of salmon in numbers and third highest in weight since 1977 (Table 56). This increase was due to the two operations mentioned above, and to slightly higher rates in the joint venture fishery in Eureka. In 1988, 65% of the salmon catch came from the Columbia area, 18% were caught in the Vancouver area, 17% were caught in the Eureka area, and two fish were caught in the Monterey area. July and August accounted for 69% of the

salmon catch. The 1986 salmon catch shown in Table 56 reflects a correction from the 1986 and 1987 reports.

In the foreign fishery, three species of salmon were identified by observers. Chinook salmon composed 89.4% of the incidental catch and had an average fork length of 61.0 cm (Table 57). Coho salmon averaging 61.9 cm in fork length accounted for 8.8% of the catch. Chum salmon comprised 1.8% of the catch, and had a fork length of 67.9 cm. In the joint venture fishery, four species of salmon occurred. Chinook salmon made up 81.6% of the incidental catch and had an average fork length of 52.4 cm. Coho salmon accounted for 18.1% of the incidental salmon catch and averaged 51.6 cm. The remaining incidental salmon catch was composed of chum salmon (0.25%) and pink salmon (Oncorhynchus gorbuscha) (0.01%). No steelhead (O. mykiss also known as Salmo gairdneri) were caught in 1988.

Pacific Halibut

As in previous years, the annual incidence of halibut in the 1988 Pacific whiting fishery remained extremely low with rates ranging between 0.0 fish/t in the Monterey area to 0.038 fish/t in the U.S.-ROK joint venture fishery in the Vancouver area. (Table 58). However, even with the low incidence rate, the 142 halibut caught in 1988 was the second highest halibut catch (by number) since 1977 (Tables 59 and 60).

Rockfish Catch by Species

Observers identified 31 species of rockfish in catches landed in the foreign and joint venture Pacific whiting fisheries in 1988 (Table 61). The catch of yellowtail rockfish (Sebastes flavidus) composed 56.0% of the overall rockfish catch and catches of widow rockfish (S. entomelas) composed 28.0% of the rockfish catch (Table 62). Yellowtail rockfish was the dominant rockfish species caught in both the Vancouver and Columbia areas. Widow rockfish was the primary species caught in the Eureka and Monterey areas.

In 1988, a total of about 812 t of rockfish (down 6% from 1987) were taken by the foreign and joint venture fisheries targeting on Pacific whiting in the Washington-Oregon-California region, (Table 62). This total includes catches of rockfish retained and discarded in the joint venture fishery. The Columbia area yielded 76.8% of the rockfish catch, the Vancouver area accounted for 15.6%. The Eureka (5.5%) and Monterey (2.1%) areas accounted for the rest of the rockfish catch.

Flatfish Catch by Species

The catch of 14 different species of flatfish (Table 63) accounted for 38.57 t (a 102% increase over 1987) in the Pacific whiting fishery (Table 64). The Columbia area accounted for 99.0% of the flatfish catch; the Vancouver area made up 1.0%; the Eureka area made up 0.1% of the catch. There was no flatfish catch reported from the Monterey area. The primary species of flatfish identified in the catch were Pacific sanddab (Citharichthys sordidus) (85.8%) arrowtooth flounder (10.8%), and rex sole (Glyptocephalus zachirus) (1.6%).

