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Biological Information on Pacific Salmon and Steelhead Trout in Observer Samples from the Japanese Squid Driftnet Fishery in 1990

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ABSTRACT

Biological samples and data from salmonids *Oncorhynchus* spp. collected in 1990 by Canadian, Japanese, and U.S. observers on board Japanese squid driftnet vessels in the North Pacific Ocean (south of 46°N, between 170°E and 145°W) in June-October were analyzed. Coho *O. kisutch* and chum *O. keta* salmon predominated in the samples, and sockeye *O. nerka*, pink *O. gorbuscha*, and chinook *O. tshawytscha* salmon and steelhead trout *O. mykiss* were present in low numbers. The majority of sockeye salmon and steelhead trout in the samples were taken in the eastern region of the fishery area (east of 170°W), and the majority of chum, pink, coho, and chinook salmon were taken in the western region (west of 170°W). The largest samples of chum and coho salmon were taken in July, and the largest samples of the other species were taken in August. Based on previously published information, the fish were distributed well south of areas of known concentrations of salmonids in the central and eastern North Pacific Ocean. Previous analyses of research vessel data indicated that all of the species might be present in low abundance in or near the area of the fishery. Coho salmon are distributed farther south than the other species, and may be more susceptible to interception by the fishery. Sea surface temperatures at the beginning of fishing operations that caught salmonids were close to or exceeded the maximum or upper range of temperatures previously reported for these species in the North Pacific Ocean.

By species, age 1.2 sockeye, age 0.3 chum, age 0.1 pink, age 2.1 coho, ages 1.2 and 1.3 chinook salmon, and ages 1.1 and 1.2 steelhead trout predominated in the samples. The majority of sockeye, chum, pink, and coho salmon, and steelhead trout were maturing fish. Most chinook salmon were probably immature. Because the samples included a high proportion of maturing fish that were caught relatively late in the season, the fish in the samples were generally in the upper range of sizes for salmonids in offshore waters. Males were the predominant sex.

Information from previous tagging studies indicates that in the western region, where most samples were taken, the Pacific salmon are likely a mixture of Asian (U.S.S.R. and Japan) and western Alaska stocks. In the eastern region, where few samples were taken, North American salmonids from a broad range of stocks (Alaska, British Columbia, and U.S. Pacific Northwest, south to at least the Columbia River Basin) likely predominate. The steelhead trout in the samples are likely all of North American origin, and include both hatchery and wild fish. In the eastern region, tag recovery information from a previous study and from the 1990 fishery indicates that inland summer-run steelhead from the Columbia River Basin are distributed farther to the south than other seasonal races and regional groups of steelhead, and, therefore, may be more susceptible than other groups of steelhead trout to interception by the squid driftnet fishery.

INTRODUCTION

Cooperative observer programs established in 1989 by Canada, Japan, and the United States are providing new biological information on Pacific salmon and steelhead trout *Oncorhynchus* spp. caught by the Japanese driftnet fishery for flying squid *Ommastrephes bartrami*; Int. N. Pac. Fish. Comm. 1990, 1991). These data are essential to the assessment of the effect of the squid driftnet fishery on salmonid resources of the North Pacific Ocean.

In this paper, we analyze samples and biological data collected by Canadian, Japanese, and U.S. observers aboard Japanese commercial squid driftnet vessels in 1990 (Int. N. Pac. Fish. Comm. 1991). Information on spatial and temporal distribution of fish, sea surface temperature at the beginning of each fishing operation, and age, maturity, size, and sex of fish in the samples is presented by species and compared to previously published information. Continent or region of origin of salmonids in the samples is inferred from catch location, known ocean ranges of major stocks, age and maturity of fish, and focal resorption of scales.

MATERIALS AND METHODS

Sample and Data Collection

Biological sampling was conducted by 10 Canadian, 29 Japanese, and 35 U.S. observers aboard 75 Japanese commercial squid driftnet vessels in June-December 1990 (Int. North Pac. Fish. Comm. 1991). The main objective of the 1990 observer program was to enumerate the catch of squid and bycatch of all non-target species. Sampling of salmonids by observers for scales and other biological information was opportunistic.

U.S. observers were provided with gummed cards for mounting scale samples. A form on the back of the card included spaces for entering biological data (species, fish length, sex, and gonad weight) and sample identification information (vessel name, vessel license number, operation, net section, and scale card number). Observers collected up to five scales per fish from the point on an imaginary line drawn from the posterior edge of the dorsal fin to the anterior edge of the anal fin, one or two scale rows above or below the lateral line. Fish length was measured as the straight line length in millimeters from the tip of the snout to the fork in the tail (TSFT). Sex was determined by visual examination of gonads. Gonad weight in grams was measured only by those observers equipped with balances. Procedures used by Canadian and Japanese observers were similar to those used by U.S observers.

Observers were instructed to conduct biological sampling for salmonids from monitored net sections only. However, some observers sampled salmonids from net sections that were not intended to be monitored. Observers also sometimes collected length and other biological data from fish that were not sampled for scales. These data were not included in our analyses.

Sample and Data Processing

Scale samples and biological data collected by U.S. observers were processed at the University of Washington, School of Fisheries, Fisheries Research Institute (FRI). Processing involved making acetate impressions of U.S. observer scale cards in a heated scale press (5,000 psi at 100°C for approximately 3 minutes), examining the scales to determine species and age (see description below), and entering the biological data and sample identification information into a computer data form. Duplicate sets of acetate impressions of scales and computer listings of biological data collected by U.S. observers were provided to the U.S. National Marine Fisheries Service (NMFS), the Canadian Department of Fisheries and Oceans (CDFO), and the Fisheries Agency of Japan (FAJ).

The Canadian and Japanese observer samples were initially processed by CDFO and FAJ, respectively. Acetate impressions of scale samples and computer listings of biological data (including species and age determinations by CDFO and FAJ biologists) were provided by these agencies through NMFS to FRI. At FRI, Canadian and Japanese biological and sample identification information were entered into the same computer data form that was used for U.S. observer samples, and the acetate impressions of scales collected by Canadian and Japanese observers were reexamined to determine species and age using the same criteria that were used for the U.S. samples.

Additional data on catch location (vessel location at the beginning of a fishing operation), catch date (date at the start of net retrieval), and sea surface temperature (SST, temperature (°C) at the beginning of a fishing operation) were provided to FRI by NMFS, and were coded onto the computer data forms.

Species and Age Determination

Species and age were determined for all Canadian, Japanese, and U.S. samples by viewing acetate impressions of scales at 40-100x on a microfiche reader. Well-established visual criteria, described by Koo (1962a), Bilton et al. (1964), and Mosher (1969), were used to determine species from scales. The few differences among CDFO, FAJ, and FRI scale biologists in species determinations from scales were due mostly to coding errors on computer data forms, and all differences were resolved by mutual agreement among the agencies prior to final analysis.

Age was determined by counting the number of freshwater and ocean annuli (groups of closely spaced, narrow, discontinuous, or broken circuli formed annually in the winter or spring) on the scales, and was designated by the European method, in which the number of freshwater annuli is separated from the number of ocean annuli by a decimal point (Koo 1962b). For example, an age 2.3 fish spent two winters in freshwater after emergence and three winters in the ocean. Scales that were regenerated or otherwise unreadable were not included in final age composition estimates.

Differences in some age determinations by FRI, CDFO, and FAJ biologists indicated that criteria for age determination varied slightly from laboratory to laboratory. Because there were only two fish of known age in the 1990 samples (both coded-wire tagged steelhead), validation of age determinations was not usually possible. To ensure consistency in our results, all age determinations reported in this paper are those made by FRI biologists.

