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SUMMARY OF U.S. OBSERVER SAMPLING OF FOREIGN AND JOINT VENTURE FISHERIES IN THE NORTHEAST PACIFIC OCEAN AND EASTERN BERING SEA, 1989

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ABSTRACT

This report summarizes the 1989 foreign and joint venture groundfish activities in the eastern Bering Sea and off the Washington-Oregon-California coast. Tables contained herein provide estimates of the foreign and joint venture groundfish catches. Estimates of the rockfiih and flatfish catches are shown by species group and also by species. Estimates are made of the catches and average weights of Pacific salmon (Oncorhvnchus spp.), Pacific halibut (Hippoglossus stenolenis), snow (Tanner) crab (Chionoecetes spp.), and king crab (Lithodes and Paralithodes spp.).

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INTRODUCTION

The year of 1989 was the 13th year in which foreign vessels engaging in fishing operations within U.S. waters were required to have a U.S. fisheries observer aboard, as mandated by the Magnuson Fishery Conservation and Management Act (MFCMA) of 1976. The observers' objectives were to 1) collect data used to estimate the commercial catches, 2) determine the incidental catches of species whose retention is prohibited by U.S. regulations, 3) provide information needed to assess the biological status of the various stocks of fish, and 4) report suspected violations of U.S. fishing regulations.

Observers obtained trawl information on the location, duration, average depth, and catch weight of each trawl haul made while they were on board. They sampled several hauls each day to determine species composition by weight, the incidence of species whose retention was prohibited, and the age and length composition of designated species. In addition, observers reported suspected violations of U.S. regulations and described fishing strategies and sampling methods used.

l-his report summarizes the 1989 **observer** sampling data **collected** aboard foreign commercial groundfish vessels operating within the U.S. 200-mile exclusive economic zone (EEZ) of the the northeast Pacific Ocean and eastern Bering Sea. The Alaska Fisheries Science Center sent 189 observers to sample aboard vessels from five nations: Japan, Poland, the Republic of Korea (R.O.K), the People's Republic of China (P.R.O.C.), and the Union of Soviet Socialist Republics (U.S.S.R.). A description of vessel types and a listing of vessel-class abbreviations used in this paper's **tables** are presented in Table 1. Observers sampled a total of 8,165 days out of the 8,615 days spent by foreign vessels on fishing grounds. The 95% level of coverage in 1989 represented an increase of 1.1% over the 93.9% coverage level of 1988 (Berger and Weikart 1989).

The face of fisheries within the U.S. EEZ of the northeast Pacific Ocean dramatically changed after the inception of the MFCMA in 1976. Foreign independent fishing fleets and joint venture fisheries (foreign vessels operating as processors of groundfish caught by U.S. catcher boats) formerly dominated fisheries in U.S. waters, but **by** 1989, U.S. domestic fisheries had grown to preeminence. The domestic fisheries had virtually eliminated foreign fishing and were rapidly displacing joint venture fisheries. In 1989, no groundfish resources were allotted for foreign fishing except for a small allowance given to a minor snail pot fishery. Joint venture fisheries received groundfish allocations in only two of the three major regions: the Bering Sea-Aleutian Islands region and the Washington-Oregon-California (WOC) coast. Neither foreign-directed fisheries nor joint venture fisheries were allocated any groundfish resources in the third major region, the Gulf of Alaska, and thus there was no fishing in that region to report.

OBSERVER SAMPLING PROCEDURES

The sampling procedures used by observers in 1989 have been described by Nelson et al. (1981) and French et al. (1981). While on the vessel, observers determined the species composition of the catch by taking representative basket samples of various delivered hauls. Individuals of each species in the samples were then counted and weighed. If the catch delivered to a 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 catch 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 catch 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 (Hippoelossus stenolenis), 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 vessel 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 on 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 vessel-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 of the catch. 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 catch weight was calculated by multiplying the estimated numbers of fish or crab caught each month by the average weight per individual in kilograms, this being determined from observer samples.

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 1989, specific catch allocations were set for yellowfin sole (Limanda aspera), rock sole (Leoidopsetta bilineata), Pacific ocean perch (Sebastes alutus), and Greenland turbot (Reinhardtius hippolossoides) in the Bering Sea and Aleutian Islands region and Pacific ocean perch in the WOC region; therefore, actual catch estimates have already been made for these species. 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 the U.S. observer program in the Bering Sea and Aleutian Islands and North Pacific groundfish fishery in 1989.

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.
Snail pot		Independent vessels fishing strings of pots for snails.

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

Area of Sampling

The area sampled by observers in the eastern Bering Sea lies within the U.S. EEZ off the Alaskan coastline and the Aleutian Islands. The U.S. statistical areas, Areas I, II, III, and IV as shown in Figure 1, were used in previous years, but have been replaced by the zones and subareas seen in Figure 2. Zones 1, 2, and 3 are areas designated in the management plan Amendment 12A protecting crab stocks. These three zones are further divided into subareas: Zone 1 = Subareas 511, 512, and 516; Zone 2 = Subareas 513, 517, and 521; Zone 3 = Subareas 514, 515, 522, 530, and 540. These zones and subareas were used in the following summary, with the exception of the rockfish and flatfish sections in which the former U.S. statistical areas were used.

Catch Allocations

For 1989, the Domestic Annual Harvest (DAH), which consists of Domestic Annual Processing (DAP--the total amount of groundfish expected to be caught in fully U.S. groundfish fisheries) and Joint Venture Processing (JVP--the total amount of groundfish allotted to be caught in joint venture groundfish operations), was expected to account for the entire 2 million metric tons (t) allowed to be taken within the U.S. EEZ in the Bering Sea and Aleutian Islands region. As a result, the only foreign allocation was that allotted to a small pot fishery for sea snails.

Observer Coverage of Fishing Fleets

Foreign vessels spent 6,033 days in joint venture fishing operations, representing a 53% decrease in effort from that in 1988 (Table 2). Joint ventures were conducted between U.S. vessels and processing vessels from the U.S.S.R., Japan, Poland, the Republic of Korea, and the People's Republic of China. Observers spent 5,686 days sampling aboard the 119 foreign processing vessels, providing a level of observer coverage of 94.2%, an increase of 0.7% over the 93.5% coverage level obtained in 1988 (Berger and Weikart 1989). Two U.S.S.R. vessels participated in a foreign snailpot fishery. Observers sampled 187 of the 190 fishing days, providing coverage of 98.4%.

Estimates of U.S. Joint Venture Catches

In 1989, the increase of fish allotments given to fully U.S. domestic operations resulted in decreased JVP allotments of 62% for walleye pollock (Theraera chalcopramma), 40% for Pacific cod (Gadus macrocenhalus), 19% for yellowfin sole, and 23% for rock sole and "other" flounders (primarily flathead sole (Hippoglossoides elassodon) and Alaska plaice (Pleuronectes quadrituberculatus) from allotments for 1988. (Prior to 1989, rock sole had been part of the

"other" flounders category.) No allocation was given for Atka mackerel (Pleurogrammus monopterygius) in 1989.

Closures divided the 1989 joint venture fishery into two seasons (Fig. 3). Due to reduced allocations, initial quotas were quickly achieved during the first quarter. The walleye pollock fishery lasted only 7 days, from 15 January to 21 January. Within the next 23 days, all of the other target fisheries were closed. The Bering Sea remained closed to joint venture fishing from 13 March until 3 September, when supplementary releases opened the fishery for the remainder of 1989. The Bering Sea was closed to pollock joint venture fisheries on 9 November but opened in the Aleutian Islands subarea 540 during 9-19 November and 7-31 December. The U.S.-Poland joint venture pollock Fisheries were given an allocation of pollock in the Bering Sea-Aleutian Islands region from 29 November to 31 December.

United States fishing vessels delivered 533,552 t of groundfish or 81.3% of their joint venture allotment (Berger et al. 1990) to foreign processing vessels in 1989 (Table 3). Joint venture catches fell short of the allocated amounts primarily due to a greatly reduced vessel effort during the latter part of the year; during the first 3 months of the year, 102 foreign processors participated in joint venture fisheries while only 52 foreign vessels participated during the last 4 months.

Because of the decreased allotments, joint venture catches decreased by 65% for walleye pollock, 59% for Pacific cod, 29.0% for yellowfin sole, and 65% for rock sole and other flounders. In 1989, catches were predominantly walleye pollock (54.0%) and yellowfin sole (28.4%), followed by Pacific cod (8.4%), rock sole (3.9%), and other flounders (3.5%).

Table 4 presents a summary of foreign and joint venture catches by species from 1977 through 1989. The 1989 joint venture groundfish catch represented the lowest total since 1984. The combined foreign and joint venture catch was the lowest since the inception of the Magnuson Act, less by 750,000 t than the previously lowest total taken in 1979.

Figure 4 presents the distribution of joint venture groundfish catch by subarea. Subareas in Zone 2 contributed 61% (subarea 513--12%, 517--29%, 521--20%); subareas in Zone 1 added 32% (subarea 511--l5%, 516.-17%); and subareas in Zone 3 accounted for 7% (subarea 514.-4%, 5l5--0.2%, 522--l% and 540--2%).

Restrictions

In 1987, Amendment 10 was enacted to control the incidental catches of red king crab (Paralithodes camtschaticus) and Chionoecetes bairdi Tanner crab during yellowfin sole and other flatfish fisheries and to protect the stocks of these two crab species from further decline. When this amendment expired at the end of 1988, emergency regulations were imposed to control the bycatch of these species in foreign, joint venture, and domestic fisheries until the implementation of Amendment 12A in August 1989. Restrictions retained from Amendment 10 by Amendment 12A are 1) the prohibition of foreign and joint venture trawling in the area between long. 160 and 162°W and south of lat. 58°N; 2) the reservation of the southern portion of this area for a controlled domestic trawl fishery for Pacific cod; and 3) the designation of

zones which can be closed to a fishery whenever its particular bycatch limits are attained (Fig. 2). Amendment 12A also established limits on the bycatch of Pacific halibut. For a complete account of the bycatch limits, restrictions, and closures in the Bering Sea and Aleutian Islands region, refer to Guttormsen (1990).

Incidence and Incidental Catch of Prohibited Species

Incidence rates for Pacific salmon, halibut, snow (Tanner) crab, and king crab were calculated as described in the introduction section. Estimated incidental catches taken by yellowfin sole and other flatfish fisheries and by nonflatfish fisheries in each of the three zones have been included in this report. Refer to Guttormsen (1990) for definitions of target fisheries and for information on catches by subarea (subsections of these zones) and target fishery.

Pacific Salmon

Incidence rates and average weights of Pacific salmon taken in catches sampled by observers are shown in Table 5. For all nations, the highest annual average incidence rate occurred in Subarea 517.

The incidence rates of salmon in joint venture groundfish catches are plotted by quarter in l/2 degree latitude and 1 degree longitude statistical areas in Figure 5. During the first quarter, joint venture fishing was located in the southeastern Bering Sea (subareas 511, 513, 516, and 517) where salmon incidence rates were less than 0.1 salmon/t, except at lat. 55°30'N, long. 166°W, where the rate was between 0.1 and 0.5 salmon/t. Joint venture fishing was closed during the second quarter. During the third and fourth quarters, the area fished expanded north and west of first quarter fishing grounds, primarily within the borders of Zone 2. Rates were less than 0.1 salmon/t in most areas except along the continental slope and outer shelf just north of the eastern Aleutian chain where higher rates ranged from 0.5 to 1.0 salmon/t. Limited fishing occurred in the Aleutian Islands during the fourth quarter.

The estimated joint venture incidental catch of Pacific salmon by nation and area is presented in Table 6. The total number of salmon taken in subarea 517 combined with the number taken by the U.S.-Japan joint venture in subarea 511 accounted for 83% of the total joint venture incidental catch; most of the catch occurred in the walleye pollock fishery. The catch of 14,153[1] salmon in 1989 was the second lowest (foreign and joint venture combined) since the implementation of the Magnuson Act in 1977 (Table 7); only the 1988 catch was less. However, 1989 was the first year since 1984 that the joint venture incidence rate did not represent a decrease from the previous year's rate.

Table 8 presents the incidental catch of Pacific salmon by zone and joint venture fishery in 1989. The incidental catch of salmon in yellowfin sole and other flatfish fisheries was 70

[1]**The catch of Pacific salmon was reported as 14,758 fish in Gullormsen (1990). However, the reported catch of 607 salmon in the U.S.-U.S.S.R. joint venture fishery in Subarea 514 was found IO be in error and has been changed to 0 salmon, reducing the total estimate of salmon lo 14,153 fish.**

salmon in Zone 1, 143 salmon in Zone 2, and 7 salmon in Zone 3. The incidental catch of salmon in nonflatfsh fisheries was 2,626 salmon in Zone 1, 11,098 salmon in Zone 2, and 207 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. Three species of Pacific salmon were observed in the joint venture catches. Chinook salmon (Oncorhynchus tshawytscha) (60.7%) and chum salmon (O. keta) (39.2%) accounted for virtually all of the joint venture salmon catch. Coho salmon (0. kisutch) accounted for only 0.1% of the catch.

Pacific Halibut

Table 10 lists incidence rates and average weights of Pacific halibut in joint venture catches by nation, area, and month. Excluding subareas where the groundfish catch was low, the highest annual incidence rates occurred in subarea 517 in the U.S.-U.S.S.R. joint venture (1.590 halibut/t) and in subarea 511 in the U.S.-Japan joint venture (1.309 halibut/t). The high rate in the U.S.-U.S.S.R joint venture occurred in the Pacific cod fishery; for the U.S.-Japan fishery the high rate occurred in fisheries for yellowfin sole and rock sole.

The incidence of Pacific halibut in groundfish catches are plotted in Figure 6 by quarter and blocks of l/2 degree latitude by 1 degree longitude. During the first quarter, rates were generally less than 1 halibut/t on the continental shelf and between 1 and 5 halibut/t along the continental slope and outer shelf just north of the eastern Aleutian Island chain and the Alaska Peninsula. The only block with a rate greater than 5 halibut/t was located southwest of the Pribilof Islands (lat. 56°N, long. 167°W). The Bering Sea was closed to joint venture fishing during the second quarter. Third and fourth quarter rates were generally less than 1 halibut/t in Zones 1 and 2. The only rates greater than 5 halibut/t occurred near St. Matthew Island in the third quarter.

Nearly half of the incidentally-caught halibut in joint venture fisheries were taken in Subarea 517 (Table 11). The estimated incidental halibut catch in the 1989 joint venture fishery (525,673 fish) was the lowest since 1985; in terms of combined foreign and joint venture totals, the incidental catch in 1989 was the second lowest by number and lowest by weight since the inception of the Magnuson Act (Table 12).

In 1988 and 1989, the average weight and length of halibut was less than in previous years--l.9 kilograms (kg) and 46.2 centimeters (cm) in 1989 and 1.7 kg and 49.4 cm in 1988 (Berger and Weikart 1989), as compared with 2.8 kg and 56.2 cm in 1987 (Berger and Weikart 1988), 2.9 kg and 57.9 cm in 1986 (Berger et al. 1988), and 2.5 kg and 56.6 cm in 1985 (Berger et al. 1987).

Table 13 presents the incidental catch of Pacific halibut by zone and joint venture fishery for 1989. The incidental catch of halibut in the combined yellowfin sole and other flatfish joint venture fisheries was 126,908 halibut in Zone 1, 54,835 halibut in Zone 2, and 8,019 halibut in Zone 3 (Table 13). The incidental catch of halibut in nonflatfish fisheries was 47,517 halibut in Zone 1, 283,729 halibut in Zone 2, and 4,662 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 1989 are summarized in Table 14 by nation, month, and area. The highest annual incidence rates were observed in subareas 513 and 514 and were associated with fisheries targeting on yellowfin sole and other flounders and with bottom trawl pollock fisheries.

The incidence rates of snow (Tanner) crab in joint venture groundfish catches are given by l/2 degree latitude and 1 degree statistical areas by quarter in Figure 7. In the first quarter, all blocks showed incidence rates less than 25 crab/t with the exception of one block which experienced a rate greater than 25 crab/t at lat. 56°N, long. 167°W. Fishing was closed to joint venture fishing in the second quarter. In the third and fourth quarters when fishing extended north along the continental slope and outer shelf, rates generally increased with latitude, with locations south of lat. 56°30'N experiencing rates less than 1 crab/t and those north of lat. 56°30'N experiencing rates greater than 1 crab/t. In the third quarter, one location (lat. 58°30'N, long. 173°W) showed a rate greater than 10 crab/t and two locations north of the Pribilof Islands (lat. 57°30'-58°00'N, long. 169°W) had rates greater than 25 crab/t. In the fourth quarter, high rates were found throughout the area north of lat. 56°30'N and west of long. 165°W. Four locations had rates greater than 10 crab/t and four locations had rates greater than 25 crab/t.

The estimated incidental catch of 3.8 million snow (Tanner) crab in the 1989 joint venture groundfish fishery was 23% higher than that of 1988 (Tables 15 and 16) and is the third largest bycatch by numbers and the largest by weight taken by the joint venture fishery since the inception of the joint venture fishery in 1980 (Table 16). The increase in the incidental catch of Tanner crab in the joint venture fishery was largely due to an increase of over 1 million crab taken in the joint venture pollock fishery in subarea 521.

Table 17 presents the incidental catch of Tanner crab by species, zone, and joint venture fishery for 1989. In yellowfin sole and other flatfish fisheries in Zone 1, 97.2% (130,639 crab) of the catch was C. bairdi (Table 17). In Zones 2 and 3, C. bairdi made up 32.1% (453,968 crab) and 21.1% (150,235 crab), respectively, of the Tanner crab catch. For nonflatfish fisheries, C. bairdi represented 85.6% (19,645 crab) of the crab catch in Zone 1, 11.3% (155,538 crab) in Zone 2, and 5.4% (6,003 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: C. opilio. C. bairdi, C. aneulatus, and C. tanneri. C. opilio (71.91%) and C. bairdi (28.08%) together comprised almost the entire incidental Tanner crab catch. C. angulatus (<0.01%) and G. tanneri (<0.01%) were found in small numbers. The species C. angulatus and C. tanner-i 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 (Anonlooma fimbria).

King Crab

The incidence and average weights of king crab (Lithodes and Paralithodes spp.) observed in the 1989 joint venture fisheries are summarized by nation, month, and area in Table 19. Incidence rates of king crab were highest in subareas 511 and 516 of Zone 1 where most fishing was conducted during the fit quarter. The highest rates were observed in the U.S.-Poland and U.S.-Japan joint venture fisheries, although the groundfish and crab catches of the latter were much larger than those of the former. The average king crab weight in subarea 516 was greater than the average king crab weight in subarea 511.

The observed incidence rates of king crab in catches made by joint venture vessels by quarter and l/2 degree by 1 degree areas are plotted in Figure 8. Joint venture operations exceeded the incidence rate of 1 crab/t in only three statistical blocks (lat. 55°30'-56°30'N, long. 162°-163°W) during the first quarter (in Zone l), in one block during the third quarter (near St. Matthew Island), and in one block during the fourth quarter (near the Pribilof Islands). On the mid-continental shelf, rates were generally less than 1 crab/t.

The incidental catch of king crab in Subareas 511, 513, and 516 accounted for 207,703 t or 99.3% of total number taken in joint venture fisheries in 1989 (Table 20). Although the incidental catch of king crab was more than double the 1988 catch, the catch was the third lowest by number and weight since the inception of the Magnuson Act (Table 21).

Joint venture fisheries targeting on yellowfin sole and other flatfish caught 99.7% of the incidental catch of king crab in 1989. The estimated catch of red king crab was 179,407 crab in Zone 1, while in Zones 2 and 3, where incidence rates were substantially lower, the catch was 22,145 crab and 666 crab, respectively (Table 22). In nonflatfsh fiheries, the catch of red king crab was 137 crab in Zone 1, 12 crab in Zone 2, and 1 crab in Zone 3.