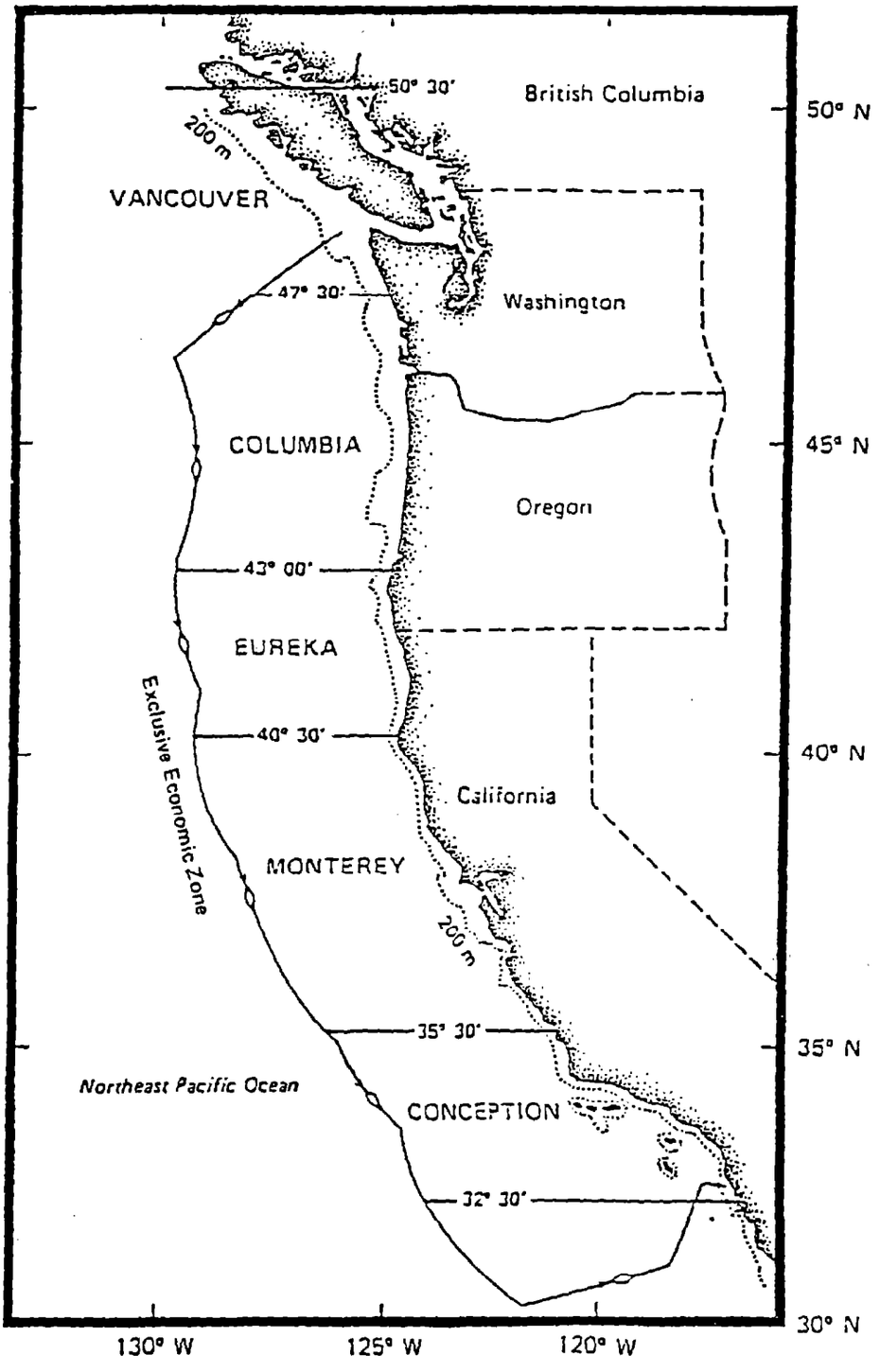

Figure 11. --U.S. statistical areas in the Washington-Oregon-California region.

Table 51. -- Annual summary of observer effort, vessel effort, and observer coverage (100 x observer days/ vessel days) by nation and vessel class in the foreign and joint venture fisheries off Washington, Oregon, and California, 1988.

Nation	Vessel class	No. of observers	No. of ships observed[a]	No. of ships in fishery	No. of observer days	No. of vessel days	Percent coverage
Poland	Large freezer trawler	21	18	18	458	461	99.3
U.S.-Poland	Joint venture	21	14	14	894	947	94.4
U.S.-Japan	Joint venture	2	1	1	26	29	89.7
U.S.-U.S.S.R.	Joint venture	18	13	13	1,184	1,239	95.6
U.S.-ROK	Joint venture	2	2	2	64	65	98.5
U.S.-PRC	Joint venture	2	1	1	71	75	94.7
Total[b]		49[c]	35	35	2,697	2,816	95.8

[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.

ROK = Republic of Korea.
PRC = People's Republic of China.

Table 52. --Estimated catches of groundfish taken by foreign and joint venture vessels operating in the Pacific whiting fishery off Washington, Oregon, and California, 1988.

	Poland		Joint venture fishery[a]				All fisheries
Species group	Catch (t)	% of whiting quota[b]	Retained (t)	Discarded (t)	Total (t)	% of whiting catch	Total (t)
Pacific whiting	18,041.0		135,781.2		135,781.2		153,822.2
Jack mackerel	48.5	0.3	42.8	138.8	181.6	0.1	230.1
Rockfish (excluding Pacific ocean perch)	149.1	0.8	121.9	537.1	659.0	0.5	808.1
Pacific ocean perch	2.5	<0.1	0.3	1.7	2.0	<0.1	4.5
Sablefish	26.9	0.1	10.1	62.2	72.3	<0.1	99.2
Flounders	2.5	<0.1	1.1	35.1	36.2	<0.1	38.7
Other fish	67.7	0.4	23.0	138.5	161.5	0.1	229.2
TOTAL	18,338.2		135,980.4	913.4	136,893.8		155,232.0

[a] See text for description of regulations pertaining to retention and discarding of joint venture catch.
[b] The Pacific whiting quota in 1988 was 36,500 t for Poland.

Table 53. --Estimated catch of Pacific whiting by foreign and joint venture fisheries off Washington, Oregon, and California, 1977-88*.

Year	Foreign (t)	Joint venture (t)	Total (t)
1977	127,013	NF	127,013
1978	96,827	856	97,683
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
1988	18,041	135,781	153,822

* Estimates for years 1977-87 are from Berger and Weikart 1988.

NF = No fishing.

Table 54.-- 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, 1988. Lines indicate areas not fished.

	Vancouver		Columbia		Eureka		Monterey	
	Rate	Average weight	Rate	Average weight	Rate	Average weight	Rate	Average weight
Polish Large Freezer Trawler								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	0.014	2.26	--	--	--	--
July	--	--	0.086	2.94	0.041	6.09	--	--
Aug.	--	--	--	--	--	--	--	--
Sep.	--	--	0.065	3.39	--	--	--	--
Oct.	--	--	0.160	3.18	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	--	--	0.127	3.19	0.041	6.09	--	--
U.S.-U.S.S.R. Joint Venture Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	0.106	2.01	--	--	--	--
May	0.004	3.80	0.067	1.97	--	--	--	--
June	0.083	2.64	0.042	2.38	--	--	--	--
July	--	--	0.035	2.82	0.104	2.81	--	--
Aug.	0.922	1.52	0.090	1.81	0.116	3.11	--	--
Sep.	0.086	1.55	0.034	1.84	--	--	--	--
Oct.	0.029	1.77	0.026	2.57	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.301	1.58	0.059	2.05	0.107	2.90	--	--

Table 54. --Continued.