Distribution

Figures showing the distribution of the samples by species, month, and geographic location were plotted using the DISSPLA software mapping package on the VAX computer at the University of Washington, Academic Computer Center. In these figures, salmon catch locations were rounded to the nearest degree of longitude and latitude, and samples from adjacent 1° x 1° areas were sometimes pooled.

Maturity Determination

Maturity was inferred from information on species, age, sex, gonad size, and month of capture. Most coho and pink salmon mature after one winter at sea, therefore, we assumed that all coho and pink salmon with one ocean annulus on their scales were maturing fish. Methods that incorporate seasonal change in gonad development (weight) were used to estimate the maturity of other species of salmonids. For chum and sockeye salmon, we used Takagi's (1961) technique (based on histological work performed by Ishida et al. 1961) and Godfrey's (1961) technique (based on the ratio of gonad weight to total body weight). Maturity of chinook salmon was determined using criteria compiled by Ito et al. (1974), which are based on the methods applied by Ishida and Miyaguchi (1958). Data on gonad weight compiled by Okazaki (1984) were used to determine maturity of steelhead.

Continent or Region of Origin

Continent or region of origin of salmonids in the samples was inferred from information on known ocean ranges of major stocks, age and maturity of fish, and focal resorption of scales.

Known ocean ranges of major stocks

Information on known ocean ranges of major stocks of salmonids was derived primarily from tag recovery data. The International North Pacific Fisheries Commission (INPFC) reports annually on the extent of ocean ranges of stocks of Pacific salmon and steelhead as determined by tagging. We used information from two tag recovery databases: (1) the INPFC tag recovery database, which includes all recoveries from 1956 through 1990 of salmon and steelhead that were tagged with external tags on the high seas, and (2) the coded-wire tag (CWT) database, which includes all recoveries of coded-wire tagged salmonids from 1980 through 1990 in catches by the Japanese high seas salmon fisheries, by salmon research vessels on the high seas, by foreign and domestic groundfish vessels, and by Canadian experimental squid fishing operations. The INPFC tag recovery database is archived at FRI, and the CWT database is archived at NMFS, Alaska Fisheries Science Center, Auke Bay Laboratory. Known ranges of Asian and North American salmonids as determined by recoveries of INPFC and CWT tagged fish were plotted (within 1° latitude by 1° longitude) using the World Data Bank II database and mapping package (AMP) on the University of Washington's CYBER computer (Myers et al. 1990).

Focal resorption of scales

Focal resorption of scales has been proposed as a character that might be useful in identifying continent of origin of chum salmon caught on the high seas (Bigler 1988, 1989). Focal resorption occurs as a result of osteoclastic cells resorbing the fibrous and calcified layers of the scale. The damage results in a hole in the scale. "Focal" refers to the fact that damage is usually confined to the first annual growth zone on the scale. In chum salmon, Bigler found that focal scale resorption occurs almost exclusively among fish originating in Japan and the Soviet Union. Focal resorption sites in chum salmon scales usually consist of several holes surrounding the main focal resorption area, and frequently involve both the calcified and fibrous layers. Bigler noted that focal resorption might be dismissed as tissue, debris, or regeneration when acetate impressions of scales are used. Therefore, if there was only one focal hole or the hole involved only the calcified layer, we analyzed the shape of the hole. Holes caused by resorption were tattered, irregular, and multilevel in appearance, whereas glue or debris on the scale had a more regular, rounded, and smooth appearance. In the database, "1" was used to indicate chum salmon that had one or more scales with focal resorption, and "0" was used for fish did not have focal resorption of scales (see HLS column, Appendix Table 2).

RESULTS AND DISCUSSION

Analysis of scale samples collected by U.S. observers showed a high proportion of species identification errors (52% identified incorrectly or unidentified, Table 1). The most common errors were chum salmon *O. keta* identified as coho salmon *O. kisutch* (n=59), coho salmon identified as chinook salmon *O. tshawytscha* (n=65), and coho salmon identified as chum salmon (n=25). Because of the high rate of species identification errors in the U.S. observer samples, only data from salmonids that we were able to identify to species by examination of scales were used in our analyses. The final salmonid biological database, including Canadian (n=108 fish), Japanese (n=145 fish), and U.S. (n=468 fish) observer samples, totalled 721 fish, and included samples collected aboard 49 vessels from June-October. Length was recorded by observers for 92% of the fish (n=660), sex for 71% of the fish (n=515), and gonad weight for only 8% of the fish (n=55).

The biological data are presented by species in Appendix Tables 1-6. Vessel locations at the beginning of fishing operations were coded to 1°-latitude by 1°-longitude using the INPFC convention (latitude and longitude in the lower left hand corner of 1° x 1° squares), dates at the start of net retrieval were summarized by month and 10-day period, and data were sorted by date and location (east to west and north to south).

Species Composition

The samples included six species: sockeye *O. nerka*, chum, pink *O. gorbuscha*, coho, and chinook salmon, and steelhead trout *O. mykiss*. Coho salmon predominated in the samples (68%, 494 fish) followed in decreasing order by chum salmon (23%, 165 fish), pink salmon (18 fish), steelhead trout (18 fish), chinook salmon (14 fish), and sockeye salmon (12 fish).

CDFO, FAJ, and NMFS used the results of identification of species by scales to decide whether or not to accept an observer's species identification or to assign an individual fish to the category "unknown" in cases where scales were not collected by observers (Int. North Pac. Fish. Comm. 1991). Using this method, CDFO, FAJ, and NMFS determined that of the total number of salmonids observed in 1990 (9,747 fish) there were 1,933 chum, 1,402 coho, 22 pink, 18 steelhead, 17 chinook, 12 sockeye, and 6,343 unidentified salmonids. Therefore, the samples included in this report represent 7% of the total number of salmonids observed, and 8% of the chum, 35% of the coho, 82% of the pink, 82% of the chinook, and 100% of the steelhead and sockeye that were identified.

Sockeye Salmon

Distribution. The biological samples included twelve sockeye salmon that were caught in July (4 fish), August (5 fish), and September (3 fish) between 40-46°N latitude, 150°W-177°E longitude (Fig. 1). Most (10 fish) of the sockeye salmon in the samples were taken east of 170°W, and all were caught within 2°-latitude of the monthly northern boundaries of the squid fishery area.

Information from previous studies indicates that the sockeye salmon in the 1990 observer samples were distributed well south of the areas of known concentrations of sockeye salmon in the central and eastern North Pacific Ocean. The ocean distribution of sockeye salmon shifts northward in the spring, and by June, when the fishery begins, the center of abundance of sockeye salmon is well north of the northern boundary of the fishery area; by July most maturing sockeye salmon have left offshore areas, and the center of abundance of immature fish in July and August is north of 50°N (French et al. 1976; Harris and Kautsky 1987). A study of salmon distributions and sea surface temperatures relative to the pre-1989 squid driftnet fishery had indicated that sockeye salmon might be encountered in the fishery area in July and September (Burgner and Meyer 1983). But a later analysis of Japanese salmon research vessel catch data (1972-85) indicated that sockeye salmon did not occur within the pre-1989 squid driftnet fishery area or the 2°-

latitude sector immediately north of the pre-1989 fishery area (Harris and Kautsky 1987). Walker (1991) summarized Japanese salmon and squid research gillnet catch and effort data (1972-1989) by month (June-November), 1°-latitude sectors from 39°-54°N, and two longitudinal regions (170°E-170°W and 170°-145°W); these data show that concentrations of sockeye salmon are well to the north of the present northern boundary of the fishery area in all months, that sockeye salmon occur in low abundance to within three degrees of the northern boundary in July and September and to within two degrees of the northern boundary in August, and that CPUE (catch per unit effort) in areas of low abundance near the northern boundary of the fishery in July and August were higher in the eastern region (170°-145°W) than in the western region (170°E-170°W).