Red king crab composed 97.90% **of** the king **crab** incidentally taken in 1989 by joint venture fisheries in Bristol Bay (Table, 23). Blue king crab (p. platypus, 2.05%) and golden king crab (L. aequispina, 0.05%) accounted for the remainder. Males once again dominated the joint venture red king crab catch. In 1989, males were larger than in past years--carapace length averaged 132 mm in 1989, 130 mm in 1988 (Berger and Weikart 1989), 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 (Clunea hareneus pallasi) was designated a prohibited species for both foreign and joint venture operations in 1980. Table 24 gives the foreign and joint venture catches and percentages of Pacific herring in the groundfish fisheries since 1977. The rate of the incidental catch in 1989 was the highest in the joint venture fishery since 1985 due to a high incidental catch of Pacific herring in the joint venture pollock fishery in subareas 521 and 522--over 2,400 t of the reported 2,500 t were taken in these two subareas. Most of the bycatch was taken during September and October.

Rockfish Catch by Species

Eleven species of rockfish were identified by observers as appearing in joint venture catches in the Bering Sea and Aleutian Islands region during 1989 (Table 25). In Tables 25 and 26, the group "other rockfish consists of five species which each make up less than 0.1% of the rockfish catch.

Approximately 51 t of rockfish were caught in the 1989 joint venture fishery (Table 26). The joint venture catch of rockfish decreased 98% from the catch in 1988. In 1988, most of the rockfish catch occurred in the Atka mackerel fishery in the Aleutian Islands region.

The U.S. statistical areas, Area I, Area II, Area III, and Area IV (Figure l), were used in summarizing the Bering Sea rockfish and flatfish catches as in previous years.

Two species of rockfish made up the greatest portion of the rockfish catch: Pacific ocean perch (61.7%) and northern rockfish (Sebastes polyspinis, 23.7%). Pacific ocean perch predominated in Areas I and IV, yielding 81.9 and 87.3% of rockfish catch, respectively. In Area II, northern rockfish and Pacific ocean perch accounted for 35.9 and 33.7% of the catch, respectively.

Flatfish Catch by Species

In the 1989 joint venture groundfish catch, observers identified 15 species in the flatfish catch (Table 27) which totaled 193,669 t (Table 28) or 39% of the total groundfish catch (Table 3). The primary flatfish species, yellowfin sole (151,506 t) accounted for 28% of the groundfish catch, making it the second most important target species in the eastern Bering Sea after walleye pollock (297,769 t, 54%). Within the flatfish species group, the species with the largest catches were yellowfin sole (151,506 t, 78% of the total eastern Bering Sea flatfish catch), rock sole (21,010 t, ll%), Alaska plaice (13,884 t, 7%) flathead sole (3,534 t, 2%), arrowtooth flounder (Atheresthes stomias) (2,275 t, l%), and starry flounder (Platichthvs stellatus) (1,140 t, 0.6%) (Table 28). Nearly 99% (191,572 t) of this flatfish catch was taken in Area I, which includes most of the shallow waters of the continental shelf where virtually all demersal trawling targeting on flatfish is conducted, while only 1% (2,098 t) was taken in Area II, which encompasses the deep waters of the outer continental shelf and slope. In Area II, the two species with the largest flatfish catches were arrowtooth flounder (876 t, 42% of Area II flatfsh catch) and flathead sole (503 t, 24%). No flatfish were reported taken during the limited amount of fishing in Area IV.

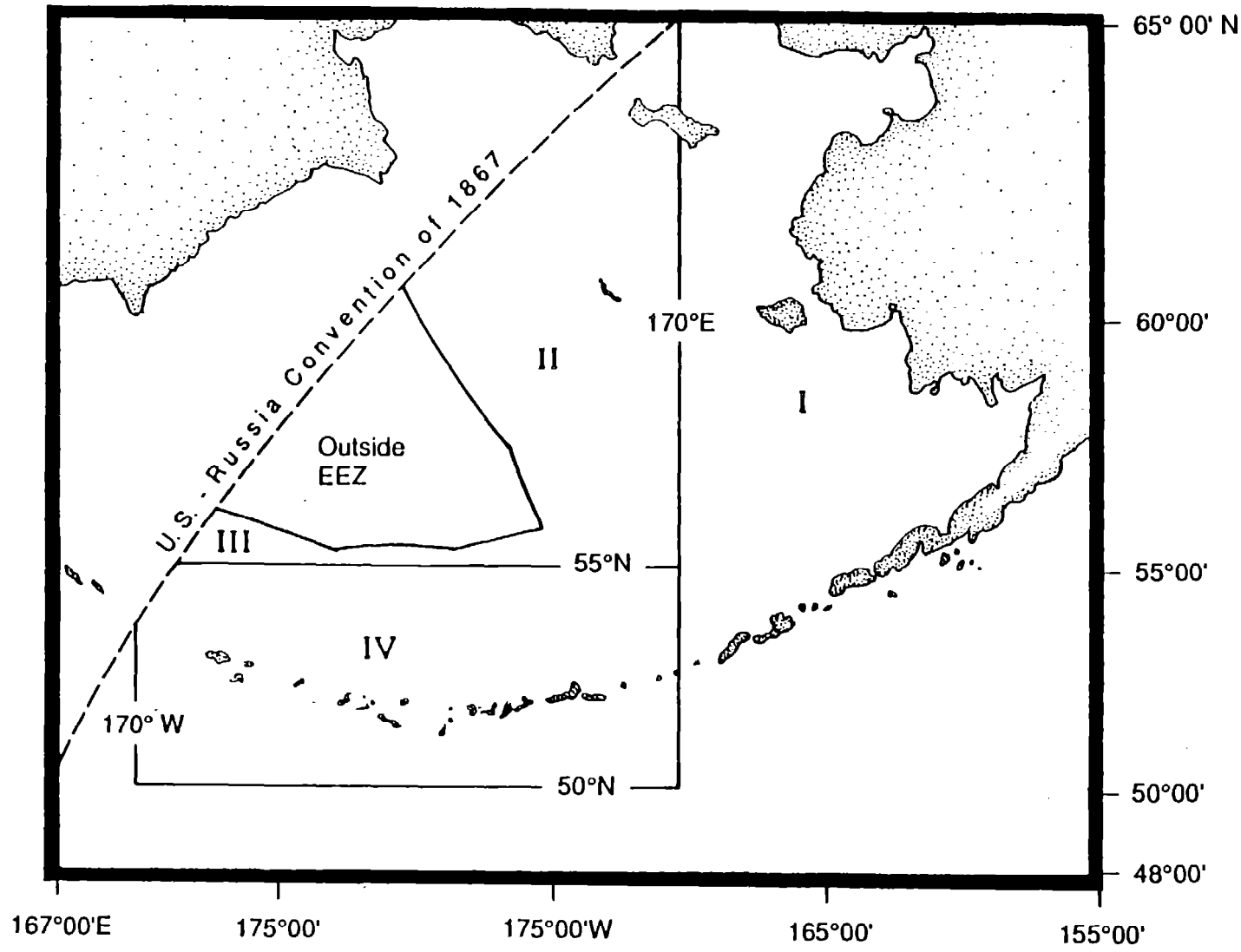


Figure 1.--U.S. statistical areas in the Bering Sea and Aleutian Islands region.

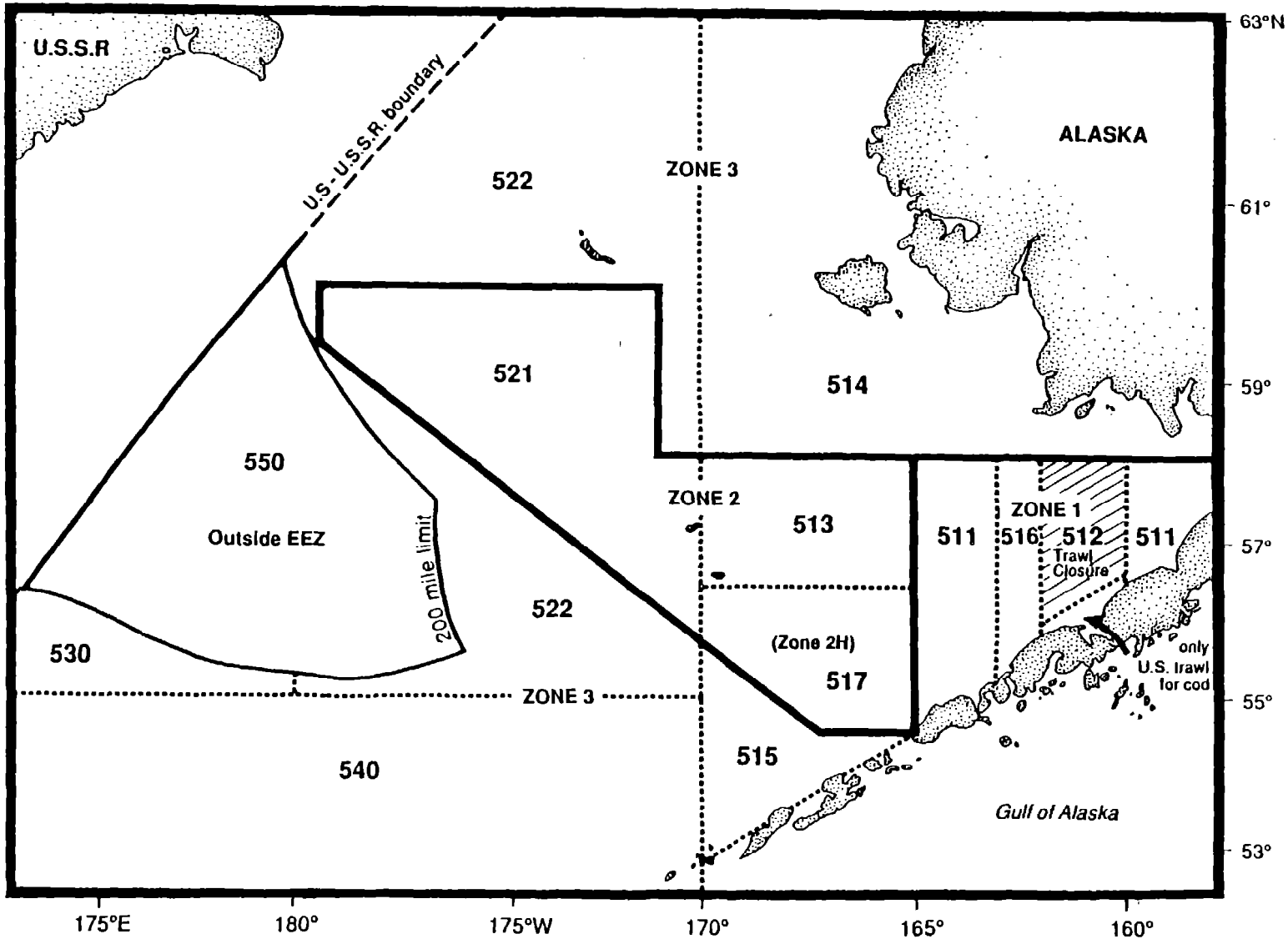


Figure 2.--Bering Sea zones by which the restrictions on the incidental catch of king and Tanner crab and Pacific halibut apply.

Table 2.-Annual summary of observer effort, joint venture and foreign 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, 1989.

Nationality	Vessel	No. of observers	No. of ships observed[a]	No. of ships in fishery	No. of observer days	No. of vessel days	Percent coverage
U.S.-Japan	Other FJV		13	13	284	296	95.9
U.S.-Japan	Other SJV		13	13	569	620	91.8
U.S.-Japan	Yell/Flat FJV		24	24	853	899	94.9
U.S.-Japan	Yell/Flat SJV		4	4	98	105	93.3
U.S.-Japan	Total	53	38	38	1,804	1,920	94.0
U.S.-Poland	Other FJV		15	15	357	393	90.8
U.S.-Poland	Other FJV		7	7	157	171	91.8
U.S.-Poland	Total	20	17	17	514	564	91.1
U.S.-ROK	Other FJV		24	24	513	535	95.9
U.S.-ROK	Other SJV		4	4	194	203	95.6
U.S.-ROK	Yell/Flat FJV		25	25	869	916	94.9
U.S.-ROK	Yell/Flat SJV		3	3	66	72	91.7
U.S.-ROK	Total	43	31	31	1,642	1,726	95.1
U.S.-PROC	Other FJV		3	3	16	17	94.1
U.S.-PROC	Yell/Flat FJV		5	5	176	183	96.2
U.S.-PROC	Total	6	5	5	192	200	96.0
U.S.-U.S.S.R.	Other FJV		17	17	446	469	95.1
U.S.-U.S.S.R.	Yell/Flat FJV		28	28	1,088	1,154	94.3
U.S.-U.S.S.R.	Total	36	28	28	1,534	1,623	94.5
Joint venture total[b]		139[c]	119	119	5,686	6,033	94.2
U.S.S.R.	Snail pot	4	2	2	187	190	98.4
Grand Total[b]		142[c]	121	121	5,873	6,223	94.4

[a] Vessels that participated in more than one fshery 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.
PROC = 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[a] in the Bering Sea and Aleutian Islands region in 1989.

Species	Metric tons	Percent
Squid	111	<0.1
Yellowfin sole	151,506	28.4
Rock sole	21,010	3.9
Arrowtooth flounder	2,294	0.4
Greenland turbot	50	<0.1
Other flatfishes	18,809	3.5
Walleye pollock	287,769	53.9
Pacific cod	44,618	8.4
Sablefish	3	<0.1
Atka mackerel	51	<0.1
Pacific ocean perch[C]	41	<0.1
Other rockfishes	10	<0.1
Pacific herrind	2,527	0.5
Other fish	4,753	0.9
Total	533,552	

[a] In 1989, 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.

' Arrow-tooth includes arrowtooth flounder (Atheresthes stomias) and Kamchatka flounder (A evermanni).

' Includes Pacific ocean perch, Sebastes alutus, rougheye rockfish, S. aleutianus, northern rockfish, S. polvsninus, sharpchin rockfish, S. zacentrus, and shortraker rockfiih, S. borealis.

' Non-U.S. groundfish vessels were not allowed to retain Pacific herring in 1989.

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, 1977-89.

Fisheries and species group	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
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	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	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	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	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	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	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	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	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	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	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	0.1
Total	1,289.1	1,388.3	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	0.1
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	287.8
Pacific cod	NF	NF	NF	8.5	9.2	13.6	14.4	30.8	41.3	63.9	58.2	109.9	44.6
Sablefish	NF	NF	NF	<0.1	0.2	0.1	0.1	0.3	0.1	0.4	0.1	<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	0.1
All rockfish	NF	NF	NF	0.1	<0.1	<0.1	0.1	0.6	0.5	0.5	0.9	2.1	0.1
Yellowfin sole	NF	NF	NF	9.6	16.0	17.4	22.5	32.8	126.4	151.4	179.6	213.3	151.5
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	42.2
Pacific herring	NF	NF	NF	0.0	0.0	<0.1	1.1	1.8	3.1	3.8	0.5	0.4	2.5
Other fish	NF	NF	NF	0.7	3.4	1.1	1.6	2.6	6.3	7.6	6.1	11.8	4.8
Squid	NF	NF	NF	0.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.1
Snails	NF	NF	NF	0.0	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	533.6

[a] Statistics for 1978 from Berger et al. (1986). Statistics for 1977 and 1979-88 from Berger and Weikart (1989).

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

NF = No fishing.

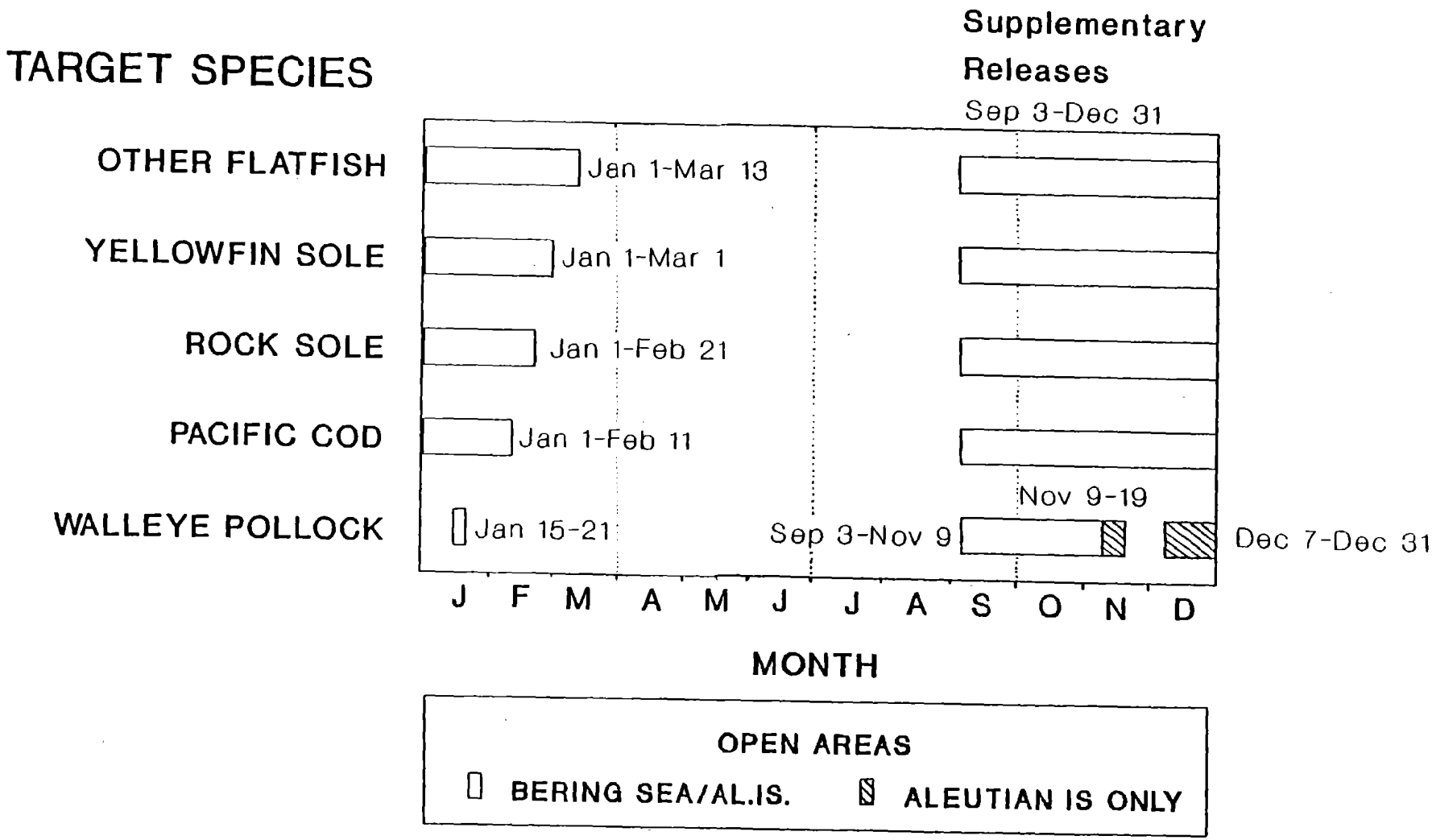
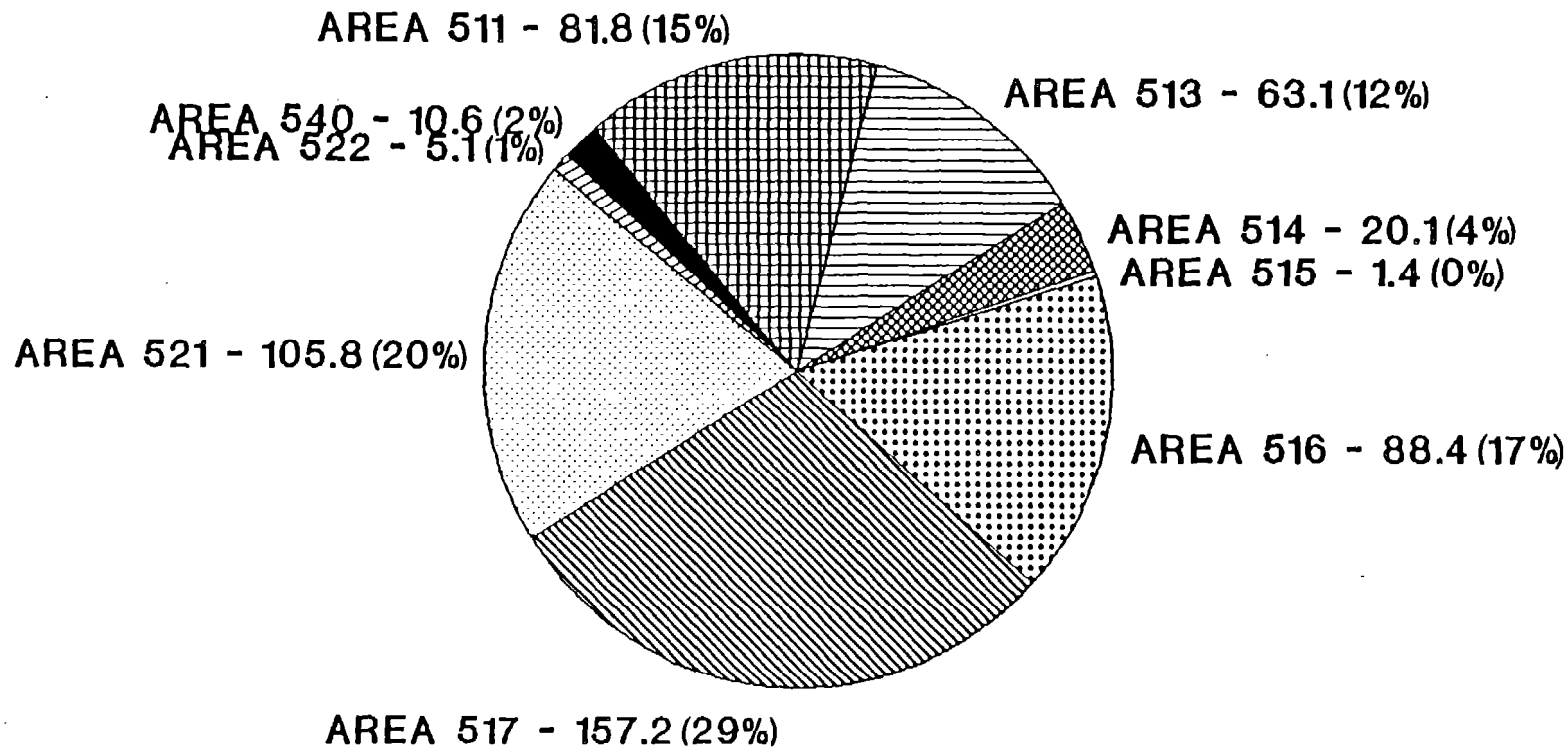


Figure 3.--Joint venture fisheries openings in the Bering Sea by target species, 1989.