	Vancouver		Columbia		Eureka		Monterey	
	Rate	Average weight	Rate	Average weight	Rate	Average weight	Rate	Average weight
U.S.-Republic of Korea Joint Venture Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	0.062	2.94	0.006	6.38	--	--
Aug.	7.598	1.63	0.389	1.83	0.067	2.56	--	--
Sep.	--	--	NS	NS	--	--	--	--
Oct.	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	7.598	1.63	0.368	1.84	0.033	2.93	--	--
U.S.-Japan Joint Venture Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	0.033	1.41	0.030	2.49	--	--	--	--
July	--	--	0.000	0.00	0.079	2.76	0.003	5.80
Aug.	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.033	1.41	0.028	2.49	0.079	2.76	0.003	5.80

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

Table 54.--Continued.

	Vancouver		Columbia		Eureka		Monterey	
	Rate	Average weight	Rate	Average weight	Rate	Average weight	Rate	Average weight
U.S.-Poland Joint Venture Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	0.044	3.41	0.032	2.61	--	--	--	--
June	0.029	3.24	0.040	2.09	--	--	--	--
July	--	--	0.065	2.45	0.103	2.23	--	--
Aug.	0.104	2.17	0.142	1.79	--	--	--	--
Sep.	0.070	1.56	0.018	2.32	--	--	--	--
Oct.	--	--	NS	NS	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.088	2.26	0.070	2.03	0.103	2.23	--	--
U.S.-People's Republic of China Joint Venture Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	0.089	2.50	0.242	2.73	--	--
Aug.	--	--	0.168	1.58	0.045	3.38	--	--
Sep.	0.019	1.85	0.026	2.23	--	--	--	--
Oct.	NS	NS	NS	NS	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.019	1.85	0.092	1.69	0.170	2.79	--	--

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

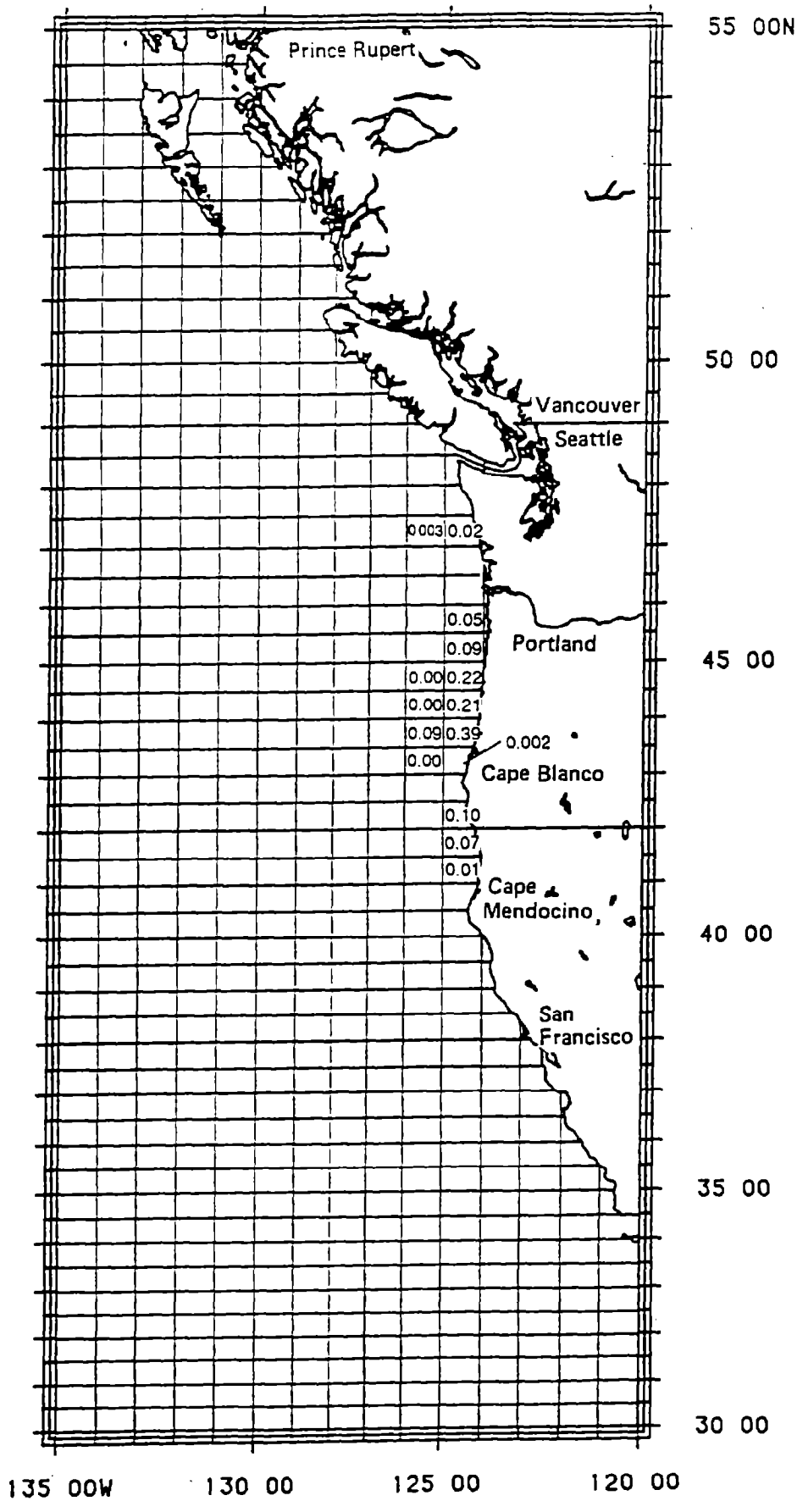

Figure 12. --Average incidence of salmonids (no. of salmonids/t of groundfish) in the foreign Pacific whiting fishery off Washington, Oregon, and California, 1988.