Temperature. SSTs at the beginning of fishing operations that caught sockeye salmon averaged 14.4°C (range 12.9°-15.6°C). In general, these temperatures are higher than those previously reported for sockeye salmon in the North Pacific Ocean. French et al. (1976) reported that the southern limit of sockeye salmon distribution in the North Pacific Ocean occurred where mean SSTs were about 12°-13°C in summer. Takagi (1983), who analyzed 1983-1986 Japanese research gillnet data, reported 1°-10°C as the optimum water temperature range for sockeye salmon. Ogura and Takagi (1987), who analyzed 1978-1982 Japanese research gillnet data, reported 2°-7°C as the optimum temperature range (i.e., the temperature range where 50% or more of the sets took a particular species) for sockeye salmon. Harris and Kautsky (1987), who analyzed 1972-1985 Japanese research gillnet data, found that sockeye salmon in the area south of 48°N, 170°E-145°W were caught at maximum SSTs of 11.6°C in July and 11.8°C in August. In research vessel data reported by Ito and Murata (1989) from Canadian, Japanese, and Taiwanese research vessels operating in July and August (1978-1988) in the area of the squid driftnet fishery (between 170°E-145°W, 36°-48°N), sockeye salmon were caught at a maximum temperature of 11.6°C.

Age. Age 1.2 sockeye predominated in the samples (7 fish), followed by ages 2.2 (2 fish), 2.3 (2 fish), and 1.3 (1 fish). All three sockeye sampled in September were age 1.2 fish. French et al. (1976) reported that in summer (July-September) most maturing age .2 sockeye and age .3 sockeye (nearly all of which would be maturing) have departed offshore areas, and age .2 immature sockeye salmon are distributed primarily north of 50° N.

Maturity. Gonad weights were measured for five age .2 fish in the samples. Both Takagi's (1961) and Godfrey's (1961) criteria indicated that all five fish were maturing. A U.S. observer noted that the gonads of one of these fish, an age 1.2 female sockeye (gonad weight = 40 g) caught in early September at 45°N, 162°W, were "ripe", i.e., fully mature. Although gonad weights were not available for the age .3 sockeye in the samples, most fish of this ocean age group in high-seas samples are maturing fish (French et al. 1976). Therefore, we assumed that the three age .3 fish in our samples were maturing. The outer margins of the scales of one of these fish, an age 2.3 male sockeye caught in late August at 45°N, 159°W were very resorbed, which is a sign of sexual maturation. French et al. (1976) reported an average fork length of 548 mm for age .2 maturing sockeye in July, and that age .2 immature sockeye averaged 484 mm in July, 493 mm in August, and 502 mm in September for sockeye taken in the North Pacific in gillnets. From this information, three large (572, 580, and 634 mm fork lengths) age 1.2 sockeye (for which there are no gonad weights) that were caught in August and September were probably maturing fish, and a small (453 mm fork length) age 1.2 sockeye caught in September was likely an immature fish. Therefore, we think that the majority, 11 of 12, of sockeye salmon in the 1990 observer samples were maturing fish.

Size. Mean fork length of fish in the samples was 584 mm (range 453-710 mm, 12 fish). Age .2 fish averaged 570 mm (range 453-707 mm, 9 fish), and age .3 fish averaged 623 mm (range 570-710 mm, 3 fish).

Sex. The observers determined the sex of eleven of the sockeye salmon in the samples. Of these, 7 fish were males and 4 fish were females.

Continent of Origin. Based on the results of INPFC-related tagging studies conducted in the North Pacific Ocean since the mid-1950s, we think that the majority of sockeye salmon in the 1990 observer samples were of North American origin. The known ocean ranges of Asian and North American sockeye salmon overlap in the area south of the central Aleutians to about 44°N between 167°E and 176°W (Fig. 2). All but one of the sockeye salmon in the samples (caught at 44°N, 177°E in mid-August) were taken eastward of the known ocean range of U.S.S.R. sockeye salmon. The known ocean range of maturing North American sockeye salmon extends farther to the southwest than that of immature fish (Myers et al. 1990). Stocks whose known range extends into the area where samples were taken (south of 48°N, between 177°E-150°W) include maturing U.S.S.R. sockeye (West Kamchatka Peninsula) and immature and maturing North American sockeye from Alaska (Arctic/Yukon/Kuskokwim, Bristol Bay/Aleutian Islands, central Alaska, and southeast Alaska), British Columbia, and Washington. Although evidence is scant, the capture of maturing age 1.2 sockeye in September suggests the presence in the fishery area of late running sockeye salmon from southern stocks (possibly southeast Alaska or British Columbia).

Chum salmon

Distribution. The samples included 165 chum salmon that were caught in June (10 fish), July (108 fish), August (36 fish), September (10 fish), and October (1 fish) between 39°-46°N latitude, 169°E-148°W longitude (Fig. 3). In contrast to the catch of sockeye salmon, the majority (94%, 156 fish) of the chum salmon in the samples were taken west of 170°W. All of the fish in the samples were caught within 3°-latitude of the monthly northern boundaries of the fishery area.

The chum salmon in the 1990 observer samples are distributed well south of the known areas of greatest abundance of chum salmon in the central and eastern North Pacific. In June, the southern limit of concentrations of both maturing and immature chum salmon is about 46°-48°N; in July, as maturing chum salmon move toward coastal waters, immature chum salmon predominate in offshore waters, and concentrations of both immature and maturing fish are north of 48° in the central North Pacific and north of 52°N in eastern North Pacific; in August, the greatest concentrations of chum salmon are found north of 54°N; and in September the southern limit of concentrations has shifted southward to about 48°-51°N (Neave et al. 1976; Walker 1991).

Analyses of research vessel data have shown that chum salmon are present in low abundance in and near the area of the fishery. Burgner and Meyer (1983) concluded that chum salmon may occur along the northern border of the squid fishery zone (pre-1989) in June, and may also be encountered in July and September. Harris and Kautsky (1987) showed that chum salmon range farther south than sockeye salmon, and occur in the northwest corner of the squid fishery area (pre-1989) in July and along the 2°-latitude sector north of the fishery's (pre-1989) June-August northern boundary. Japanese squid and salmon research vessel data (1972-1989) summarized by Walker (1991) show that chum salmon occur in low abundance both within the squid fishery area in July and August and in the 1°-latitude sector just north of the northern boundary in June-September.

Temperature. SSTs at the beginning of fishing operations that caught chum salmon averaged 14.2°C (range 10.6°-16.5°C). In general, the range exceeds temperatures previously reported as the maximum SSTs for chum salmon in the North Pacific Ocean. Manzer et al. (1965) reported catches of chum salmon in the North Pacific Ocean at temperatures as high as 13°C in June, 5°-15°C in July, and 6°-15°C in August. Neave et al. (1976) reported 1°-15°C as the "total known range of (ocean) surface temperatures associated with the presence of chum salmon"; catches were most frequent between 3° and 11°C. Takagi (1983) and Ogura and Takagi (1987) reported 1°-13°C as the preferred temperature range for chum salmon, and chum salmon were caught at a maximum temperature of 15°C in July. Harris and Kautsky (1987) found that chum salmon in the area south of 48°N, 170°E-145°W were caught at maximum SSTs of 13.5°C in June, 15.3°C in July, and 13.2°C in August. Research vessel data reported by Ito and Murata (1989) showed a maximum temperature of 15.3°C for catches of chum salmon near the northern boundary of the squid fishery area.