TOTAL GROUNDFISH CATCH, ALL AREAS-633.6

Figure 4.--Total joint venture groundfish catch in thousands of metric tons (% of total catch) in the Bering Sea by subareas, 1989.

Table 5.--Incidence rate (number per metric ton of catch) and average weight (kg) of Pacific salmon taken in joint venture catches in the Bering Sea and Aleutian Islands region, 1989. (Lines indicate areas not fished.)

	Subarea 511		Subarea 513		Subarea 514		Subarea 515		Subarea 516		Subarea 517		Subarea 521		Subarea 522		Subarea 540	
	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.
U.S.-U.S.S.R. Joint Venture Mothership																		
Jan.	0.001	4.63	NS	NS	--	--	--	--	--	--	0.001	3.60	--	--	--	--	--	--
Feb.	0.000	0.00	NS	NS	--	--	--	--	0.000	0.00	<0.001	1.84	--	--	--	--	--	--
March	0.000	0.00	0.000	0.00	--	--	--	--	NS	NS	0.001	1.30	NS	NS	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sep.	--	--	0.001	3.60	0.000	0.00	--	--	--	--	--	--	--	--	0.000	0.00	--	--
Oct.	--	--	<0.001	4.20	0.000	0.00	--	--	--	--	--	--	0.000	0.00	--	--	--	--
Nov.	--	--	0.000	0.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Annual	<0.001	4.63	<0.001	3.66	0.000	0.00	--	--	0.000	0.00	0.001	2.95	0.000	0.00	0.000	0.00	--	--
U.S.-Republic of Korea Joint Venture Mothership																		
Jan.	0.004	4.09	NS	NS	--	--	--	--	--	--	0.012	3.63	--	--	--	--	--	--
Feb.	<0.001	1.20	NS	NS	--	--	0.000	0.00	<0.001	8.50	0.005	4.37	--	--	--	--	--	--
March	0.000	0.00	--	--	--	--	--	--	0.000	0.00	0.000	0.00	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sep.	--	--	0.011	2.11	0.002	3.50	NS	NS	--	--	0.062	2.55	0.007	4.03	0.000	0.00	--	--
Oct.	NS	NS	<0.001	3.60	0.000	0.00	0.000	0.00	--	--	0.039	3.42	0.006	3.88	--	--	--	--
Nov.	--	--	0.001	4.90	--	--	--	--	--	--	0.027	3.22	0.000	0.00	--	--	--	--
Dec.	--	--	0.000	0.00	0.000	0.00	--	--	--	--	--	--	--	--	--	--	--	--
Annual	0.001	3.97	0.004	2.35	0.001	3.50	0.000	0.00	<0.001	8.50	0.026	3.15	0.006	3.97	0.000	0.00	--	--

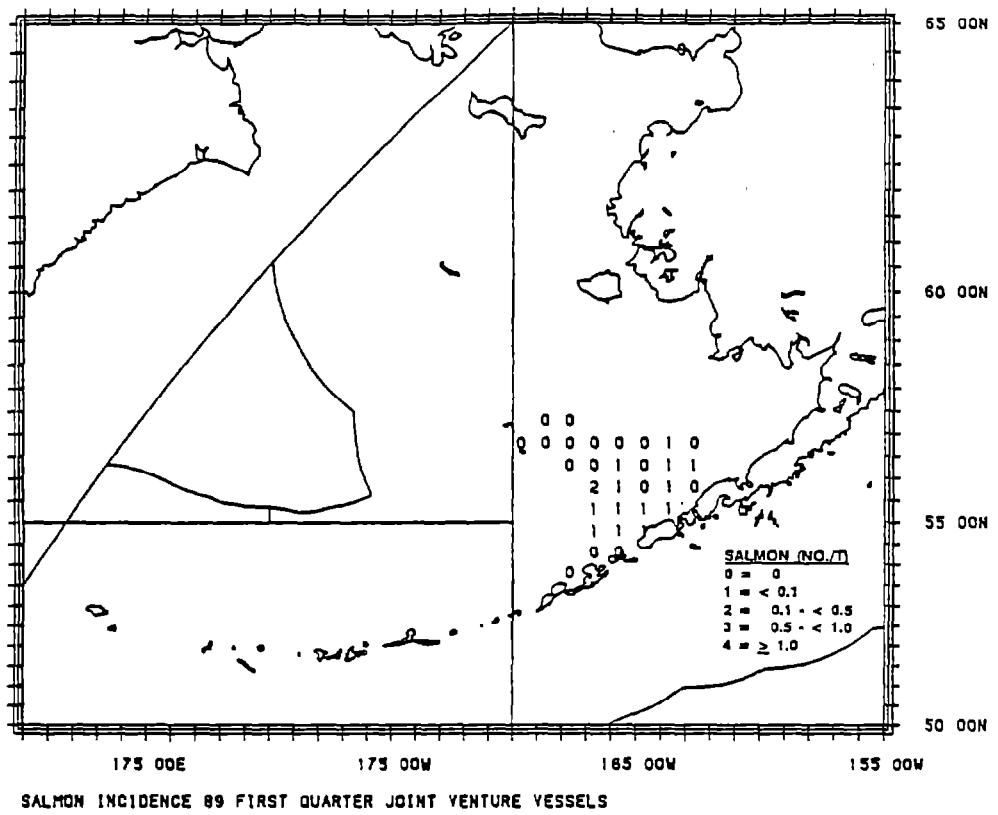
Table 5.--Continued.

	Subarea 511		Suberea 513		Suberea 514		Suberea 515		Subarea 516		Subares 517		Subarea 521		Subarea 522		Subarea 540	
	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. ut.	Rate	Avg. ut.	Rate	Avg. ut.	Rate	Avg. ut.	Rate	Avg. ut.
U.S.-Japan Joint Venture Mothership																		
Jan.	0.023	3.84	NS	NS	--	--	0.000	0.00	--	--	0.026	3.65	--	--	--	--	--	--
Feb.	<0.001	5.37	NS	NS	--	--	--	--	0.000	0.00	0.001	7.76	--	--	--	--	--	--
March	0.000	0.00	0.000	0.00	--	--	--	--	0.000	0.00	0.000	0.00	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sep.	0.484	2.90	0.004	4.80	0.001	3.50	0.000	0.00	--	--	0.074	2.82	0.010	3.66	0.022	5.97	--	--
Oct.	--	--	0.001	2.37	0.000	0.00	--	--	--	--	0.043	3.29	0.016	3.78	0.012	3.81	--	--
Nov.	--	--	0.000	0.00	0.000	0.00	--	--	--	--	0.067	3.62	0.015	4.45	0.002	3.40	0.001	1.50
Dec.	--	--	0.002	4.40	0.000	0.00	--	--	--	--	--	--	--	--	--	--	0.002	4.48
Annual	0.046	3.05	0.001	4.37	<0.001	3.50	0.000	0.00	0.000	0.00	0.048	3.22	0.014	3.82	0.012	5.23	0.002	4.03
U.S.-Poland Joint Venture Mothership																		
Jan.	0.037	4.18	NS	NS	--	--	--	--	--	--	0.044	3.73	--	--	--	--	--	--
Feb.	0.000	0.00	--	--	--	--	--	--	0.000	0.00	--	--	--	--	--	--	--	--
March	0.000	0.00	0.000	0.00	--	--	--	--	NS	NS	0.000	0.00	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sep.	--	--	0.003	1.20	--	--	0.025	4.87	--	--	0.077	2.43	0.008	3.17	--	--	--	--
Oct.	--	--	NS	NS	--	--	0.000	0.00	--	--	0.164	3.63	0.013	3.04	--	--	--	--
Nov.	--	--	0.000	0.00	--	--	--	--	--	--	0.165	3.15	--	--	--	--	--	--
Dec.	0.045	3.66	0.000	0.00	0.000	0.00	0.051	2.44	--	--	0.346	2.62	--	--	--	--	0.002	1.15
Annual	0.018	4.04	0.001	1.20	0.000	0.00	0.044	2.70	0.000	0.00	0.193	2.87	0.010	3.09	--	--	0.002	1.15

Table 5. --Continued.

	Subarea 511		Subarea 513		Subarea 514		Subarea 515		Subarea 516		Subarea 517		Subarea 521		Subarea 522		Subarea 540	
	Rate	Avg. wt.	Rate	Avg. ut.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. Mt.	Rate	Avg. wt.	Rate	Avg. ut.	Rate	Avg. wt.
U.S.-People's Republic of China Joint Venture Mothership																		
Jan.	0.007	3.05	NS	NS	--	--	--	--	--	--	0.054	3.45	--	--	--	--	--	--
Feb.	0.000	0.00	--	--	--	--	--	--	0.000	0.00	--	--	--	--	--	--	--	--
March	0.000	0.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sep.	--	--	0.000	0.00	NS	NS	--	--	--	--	NS	NS	--	--	--	--	--	--
Oct.	--	--	0.000	0.00	0.000	0.00	--	--	--	--	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Annual	0.003	3.05	0.000	0.00	0.000	0.00	--	--	0.000	0.00	0.054	3.45	--	--	--	--	--	--

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



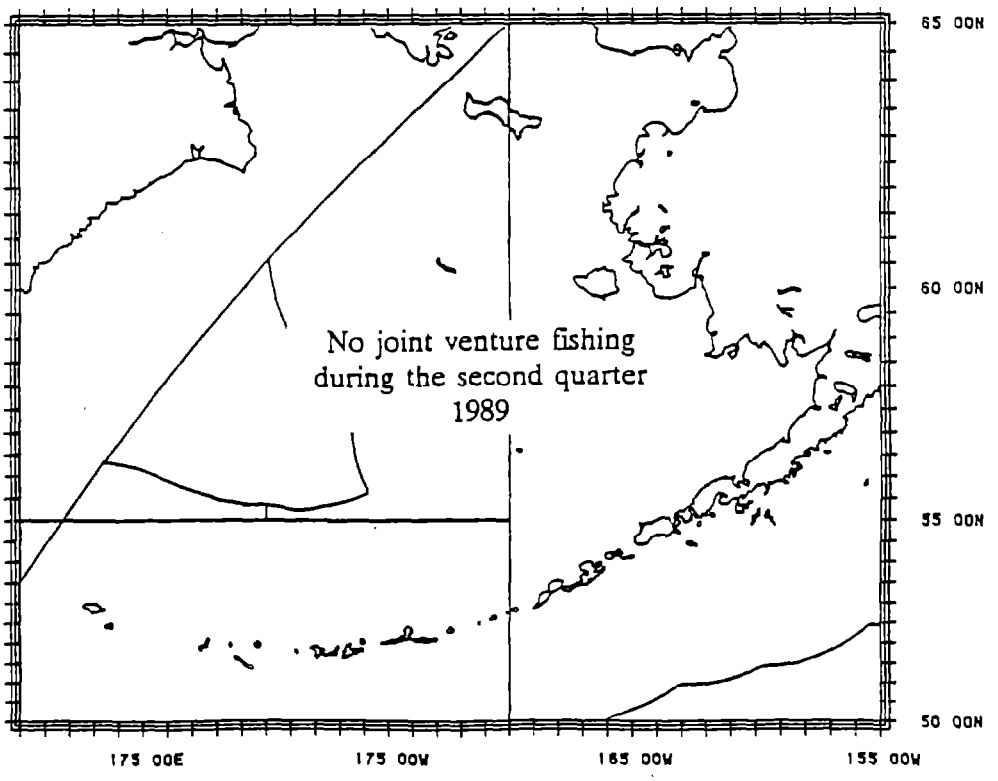
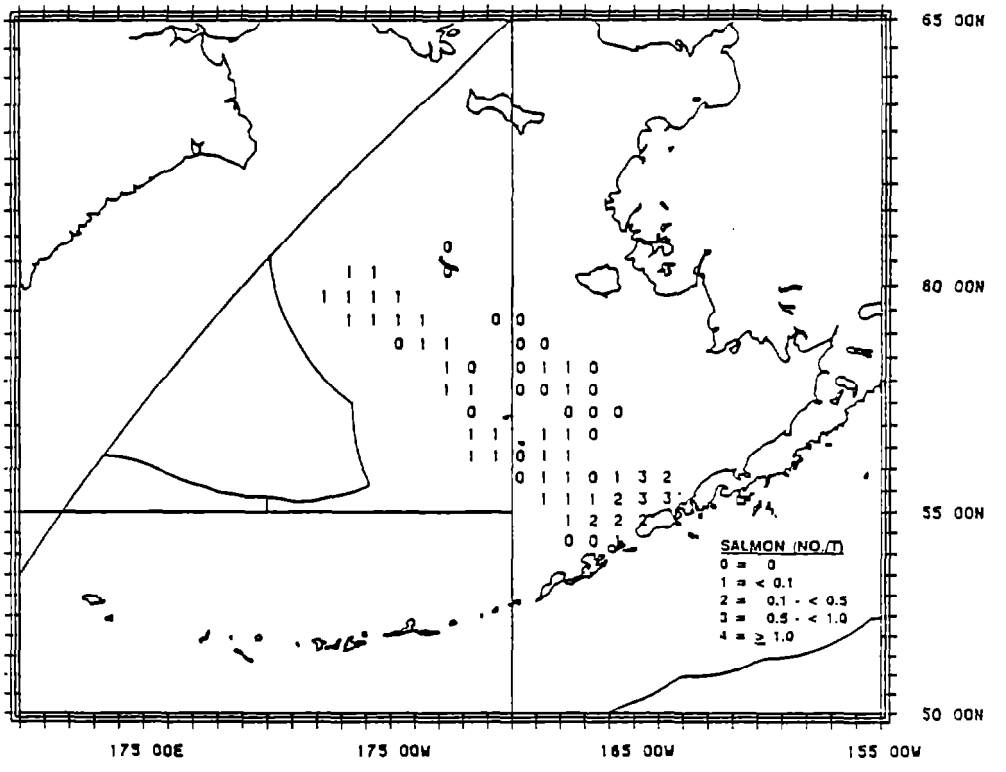
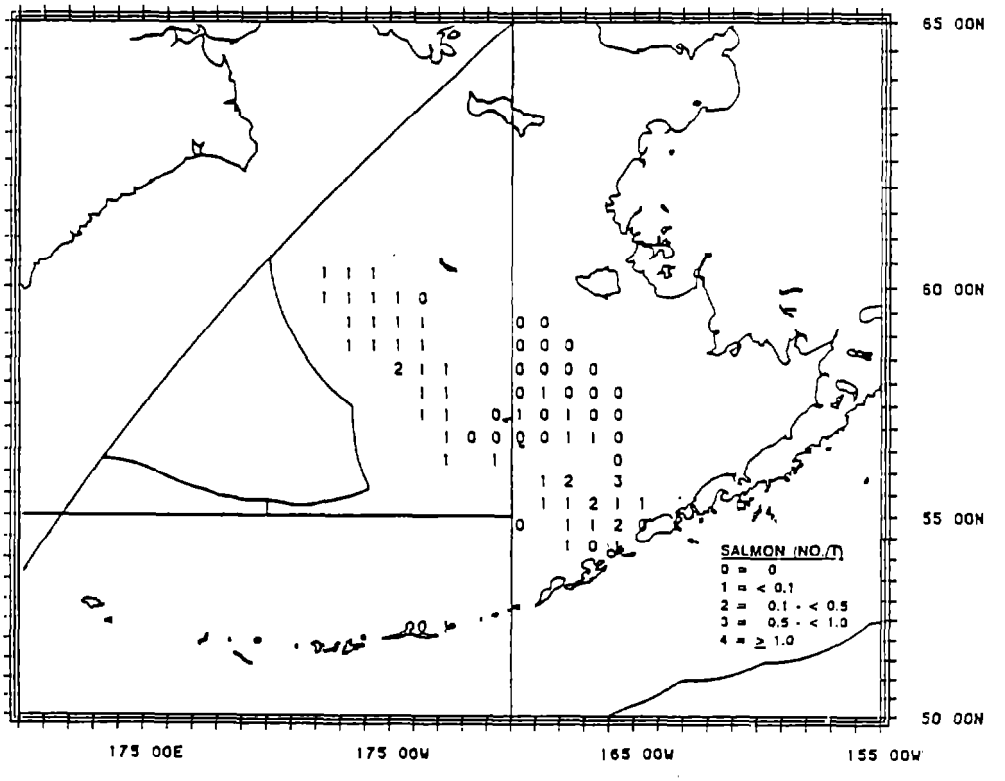


Figure 5-Average incidence (no./t) of Pacific salmon in joint venture fisheries by quarter and 1/2° latitude by 1° longitude areas, 1989.



SALMON INCIDENCE 89 THIRD QUARTER JOINT VENTURE VESSELS



SALMON INCIDENCE 89 FOURTH QUARTER JOINT VENTURE VESSELS

Figure 5.--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, 1989.