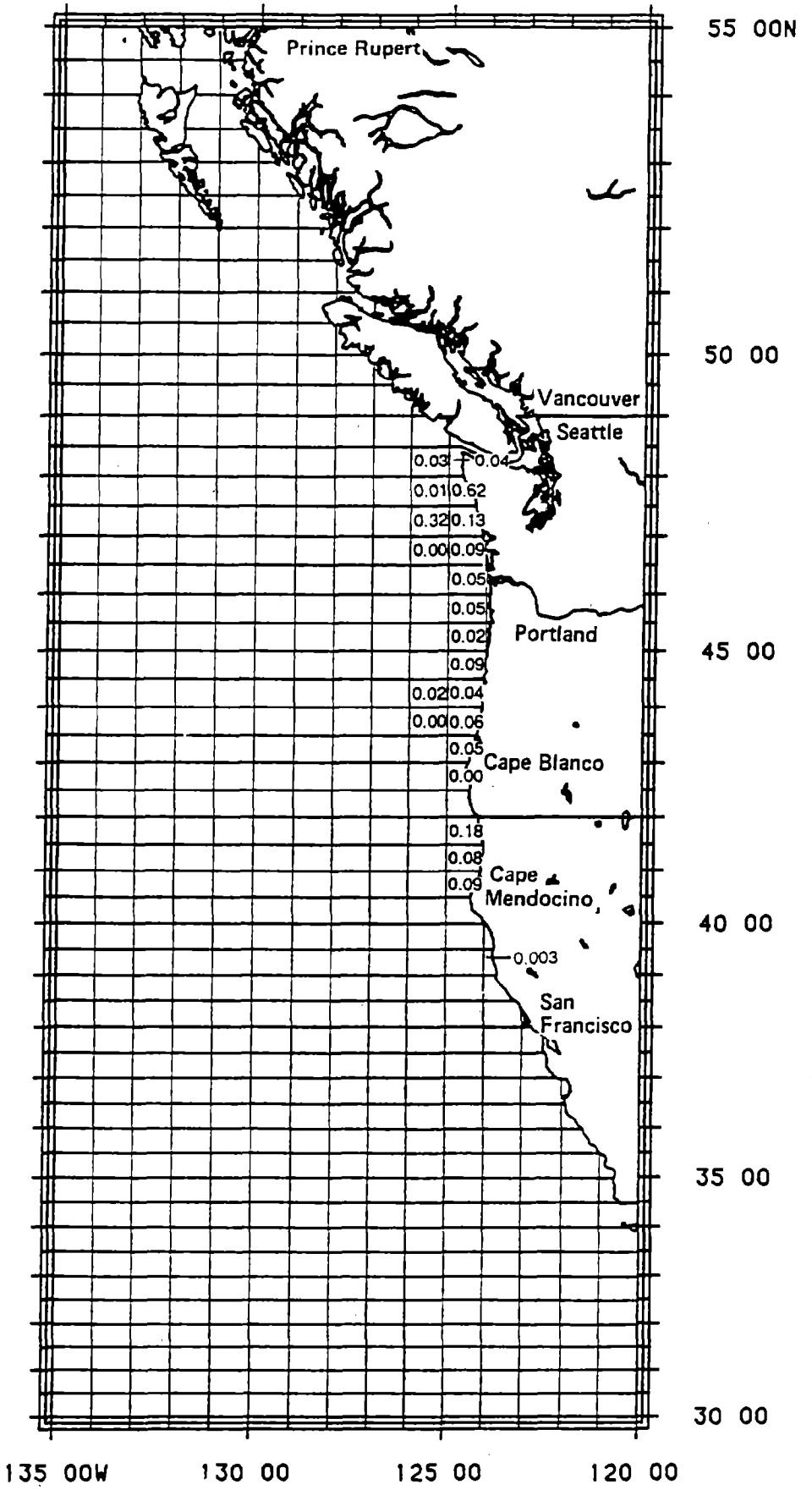

Figure 13. --Average incidence of salmonids (no. of salmonids/t of groundfish) in the joint venture Pacific whiting fishery off Washington, Oregon, and California, 1988.

Table 55. --Estimated incidental catch of Pacific salmon (numbers and tons) in the foreign and joint venture Pacific whiting fisheries off Washington, Oregon, and California, 1988.