Age. Age 0.3 chum salmon predominated in the samples (64%, 106 fish), followed by ages 0.2 (41 fish), 0.4 (17 fish), and 0.6 (1 fish). Neave et al. (1976) used Japanese mothership fishery catches (1961-70) in the western North Pacific and Canadian and U.S. longline catches (1961-70) in the eastern North Pacific to characterize age compositions of maturing chum salmon on the high seas, and found that "age .3 fish predominated in samples in all time periods in the western Pacific and in most time periods in the eastern Pacific except for July, when age .2 fish predominated." In the 1990 observer samples, age .3 chum salmon predominated in all months (70% of the total sample in June, 64% in July, 61% in August, and 73% in September-October). The oldest age groups, ages .4 and .6, were present only in the July samples (17%). The percentage of age .2 chum salmon increased from July (19%) to August (39%). Neave et al. (1976) reported that the majority of age .2 chum salmon caught on the high seas are immature, and that fish of age .3 and older are maturing. The increase in the proportion of age .2 chum in the August 1990 observer samples may be the result of the movement of maturing chum salmon out of the fishery area.

Maturity. Gonad weights were measured for 37 chum salmon (20 males and 17 females) in the samples. Takagi's (1961) criteria for gonad weight of commercial-sized immature chum salmon (gonad weights ≤ 5 g for males and <25 g for females) indicate that 45% (9 fish) of the males and 71% (12 fish) of the females were maturing. Godfrey's (1961) criteria for maturing chum (gonad weights >2 g for males and >15 g for females) indicate a higher percentage of maturing fish (100% of the males and 76% of the females), and places all age .2 male chum, which had gonad weights of 3-4 g in July and August, in the "maturing" category. As mentioned above, the majority of age .2 chum salmon caught on the high seas are thought to be immature (Neave et al. 1976). If we assume that all age .2 chum in the samples were immature and all age .3 and older fish were maturing, then 75% (n=124 fish) of the sample was composed of maturing fish. However, tag recovery information shows that the known ocean range of maturing chum salmon is wider than that of immature fish (Myers et al. 1990). We suspect that the majority of age .2 chum salmon in the samples were maturing fish, perhaps from more southerly coastal areas, where a high proportion of chum salmon mature at age .2 (Neave et al. 1976). Therefore, using Godfrey's (1961) criteria, we conclude that the majority, 33 of 37, of chum in the gonad weight samples were maturing fish.

Size. Mean lengths were 524 mm for age .2 chum salmon (range 458-630 mm, 39 fish), 598 mm for age .3 chum salmon (range 390-730 mm, 106 fish), and 598 mm for age.4 chum (range 520-790 mm, 16 fish); one age 0.6 chum was 645 mm.

Sex. The observers determined the sex of 62% (103 fish) of the chum salmon in the samples. Of these, 50% (52 fish) were males and 50% (51 fish) were females.

Continent of Origin. As noted above, the majority of 1990 observer samples of chum salmon were taken in the western region of the fishery area (west of 170°W). Information from recoveries of chum salmon tagged on the high seas indicates that a large proportion of the fish in this area, particularly west of 180°, are of Asian origin (Japan, Kuril Islands/Primore/southern Sakhalin, Amur R./northern Sakhalin, north Okhotsk coast/Shelekova, West Kamchatka, East Kamchatka, and Siberia N. of Cape Oliutorsky; Fig. 2). However, these tag recovery data may be biased. Recovery effort for tagged chum salmon in Asia and North America is not uniform, and the large number of recoveries of tagged maturing chum salmon of Japanese origin compared to recoveries of other stocks is attributed to intense coastal fisheries and close examination of hatchery returns in Japan (Shepard et al. 1968, French et al. 1975, Myers et al. 1990). The only North American stock known from tagging studies to occur in waters south of 46°N, west of 170°W is maturing chum salmon from the Arctic/Yukon/Kuskokwim region of western Alaska (one recovery in the Yukon River of a chum salmon tagged at 178°30'W, 45°26'N). However, we suspect that stocks from the Bristol Bay-Aleutian Islands region of western Alaska may also occur in this area. Drawing on the results of tagging studies, we conclude that chum salmon samples from the western region of the squid fishery area likely represent a mixture of Asian (U.S.S.R. and Japan) and western Alaskan stocks.

Stocks from southern coastal areas have a higher proportion of chum salmon that mature at age .2 than stocks from northern areas (Neave et al. 1976). The age composition of chum salmon in 1990 observer samples from the western region of the squid fishery area (west of 170°W) was 26% age .2 (40 fish), 64% age .3 (100 fish), 10% age .4 (15 fish), and <1% age .6 (1 fish). Age .3 chum salmon predominated in all months in this area: 67% in June (6 fish) and September (6 fish), 65% in July (105 fish), 59% in August (32 fish), and 100% in October (1 fish). The predominance of older age groups (ages .3 and older) indicates that the samples are composed primarily of maturing fish from northern stocks (Asia or North American or both).

Focal resorption of scales occurred in 38% (63 fish) of the chum salmon in the samples. The incidence of focal resorption was higher in samples from the western region of the fishery area (west of 170°W), where focal resorption occurred in 40% of the chum salmon (62 fish), than in samples from the eastern region of the fishery area, where only one fish had focal resorption. Bigler (1989) showed that scales with focal resorption occur in discontinuous patches over the entire body of the fish, and that the percentage of fish exhibiting this trait varies both within (annually) and between stocks. Therefore, this character cannot be used to estimate the proportion of Asian chum in the samples. However, Bigler found this trait in 10.8% of the Japanese chum (10,544 fish), 15.9% of U.S.S.R. chum (1,875 fish), and <0.5% of North American chum (6,934 fish) that he examined. Incidence was highest in U.S.S.R. chum from the Bolshaya R. in western Kamchatka (52%, 23%, and 38% of fish sampled in 1980, 1983, and 1984, respectively). The relatively large proportion of fish with focal scale resorption that were caught in the western region of the squid fishery area in 1990 indicates that Asian stocks are present in these samples.

Tag recovery data show that at least a portion of maturing chum salmon from a broad region of the Asian continent (Japan, Kuril Islands, Sakhalin Island, Kamchatka Peninsula, Anadyr R.) spend their last winter in the northeastern part of the North Pacific Ocean (to as far east as 140°W in the Gulf of Alaska, Neave et al. 1976). In the spring, there is intermingling of both immature and maturing Asian and maturing North American chum salmon in this region, but by summer, many maturing Asian fish and some immature Asian fish have left the Gulf of Alaska. Tag recovery data show that North American stocks spend most of their ocean life in the Gulf of Alaska, and are usually not found west of 180° (Fig. 2; Neave et al. 1976). Therefore, we think that the samples from the eastern region of the squid fishery area (east of 170°W), include a mixture of Asian and North American chum salmon, with a declining proportion of Asian fish as the season progresses. By July, maturing chum salmon from North America may predominate in the eastern region of the fishery area.

Pink Salmon

Distribution . The samples included 18 pink salmon that were caught in June (3 fish), July (6 fish), August (8 fish), and September (1 fish) between 39-46°N latitude, 170°E-154°W longitude (Fig. 4). Seven fish were taken east of 170°W and 11 fish were taken west of 170°W. All pink salmon were caught within 2°-latitude of the monthly northern boundaries of the fishery area.