Number of fish

	Subarea 511	Subarea 513	Subarea 514	Subarea 515	Subarea 516	Subarea 517	Subarea 521	Subarea 522	Subarea 540	Total
U.S.-Japan	2,534	66	4	0	0	5,492	1,081	41	14	9,232
U.S.-ROK	103	315	3	0	2	1,632	462	0	--	2,517
U.S.-Poland	30	34	0	45	0	1,979	46	--	0	2,134
U.S.-PROC	9	3	0	--	0	54	--	--	--	66
U.S.-U.S.S.R.	18	120	0	--	0	66	0	0	--	204
Total	2,694	538	7	45	2	9,223	1,589	41	14	14,153
Percent by area	19.0%	3.8%	<0.1%	0.3%	<0.1%	65.2%	11.2%	0.3%	0.1%	

Weight (metric tons)

	Subarea 511	Subarea 513	Subarea 514	Subarea 515	Subarea 516	Subarea 517	Subarea 521	Subarea 522	Subarea 540	Total
U.S.-Japan	7.73	0.29	0.01	0.00	0.00	17.68	4.13	0.21	0.06	30.12
U.S.-ROK	0.41	0.74	0.01	0.00	0.02	5.10	1.83	0.00	--	8.15
U.S.-Poland	0.12	0.04	0.00	0.12	0.00	5.68	0.14	--	0.00	6.11
U.S.-PROC	0.03	<0.01	0.00	--	0.00	0.19	--	--	--	0.21
U.S.-U.S.S.R.	0.08	0.44	0.00	--	0.00	0.19	0.00	0.00	--	0.72
Total	8.37	1.51	0.02	0.12	0.02	28.89	6.11	0.21	0.06	45.30
Percent by area	18.5%	3.3%	0.1%	0.3%	<0.1%	63.8%	13.5%	0.5%	0.1%	

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

Lines indicates area 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, 1977-89*.

Year	Foreign		Joint Venture		Total	
	Nos.	t	NOS.	t	Nos.	t
1977	47,840	198	N-F	NF	47,840	198
1978	44,548	137	NF	N-F	44,548	137
1979	107,706	340	N-F	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
1989	NF	NF	14,153	45	14,153	45

✍✍ Estimated catches for years 1977-88 from Berger and Weikart (1989).

NF = No fishing.

Table 8.--Groundfish catch (in metric tons) and numbers of Pacific salmon caught by each zone and joint venture fishery, 1989.

Fishery	Zone	Groundfish catch (t)	Chinook salmon	Other salmon
Yellowfin sole and other flatfish	1	151,223.8	70	0
	2	50,191.1	22	121
	3	20,350.7	0	7
Nonflatfish	1	18,986.1	683	1,943
	2	275,931.0	7,770	3,437
	3	16,869.3	67	33

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, 1989.

Species	Percent by species	Sex	Sex composition	Average weight (kg)	Average length (cm)
Chinook	60.72	Male	47.90	3.53	62.6
		Female	52.10	3.62	63.2
		Unsexed		4.34	68.5
		Combined		3.61	63.2
Chum	39.18	Male	**55.49**	2.66	58.1
		Female	44.51	2.53	57.0
		Unsexed		2.53	57.9
		Combined		2.59	57.6
Coho	0.10	Male	100.00	3.37	62.8
		Unsexed		6.30	20.0
		Combined		2.61	54.3

Table 10.-- Incidence rate (number per metric ton of catch) and average weight (kg) of Pacific halibut taken in joint venture catches in the Bering Sea and Aleutian Islands region, 1989. (Lines indicate areas not fished.)

	Subarea 511		Subarea 513		Subarea 514		Subarea 515		Subarea 516		Subarea 517		Subarea 521		Subarea 522		Subarea 540	
	Rate	Avg. ut.	Rate	Avg. ut.	Rate	Avg. ut.	Rate	Avg. ut.	Rate	Avg. ut.	Rate	Avg. wt.	Rate	Avg. ut.	Rate	Avg. ut.	Rate	Avg. ut.
U.S.-U.S.S.R. Joint Venture Mothership																		
Jan.	4.290	0.81	NS	NS	--	--	--	--	--	--	1.918	0.99	--	--	--	--	--	--
Feb.	0.285	0.66	NS	NS	--	--	--	--	0.160	0.68	1.957	0.99	--	--	--	--	--	--
March	0.425	0.82	0.602	1.07	--	--	--	--	NS	NS	0.589	2.48	NS	NS	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sep.	--	--	0.113	8.07	0.058	8.63	--	--	--	--	--	--	--	--	14.127	2.04	--	--
Oct.	--	--	0.510	6.56	0.173	7.96	--	--	--	--	--	--	0.063	3.75	--	--	--	--
Nov.	--	--	0.146	7.92	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Annual	0.923	0.78	0.352	5.06	0.117	8.12	--	--	0.160	0.68	1.590	1.13	0.063	3.75	14.127	2.04	--	--
U.S.-Republic of Korea Joint Venture Mothership																		
Jan.	0.220	3.33	NS	NS	--	--	--	--	--	--	0.450	1.80	--	--	--	--	--	--
Feb.	0.247	1.25	NS	NS	--	--	7.060	1.26	0.088	1.49	1.748	1.44	--	--	--	--	--	--
March	0.015	13.33	--	--	--	--	--	--	0.036	0.24	0.161	7.69	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sep.	--	--	0.168	6.73	0.039	12.94	NS	NS	--	--	0.086	7.43	0.245	6.49	0.098	12.58	--	--
Oct.	NS	NS	0.615	5.05	2.052	2.73	0.045	13.75	--	--	0.013	7.03	0.341	5.76	--	--	--	--
Nov.	--	--	0.666	6.58	--	--	--	--	--	--	0.022	6.33	2.790	3.59	--	--	--	--
Dec.	--	--	0.634	4.05	0.142	4.40	--	--	--	--	--	--	--	--	--	--	--	--
Annual	0.233	1.98	0.471	5.89	0.253	3.99	3.093	1.36	0.088	1.49	0.309	2.04	0.285	6.12	0.098	12.58	--	--

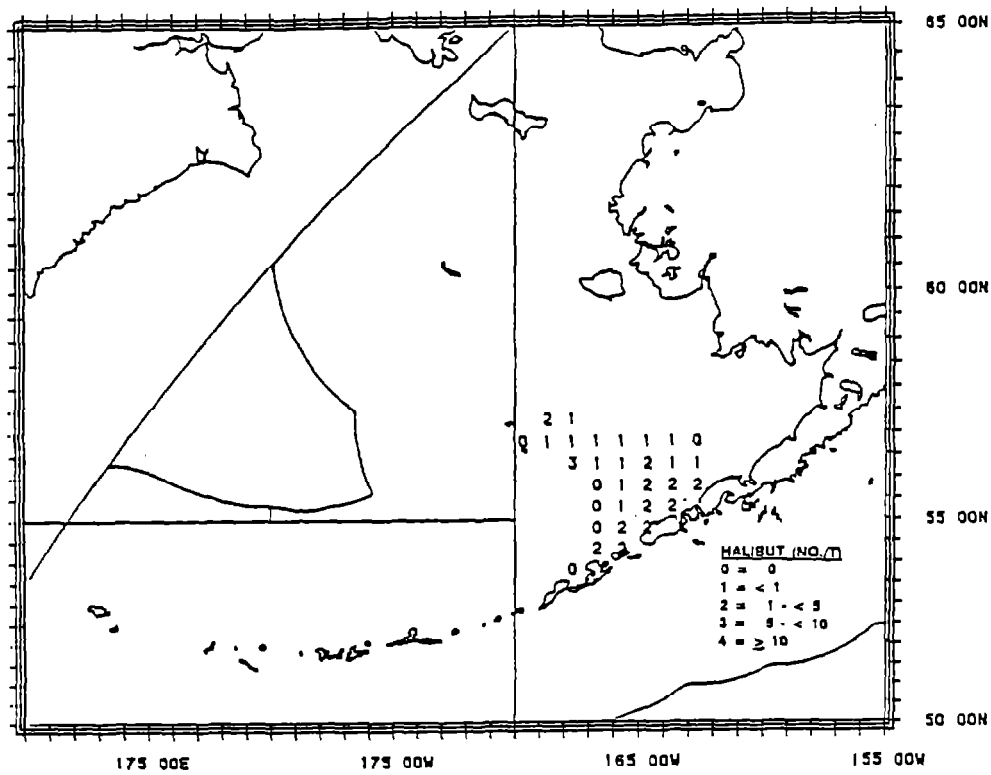
Table 10.--Continued.

	Subarea 511		Subarea 513		Subarea 514		Subarea 515		Subarea 516		Subarea 517		Subarea 521		Subarea 522		Subarea 540	
	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.
U.S.-Japan Joint Venture Mothership																		
Jan.	2.322	0.74	NS	NS	--	--	4.560	1.42	--	--	0.543	1.15	--	--	--	--	--	--
Feb.	0.981	1.22	NS	NS	--	--	--	--	0.371	2.40	8.783	1.11	--	--	--	--	--	--
March	0.540	3.33	0.656	4.64	--	--	--	--	0.101	0.36	1.317	3.52	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sep.	0.016	3.42	0.122	7.99	0.062	10.11	0.033	9.20	--	--	0.022	6.79	0.016	8.70	0.000	0.00	--	--
Oct.	--	--	0.286	6.19	0.239	7.91	--	--	--	--	0.014	7.16	0.033	7.73	0.007	15.33	--	--
Nov.	--	--	0.985	5.47	18.606	1.63	--	--	--	--	0.029	7.63	0.000	0.00	0.000	0.00	0.000	0.00
Dec.	--	--	0.615	6.59	0.605	2.70	--	--	--	--	--	--	--	--	--	--	0.000	0.00
Annual	1.309	1.01	0.551	5.79	0.389	3.86	1.223	1.59	0.363	2.39	0.580	1.41	0.024	7.92	0.002	15.33	0.000	0.00
U.S.-Poland Joint Venture Mothership																		
Jan.	0.407	2.11	NS	NS	--	--	--	--	--	--	0.004	2.05	--	--	--	--	--	--
Feb.	0.897	1.35	--	--	--	--	--	--	0.498	0.45	--	--	--	--	--	--	--	--
March	2.043	2.93	0.953	3.30	--	--	--	--	NS	NS	2.722	1.51	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sep.	--	--	0.086	5.07	--	--	1.948	2.10	--	--	0.179	7.29	0.716	6.59	--	--	--	--
Oct.	--	--	NS	NS	--	--	0.000	0.00	--	--	0.192	3.66	0.554	5.08	--	--	--	--
Nov.	--	--	2.670	5.77	--	--	--	--	--	--	0.043	5.48	--	--	--	--	--	--
Dec.	0.038	11.36	1.148	3.12	0.327	2.88	0.532	1.44	--	--	0.068	2.78	--	--	--	--	0.000	0.00
Annual	0.886	2.32	0.719	4.72	0.327	2.88	0.754	1.73	0.498	0.45	0.210	3.06	0.638	5.96	--	--	0.000	0.00

Table 10.--Continued.

	Subarea 511		Subarea 513		Subarea 514		Subarea 515		Subarea 516		Subarea 517		Subarea 521		Subarea 522		Subarea 540	
	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.
U.S.-People's Republic of China Joint Venture Mothership																		
Jan.	0.212	2.18	--	--	--	--	--	--	--	--	0.000	0.00	--	--	--	--	--	--
Feb.	0.109	0.75	NS	NS	--	--	--	--	0.097	1.09	--	--	--	--	--	--	--	--
March	0.000	0.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sep.	--	--	0.024	5.26	NS	NS	--	--	--	--	NS	NS	--	--	--	--	--	--
Oct.	--	--	0.126	3.84	0.068	7.69	--	--	--	--	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Annual	0.154	1.62	0.053	4.31	0.068	7.69	--	--	0.097	1.09	0.000	0.00	--	--	--	--	--	--

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



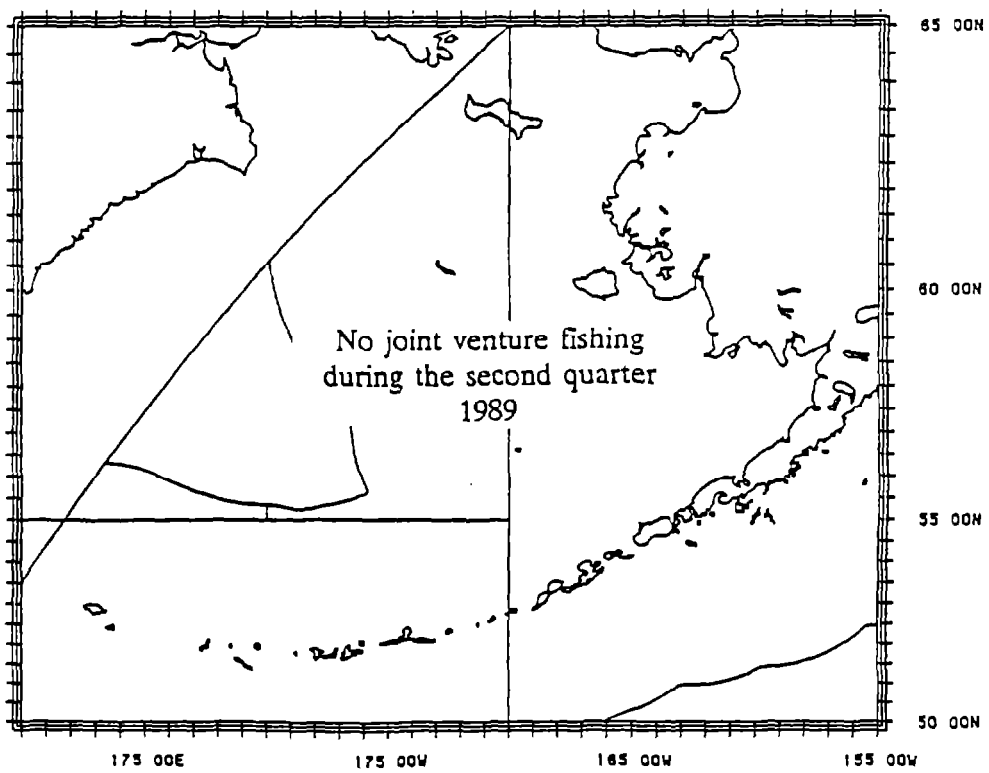
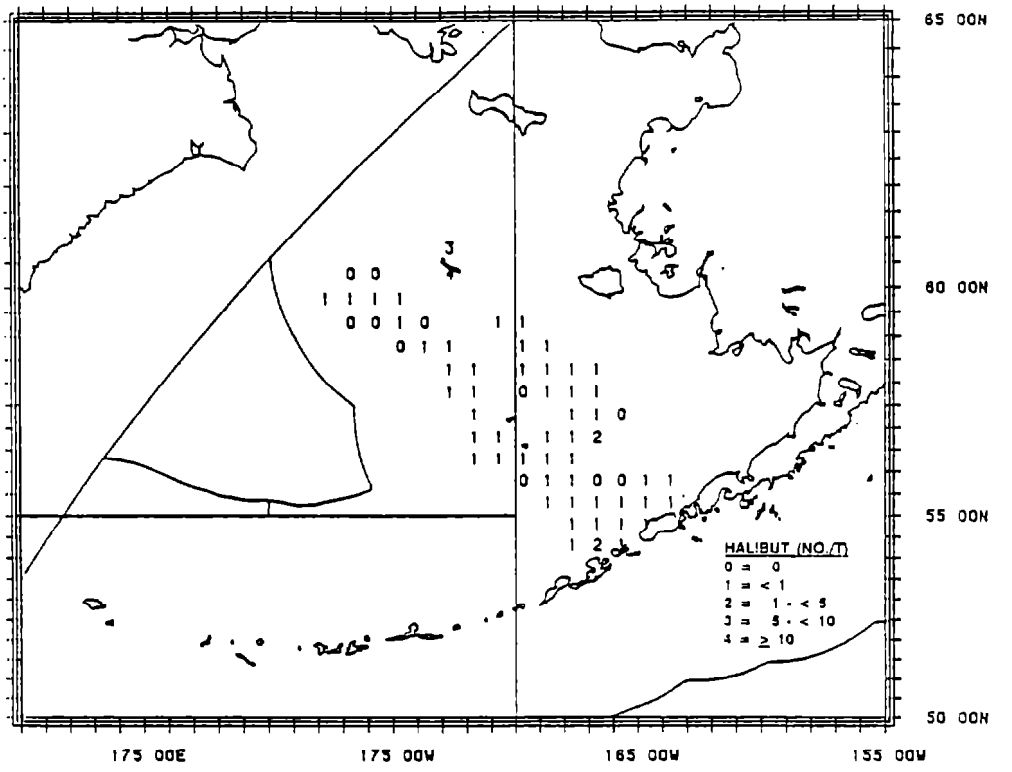
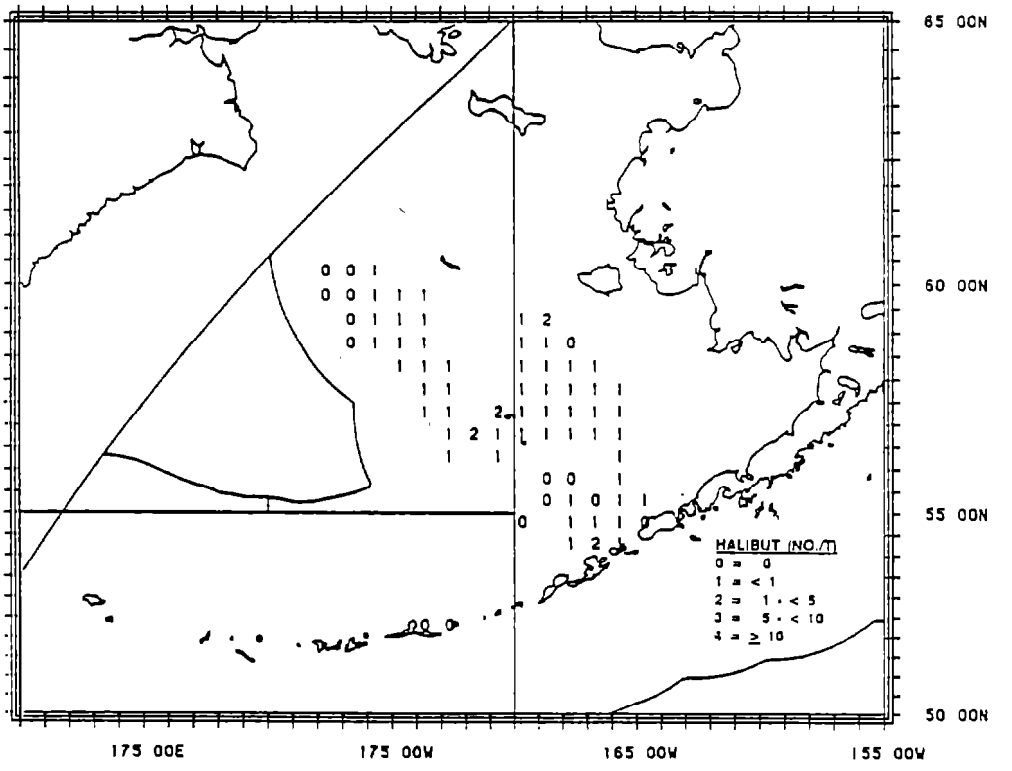


Figure 6.--Average incidence (no./t) of Pacific halibut in joint venture fisheries by quarter and l/2° latitude by 1° longitude areas, 1989.



HALIBUT INCIDENCE 89 THIRD QUARTER JOINT VENTURE VESSELS



HALIBUT INCIDENCE 89 FOURTH QUARTER JOINT VENTURE VESSELS

Figure 6.--Continued.

Table 11.--Estimated incidental catches of Pacific halibut fin numbers of fish and metric tons) by joint venture vessels in the Bering Sea and Aleutian Islands region, 1989.