Month	Vancouver*		Columbia		Eureka		Monterey		All areas	
	Nos.	t	Nos.	t	Nos.	t	Nos.	t	Nos.	t
Foreign fishery--Poland										
June	--	--	17	<0.1	--	--	--	--	17	<0.1
July	--	--	136	0.4	62	0.4	--	--	198	0.8
August	--	--	--	--	--	--	--	--	--	--
September	--	--	173	0.6	--	--	--	--	173	0.6
October	--	--	1,797	5.7	--	--	--	--	1,797	5.7
TOTAL	--	--	2,123	6.7	62	0.4	--	--	2,185	7.1
Joint venture fishery--U.S.-Japan										
June	36	0.1	91	0.2	--	--	--	--	127	0.3
July	--	--	46	0.1	341	0.9	2	<0.1	389	1.0
TOTAL	36	0.1	137	0.3	341	0.9	2	<0.1	516	1.3
Joint venture fishery--U.S.-Poland										
May	20	0.1	29	0.1	--	--	--	--	49	0.2
June	17	0.1	344	0.7	--	--	--	--	361	0.8
July	--	--	655	1.6	472	1.1	--	--	1,127	2.7
August	543	1.2	1,619	2.9	--	--	--	--	2,162	4.1
September	14	<0.1	392	0.9	--	--	--	--	406	0.9
October	--	--	1	<0.1	--	--	--	--	1	<0.1
TOTAL	594	1.4	3,040	6.2	472	1.1	--	--	4,106	8.7
Joint venture fishery--U.S.-U.S.S.R.										
April	--	--	373	0.8	--	--	--	--	373	0.8
May	--	--	735	1.4	--	--	--	--	735	1.4
June	54	0.1	368	0.9	--	--	--	--	422	1.0
July	--	--	351	1.0	1,235	3.5	--	--	1,586	4.5
August	1,408	2.1	793	1.4	356	1.1	--	--	2,557	4.6
September	39	0.1	404	0.7	--	--	--	--	443	0.8
October	23	<0.1	56	0.1	--	--	--	--	79	0.1
TOTAL	1,524	2.3	3,080	6.3	1,591	4.6	--	--	6,195	13.2
Joint venture fishery--U.S.-ROK										
July	--	--	2	<0.1	3	<0.1	--	--	5	<0.1
August	811	1.3	1,737	3.2	28	0.1	--	--	2,576	4.6
September	--	--	18	<0.1	--	--	--	--	18	<0.1
TOTAL	811	1.3	1,757	3.2	31	0.1	--	--	2,599	4.6
Joint venture fishery--U.S.-PRC										
July	--	--	1	<0.1	220	0.6	--	--	221	0.6
August	--	--	253	0.4	27	0.1	--	--	280	0.5
September	4	<0.1	55	0.1	--	--	--	--	59	0.1
October	0	0.0	7	<0.1	--	--	--	--	7	<0.1
TOTAL	4	<0.1	316	0.5	247	0.7	--	--	567	1.2
All fisheries--TOTAL										
April	--	--	373	0.8	--	--	--	--	373	0.8
May	20	0.1	764	1.5	--	--	--	--	784	1.6
June	107	0.3	820	1.8	--	--	--	--	927	2.1
July	--	--	1,191	3.1	2,333	6.5	2	<0.1	3,526	9.6
August	2,762	4.6	4,402	7.9	411	1.3	--	--	7,575	13.8
September	57	0.1	1,042	2.3	--	--	--	--	1,099	2.4
October	23	<0.1	1,861	5.8	--	--	--	--	1,884	5.8
TOTAL	2,969	5.1	10,453	23.2	2,744	7.8	2	<0.1	16,168	36.1

* The foreign fishery is prohibited from fishing in the Vancouver area.

Lines indicate areas not fished.

Table 56. --Estimated incidental catches (numbers and metric tons) of Pacific salmon Oncorhynchus spp.) in the foreign and joint venture Pacific whiting fishery off Washington, Oregon, and California, 1977-88*.

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	11,739	26.0	32,051	47.7	43,790	73.7
1987	4,649	14.7	8,636	19.6	13,285	34.3
1988	2,185	7.1	13,983	29.0	16,168	36.1

* Estimated catches for years 1977-87 from Berger and Weikart 1988.

NF = No fishing.

Table 57. --Biological data on the incidental catch of Pacific salmon (Oncorhynchus spp.) in the foreign and joint venture groundfish fisheries off Washington, Oregon, and California, 1988.

Species	Percent by species	Sex	Sex composition	Average weight (kg)	Average length (cm)
Foreign directed fisheries					
Chinook	89.41	Male	46.41	3.15	59.7
		Female	53.59	3.26	61.9
		Unsexed		3.55	65.6
		Combined		3.22	61.0
Coho	8.82	Male	62.83	3.30	61.3
		Female	37.17	3.29	63.1
		Unsexed		2.74	60.6
		Combined		3.28	61.9
Chum	1.76	Male	35.20	4.33	69.8
		Female	64.80	3.92	66.9
		Combined		4.07	67.9
Joint venture fisheries					
Chinook	81.60	Male	50.79	2.03	51.4
		Female	49.21	2.33	53.8
		Unsexed		1.64	48.9
		Combined		2.16	52.4
Coho	18.14	Male	60.55	1.67	50.6
		Female	39.45	1.90	53.3
		Unsexed		1.68	50.6
		Combined		1.76	51.6
Chum	0.25	Male	70.04	6.21	76.6
		Female	29.96	3.25	62.2
		Unsexed		0.68	38.0
		Combined		5.09	70.5
Pink	0.01	Female	100.00	1.60	48.0

Table 58.-- 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, 1988. Lines indicate areas not fished.