The pink salmon in the samples are distributed well south of known areas of greatest abundance of pink salmon in the central and eastern North Pacific. In June, the southern limit of concentrations of pink salmon in the central North Pacific is at about 46°-48°N and is north of 49°N in the eastern North Pacific; in July, concentrations of pink salmon occur mainly in coastal waters and north of 51°N in the central and eastern North Pacific; in August, distributions on the high seas are "intermittent and sparse", and remaining concentrations occur in nearshore waters close to spawning areas; in September, concentrations occurred in odd years off Vancouver Island, where there are late runs (Takagi et al. 1981; Walker 1991).

Analyses of research vessel data have shown that pink salmon are present in low abundance in and near the area of the fishery. Burgner and Meyer (1983) concluded that pink salmon may occur along the northern border of the fishery zone (pre-1989) in June and may also be encountered in July and September. Harris and Kautsky (1987) found that pink salmon were in greatest abundance in the far western sectors of their study area (south of 48°N, 150°E-145°W), and "occurred southward to about the northern edge of the squid fishery area (pre-1989), at least in the central North Pacific, and were encountered inside the northwest corner of the (pre-1989) fishery area in July." Japanese research vessel data summarized by Walker (1991) show that pink salmon occur in low abundance within the squid fishery area in July and August and in the sector 2° north of the northern boundary of the fishery in June.

Temperature. SSTs at the beginning of fishing operations that caught pink salmon averaged 14.6°C (range 12.8°-17.0°C). This range exceeds the maximum SSTs reported for pink salmon in the North Pacific. Manzer et al. (1965) found that the temperature range for pink salmon in the North Pacific Ocean was 3°-15°C (preferred temperatures were 4°-11°C), and the largest catches of pink salmon occurred at progressively higher temperatures over the period May through August. Takagi et al. (1981) reported catches of pink salmon in the North Pacific Ocean at temperatures of 3°-13°C in June, 4°-15°C in July, and 6°-15°C in August; there was a "tendency for water temperatures in areas of high CPUE to shift seasonally toward the warmer end of the range." Takagi (1983) reported 3°-11°C as the preferred temperature range for pink salmon. Ogura and Takagi (1987) reported 3°-13°C as the optimum temperature range for pink salmon. Harris and Kautsky (1987) found that pink salmon in the area south of 48°N, 170°E-145°W were caught at maximum SSTs of 11.8°C in June, 15.0°C in July, and 12.3°C in August, and CPUEs in May-July were low in waters over 11.0°C. Research vessel data reported by Ito and Murata (1989) showed a maximum temperature of 15.0°C for catches of pink salmon near the northern boundary of the squid fishery area.

Age. All of the pink salmon in the samples were age 0.1 fish.

Maturity. As noted above, all pink salmon in the samples were ocean age .1, and, therefore, were maturing fish.

Size. Fork lengths of pink salmon in the samples averaged 492 mm (17 fish).

Sex. The observers determined the sex of all pink salmon in the samples, and the majority were males (14 fish).

Continent of Origin. The pink salmon in the samples likely represent a mixture of Asian and North American fish. The known ocean ranges of Asian and North American pink salmon in the central North Pacific overlap between 178°35'W and 161°55'W (Fig. 2). Pink salmon taken in the western region of the fishery area (west of 179°W) in June, July, and August (10 fish) are likely of Asian origin. The results of high seas tagging studies show that both Japanese fish and U.S.S.R. fish from the North Okhotsk coast/Shelekova, East Kamchatka, and West Kamchatka regions occur in this area (Myers et al. 1990). Pink salmon taken in the eastern region of the fishery area (east of 160°W) in July and August (5 fish) are likely of North American origin (central Alaska and southeast Alaska regions).

Coho Salmon

Distribution . The samples included 494 coho salmon that were caught in June (63 fish), July (390 fish), August (37 fish), and September (4 fish) between 39-46°N latitude, 168°E-151°W longitude (Fig. 5). Similar to chum and pink salmon, the majority of the coho in the samples (89.3%, 441 fish) were taken west of 170°W. The fish were caught within 3°-latitude of the monthly northern boundaries of the fishery area. Coho salmon were distributed farther south in August and September than other species of salmonids in the samples (Figs. 1, 3-7).

Coho salmon in samples taken in June and July were distributed near the southern limit of areas of abundance of maturing coho salmon in the central North Pacific. The distribution of coho salmon in the North Pacific tends to extend farther south than that of other species of Pacific salmon. Abundance is low in May, but in June the abundance of maturing coho salmon in offshore waters increases, and the area of greatest abundance is between 42°-45°N in the central North Pacific; abundance peaks in July, as concentrations shift northward to 47°-50°N; in August, abundance decreases as maturing fish move toward coastal areas, and concentrations of coho salmon in the central North Pacific shift farther northward to 51°N; by September the greatest concentrations occur in nearshore waters close to spawning areas (Godfrey et al. 1975, Walker 1991). In an analysis of Japanese research vessel catch data as a function of temperature, Burgner and Meyer (1983) concluded that coho salmon may be more susceptible than other species of Pacific salmon to incidental capture in June. Analyses of Japanese salmon and squid research gillnet data have shown that coho salmon occur in low abundance within the area of the squid fishery in June, July, and August, and in the 1°-latitude sector just north of the northern boundary in September (Harris and Kautsky 1987, Walker 1991).

Temperature. SSTs at the beginning of fishing operations that caught coho salmon averaged 14.4°C (range 12.4°-16.9°C). These temperatures range above the maximum SSTs reported for coho salmon in the North Pacific. Godfrey et al. (1975) reported that the temperature range for coho salmon in the North Pacific Ocean was approximately 3°-

15°C (preferred temperatures were 8°-12°C), and catches of coho salmon occurred at progressively higher temperatures over the period June through August. Takagi (1983) reported 6°-13°C as the preferred temperature range for coho salmon. Ogura and Takagi (1987) reported 7°-11°C as the optimum temperature range for coho salmon, and coho salmon were caught at a maximum temperature of 15°C in July. Harris and Kautsky (1987) found that coho salmon in the area south of 48°N, 170°E-145°W were caught at maximum SSTs of 14.2°C in June, 15.0°C in July, and 13.2°C in August; coho were most abundant in 8°-9°C waters in June, 9°-10°C waters in July, and by August most coho salmon had migrated out of the study area, but "moderate catches were made in waters below 12°C." Research vessel data reported by Ito and Murata (1989) showed a maximum temperature of 15.0°C for catches of coho salmon near the northern boundary of the squid fishery area.

Age. Age 2.1 coho salmon predominated in the samples (86%, 378 fish), followed by ages 1.1 (11%, 47 fish), and 3.1 (3%, 12 fish). One age 0.1 fish, which is a very unusual age group for coho salmon in mid-ocean areas, was caught during the third period in August at 44°N, 180°. Godfrey et al. (1975), who used samples collected by U.S. high seas research vessels (1962-1970) operating in the area between 165°E-150°W and 54°-46°N to characterize age composition of coho salmon in mid-ocean areas, also found that age 2.1 fish were the predominant age group.

Maturity. As noted above, all coho salmon in the samples were ocean age .1, and, therefore, were maturing fish.