	Number of fish									
	Subarea 511	Subarea 513	Subarea 514	Subarea 515	Subarea 516	Subarea 517	Subarea 521	Subarea 522	Subarea 540	Total
U.S.-Japan	76,239	31,627	2,734	100	10,114	57,191	6,410	10	0	184,425
U.S.-ROK	11,562	13,307	1,170	3,088	16,895	31,485	14,076	412	--	91,995
U.S.-Poland	745	1,945	162	1,052	921	2,380	2,425	--	0	9,630
U.S.-PROC	1,357	331	56	--	651	46	--	--	--	2,441
U.S.-U.S.S.R.	43,076	13,806	1,104	--	12,864	163,364	174	2,794	--	237,182
Total	132,979	61,016	5,226	4,240	41,445	254,466	23,085	3,216	0	525,673
Percent by area	25.3%	11.6%	1.0%	0.8%	7.9%	48.4%	4.4%	0.6%	0.0%	

	Weight (metric tons)									
	Subarea 511	Subarea 513	Subarea 514	Subarea 515	Subarea 516	Subarea 517	Subarea 521	Subarea 522	Subarea 540	Total
U.S.-Japan	66.1	69.4	6.6	0.2	18.5	72.4	58.9	0.2	0.0	292.3
U.S.-ROK	23.1	73.4	6.0	4.2	18.4	59.6	84.5	2.2	--	271.4
U.S.-Poland	1.7	9.0	0.4	1.8	0.8	6.3	14.0	--	0.0	34.0
U.S.-PROC	2.2	1.3	0.4	--	0.8	0.6	--	--	--	5.3
U.S.-U.S.S.R.	38.3	46.3	8.2	--	6.5	165.9	0.7	5.4	--	271.3
Total	131.4	199.4	21.6	6.2	45.0	304.8	158.1	7.8	0.0	874.3
Percent by area	15.0%	22.8%	2.5%	0.7%	5.1%	34.9%	18.1%	0.9%	0.0%	

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

Lines indicates area not fished.

Table 12-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, 1977-89*.

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
1989	NF	NF	525,673	874	525,673	874

* Estimated catches for years 1977-88 from Berger and Weikart (1989).

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, 1989.

Fishery	Zone	Groundfish catch (t)	Pacific Halibut nos.	Pacific Halibut t
Yellowfin sole and other flatfish	1	151223.8	126,908	127.7
	2	50,191.l	54,835	182.2
	3	20,350.7	8,019	27.0
Nonflatfish	1	18,986.l	47,517	48.6
	2	275,931.0	283,729	479.9
	3	168369.3	4,662	8.4

Table 14.--Incidence rate (number per metric ton of catch) and average weight (kg) of Tanner crab taken in joint venture catches in the Bering Sea and Aleutian Islands region, 1989. (Lines indicate areas not fished.)

	Subarea 511		Subarea 513		Subarea 514		Subarea 515		Subarea 516		Subarea 517		Subarea 521		Subarea 522		Subarea 540	
	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.
U.S.-U.S.S.R. Joint Venture Mothership																		
Jan.	1.004	0.24	NS	NS	--	--	--	--	--	--	0.318	0.16	--	--	--	--	--	--
Feb.	0.133	0.49	NS	NS	--	--	--	--	0.079	0.46	0.365	0.14	--	--	--	--	--	--
March	0.208	0.43	4.485	0.13	--	--	--	--	NS	NS	2.506	0.21	NS	NS	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sep.	--	--	7.410	0.16	9.359	0.16	--	--	--	--	--	--	--	--	2.528	0.14	--	--
Oct.	--	--	14.879	0.14	13.003	0.12	--	--	--	--	--	--	0.126	0.38	--	--	--	--
Nov.	--	--	9.939	0.14	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Annual	0.279	0.35	8.778	0.14	10.791	0.14	--	--	0.079	0.46	0.883	0.20	0.126	0.38	2.528	0.14	--	--
U.S.-Republic of Korea Joint Venture Mothership																		
Jan.	0.694	0.37	NS	NS	--	--	--	--	--	--	0.122	0.14	--	--	--	--	--	--
Feb.	0.209	0.53	NS	NS	--	--	0.067	0.04	0.101	0.48	0.957	0.16	--	--	--	--	--	--
March	0.614	0.44	--	--	--	--	--	--	0.006	1.06	1.153	0.16	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sep.	--	--	2.130	0.23	6.096	0.14	NS	NS	--	--	0.385	0.23	0.911	0.15	3.031	0.10	--	--
Oct.	NS	NS	8.825	0.18	4.036	0.14	0.000	0.00	--	--	0.008	0.10	1.447	0.15	--	--	--	--
Nov.	--	--	11.676	0.16	--	--	--	--	--	--	0.003	0.15	31.393	0.19	--	--	--	--
Dec.	--	--	3.936	0.23	2.354	0.10	--	--	--	--	--	--	--	--	--	--	--	--
Annual	0.389	0.42	6.668	0.18	4.738	0.14	0.037	0.04	0.101	0.48	0.172	0.18	1.124	0.15	3.031	0.10	--	--

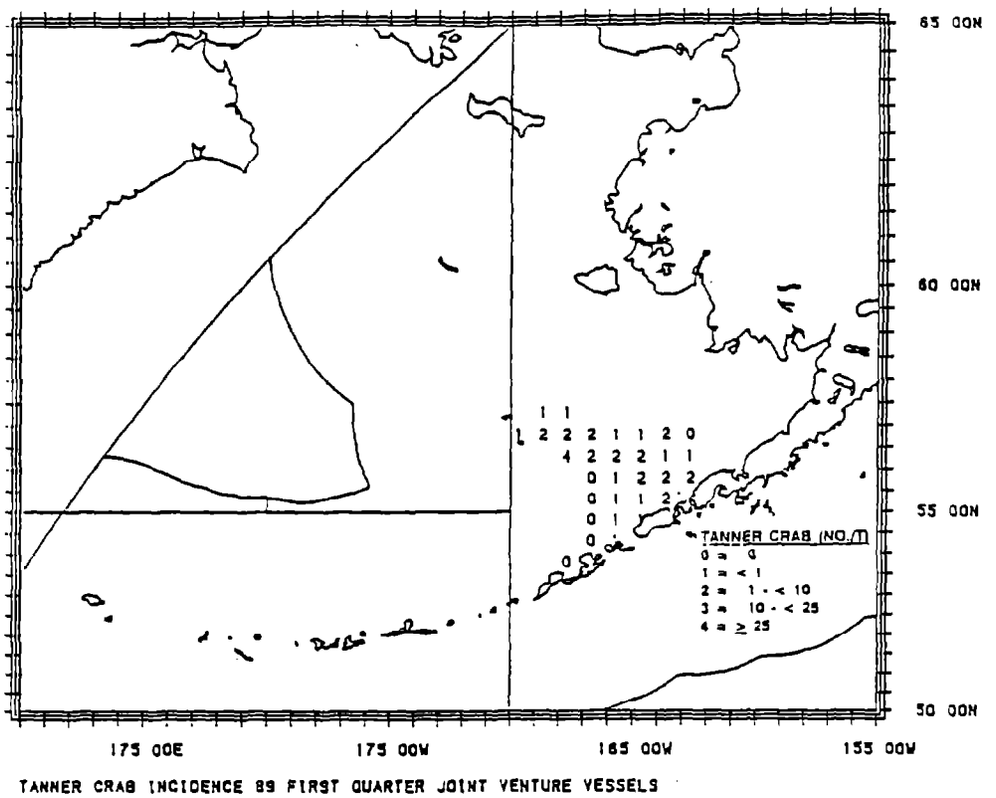
Table 14.--Continued.

	Subarea 511		Subarea 513		Subarea 514		Subarea 515		Subarea 516		Subarea 517		Subarea 521		Subarea 522		Subarea 540	
	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.
U.S.-Japan Joint Venture Mothership																		
Jan.	1.468	0.27	NS	NS	--	--	0.105	0.15	--	--	0.089	0.17	--	--	--	--	--	--
Feb.	1.181	0.31	NS	NS	--	--	--	--	0.474	0.43	1.984	0.13	--	--	--	--	--	--
March	2.809	0.28	11.509	0.23	--	--	--	--	0.311	0.55	13.177	0.25	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sep.	0.000	0.00	11.569	0.18	35.923	0.14	1.223	0.12	--	--	0.249	0.24	1.539	0.42	0.000	0.00	--	--
Oct.	--	--	16.664	0.18	19.716	0.14	--	--	--	--	0.017	0.14	3.771	0.21	1.001	0.31	--	--
Nov.	--	--	12.259	0.22	35.883	0.15	--	--	--	--	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00
Dec.	--	--	6.416	0.20	4.065	0.13	--	--	--	--	--	--	--	--	--	--	0.000	0.00
Annual	1.299	0.29	12.679	0.20	18.283	0.14	0.316	0.13	0.470	0.43	0.529	0.22	2.728	0.25	0.284	0.31	0.000	0.00
U.S.-Poland Joint Venture Mothership																		
Jan.	2.471	0.44	NS	NS	--	--	--	--	--	--	0.000	0.00	--	--	--	--	--	--
Feb.	3.445	0.47	--	--	--	--	--	--	0.276	0.56	--	--	--	--	--	--	--	--
March	3.578	0.30	13.456	0.21	--	--	--	--	NS	NS	6.077	0.27	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sep.	--	--	8.269	0.27	--	--	1.009	0.07	--	--	4.773	0.20	7.587	0.11	--	--	--	--
Oct.	--	--	NS	NS	--	--	0.000	0.00	--	--	<0.001	0.25	23.378	0.09	--	--	--	--
Nov.	--	--	6.705	0.18	--	--	--	--	--	--	0.000	0.00	--	--	--	--	--	--
Dec.	0.000	0.00	4.053	0.14	5.096	0.11	0.000	0.00	--	--	0.000	0.00	--	--	--	--	0.000	0.00
Annual	2.771	0.41	10.373	0.22	5.096	0.11	0.197	0.07	0.276	0.56	1.069	0.22	14.876	0.10	--	--	0.000	0.00

Table 14.--Continued.

	Subarea 511		Subarea 513		Subarea 514		Subarea 515		Subarea 516		Subarea 517		Subarea 521		Subarea 522		Subarea 540	
	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. wt.
U.S.-People's Republic of China Joint Venture Mothership																		
Jan.	2.683	0.35	--	--	--	--	--	--	--	--	0.000	0.00	--	--	--	--	--	--
Feb.	0.071	0.45	NS	NS	--	--	--	--	0.114	0.48	--	--	--	--	--	--	--	--
March	0.047	0.21	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sep.	--	--	1.678	0.18	NS	NS	--	--	--	--	NS	NS	--	--	--	--	--	--
Oct.	--	--	4.236	0.14	5.783	0.11	--	--	--	--	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Annual	1.227	0.35	2.397	0.16	5.783	0.11	--	--	0.114	0.48	0.000	0.00	--	--	--	--	--	--

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



TANNER CRAB INCIDENCE 89 FIRST QUARTER JOINT VENTURE VESSELS

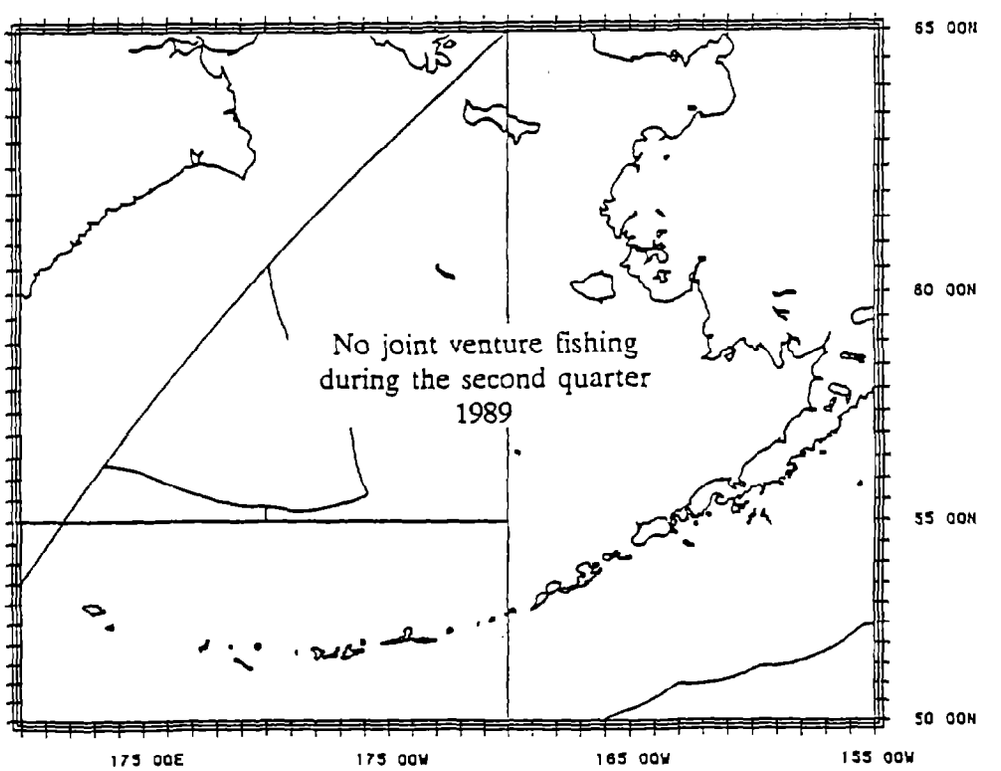
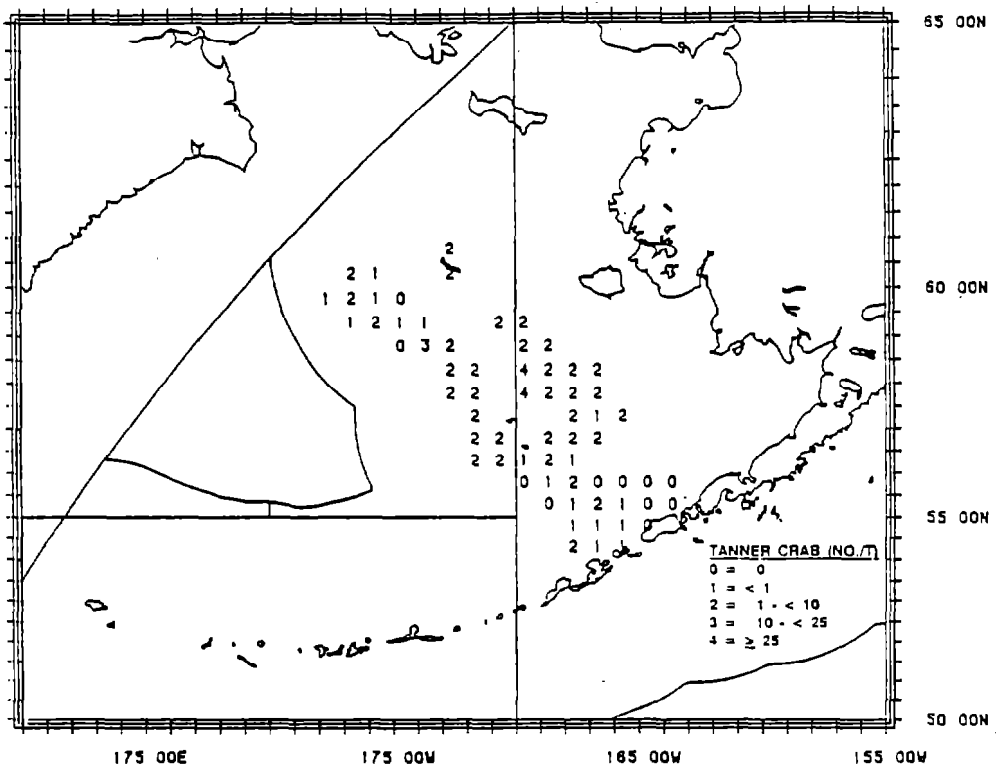
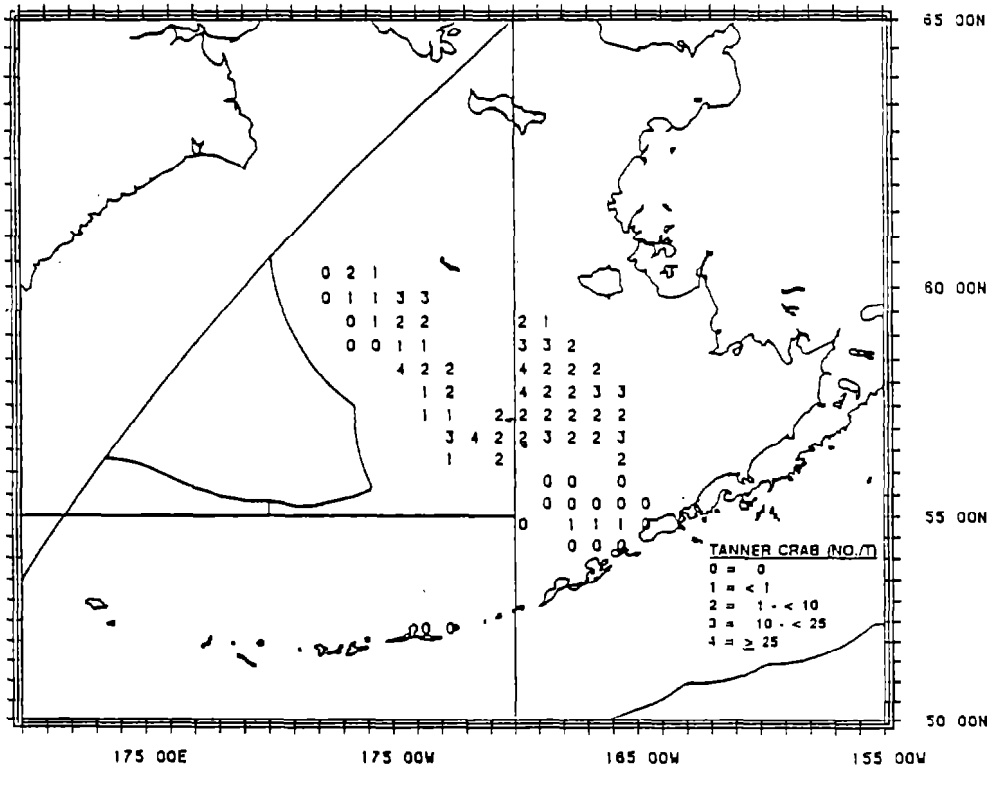


Figure 7.--Average incidence (no-/t) of Tanner crab in joint venture fisheries by quarter and l/2° latitude by 1° longitude areas, 1989.



TANNER CRAB INCIDENCE 89 THIRD QUARTER JOINT VENTURE VESSELS



TANNER CRAB INCIDENCE 89 FOURTH QUARTER JOINT VENTURE VESSELS

Figure 7.--Continued.

Table 15.-- Estimated incidental catches of Tanner crab (in numbers of fish and metric tons) by joint venture vessels in the Bering Sea and Aleutian Islands region, 1989.

	Number of crab									
	Subarea 511	Subarea 513	Subarea 514	Subarea 515	Subarea 516	Subarea 517	Subarea 521	Subarea 522	Subarea 540	Total
U.S.-Japan	59,717	242,590	80,605	405	11,050	55,054	459,198	30,840	0	939,459
U.S.-ROK	37,861	577,880	109,615	453	9,684	51,709	546,904	79,255	--	1,413,361
U.S.-Poland	4,442	34,956	14,976	203	756	21,515	66,186	--	0	143,034
U.S.-PROC	4,014	30,850	7,811	--	1,894	0	--	--	--	44,569
U.S.-U.S.S.R.	22,187	627,072	476,161	--	5,813	75,647	347	26,942	--	1,234,169
Total	128,221	1,513,398	689,168	1,061	29,197	203,875	1,072,635	137,037	0	3,774,592
Percent by area	3.4%	40.1%	18.3%	<0.1%	0.8%	5.4%	28.4%	3.6%	0.0%	

	Weight (metric tons)									
	Subarea 511	Subarea 513	Subarea 514	Subarea 515	Subarea 516	Subarea 517	Subarea 521	Subarea 522	Subarea 540	Total
U.S.-Japan	17.32	48.52	11.28	0.05	4.75	12.11	114.80	9.56	0.00	218.40
U.S.-ROK	15.90	104.02	15.35	0.02	4.65	9.31	82.04	7.93	--	239.20
U.S.-Poland	1.82	7.69	1.65	0.01	0.42	4.73	6.62	--	0.00	22.95
U.S.-PROC	1.40	4.78	0.86	--	0.91	0.00	--	--	--	7.96
U.S.-U.S.S.R.	7.77	87.79	66.66	--	2.67	15.13	0.13	3.77	--	183.93
Total	44.21	252.80	95.80	0.08	13.41	41.28	203.59	21.26	0.00	672.43
Percent by area	6.6%	37.6%	14.2%	<0.1%	2.0%	6.1%	30.3%	3.2%	0.0%	

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

Lines indicates area 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, 1977-89*.