	Vancouver		Columbia		Eureka		Monterey	
	Rate	Average weight	Rate	Average weight	Rate	Average weight	Rate	Average weight
Polish Large Freezer Trawler								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	0.002	5.15	--	--	--	--
July	--	--	0.001	10.34	0.000	0.00	--	--
Aug.	--	--	--	--	--	--	--	--
Sep.	--	--	0.000	0.00	--	--	--	--
Oct.	--	--	0.001	6.47	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	--	--	0.001	6.62	0.000	0.00	--	--
U.S.-U.S.S.R. Joint Venture Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	<0.001	14.80	--	--	--	--
May	0.000	0.00	<0.001	3.04	--	--	--	--
June	0.000	0.00	0.001	5.09	--	--	--	--
July	--	--	0.002	5.01	0.000	0.00	--	--
Aug.	0.001	6.91	0.001	5.03	0.000	0.00	--	--
Sep.	0.000	0.00	0.001	13.21	--	--	--	--
Oct.	0.000	0.00	0.000	0.00	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	<0.001	6.91	0.001	6.58	0.000	0.00	--	--

Table 58. --Continued.

	Vancouver		Columbia		Eureka		Monterey	
	Rate	Average weight	Rate	Average weight	Rate	Average weight	Rate	Average weight
U.S.-Republic of Korea-Joint Venture Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	0.000	0.00	0.000	0.00	--	--
Aug.	0.038	3.30	0.005	6.01	0.000	0.00	--	--
Sep.	--	--	NS	NS	--	--	--	--
Oct.	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.038	3.30	0.005	6.01	0.000	0.00	--	--
U.S.-Japan Joint Venture Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	0.000	0.00	0.000	0.00	--	--	--	--
July	--	--	0.000	0.00	0.000	0.00	0.000	0.000
Aug.	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.000

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

Table 58.--Continued.

	Vancouver		Columbia		Eureka		Monterey	
	Rate	Average weight	Rate	Average weight	Rate	Average weight	Rate	Average weight
U.S.-Poland Joint Venture Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	0.000	0.00	0.000	0.00	--	--	--	--
June	0.000	0.00	0.001	7.61	--	--	--	--
July	--	--	0.002	6.40	0.001	6.61	--	--
Aug.	0.000	0.00	0.001	7.03	--	--	--	--
Sep.	0.000	0.00	<0.001	10.65	--	--	--	--
Oct.	--	--	NS	NS	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.000	0.00	0.001	7.14	0.001	6.61	--	--
U.S.-People's Republic of China Joint Venture Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	0.000	0.00	0.000	0.00	--	--
Aug.	--	--	0.001	9.80	0.000	0.00	--	--
Sep.	0.000	0.00	0.000	0.00	--	--	--	--
Oct.	NS	NS	NS	NS	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.000	0.00	0.001	9.80	0.000	0.00	--	--

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

Table 59. --Estimated incidental catches of Pacific halibut (numbers and metric tons) in the foreign and joint venture Pacific whiting fisheries off Washington, Oregon, and California, 1988[a].

Month	Vancouver[b]		Columbia		Eureka		Monterey		All areas	
	Nos.	t	Nos.	t	Nos.	t	Nos.	t	Nos.	t
Foreign fishery--Poland										
June	--	--	3	<0.1	--	--	--	--	3	<0.1
July	--	--	3	<0.1	0	0.0	--	--	3	<0.1
August	--	--	--	--	--	--	--	--	--	--
September	--	--	0	0.0	--	--	--	--	0	0.0
October	--	--	5	<0.1	--	--	--	--	5	<0.1
TOTAL	--	--	11	0.1	0	0.0	--	--	11	0.1
Joint venture fishery--U.S.-Japan										
June	0	0.0	0	0.0	--	--	--	--	0	0.0
July	--	--	0	0.0	0	0.0	0	0.0	0	0.0
TOTAL	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Joint venture fishery--U.S.-Poland										
May	0	0.0	0	0.0	--	--	--	--	0	0.0
June	0	0.0	6	<0.1	--	--	--	--	6	<0.1
July	--	--	16	0.1	3	<0.1	--	--	19	0.1
August	0	0.0	22	0.2	--	--	--	--	22	0.2
September	1	<0.1	1	<0.1	--	--	--	--	2	<0.1
October	--	--	0	0.0	--	--	--	--	0	0.0
TOTAL	1	<0.1	45	0.3	3	<0.1	--	--	49	0.3
Joint venture fishery--U.S.-U.S.S.R.										
April	--	--	2	<0.1	--	--	--	--	2	<0.1
May	--	--	3	<0.1	--	--	--	--	3	<0.1
June	0	0.0	18	0.1	--	--	--	--	18	0.1
July	--	--	10	0.1	0	0.0	--	--	10	0.1
August	0	0.0	16	0.1	0	0.0	--	--	16	0.1
September	0	0.0	11	0.1	--	--	--	--	11	0.1
October	0	0.0	0	0.0	--	--	--	--	0	0.0
TOTAL	0	0.0	60	0.4	0	0.0	--	--	60	0.4
Joint venture fishery--U.S.-ROK										
July	--	--	0	0.0	0	0.0	--	--	0	0.0
August	4	<0.1	16	0.1	0	0.0	--	--	20	0.1
September	--	--	0	0.0	--	--	--	--	0	0.0
TOTAL	4	<0.1	16	0.1	0	0.0	--	--	20	0.1
Joint venture fishery--U.S.-PRC										
July	--	--	0	0.0	0	0.0	--	--	0	0.0
August	--	--	2	<0.1	0	0.0	--	--	2	<0.1
September	0	0.0	0	0.0	--	--	--	--	0	0.0
October	0	0.0	0	0.0	--	--	--	--	0	0.0
TOTAL	0	0.0	2	<0.1	0	0.0	--	--	2	<0.1
All fisheries--TOTAL										
April	--	--	2	<0.1	--	--	--	--	2	<0.1
May	0	0.0	3	<0.1	--	--	--	--	3	<0.1
June	0	0.0	27	0.2	--	--	--	--	27	0.2
July	--	--	29	0.2	3	<0.1	0	0.0	32	0.2
August	4	<0.1	56	0.4	0	0.0	--	--	60	0.4
September	1	<0.1	12	0.1	--	--	--	--	13	0.1
October	0	0.0	5	<0.1	--	--	--	--	5	<0.1
TOTAL	5	<0.1	134	0.9	3	<0.1	0	0.0	142	0.9

[a] Fishing did not occur in the Monterey area in 1988.
[b] The foreign fishery is prohibited from operating in the Vancouver area.