Size. The coho salmon in the samples averaged 606 mm in fork length (range 480-774 mm, 438 fish). An age 0.1 coho salmon was 496 mm in fork length. Average fork lengths of other age groups were 596 mm for age 1.1 fish (range 510-670 mm,40 fish), 607 mm for age 2.1 fish (range 480-774 mm, 351 fish), and 618 mm for age 3.1 fish (range 560-748 mm, 9 fish).

Sex. The observers determined the sex of 72% (356 fish) of the coho salmon in the samples. Of these, 60% (213 fish) were males and 40% (143 fish) were females.

Continent of Origin. As noted above, age 2.1 fish were the predominant age group in the 1990 observer samples. Freshwater age 2. is often the predominant age group in northern stocks of U.S.S.R. and North American coho salmon (Godfrey 1965, Godfrey et al. 1975). Tag recovery data also show that coho salmon in mid-ocean areas are from northern stocks. The known ocean ranges of U.S.S.R. and North American coho salmon overlap in the area between 177°E and 173°W (south to about 44°N, Fig. 2). Stocks whose known ranges extend into the area where samples were taken (south of 48°N, between 168°E-151°W) include maturing U.S.S.R. fish from the Kuril Islands/Primore/southern Sakhalin, Okhotsk coast/Shelekova, West Kamchatka, and East Kamchatka regions and maturing North American fish from the Arctic/Yukon/Kuskokwim, Bristol Bay/Aleutian Is., and central Alaska regions (Myers et al. 1990). Coho salmon in the eastern region of the squid fishery area (east of 170°W) are likely all of North American origin, as there have been no recoveries in the U.S.S.R. of coho salmon tagged east of 173°W. Coho salmon in the western region of the fishery area (west of 170°W), where the majority of coho salmon in the samples were taken, are likely a mixture of U.S.S.R. and North American (western Alaska) fish. Freshwater age 3. fish in the samples are also likely from northern (U.S.S.R. and western Alaska) stocks, and freshwater age 1. fish may include stocks from more southerly regions than those of freshwater age 2. and 3. fish. Freshwater age 0. coho salmon are released by some hatcheries in North America, but we do not know if the age 0.1 coho salmon caught in late August at 44°N, 180°, was a hatchery fish or not.

Chinook Salmon

Distribution. The samples included 14 chinook salmon that were caught in June (1 fish), July (2 fish), August (6 fish), and September (5 fish) between 39°-46°N latitude, 170°E-160°W longitude (Fig. 6). Similar to chum, pink, and coho salmon, the majority of chinook salmon (12 fish) were taken west of 170°W. All chinook salmon were caught within 1°-latitude of the monthly northern boundaries of the fishery area. Japanese fishery and research vessel catch data show that chinook salmon occur over wide areas of the North Pacific Ocean north of 40°N, but catches are too small to allow adequate description of seasonal changes in distribution and abundance (Major et al. 1978). Analysis of Japanese salmon research gillnet data (1972-1985) showed that in June chinook salmon occurred south of 42°N only in waters west of 170°E; in July, chinook occurred just north of the northern boundary of the pre-1989 squid area; and in August chinook salmon were caught near the northwest corner of the pre-1989 fishery area (Harris and Kautsky 1987). Japanese research vessel data (1972-1989) summarized by Walker (1991) show that chinook salmon occur in low abundance within the area of the squid driftnet fishery in July and in the sector 2° north of the northern boundary in August.

Temperature. SSTs at the beginning of fishing operations that caught chinook salmon averaged 14.9°C (range 13.2°-18.5°C). These temperatures range above the maximum SSTs reported for chinook salmon in the North Pacific. Japanese research vessel gillnet data (1962-1970) show that chinook salmon in the North Pacific Ocean occur over a wide range of SSTs (1°-15°C, with greatest likelihood of encounter between 6°-8°C), and that the upper temperature limits at which chinook salmon are caught generally increase with season (Major et al. 1978). Takagi (1983) reported 4°-10°C as the preferred temperature range for chinook salmon. Ogura and Takagi (1987) reported 1°-9°C as the optimum temperature range for chinook salmon. Data reported by Ito and Murata (1989) showed a maximum temperature of 12.4°C for research vessel catches of chinook salmon near the northern boundary of the squid fishery area. Kautsky and Harris (1987) reported that in the area south of 48°N and between 170°E-145°W chinook catches in June were very low at temperatures over 10°C, and that slightly higher catches occurred in July and August at temperatures up to 13°C.

Age. All chinook salmon in the samples with readable scales were freshwater age 1. fish. Ocean age composition was age .1 (1 fish), age .2 fish (6 fish), age .3 (6 fish), and age .4 (1 fish). Ocean ages .2 and .3 chinook salmon also predominate in Japanese mothership and research vessel samples from the North Pacific Ocean (Major et al. 1978).

Maturity. Gonad weights were measured for four chinook salmon in the samples. Gonad weights used to define immature chinook salmon were $\leq$15 g in late June and $\leq$30 g in early August for males and $\leq$100 g in early August for females (Ito et al. 1974). Using these criteria, three fish in the gonad weight samples were immature and one fish was maturing.

The predominant ocean age groups of both immature and maturing pelagic chinook are .2 and .3 (Major et al. 1978). As described above, these were also the predominant age groups in the 1990 observer samples. Therefore, ocean age is not particularly useful in determining the maturity of chinook in the samples. All chinook salmon in the samples with readable scales were freshwater age 1. fish, and most age 1. chinook belong to northern populations or to spring or summer returning fish from more southerly populations. Most maturing age 1. fish would be expected to have left offshore areas by August and September, when the majority (79%) of the fish in the samples were caught. Therefore, our estimate based on gonad weights that the majority of the chinook salmon in the samples were immature fish may not be unreasonable.

Size. Mean fork length of chinook salmon in the samples was 774 mm (range 600-944 mm, 13 fish). Age .2 fish averaged 688 mm (range 600-820 mm, 6 fish) and age .3 fish averaged 857 mm (range 746-944 mm, 5 fish).

Sex. The observers determined the sex of eleven of the chinook salmon in the samples. Of these, seven were males and four were females.

Continent of Origin. There is no direct information from tagging studies on origins of chinook salmon in the area where observer samples were taken in 1990. Tag recovery information shows only that the known ranges of Asian and North American chinook salmon overlap in the area just south of the central Aleutian Islands between 177°W and 172°W (Fig. 2). Using scale pattern analyses and maturity studies Major et al. (1978) concluded that U.S.S.R. chinook salmon probably range as far south as about 40°N and as far east as about 180° in the North Pacific Ocean. The results from scale pattern analysis are varied, but indicate that both U.S.S.R. and North American (western and central Alaska) chinook salmon may be present in the area southwest of 46°N, 175°W (Myers et al. 1984; Ito et al. 1985, 1986; Davis 1990). Using this indirect evidence, we tentatively conclude that chinook salmon in the 1990 observer samples are likely a mix of U.S.S.R. and North American (western and central Alaska) salmon.

Steelhead Trout

Distribution. The samples included 18 steelhead trout that were caught in July (5 fish), August (12 fish), and September (1 fish) between 41°-46°N latitude, 170°E-152°W longitude (Fig. 7). Similar to sockeye salmon, the majority of steelhead trout (16 fish) were taken east of 170°W. All steelhead were caught within 2°-latitude of the monthly northern boundaries of the fishery area.