	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
1989	NF	NF	3.8	672	3.8	672

* Estimated catches for years 1977-88 from Berger and Weikart (1989).

NF = no fishing.

Table 17.-GroundFish catch (in metric tons) and numbers of Tanner crab by species and zone caught by each joint venture fishery, 1989.

Fishery	Zone	Groundfish catch (t)	Chionoecetes bairdi nos.	Other Tanner crab nos.
Yellowfin sole and other flatfish	1	151,223.8	130,639	3,823
	2	50,191.1	453,968	959,580
	3	20,350.7	150,235	565,875
Nonflatfish	1	18,986.1	19,645	3,310
	2	275,931.0	155,538	1,220,822
	3	16,869.3	6,003	105,153

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, 1989.

Species	Percent by species	Sex	Sex composition	Average weight (kg)	Average width (cm)
Chionoecetes opilio	71.91	Male	65.37	0.20	75.0
		Female	34.63	0.08	58.9
		Unsexed		0.17	69.7
		Combined		0.16	69.5
Chionoecetes bairdi	28.08	Male	71.03	0.25	84.9
		Female	28.97	0.13	70.0
		Unsexed		0.20	72.5
		Combined		0.22	80.5
Chionoecetes angulatus	<0.01	Male	100.00	0.11	75.3
		Unsexed		0.13	76.6
		Combined		0.12	75.9
Chionoecetes tanneri	<0.01	Male	100.00	0.13	73.0

Table 19. Incidence rate (number per metric ton of catch) and average weight (kg) of king crab taken in joint venture catches in the Bering Sea and Aleutien Islands region, 1989. (Lines indicate areas not fished.)

	Subarea 511		Subarea 513		Subarea 514		Subarea 515		Subarea 516		Subarea 517		Subarea 521		Subarea 522		Subarea 540	
	Rate	Avg. ut.	Rate	Avg. ut.	Rate	Avg. wt.	Rate	Avg. ut.	Rate	Avg. ut.	Rate	Avg. wt.	Rate	Avg. ut.	Rate	Avg. wt.	Rate	Avg. ut.
U.S.-U.S.S.R. Joint Venture Mothership																		
Jan.	0.000	0.00	NS	NS	--	--	--	--	--	--	0.000	0.00	--	--	--	--	--	--
Feb.	0.313	1.57	NS	NS	--	--	--	--	0.199	1.71	0.000	0.00	--	--	--	--	--	--
March	0.141	1.54	<0.001	1.60	--	--	--	--	NS	NS	0.008	1.41	NS	NS	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sep.	--	--	0.008	1.76	0.008	1.29	--	--	--	--	--	--	--	--	1.868	0.48	--	--
Oct.	--	--	0.273	0.87	0.009	1.98	--	--	--	--	--	--	0.000	0.00	--	--	--	--
Nov.	--	--	0.004	1.35	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Annual	0.237	1.57	0.099	0.90	0.008	1.65	--	--	0.199	1.71	0.002	1.41	0.000	0.00	1.868	0.48	--	--
U.S.-Republic of Korea Joint Venture Mothership																		
Jan.	0.604	1.54	NS	NS	--	--	--	--	--	--	0.007	1.56	--	--	--	--	--	--
Feb.	0.498	1.55	NS	NS	--	--	0.000	0.00	0.276	1.76	0.000	0.00	--	--	--	--	--	--
March	0.440	1.27	--	--	--	--	--	--	0.003	1.65	0.000	0.00	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sep.	--	--	0.001	1.83	0.003	2.09	NS	NS	--	--	0.000	0.00	0.000	0.00	0.000	0.00	--	--
Oct.	NS	NS	0.325	0.84	0.028	3.00	0.000	0.00	--	--	0.000	0.00	0.002	0.54	--	--	--	--
Nov.	--	--	0.107	1.26	--	--	--	--	--	--	0.000	0.00	0.698	1.05	--	--	--	--
Dec.	--	--	0.399	0.94	0.013	1.48	--	--	--	--	--	--	--	--	--	--	--	--
Annual	0.535	1.54	0.160	1.01	0.008	2.10	0.000	0.00	0.276	1.76	0.003	1.56	0.001	0.94	0.000	0.00	--	--

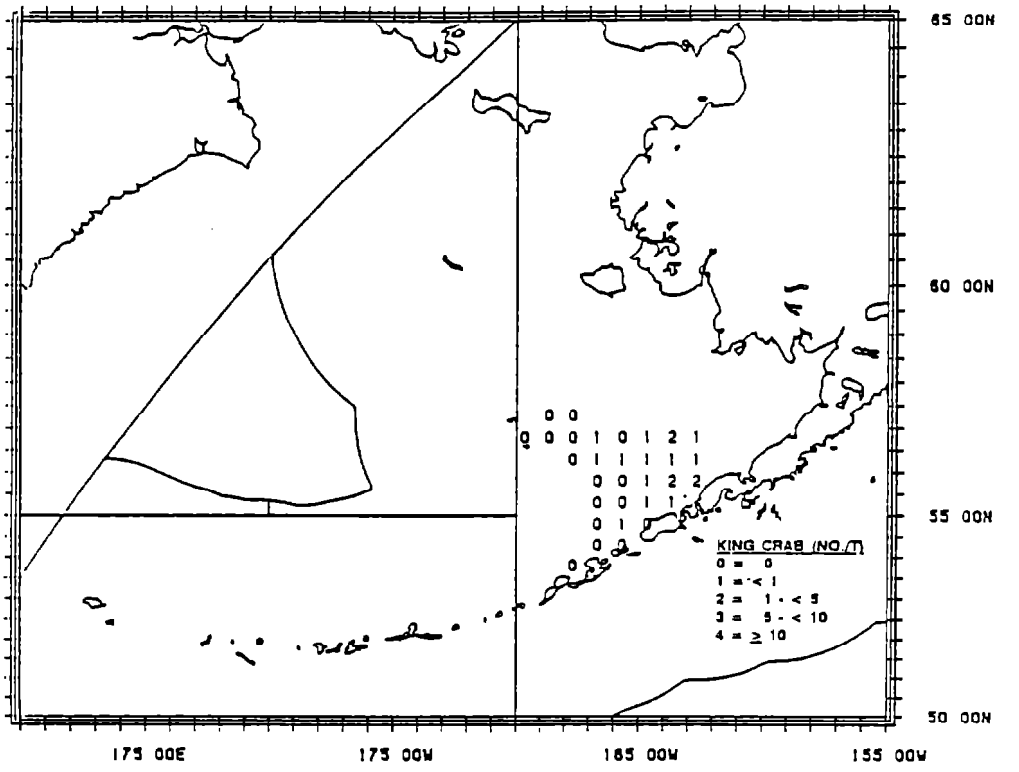
Table 19. --Continued.

	Subarea 511		Subarea 513		Subarea 514		Subarea 515		Subarea 516		Subarea 517		Subarea 521		Subarea 522		Subarea 540	
	Rate	Avg. ut.	Rate	Avg. wt.	Rate	Avg. ut.	Rate	Avg. ut.	Rate	Avg. wt.	Rate	Avg. ut.	Rate	Avg. wt.	Rate	Avg. ut.	Rate	Avg. ut.
U.S.-Japan Joint Venture Mothership																		
Jan.	1.098	1.39	NS	NS	--	--	0.000	0.00	--	--	0.000	0.00	--	--	--	--	--	--
Feb.	1.870	1.64	NS	NS	--	--	--	--	1.148	1.63	0.000	0.00	--	--	--	--	--	--
March	0.929	1.35	0.000	0.00	--	--	--	--	0.675	1.77	0.017	1.94	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sep.	0.000	0.00	0.011	1 48	0.008	1.78	0.000	0.00	--	--	<0.001	0.85	<0.001	2.20	0.000	0.00	--	--
Oct.	--	--	0.268	0.91	0.034	1.99	--	--	--	--	0.000	0.00	0.003	1.27	0.000	0.00	--	--
Nov.	--	--	0.045	1.85	0.000	0.00	--	--	--	--	<0.001	0.75	0.000	0.00	0.000	0.00	0.000	0.00
Dec.	--	--	0.085	2.06	0.016	2.23	--	--	--	--	--	--	--	--	--	--	0.000	0.00
Annual	1.400	1.56	0.100	1.17	0.020	2.04	0.000	0.00	1.147	1.63	0.001	1.79	0.002	1.27	0.000	0.00	0.000	0.00
U.S.-Poland Joint Venture Mothership																		
Jan.	1.765	1.53	NS	NS	--	--	--	--	--	--	0.000	0.00	--	--	--	--	--	--
Feb.	6.924	1.36	--	--	--	--	--	--	1.087	1.72	--	--	--	--	--	--	--	--
March	0.209	1.88	0.010	0.80	--	--	--	--	NS	NS	0.046	1.58	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sep.	--	--	0.000	0.00	--	--	0.008	0.14	--	--	0.000	0.00	0.000	0.00	--	--	--	--
Oct.	--	--	NS	NS	--	--	0.000	0.00	--	--	0.000	0.00	0.000	0.00	--	--	--	--
Nov.	--	--	0.028	1.78	--	--	--	--	--	--	0.000	0.00	--	--	--	--	--	--
Dec.	0.000	0.00	0.083	1.99	0.085	1.45	0.000	0.00	--	--	0.000	0.00	--	--	--	--	0.000	0.00
Annual	2.893	1.40	0.016	1.81	0.085	1.45	0.002	0.14	1.087	1.72	0.002	1.58	0.000	0.00	--	--	0.000	0.00

Table 19--Contiued.

	Subarea 511		Subarea 513		Subarea 514		Subarea 515		Subarea 516		Subarea 517		Subarea 521		Subarea 522		Subarea 540	
	Rate	Avg. ut.	Rate	Avg. wt.	Rate	Avg. wt.	Rate	Avg. ut.	Rate	Avg. ut.	Rate	Avg. ut.	Rate	Avg. ut.	Rate	Avg. ut.	Rate	Avg. ut.
U.S.-People's Republic of China Joint Venture Mothership																		
Jan.	1.791	1.47	--	--	--	--	--	--	--	--	0.000	0.00	--	--	--	--	--	--
Feb.	0.312	1.75	NS	NS	--	--	--	--	0.333	1.60	--	--	--	--	--	--	--	--
March	0.026	1.44	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sep.	--	--	0.000	0.00	NS	NS	--	--	--	--	NS	NS	--	--	--	--	--	--
Oct.	--	--	0.065	1.10	0.015	1.60	--	--	--	--	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Annual	0.966	1.52	0.018	1.10	0.015	1.60	--	--	0.333	1.60	0.000	0.00	--	--	--	--	--	--

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



KING CRAB INCIDENCE 89 FIRST QUARTER JOINT VENTURE VESSELS

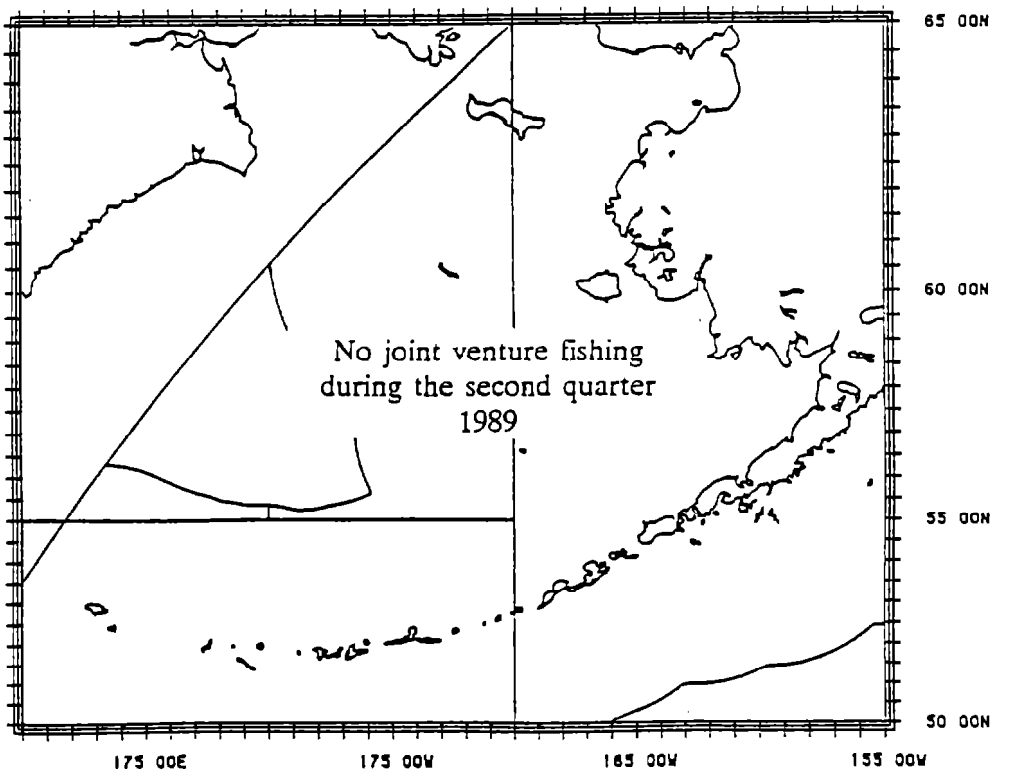
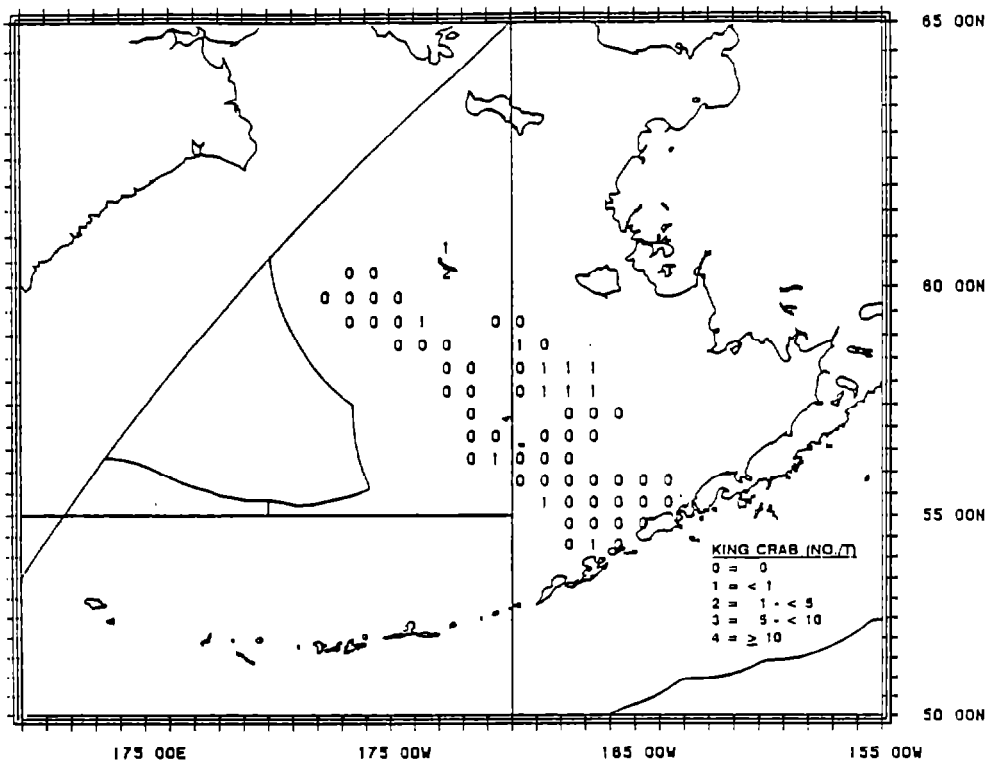
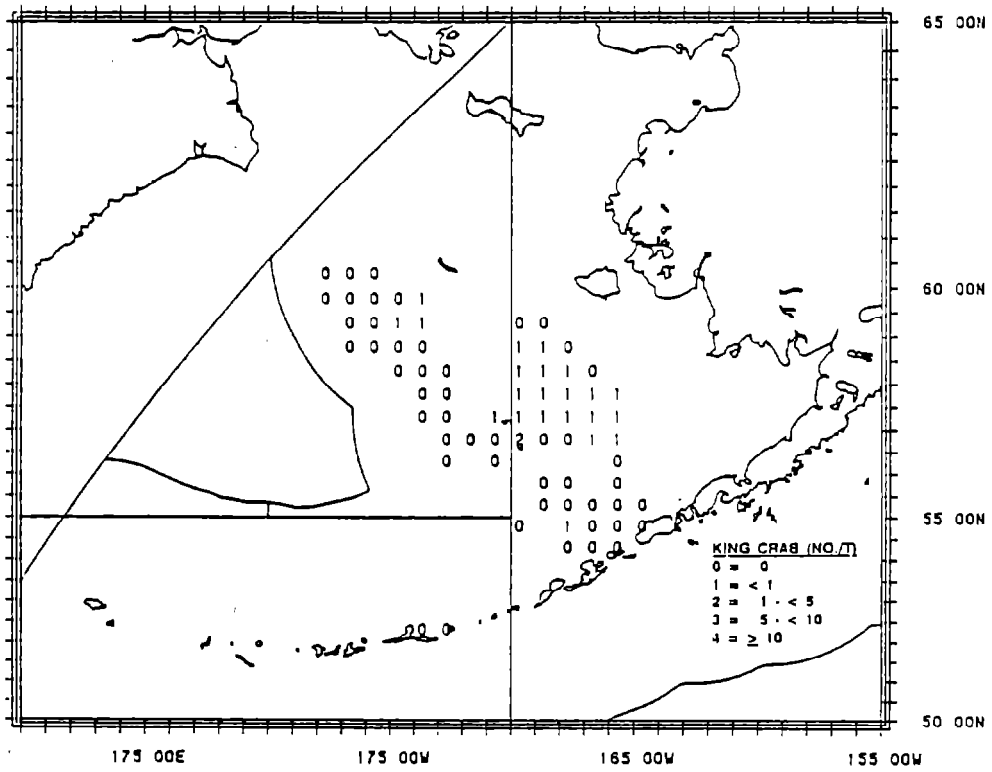


Figure 8..-Average incidence (no./t) of king crab in joint venture fisheries by quarter and l/2° latitude by 1° longitude areas, 1989.



KING CRAB INCIDENCE 89 THIRD QUARTER JOINT VENTURE VESSELS



KING CRAB INCIDENCE 89 FOURTH QUARTER JOINT VENTURE VESSELS

Figure 8.Continued.

Table 20.--Estimted incidental catches of king crab (in numbers of fish and metric tons) by joint venture vessels in the Bering Sea and Aleutian Islands region, 1989.