Lines indicate areas not fished.

Table 60. --Estimated incidental catches (numbers and metric tons) of Pacific halibut Hippoglossus stenolepis) in the foreign and joint venture Pacific whiting fishery off Washington, Oregon, and California, 1977-88*.

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
1988	11	0.1	131	0.8	142	0.9

*Estimated catches for years 1977-1987 from Berger and Weikart 1988.

NF = No fishing.

Table 61. --The common and scientific names of rockfish identified in the 1988 foreign and joint venture catches in the Washington, Oregon, and California region.

Common name[a]	Scientific name
Black rockfish	Sebastes melanops
Blue rockfish	Sebastes mystinus
Bocaccio	Sebastes paucispinis
Canary rockfish	Sebastes pinniger
Chilipepper	Sebastes goodei
Darkblotched rockfish	Sebastes crameri
Greenstriped rockfish	Sebastes elongatus
Pacific ocean perch	Sebastes alutus
Redstripe rockfish	Sebastes proriger
Rougheye rockfish	Sebastes aleutianus
Sharpchin rockfish	Sebastes zacentrus
Shortbelly rockfish	Sebastes jordani
Shortraker rockfish	Sebastes borealis
Shortspine thornyhead	Sebastolobus alascanus
Splitnose rockfish	Sebastes diploproa
Widow rockfish	Sebastes entomelas
Yellowmouth rockfish	Sebastes reedi
Yellowtail rockfish	Sebastes flavidus
Other rockfish[b]	
Aurora rockfish	Sebastes aurora
Blackgill rockfish	Sebastes melanostomus
Brown rockfish	Sebastes auriculatus
Dusky rockfish	Sebastes ciliatus
Northern rockfish	Sebastes polyspinis
Pygmy rockfish	Sebastes wilsoni
Quillback rockfish	Sebastes maliger
Redbanded rockfish	Sebastes babcocki
Rosethorn rockfish	Sebastes helvomaculatus
Silvergray rockfish	Sebastes brevispinis
Stripetail rockfish	Sebastes saxicola
Vermilion rockfish	Sebastes miniatus
Yelloweye rockfish	Sebastes ruberrimus

[a] 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.

[b] 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 62. --Estimated catch of rockfish by species and area in the Washington, Oregon, and California region during 1988.

Common name	Vancouver t	Vancouver %	Columbia t	Columbia %	Eureka t	Eureka %	Monterey t	Monterey %	Total t	Total %
Foreign directed fisheries[a]										
Bocaccio			0.72	0.48	0.00	0.00	0.00	0.00	0.72	0.48
Canary rockfish			3.29	2.18	0.00	0.00	0.00	0.00	3.29	2.17
Chilipepper			0.20	0.13	0.00	0.00	0.00	0.00	0.20	0.13
Darkblotched rockfish			3.39	2.25	0.00	0.00	0.00	0.00	3.39	2.24
Greenstriped rockfish			0.25	0.17	0.00	0.00	0.00	0.00	0.25	0.17
Pacific ocean perch			2.44	1.62	0.00	0.00	0.00	0.00	2.44	1.61
Redstripe rockfish			0.31	0.21	0.00	0.00	0.00	0.00	0.31	0.20
Rougheye rockfish			35.36	23.42	0.00	0.00	0.00	0.00	35.36	23.37
Sharpchin rockfish			0.17	0.11	0.00	0.00	0.00	0.00	0.17	0.11
Shortbelly rockfish			9.38	6.21	0.00	0.00	0.00	0.00	9.38	6.20
Shortraker rockfish			0.58	0.38	0.00	0.00	0.00	0.00	0.58	0.38
Shortspine thornyhead			5.92	3.92	0.00	0.00	0.00	0.00	5.92	3.91
Splitnose rockfish			8.51	5.64	0.00	0.00	0.00	0.00	8.51	5.62
Widow rockfish			60.33	39.96	0.29	96.67	0.00	0.00	60.62	40.07
Yellowmouth rockfish			0.76	0.50	0.00	0.00	0.00	0.00	0.76	0.50
Yellowtail rockfish			19.18	12.70	0.01	3.33	0.00	0.00	19.19	12.68
Other rockfish[b]			0.21	0.14	0.00	0.00	0.00	0.00	0.21	0.14
Total			151.00		0.30		0.00		151.30	
Percent by area			99.80		0.20		0.00			
Joint venture fisheries										
Black rockfish	0.83	0.65	11.45	2.42	0.42	0.95	<0.01	<0.01	12.70	1.92
Blue rockfish	0.02	0.02	1.18	0.25	<0.01	<0.01	0.00	0.00	1.20	0.18
Bocaccio	0.19	0.15	1.15	0.24	0.29	0.66	0.00	0.00	1.63	0.25
Canary rockfish	0.41	0.32	2.70	0.57	0.20	0.45	<0.01	<0.01	3.31	0.50
Chilipepper	0.05	0.04	0.45	0.10	0.98	2.23	0.00	0.00	1.48	0.22
Darkblotched rockfish	0.42	0.33	1.87	0.40	4.95	11.24	0.00	0.00	7.24	1.10
Greenstripe rockfish	0.05	0.04	0.11	0.02	0.00	0.00	0.00	0.00	0.16	0.02
Pacific ocean perch	0.41	0.32	0.82	0.17	0.54	1.23	0.21	1.25	1.98	0.30
Redstripe rockfish	0.01	0.01	1.05	0.22	0.08	0.18	0.01	0.06	1.15	0.17
Rougheye rockfish	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	0.00	0.00	0.02	<0.01
Sharpchin rockfish	0.00	0.00	0.06	0.01	0.80	1.82	0.00	0.00	0.86	0.13
Shortbelly rockfish	0.00	0.00	9.27	1.96	0.68	1.54	<0.01	<0.01	9.95	1.51
Shortraker rockfish	0.00	0.00	0.14	0.03	0.01	0.02	0.00	0.00	0.15	0.02
Shortspine thornyhead	0.00	0.00	0.02	<0.01	0.00	0.00	0.00	0.00	0.02	<0.01
Splitnose rockfish	<0.01	<0.01	0.01	<0.01	0.10	0.23	0.00	0.00	0.11	0.02
Widow rockfish	27.76	21.86	95.73	20.24	30.10	68.36	16.58	98.63	166.60	25.21
Yellowmouth rockfish	0.00	0.00	0.04	0.01	0.01	0.02	0.00	0.00	0.05	0.01
Yellowtail rockfish	96.83	76.26	346.81	73.31	4.38	9.95	0.01	0.06	435.45	65.89
Other rockfish[b]	<0.01	<0.01	0.19	0.04	0.49	0.11	0.00	0.00	0.68	0.10
Total	126.98		473.07		44.03		16.81		660.89	
Percent by area	19.21		71.58		6.66		2.54			