Canadian, Japanese, U.S., and U.S.S.R. research vessel catch data show that in the spring steelhead occur over wide areas of the North Pacific Ocean north of 38°N from the North American coastline to nearly 150°E; by summer, the distribution of steelhead has shifted north and west in the eastern North Pacific, and the southern limit of distribution is near 40°N (Burgner et al., in press). Analysis of Japanese salmon research gillnet data (1981-1985) showed that steelhead occurred just north of the pre-1989 northern boundary of the squid area in June-August (Harris and Kautsky 1987). Japanese squid and salmon research vessel data (1981-1989) summarized by Walker (1991) show that steelhead occur in low abundance in the sector 2° north of the northern boundary in June, in the sector 1° north of the fishery area in July, and within the eastern region of the fishery area (170°-145°W) in August; these data also show that the greatest concentrations of steelhead occur well north of the northern boundary of the squid fishery area in June-August.

Temperature. SSTs at the beginning of fishing operations that caught steelhead averaged 13.4°C (range 10.6°-15.2°C), and mean SSTs were 14.4 °C (range 13.4°-15.2°C) in July and 13.1°C (range 12.8°-14.4°C) in August. The mean temperatures for steelhead catches in the July and August observer samples are in the upper range of SSTs reported for steelhead in the North Pacific Ocean. Research vessel data reported by Sutherland (1973) showed that pelagic steelhead were caught at temperatures ranging from 5°-14.9°C, and the majority of fish were caught at SSTs ranging from 8°-11.4°C. SST data presented by Okazaki (1983) showed that steelhead were caught on the high seas at temperatures ranging from 2.8°-15.2°C, and fish were caught most frequently at 6°-10°C. Takagi (1983) reported 7°-11°C as the preferred temperature range for steelhead. Walker and Burgner (1985), who analyzed steelhead distribution with respect to SSTs, concluded that in years with cooler than normal temperatures steelhead may occur in low numbers near the northern boundary of the squid fishery area, and that incidental catches might occur in September. Harris and Kautsky (1987) found that abundance of steelhead in the area south of 48°N, 170°E-145°W was low in waters with SSTs over about 9°C in June, 11°C in July, and 12°C in August. Data reported by Ito and Murata (1989) showed a maximum temperature of 13.0°C for research vessel catches of steelhead near the northern boundary of the squid fishery area. Burgner et al. (in press) analyzed research vessel SST and steelhead CPUE data (1981-1989) from the North Pacific-Bering Sea area between 170°E-145°W; they found that in July peak CPUEs of steelhead occurred at 9.0°-9.9°C and no steelhead were caught at SSTs above 13.9°C.

Age. Ages 1.1 (5 fish, which includes one scale aged as x.1 from a coded-wire tagged fish released at age 1.) and 1.2 (5 fish) steelhead predominated in the samples, followed by ages 3.2 (2 fish), 2.1 (1 fish), and 2.2 (1 fish). Many of the scales in the samples had a check (band of closely spaced circuli) at the edge of the scale that was not counted as an ocean annulus since the fish were caught in July and August. We were able to verify age determinations for four steelhead, which were coded wire tagged fish that had been released from the same hatchery in Idaho in 1988 and 1989.

The age composition of steelhead in the 1990 observer samples is different than age compositions of steelhead reported in other analyses of pelagic steelhead, but the number of fish in our sample was small. Data summarized by Burgner et al. (in press) showed that for scales for which both a freshwater and an ocean age could be determined (3,475 fish) ages 3.1 (27%), 2.1 (16%), 3.2 (12%), and 1.1 (11%) fish predominated in research vessel samples collected on the high seas from 1955 to 1985. Ages 3.1, 2.1, and 3.2 steelhead also predominated in studies of pelagic steelhead by Sutherland (1973) and Okazaki (1984). The percentage of freshwater age 1. fish (17% of the usable scales) reported by Burgner et al. was much lower than that found in the 1990 observer samples (10 of 14 fish for which ages could be determined or 71%). In the data reported by Burgner et al. for fish with readable ocean ages (9,863 fish), ocean age .1 fish predominated (62%); among the 1990 observer samples older fish predominated (11 of 17 fish with readable ocean ages or 65% were age .2 or .3).

Maturity. Gonad weights were measured for nine of the steelhead in the samples. Gonad weights used to define immature steelhead were ≤1 g in July and ≤3 g in August for males and ≤9 g in July, ≤10 g in August, and ≤11 g in September for females (Okazaki 1984). From these criteria, 78% (7 fish) of the steelhead in the gonad weight samples were maturing fish. However, these results may be biased, as observers collected gonad weight from only one of six ocean age .1 fish. Most North American steelhead return to spawn for the first time at an ocean age of .2 or .3. Therefore, a reasonable assumption is that all of the ocean age .1 (six) fish in the samples were immature and that the one ocean age .3 fish was maturing. Based on this assumption and information on gonad weights, maturity can be designated for 15 fish in the 1990 samples, and eight (53%) of these were maturing fish.

Size. Mean fork length of steelhead in the samples was 695 mm (range 557-940 mm, 18 fish).

Sex. The observers determined the sex of sixteen of the steelhead in the samples. Of these, 9 fish were males and 7 fish were females. Burgner et al. (in press) found that female steelhead tended to predominate (54.1%) in high seas research vessel samples (1956-1985).

Continent of Origin. Based on the results of INPFC-related tagging studies, we think that all of the steelhead in the 1990 observer samples are of North American origin. There are no reported recoveries in Asia of steelhead tagged on the high seas, and tag recovery data show that North American steelhead range across almost the entire North Pacific Ocean, south to 41°N, and west to 163°32'E (Fig. 2). The results of tagging studies are confirmed by parasite studies, which show that steelhead infected by parasites that indicate U.S. Pacific Northwest origin (Washington, Oregon, Northern California, and Idaho) range across the North Pacific Ocean to at least 162°29'E and south to about 41°-42°N (Burgner et al., in press). A similar pattern of ocean distribution is shown by high seas recoveries of North American steelhead that were marked with fin or maxillary clips (Burgner et al., in press).

Hatchery or Wild Origin. Four of the 12 steelhead sampled in August were coded-wire tagged (CWT, Fig. 7, Dahlberg et al. 1991). All four fish were released from the Dworshak National Fish Hatchery in Ahsahka, Idaho, which is the largest producer of hatchery steelhead in the world (U.S. Dept. Int. 1981). The hatchery is located over 500 miles from the Pacific Ocean on the North Fork of the Clearwater River (tributary of the Snake R. on the Columbia R. system) in Idaho.

Most North American hatchery steelhead are released as age 1. smolts (Burgner et al., in press). To the best of our knowledge, no hatchery steelhead are produced in Asia. The presence of four coded-wire tagged hatchery fish and the predominance of age l. fish in the 1990 observer samples (10 of 14 fish for which ages could be determined) indicates that a relatively high percentage of the fish in the samples are of hatchery origin. Burgner et al. estimated that about half of the annual return of adult steelhead to North American waters is of hatchery origin. Steelhead in the 1990 observer samples with more than one freshwater annulus (four fish) are likely wild steelhead.

Analysis of steelhead tag recovery data by Burgner et al. (in press) indicates that in the North Pacific Ocean in the area east of 170°W inland stocks of summer-run steelhead from the Columbia River Basin are distributed farther to the south than winter-run steelhead and coastal stocks of summer-run steelhead. The four CWT steelhead recovered in the fishery area in 1990 were all inland summer-run steelhead from the Columbia River Basin. These results suggest that in the eastern region of the fishery area inland summer-run stocks of steelhead from the Columbia River Basin may be more susceptible to interception by the squid driftnet fishery than other seasonal races and regional groups.