	Number of crab									
	Subarea 511	Subarea 513	Subarea 514	Subarea 515	Subarea 516	Subarea 517	Subarea 521	Subarea 522	Subarea 540	Total
U.S.-Japan	46,798	739	176	0	33,300	23	476	0	0	81,512
U.S.-ROK	41,303	11,091	124	0	27,032	3	33	0	--	79,586
U.S.-Poland	7,236	38	33	1	1,636	46	0	--	0	8,990
U.S.-PROC	4,056	2	14	--	3,668	0	--	--	--	7,740
U.S.-U.S.S.R.	7,644	13,998	175	--	7,596	193	0	269	--	29,875
Total	107,037	25,868	522	1	73,232	265	509	269	0	207,703
Percent by area	51.5%	12.5%	0.3%	<0.1%	35.3%	0.1%	0.2%	0.1%	0.0%	

	Weight (metric tons)									
	Subarea 511	Subarea 513	Subarea 514	Subarea 515	Subarea 516	Subarea 517	Subarea 521	Subarea 522	Subarea 540	Total
U.S.-Japan	73.00	0.86	0.36	0.00	54.28	0.04	0.60	0.00	0.00	125.15
U.S.-ROK	63.61	11.20	0.26	<0.01	47.58	<0.01	0.03	0.00	--	122.68
U.S.-Poland	10.13	0.07	0.05	0.00	2.81	0.07	0.00	--	0.00	13.13
U.S.-PROC	6.17	<0.01	0.02	--	5.87	0.00	--	--	--	12.06
U.S.-U.S.S.R.	12.00	12.60	0.29	--	12.99	0.27	0.00	0.13	--	38.28
Total	164.91	24.74	0.98	<0.01	123.53	0.39	0.64	0.13	0.00	315.30
Percent by area	52.3%	7.8%	0.3%	<0.1%	39.2%	0.1%	0.2%	<0.1%	0.0%	

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

Lines indicates area not fished.

Table 21.--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, 1977-89*.

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
1989	NF	NF	207,703	315	207,703	315

* Estimated catches for years 1977-88 from Berger and Weikart (1989).

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, 1989.

Fishery	Zone	Groundfish catch (t)	Red king crab nos.	Blue king crab nos.	Other king crab nos.
Yellowfin sole and other flatfish	1	151223.8	179,407	683	42
	2	50,191.l	22,145	3,899	144
	3	20,350.7	666	125	0
Nonflatfish	1	18,986.l	137	0	0
	2	275931.0	12	438	2
	3	16869.3	1	0	0

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, 1989.

Species	Percent by species	Sex	Sex composition	Average weight (kg)	Average length (mm)
Red	97.90	Male	66.66	1.75	132.5
		Female	33.34	0.90	105.8
		Unsexed		1.51	99.0
		Combined		1.46	123.2
Blue	2.05	Male	54.14	1.38	135.3
		Female	45.86	0.96	113.8
		Unsexed		1.80	137.7
		Combined		1.19	125.5
Golden	0.05	Male	53.75	0.35	87.7
		Female	46.25	0.38	84.7
		Unsexed		1.22	135.4
		Combined		0.46	92.2

Table 24.--Pacific herring catch statistics in the Bering Sea and Aleutian Islands groundfish fishery, 1977-89*.

	Pacific herring joint venture catch (1,000 t)	% of total joint venture catch	Pacific herring foreign catch (l,000 t)	% of total foreign catch
1977	NF	N-F	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
1989	2.5.	0.47	NF	NF

* Estimated catches for the years 1977-88 from Berger and Weikart (1989).

NF = No fishing.

Table 25.--The common and scientific names of rockfish identified in the 1989 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
Redstripe rockfish	Sebastes proriger
Rougheye rockfish	Sebastes aleutianus
Shortraker rockfish	Sebastes borealis
Other rockfish[b]	
Black rockfish	Sebastes melanops
Blackgill rockfish	Sebastes melanostomus
Canary rockfish	Sebastes pinniger
Harlequin rockfish	Sebastes variegatus
Shortspine thornyhead	Sebastolobus alascanus

[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 5 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 1989.

Common name	Area I		Area II		Area IV		Total	
	t	%	t	%	t	%	t	%
Dusky rockfish	0.42	1.43	1.70	7.97	0.00	0.00	2.12	4.18
Northern rockfish	4.34	14.79	7.66	35.90	0.00	0.00	12.00	23.65
Pacific ocean perch	24.00	81.87	7.20	33.74	0.08	87.83	31.29	61.66
Redstripe rockfish	0.01	0.02	1.88	8.81	0.00	0.00	1.88	3.70
Rougheye rockfish	0.40	1.37	2.90	13.59	60.01	1.60	3.30	6.50
Shortraker rockfish	0.13	0.44	0.00	0.00	0.01	10.57	0.14	0.27
Other rockfish*	0.02	0.07	0.00	0.00	0.00	0.00	0.02	0.04
Total	29.32		21.34		0.09		50.75	
Percent by area	57.78%		42.05%		0.17%			

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

Table 27.--Common and scientific names of flatfish identified in the 1989 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
Hybrid sole	Inopsetta ischyra
Kamchatka flounder	Atheresthes evermanni
Longhead dab	Limanda proboscidea
Rex sole	Glyptocephalus zachirus
Rock sole	Lepidopsetta bilineata
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 1989.

Common name	Area I		Area II		Area IV		Total	
	t	%	t	%	t	%	t	%
Alaska plaice	13,578.39	7.09	305.19	14.55	0.00	0.00	13,883.58	7.17
Arrowtooth flounder	1,398.93	0.73	875.95	41.76	0.00	0.00	2,274.88	1.17
Bering flounder	6.44	<0.01	0.00	0.00	0.00	0.00	6.44	<0.01
Butter sole	69.87	0.04	0.00	0.00	0.00	0.00	69.87	0.04
Dover sole	0.49	<0.01	0.53	0.03	0.00	0.00	1.02	<0.01
English sole	2.88	<0.01	0.00	0.00	0.00	0.00	2.88	<0.01
Flathead sole	3,030.74	1.58	503.27	23.99	0.00	0.00	3,533.61	1.82
Greenland turbot	14.96	0.01	35.28	1.68	0.00	0.00	50.24	0.03
Hybrid sole	6.05	<0.01	0.00	0.00	0.00	0.00	6.05	<0.01
Kamchatka flounder	5.03	<0.01	14.22	0.68	0.00	0.00	19.26	0.01
Longhead dab	0.01	<0.01	3.86	0.18	0.00	0.00	3.87	<0.01
Rex sole	127.07	0.07	34.00	1.62	0.00	0.00	161.07	0.08
Rock sole	20,804.00	10.86	206.16	9.83	0.00	0.00	21,010.16	10.85
Starry flounder	1,137.03	0.59	3.11	0.15	0.00	0.00	1,140.14	0.59
Yellowfin sole	151,390.05	79.03	116.05	5.53	0.00	0.00	151,506.11	78.23
Total	191,571.55		2,097.63		0.00		193,669.18	
Percent by area	98.92%		1.08%		0.00%			

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

Catch Allocations

The joint venture fishery for Pacific whiting (Merluccius productus) received a quota of 207,000 t of Pacific whiting in 1989, the largest amount ever allocated to that fishery. A result of this allocation was that the foreign fishery did not receive an allocation in 1989 and did not fish.

In the Pacific whiting joint venture fishery, quotas are only set for Pacific whiting. Other species are only to be taken as bycatch; thus, limits For other species are established as a percentage of the Pacific whiting quota (Table 29). The percentage limitations apply to each 5,000 t of Pacific whiting received from U.S. vessels. If the retention limit of a species is reached prior to the receipt of 5,000 t of Pacific whiting, additional catches of that species are required to be discarded until 5,000 t of Pacific whiting are received. The retention limits allow U.S. fishery managers to maintain control over the bycatch of important commercial groundfish species taken in the Pacific whiting joint venture.

Observer Coverage **of** Fishing Fleets

Joint venture fishing operations for Pacific whiting off the Washington-Oregon-California (WOC) coast (Fig. 9) in 1989 occurred between 11 April and 24 June. Participating in joint venture fishing operations with U.S. fishermen were processing vessels from Poland, Japan, the U.S.S.R., the Republic of Korea, and the People's Republic of China. In the joint venture fishery, observers sampled a total of 2,312 days out of the 2,392 days foreign processors spent on the fishing grounds, providing a level of coverage of 96.7% (Table 30). The level of coverage in the joint venture fishery for 1988 was 95.1%.

Estimates of U.S. Joint Venture Catches

In 1989, the Pacific whiting joint venture fishery landed 204,243 t of groundfish, and Pacific whiting comprised 203,600 t (99.7%) of the total catch (Table 31). Of the bycatch taken, the majority was made up of rockfish (excluding Pacific ocean perch) and the group of species classified as "other fish."

The catch of Pacific whiting taken by the joint venture fishery in 1989 exceeded the 1988 total by 49.9% and **exceeded** by 30.6% the catch taken **by** the combined foreign and joint venture fisheries in 1987; previously, the 1987 combined catch had been the highest total taken since the inception of the MFCMA in 1977 (Table 32).

Figure 10 presents how the groundfish catch in the 1989 Pacific whiting joint venture fishery was distributed by area. The catches in the Eureka and Columbia areas accounted for 49 and 46%, respectively, of the total catch. The catches in the Vancouver and Monterey areas accounted for 4 and l%, respectively.

Incidence and Incidental Catch of Prohibited Species

Pacific Salmon and Steelhead

The incidence rates and average weights of salmon taken in the Pacific whiting joint venture fishery in 1989 are shown in Table 33 by joint venture nation, statistical area, and month. Due to the early closure of the fishery, incidence rates were lower in 1989 than in 1988. (Traditionally, the highest catch of salmon occurs in July and August.) Only the U.S.-R.O.K fishery in the Eureka area in June exceeded 0.100 salmon/t.

Figure 11 provides a summary by l/2° latitude and 1° longitude blocks of the incidence of salmon in the Pacific whiting joint venture fishery for 1989. The fishery experienced generally lower incidence rates than in 1988. The only block where it exceeded 0.100 salmon/t was at lat. . 44°00'N by long. 124°W (0.103 salmon/t). The highest rates occurred in the blocks near the mouth of the Columbia River, off the central coast of Oregon, and off the northern coast of California.

The estimated incidental catch of salmon in the Pacific whiting joint venture fishery in 1989 was 9,199 fish, or 24.9 t (Table 34). The catch represented a decrease of 34% from the catch taken in 19% (Table 35). In 1989, 59.4% of the salmon catch occurred in the Columbia area, 39.4% in the Eureka area, 0.8% in the Monterey area, and 0.4% in the Vancouver area.

Three species of salmon were identified by observers in 1989 (Table 36). Chinook salmon accounted for 98.33% of the incidental catch and had an average fork length of 56.6 cm. The remaining incidental salmon catch was composed of coho salmon (1.59%) and chum salmon (0.08%). No steelhead (0. mykiss, formerly known as Salmo gairdneri) were reported in 1989.

Pacific Halibut

As in previous years, the annual incidence of halibut was extremely low in the Pacific whiting joint venture fishery (Table 37). Rates ranged from 0.000 fish/t to 0.002 fish/t. The majority of the halibut catch occurred during May and June in the U.S.-U.S.S.R. fishery in the Columbia region (Table 38). However, despite the low incidence rate, the 110 halibut caught in 1989 was the second highest halibut catch by number and highest by weight taken by the joint venture fshery since its inception in 1978 (Table 39).

RockFish Catch by Species

Table 40 lists the 27 species of rockfish identified by observers in the Pacific whiting joint venture fshery in 1989. The rockfish catch was predominantly widow rockfish (Sebastes entomelas, 228 t) and yellowtail rockfish (S. flavidus, 181 t). Other species made up only 20 t of the catch (Table 41.) The catch of yellowtail rockfish occurred primarily in the Vancouver and Columbia areas, where it was the predominant rockfish species taken, accounting for 60 and 55%, respectively, of the rocklish catches in those two areas. Widow rockfish was the primary species taken in the Eureka and Monterey areas, accounting for 94 and 89%, respectively, of the rockfish catches in those two areas. A significant amount of widow rockfish was also caught in the Columbia area (42%) and the Vancouver area (37%).

In 1989, 429 t of rockfish (down 47% from 1988) were taken by the joint venture fishery. (This total includes catches of both retained and discarded rockfish.) The Columbia area yielded 56% of the rockfish catch. The catch of rockfish in the Vancouver area, where 4% of the groundfish catch was taken, accounted for 19% of the total rockfish catch. Conversely, only 16% of the rockfish catch occurred in the Eureka area, where 49% of the groundfish catch was taken. The Monterey area accounted for 1% of the groundfish catch and 9% of the rockfish catch.

Flatfish Catch by Species

Ten species of flatfish were identified by observers in the Pacific whiting joint venture fishery in 1989 (Table 42). The incidental catch of 81 t represented an increase of 108% over the catch taken in 1988, the second year in a row that the catch increased by over 100% from the previous year. Pacific sanddab (Citharichthys sordidus) was the predominant species taken, accounting for 99.57% (by weight) of the flatfish identified in 1989 (Table 43). The catch in the Columbia area accounted for 99.82% of flatfish catch.

Table 29.--Percentage limitations of by-catch species for the Pacific whiting joint venture fishery off the coasts of Washington, Oregon, and California for 1989.

Species	Percentage of Pacific whiting quota
Flounders	0.100
Jack mackerel (Trachurus symmetricus)	3.000
Pacific ocean perch	0.062
Rockfishes (excluding Pacific ocean perch)	0.738
Sablefish	0.173
Other species	0.500

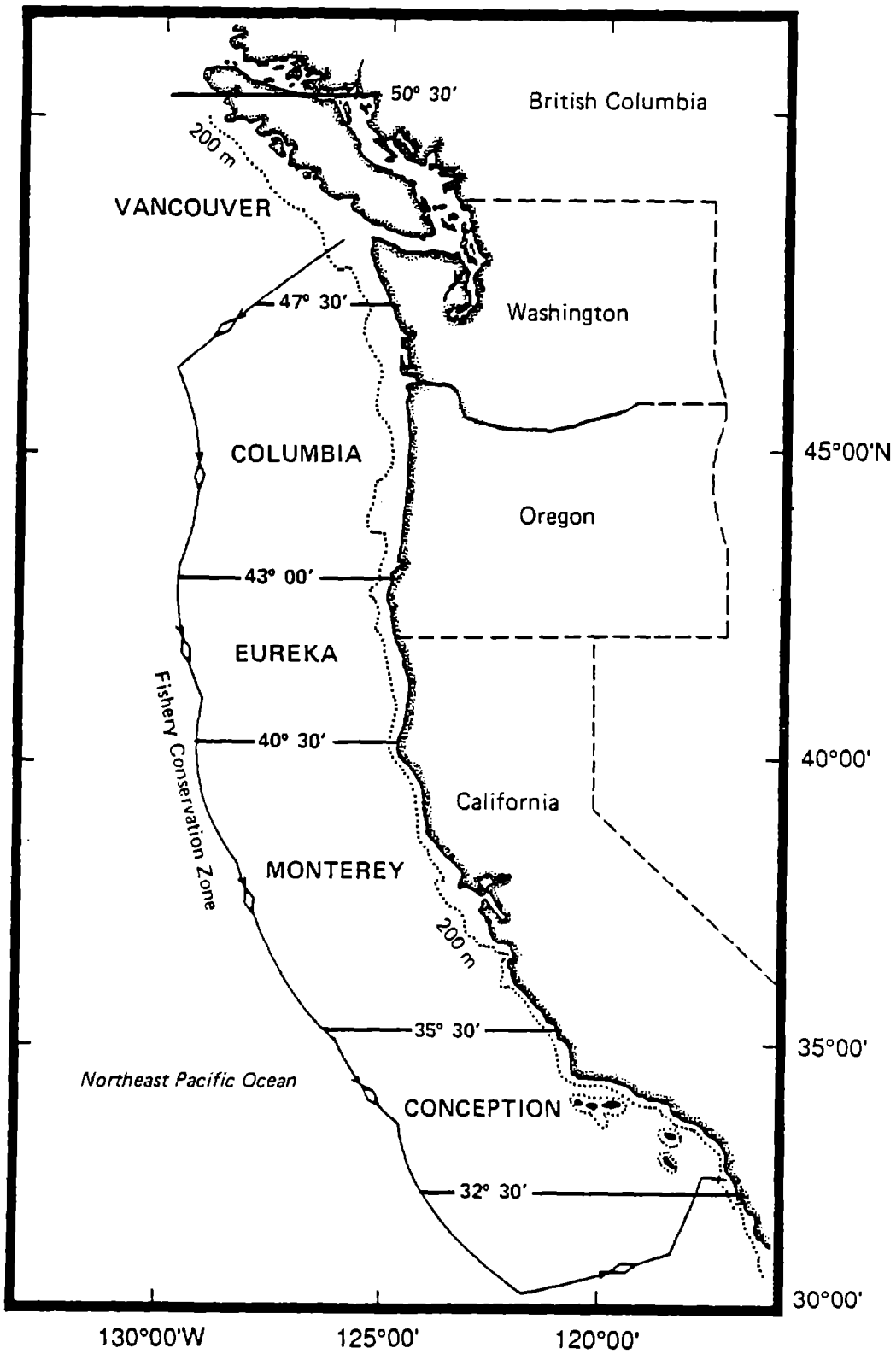


Figure 9.--U.S. statistical areas in the Washington-Oregon-California region.

Table 30.--Annual summary of observer effort, vessel effort, and observer, coverage (100 x observer days/vessel days) by nation and vessel class in the Pacific whiting joint venture fishery off Washington, Oregon, and California, 1989.

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.-Poland	Joint venture	14	13	13	578	595	97.1
U.S.-Japan	Joint venture	4	3	3	133	137	97.1
U.S.-U.S.S.R.	Joint venture	22	21	21	1,324	1,375	96.3
U.S.-ROK	Joint venture	1	1	1	18	20	90.0
U.S.-PROC	Joint venture	6	6	6	259	265	97.7
Total		47	44	44	2,312	2,392	96.7

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

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

Table 31.--Estimated catches of groundfish taken by joint venture vessels operating in the Pacific whiting fishery off Washington, Oregon, and California, 1989.

Species group	Retained (t)*	Discarded (t)	Total (t)	% of whiting catch
Pacific whiting	203,577.5		203,577.5	
Jack mackerel	4.5	7.5	12.0	<0.1
Rockfish (excluding Pacific ocean perch)	169.5	256.6	426.1	0.2
Pacific ocean perch	0.3	2.3	2.6	<0.1
Sablefish	2.2	6.4	8.6	<0.1
Flounders	7.8	73.0	80.8	<0.1
Other fish	10.8	125.0	135.8	0.1
TOTAL	203,772.6	470.8	204,243.4	

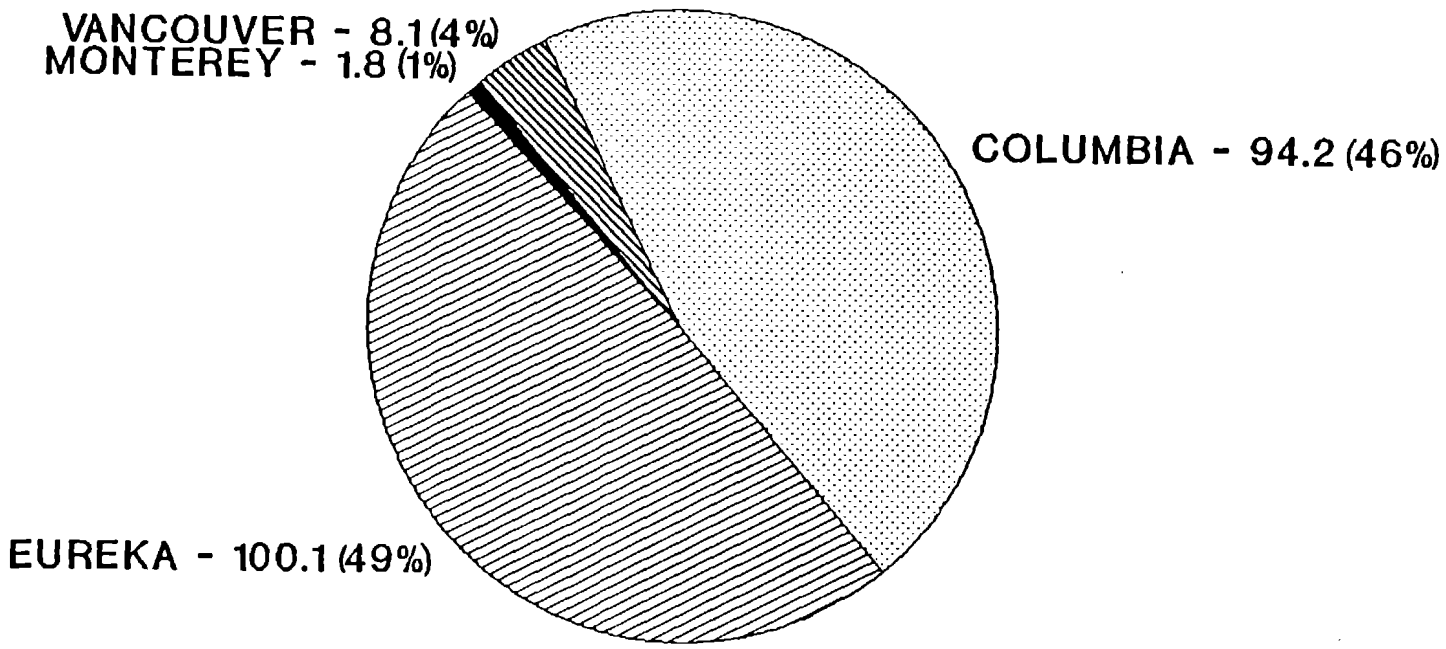
* See text for description of regulations pertaining to retention and discarding of joint venture catch.