[a] The foreign fishery is prohibited from operating in the Vancouver area.
[b] Species included in this category are listed in Table 58.

Table 63. --Common and scientific names of flatfish identified in the 1988 foreign and joint venture catches in the Washington, Oregon, and California region.

Common name	Scientific name
Arrowtooth flounder (turbot)	Atheresthes stomias
Butter sole	Isopsetta isolepis
Dover sole	Microstomus pacificus
English sole	Parophrys vetulus
Flathead sole	Hippoglossoides elassodon
Hybrid sole	Inopsetta ischyra
Pacific sanddab	Citharichthys sordidus
Petrale sole	Eopsetta jordani
Rex sole	Glyptocephalus zachirus
Rock sole	Lepidopsetta bilineata
Sand sole	Psettichthys melanostictus
Sanddab unident.	Bothidae
Slender sole	Lyopsetta exilis
Starry flounder	Platichthys stellatus

Table 64. --Estimated catch of flatfish by species and area in the Washington, Oregon, and California region during 1988[a].

Common name	Vancouver t	Vancouver %	Columbia t	Columbia %	Eureka t	Eureka %	Total t	Total %
Foreign directed fisheries[b]								
Arrowtooth flounder			0.57	22.98	0.00	0.00	0.57	22.98
Dover sole			0.02	0.81	0.00	0.00	0.02	0.81
English sole			<0.01	<0.01	0.00	0.00	<0.01	<0.01
Flathead sole			<0.01	<0.01	0.00	0.00	<0.01	<0.01
Pacific sanddab			1.77	71.37	0.00	0.00	1.77	71.37
Rex sole			0.11	4.44	0.00	0.00	0.11	4.44
Starry flounder			0.01	0.40	0.00	0.00	0.01	0.40
Total			2.48		0.00		2.48	
Percent by area			100.00		0.00			
Joint venture fisheries								
Arrowtooth flounder	0.23	60.53	3.37	9.45	0.00	0.00	3.60	9.98
Butter sole	0.00	0.00	<0.1	<0.01	0.00	0.00	<0.01	<0.01
Dover sole	0.01	2.63	0.32	0.90	0.01	33.33	0.34	0.94
English sole	0.05	13.16	0.25	0.70	<0.01	<0.01	0.30	0.83
Flathead sole	<0.01	<0.01	0.04	0.11	0.00	0.00	0.04	0.11
Hybrid sole	0.00	0.00	<0.01	<0.01	0.00	0.00	<0.01	<0.01
Pacific sanddab	0.04	10.53	31.23	87.53	0.02	66.67	31.29	86.70
Petrale sole	0.00	0.00	0.02	0.06	0.00	0.00	0.02	0.06
Rex sole	0.05	13.16	0.45	1.26	<0.01	<0.01	0.50	1.39
Rock sole	0.00	0.00	<0.01	<0.01	0.00	0.00	<0.01	<0.01
Sand sole	0.00	0.00	<0.01	<0.01	0.00	0.00	<0.01	<0.01
Sanddab unidentified	0.00	0.00	<0.01	<0.01	0.00	0.00	<0.01	<0.01
Slender sole	0.00	0.00	<0.01	<0.01	0.00	0.00	<0.01	<0.01
Starry flounder	0.00	0.00	<0.01	<0.01	0.00	0.00	<0.01	<0.01
Total	0.38		35.68		0.03		36.09	
Percent by area	1.05		98.86		0.08			

[a] No flatfish were reported from the Monterey area.

[b] No foreign directed fishing occurred in the Vancouver area.

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