Table 32.--Estimated catch of Pacific whiting by foreign and joint venture fisheries off Washington, Oregon, and California, 1977-89*.

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
1989	NF	203,578	203,578

* Estimates for years 1977-88 are from Berger and Weikart (1989).

NF = No fishing.



TOTAL GROUNDFISH CATCH, ALL AREAS-204.2

Figure 10.--Total joint venture groundfish catch in thousands of metric tons (% of total catch) along the Washington-Oregon-California coast, by subareas, 1989.

Table 33. --Incidences rates (number per metric ton of catch) and average weights (kg) of Pacific salmon by nation and area taken in the Pacific whiting joint venture fishery off the coasts of Washington, Oregon, and California, 1989. (Lines indicate areas not fished.)

	Vancouver		Columbia		Eureka		Monterey	
	Rate	Average weight	Rate	Average weight	Rate	Average weight	Rate	Average weight
U.S.-U.S.S.R. Joint Venture Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	0.046	2.11	0.016	3.43	--	--
May	0.006	3.32	0.088	2.28	0.006	1.93	--	--
June	--	--	0.044	2.06	0.049	3.49	--	--
July	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.006	3.32	0.071	2.23	0.027	3.43	--	--
U.S.-Republic of Korea Joint Venture Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	0.052	2.49	0.132	2.60	--	--
July	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	--	--	0.052	2.49	0.132	2.60	--	--
U.S.-Japan Joint Venture Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	0.005	1.56	0.067	2.42	0.049	7.14
June	--	--	0.073	2.10	0.017	4.51	0.009	2.48
July	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	--	--	0.032	2.05	0.044	2.81	0.017	3.68

Table 33.--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	--	--	0.037	2.22	--	--	--	--
May	0.001	5.70	0.025	3.11	--	--	--	--
June	0.009	3.95	0.051	2.43	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.005	4.03	0.035	2.72	--	--	--	--
U.S.-People's Republic of China Joint Venture Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	0.016	5.25	--	--
May	--	--	0.001	2.30	0.004	7.02	--	--
June	--	--	0.045	1.85	0.059	3.66	NS	NS
July	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	--	--	0.013	1.88	0.034	3.90	NS	NS

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

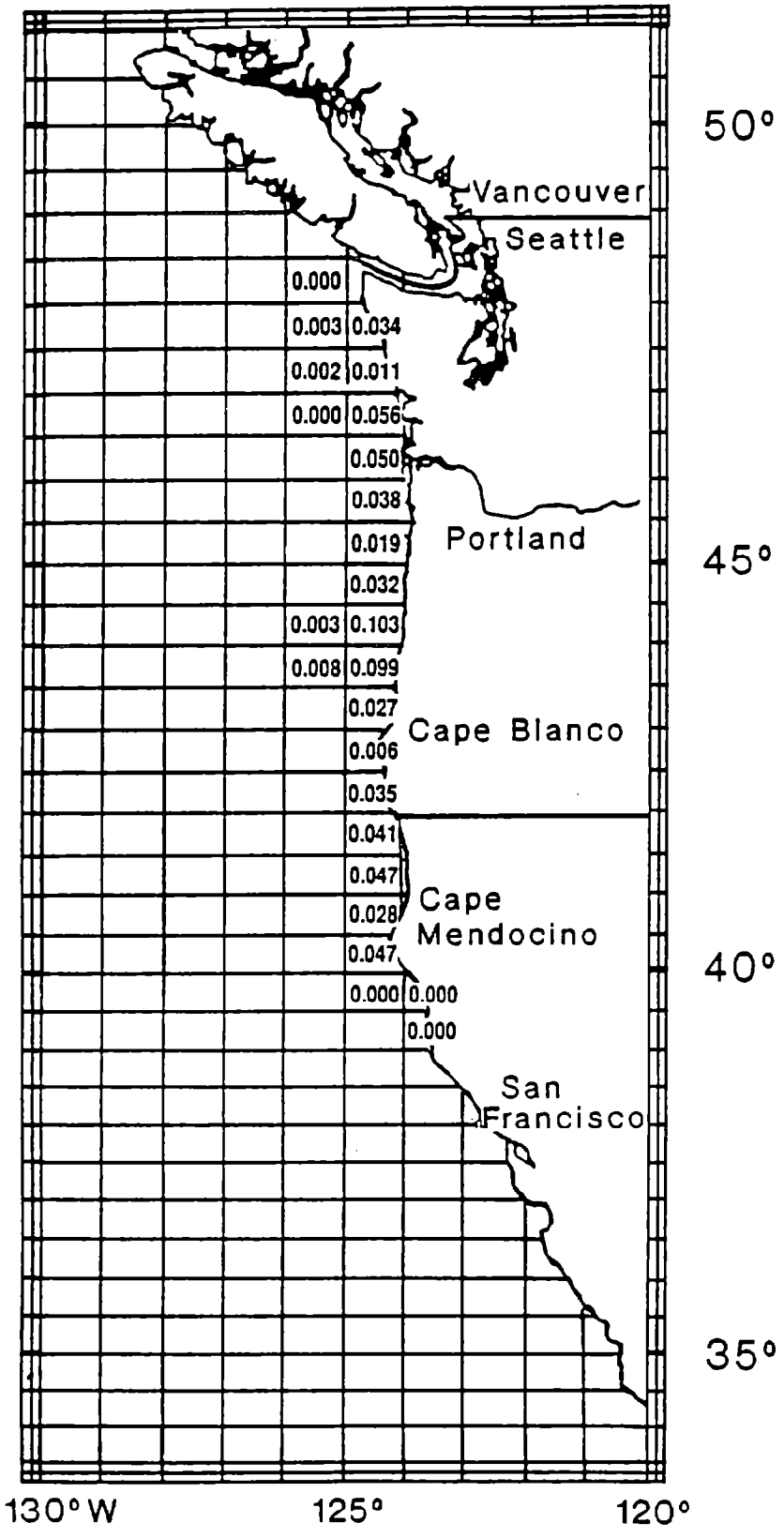


Figure 11.--Average incidence of sahnonids (no. of salmonids/t of groundfish) in the Pacific whiting joint venture fishery off the coasts of Washington, Oregon, and California, 1989.

Table 34..-Estimated incidental catch of Pacific salmon (numbers and tons) in the Pacific whiting joint venture fishery off Washington, Oregon, and California, 1989.

Month	Vancouver		Columbia		Eureka		Monterey		All areas	
	Nos.	t	Nos.	t	Nos.	t	Nos.	t	Nos.	t
Joint venture fishery--U.S.-Japan										
May	--	--	28	<0.1	1,554	3.8	19	0.1	1,601	3.9
June	--	--	153	0.3	662	3.0	55	0.1	870	3.4
TOTAL	--	--	181	0.4	2,216	6.7	74	0.3	2,471	7.4
Joint venture fishery--U.S.-Poland										
April	--	--	27	<0.1	--	--	--	--	27	<0.1
May	1	<0.1	692	2.2	--	--	--	--	693	2.2
June	30	0.1	518	1.3	--	--	--	--	548	1.4
TOTAL	31	0.1	1,237	3.5	--	--	--	--	1,268	3.6
Joint venture fishery--U.S.-U.S.S.R.										
April	--	--	142	0.3	228	0.8	--	--	370	1.1
May	4	<0.1	3,327	7.6	21	<0.1	--	--	3,352	7.6
June	--	--	528	1.1	495	1.7	--	--	1,023	2.8
TOTAL	4	<0.1	3,997	9.0	744	2.5	--	--	4,745	11.5
Joint venture fishery--U.S.-ROK										
June	--	--	25	0.1	182	0.5	--	--	207	0.5
TOTAL	--	--	25	0.1	182	0.5	--	--	207	0.5
Joint venture fishery--U.S.-PROC										
April	--	--	--	--	25	0.1	--	--	25	0.1
May	--	--	2	<0.1	15	0.1	--	--	17	0.1
June	--	--	22	<0.1	444	1.6	NS	NS	466	1.7
TOTAL	--	--	24	<0.1	484	1.9	--	--	508	1.9
All fisheries--TOTAL										
April	--	--	169	0.4	253	0.9	--	--	422	1.3
May	5	<0.1	4,049	9.8	1,590	3.9	19	0.1	5,663	13.8
June	30	0.1	1,246	2.8	1,783	6.8	55	0.1	3,114	9.8
TOTAL	35	0.1	5,464	12.9	3,626	11.6	74	0.3	9,199	24.9

Lines indicate areas not fished.

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

Table 35.--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, 1977.89*.

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
1989	NF	NF	9,199	24.9	9,199	24.9

* Estimated catches for years 1977-88 from Berger and Weikart (1989).

NF = No fishing.

Table 36--Biological data on the incidental catch of Pacific salmon (Oncorhynchus spp.) in the Pacific whiting joint venture fishery off Washington, Oregon, and California, 1989.

Species	Percent by species	Sex	Sex composition	Average weight (kg)	Average length (cm)
Chinook	98.33	Male	46.94	2.59	54.8
		Female	53.06	2.89	57.3
		Unsexed		1.88	62.5
		Combined		2.67	56.6
Coho	1.59	Male	55.49	2.02	54.0
		Female	44.51	2.11	53.9
		Combined		2.06	54.0
Chum	0.08	Male	56.71	1.51	48.2
		Female	43.29	1.71	52.7
		Combined		1.60	50.2

Table 37.--Incidence rates (number per metric ton of catch) and average weights (kg) of Pacific halibut by nation and area taken in the Pacific whiting joint venture fishery off the coasts of Washington, Oregon, and California, 1989. (Lines indicate areas not fished.)

	Vancouver		Columbia		Eureka		Monterey	
	Rate	Average weight	Rate	Average weight	Rate	Average weight	Rate	Average weight
U.S.-U.S.S.R. Joint Venture Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	0.000	0.00	0.000	0.00	--	--
May	0.001	5.42	0.001	8.71	0.000	0.00	--	--
June	--	--	0.001	7.46	<0.001	3.66	--	--
July	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.001	5.42	0.001	8.29	<0.001	3.66	--	--
U.S.-Republic of Korea Joint Venture Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	0.000	0.00	0.000	0.00	--	--
July	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	--	--	0.000	0.00	0.000	0.00	--	--
U.S.-Japan Joint Venture Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	0.000	0.00	0.000	0.00	0.000	0.00
June	--	--	0.000	0.00	0.000	0.00	0.000	0.00
July	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	--	--	0.000	0.00	0.000	0.00	0.000	0.00

Table 37. --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	--	--	0.000	0.00	--	--	--	--
May	0.000	0.00	0.001	9.44	--	--	--	--
June	0.000	0.00	0.001	10.98	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.000	0.00	0.001	10.27	--	--	--	--
U.S.-People's Republic of China Joint Venture Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	0.000	0.00	--	--
May	--	--	0.000	0.00	<0.001	3.10	--	--
June	--	--	0.000	0.00	0.002	14.20	NS	NS
July	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	--	--	0.000	0.00	0.001	12.97	NS	NS

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

Table 38.-Estimated incidental catch of Pacific halibut (numbers and tons) in the Pacific whiting joint venture fishery off Washington, Oregon, and California, 1989.

Month	Vancouver		Columbia		Eureka		Monterey		All areas	
	Nos.	t	Nos.	t	Nos.	t	Nos.	t	Nos.	t
Joint venture fishery--U.S.-Japan										
May	--	--	0	0.0	0	0.0	0	0.0	0	0.0
June	--	--	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
Joint venture fishery--U.S.-Poland										
April	--	--	0	0.0	--	--	--	--	0	0.0
May	0	0.0	7	0.1	--	--	--	--	7	0.1
June	0	0.0	10	0.1	--	--	--	--	10	0.1
TOTAL	0	0.0	17	0.2	--	--	--	--	17	0.2
Joint venture fishery--U.S.-U.S.S.R.										
April	--	--	0	0.0	0	0.0	--	--	0	0.0
May	2	<0.1	53	0.4	0	0.0	--	--	55	0.4
June	--	--	26	0.2	1	<0.1	--	--	27	0.2
TOTAL	2	<0.1	79	0.6	1	<0.1	--	--	82	0.6
Joint venture fishery--U.S.-ROK										
June	--	--	0	0.0	0	0.0	--	--	0	0.0
TOTAL	--	--	0	0.0	0	0.0	--	--	0	0.0
Joint venture fishery--U.S.-PROC										
April	--	--	--	--	0	0.0	--	--	0	0.0
May	--	--	0	0.0	1	<0.1	--	--	1	<0.1
June	--	--	0	0.0	10	0.2	NS	NS	10	0.2
TOTAL	--	--	0	0.0	11	0.2	--	--	11	0.2
All fisheries--TOTAL										
April	--	--	0	0.0	0	0.0	--	--	0	0.0
May	2	<0.1	60	0.5	1	<0.1	0	0.0	63	0.5
June	0	0.0	36	0.3	11	0.2	0	0.0	47	0.5
TOTAL	2	<0.1	96	0.8	12	0.2	0	0.0	110	1.0

Lines indicate areas not fished.

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

Table 39.--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, 1977-89".

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
1989	NF	NF	110	1.0	110	1.0

*Estimated catches for years 1977-88 from Berger and Weikart (1989).

NF = No fishing.

Table 40.--Common and scientific names of rockfish identified in the 1989 joint venture catches in the Washington, Oregon, and California region.

Common name[a]	Scientific name
Bocaccio	Sebastes paucisninis
Canary rock&h	Sebastes pinniger
Chilipepper	Sebastes poodei
Darkblotched rockfish	Sebas tes crameri
Pacific ocean perch	Sebastes alutus
Redstripe rockfish	Sebastes proriger
Shortbelly rockfish	Sebastes jordani
Splitnose rockfish	Sebastes diploproa
Stripetail rockfish	Sebastes saxicola
Widow rockfish	Sebastes entomelas
Yellowtail rockfish	Sebastes flavidus
Other rockfish[b]	
Black rockfish	Sebastes melanons
Blackgill rockfish	Sebastes melanostomus
Blue rockfish	Sebas tes mvs t inus
Greenstriped rockfish	Sebastes eloneatus
Pygmy rockfish	Sebastes wilsoni
Redbanded rockfish	Sebastes babcocki
Rosethorn rockfish	Sebastes helvomaculatus
Rosy rockfish	Sebastes rosaceus
Rougheye rockfish	Sebastes aleutianus
Sharpchin rockfish	Sebastes zacen trus
Shortraker rockfish	Sebastes borealis
Shortspine thornyhead	Sebastolobus alascanus
Silvergray rockfish	Sebastes brevispinis
Vermilion rockfish	Sebastes miniatus
Yelloweye rockfish	Sebastes ruberrimus
Yellowmouth rockfish	Sebastes reedi

[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 16 species listed under "Other rockfish" each made up less than 0.10% of the rockfish catch by joint venture operations.

Table 41.--Estimated catch of rockfish by species and area in the Pacific whiting joint venture fishery off the coasts of Washington, Oregon, and California in 1989.

Common name	Vancouver		Columbia		Eureka		Monterey		Total	
	t	%	t	%	t	%	t	%	t	%
Bocaccio	0.02	0.03	0.40	0.17	0.43	0.64	0.11	0.29	0.97	0.23
Canary rockfish	0.12	0.15	0.37	0.15	0.20	0.29	0.00	0.00	0.69	0.16
Chilipepper	0.00	0.00	1.13	0.47	0.69	1.01	2.06	5.26	3.88	0.91
Darkblotched rockfish	0.03	0.03	0.92	0.39	2.24	3.29	0.01	0.02	3.20	0.75
Pacific ocean perch	1.88	2.29	0.52	0.22	0.18	0.26	0.00	0.00	2.58	0.60
Redstripe rockfish	0.00	0.00	1.38	0.58	0.52	0.77	0.02	0.04	1.92	0.45
Shortbelly rockfish	0.00	0.00	2.94	1.23	0.93	1.37	0.11	0.29	3.99	0.93
Splitnose rockfish	0.05	0.05	0.47	0.20	0.44	0.65	0.00	0.00	0.96	0.22
Stripetail rockfish	0.00	0.00	0.00	0.00	1.09	1.60	0.00	0.00	1.09	0.25
Widow rockfish	30.84	37.42	99.95	41.81	60.67	89.16	36.73	93.92	228.19	53.24
Yellowtail rockfish	49.45	60.00	130.57	54.62	0.52	0.77	0.07	0.17	180.61	42.14
Other rockfish*	0.01	0.01	0.40	0.17	0.12	0.18	0.00	0.00	0.53	0.12
Total	82.41		239.05		68.05		39.11		428.62	
Percent by area	19.23%		55.77%		15.88%		9.12%			

* Species included in this category are listed in Table 40.

Table 42.--Common and scientific names of flatfish identified in the 1989 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
Pacific sanddab	Citharichthys sordidus
Petrale sole	Eopsetta jordani
Rex sole	Glyptocephalus zachirus
Slender sole	Lyopsetta exilis
Starry flounder	Platichthys stellatus

Table 43.--Etstimated catch of flatfish by species and area in the Pacific whiting joint venture fishery off the coasts of Washington, Oregon, and California in 1989.

Common name	Vancouver		Columbia		Eureka		Monterey		Total	
	t	%	t	%	t	%	t	%	t	%
Arrowtooth flounder	0.02	100.00	0.10	0.12	0.00	0.00	0.00	0.00	0.12	0.15
Butter sole	0.00	0.00	<0.01	<0.01	0.00	0.00	0.00	0.00	<0.01	<0.01
Dover sole	0.00	0.00	<0.01	<0.01	<0.01	0.07	0.00	0.00	<0.01	<0.01
English sole	0.00	0.00	<0.01	<0.01	0.07	58.91	0.00	0.00	0.07	0.09
Flathead sole	0.00	0.00	<0.01	<0.01	0.00	0.00	0.00	0.00	<0.01	<0.01
Pacific sanddab	0.00	0.00	80.46	99.76	<0.01	2.69	0.00	0.00	80.46	99.57
Petrale sole	0.00	0.00	<0.01	<0.01	0.00	0.00	0.00	0.00	<0.01	<0.01
Rex sole	0.00	0.00	0.10	0.12	0.05	38.26	0.00	0.00	0.15	0.19
Slender sole	0.00	0.00	<0.01	<0.01	<0.01	0.07	0.00	0.00	<0.01	<0.01
Starry flounder	0.00	0.00	<0.01	<0.01	0.00	0.00	0.00	0.00	<0.01	<0.01
Total	0.02		80.66		0.12		0.00		80.81	
Percent by area	0.02%		99.82%		0.15%					

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