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LITERATURE CITED

Bigler, B. 1988. Focal scale damage among chum salmon (*Oncorhynchus keta*) of Hokkaido, Japan. Can. J. Fish. Aquat. Sci. 45:698-704.

Bigler, B. 1989. Mechanism and occurrence of focal scale resorption among chum salmon (*Oncorhynchus keta*) of the North Pacific Ocean. Can. J. Fish. Aquat. Sci. 46:1147-1153.

Bilton, H.T., D.W. Jenkinson, and M.P. Shepard. 1964. A key to five species of Pacific salmon (genus *Oncorhynchus*) based on scale characters. J. Fish. Res. Bd. Canada 21:1267-1288.

Burgner, R.L., J.T. Light, L. Margolis, T. Okazaki, A. Tautz, and S. Ito. (In press). Distribution and origins of steelhead trout (*Oncorhynchus mykiss*) in offshore waters of the North Pacific Ocean. Int. N. Pac. Fish. Comm. Bull.

Burgner, R.L., and W.G. Meyer. 1983. Surface temperatures and salmon distribution relative to the boundaries of the Japanese drift gillnet fishery for flying squid (*Ommastrephes bartrami*). (INPFC Doc.) FRI-UW-8317. Fish. Res. Inst., Univ. Washington, Seattle. 35 pp.

Dahlberg, M.L., S. Fowler, N. Maloney, and R. Heintz. 1991. Incidence of coded-wire tagged salmonids in commercial and research catches in the North Pacific Ocean and Bering Sea, 1990-1991. (INPFC Doc.) Auke Bay Laboratory, Alaska Fisheries Science Center, NMFS, NOAA, Juneau. 19 pp.

Davis, N.D. 1990. Origins of chinook salmon in the area of the Japanese mothership and landbased driftnet salmon fisheries in 1985 and 1986. (INPFC Doc.) FRI-UW-9015. Fish. Res. Inst., Univ. Washington, Seattle. 34 pp.

French, R.R., R. Bakkala, and D.F. Sutherland. 1975. Ocean distribution of stocks of Pacific salmon, *Oncorhynchus* spp., and steelhead trout, *Salmo gairdnerii*, as shown by tagging experiments: charts of tag recoveries by Canada, Japan, and the United States, 1956-69. NOAA Tech. Rep. NMFS SSRF-689. 89 pp.

French, R., H. Bilton, M. Osako, and A. Hartt. 1976. Distribution and origin of sockeye salmon (*Oncorhynchus nerka*) in offshore waters of the North Pacific Ocean. Int. N. Pac. Fish. Comm. Bull. 34. 113 pp.

Godfrey, H. 1961. Method used to distinguish between immature and maturing sockeye and chum salmon taken by Canadian exploratory fishing vessels in the Gulf of Alaska. Int. N. Pac. Fish. Comm. Bull. 5:17-25.

Godfrey, H. 1965. Salmon of the North Pacific Ocean - Part IX. Coho, chinook and masu salmon in offshore waters. 1. Coho salmon in offshore waters. Int. N. Fish. Comm. Bull. 16:1-39.

Godfrey, H., K.A. Henry, and S. Machidori. 1975. Distribution and abundance of coho salmon in offshore waters of the North Pacific Ocean. Int. N. Pac. Fish. Comm. Bull. 31. 80 pp.

Harris, C.K., and G.A. Kautsky. 1987. Distributional overlap of salmonids and flying squid (*Ommastrephes bartrami*) in the western and central North Pacific Ocean, as indicated by analysis of Japanese salmon research vessel catches and incidental catches, 1972-85. (INPFC Doc.) FRI-UW-8712. Fish. Res. Inst., Univ. Washington, Seattle. 54 pp.

Int. N. Pac. Fish. Comm. 1990. Final report of squid and bycatch observations in the Japanese driftnet fishery for neon flying squid (*Ommastrephes bartrami*) June-December, 1989, observer program. (INPFC Doc.) Int. N. Pac. Fish. Comm., Vancouver, B.C. 111 pp.

Int. N. Pac. Fish. Comm. 1991. Final report of 1990 observations of the Japanese high seas driftnet fisheries in the North Pacific Ocean. Joint report by the National Sections of Canada, Japan and the United States. 198 pp. (Available from: Driftnet Program Coordinator, Alaska Fisheries Science Center, 7600 Sand Point Way N.E., Seattle, WA 98115-0070.)

Ishida, T., and K. Miyaguchi. 1958. On the maturity of Pacific salmon (*Oncorhynchus nerka*, *O. keta*, and *O. gorbuscha*) in offshore waters with reference to the seasonal variation in gonad weight. Bull. Hokkaido Reg. Fish. Res. Lab. 18:11-22. (Fish. Res Bd. Canada, Transl. Ser. 190.)

Ishida, R., K. Takagi, and S. Arita. 1961. Criteria for the differentiation of mature and immature forms of chum and sockeye salmon in northern areas. Int. N. Pac. Fish. Comm. Bull. 5:27-47.

Ito, J., Y. Ishida, and S. Ito. 1985. Stock identification of chinook salmon in offshore waters in 1974 based on scale pattern analysis. (INPFC Doc.) Fisheries Agency of Japan, Shimizu. 18 pp.

Ito, J., Y. Ishida, and S. Ito. 1986. Further analysis of stock identification of chinook salmon in offshore waters in 1974. (INPFC Doc.) Fisheries Agency of Japan, Shimizu. 19 pp.

Ito, J., and M. Murata. 1989. The distribution of salmonids and flying squid around the new northern boundaries of the Japanese squid gillnet fishery. (INPFC Doc.) Fisheries Agency of Japan, Far Seas Fish. Res. Lab., Shimizu. 24 pp.

Ito, J., K. Takagi, and S. Ito. 1974. The identification of maturing and immature chinook salmon, *Oncorhynchus tshawytscha* (Walbaum) in the offshore stage and some related information. Far Seas Fish. Res. Lab., Bull. 11:68-75.

Koo, T.S.Y. 1962a. Differential scale characters among species of Pacific salmon. Pages 123-135 *in* T.S.Y. Koo (ed.), Studies of Alaska red salmon, Univ. of Washington Press, Seattle.

Koo, T.S.Y. 1962b. Age designation in salmon. Pages 37-48 *in* T.S.Y. Koo (ed.), Studies of Alaska red salmon, Univ. of Washington Press, Seattle.

Major, R.L., J. Ito, S. Ito, and H. Godfrey. 1978. Distribution and origin of chinook salmon (*Oncorhynchus tshawytscha*) in offshore waters of the North Pacific Ocean. Int. N. Pac. Fish. Comm., Bull. 38. 54 pp.

Manzer, J.I., T. Ishida, A.E. Peterson, and M.G. Hanavan. 1965. Salmon of the North Pacific Ocean - Part V. Offshore distribution of salmon. Int. N. Pac. Fish. Comm. Bull. 15. 452 p.

Mosher, K.H. 1969. Identification of Pacific salmon and steelhead trout by scale characteristics. U.S. Dept. of Interior, U.S. Fish and Wildl. Serv., Bureau of Comm. Fish. Circ. 317. 17 pp.

Myers, K.W., D.E. Rogers, C.K. Harris, C.M. Knudsen, R.V. Walker, and N.D. Davis. 1984. Origins of chinook salmon in the area of the Japanese mothership and landbased driftnet salmon fisheries in 1975-1981. (INPFC Doc.) Fish. Res. Inst., Univ. Washington, Seattle. 208 pp.

Myers, K.W., R.V. Walker, S. Fowler, and M.L. Dahlberg. 1990. Known ocean ranges of stocks of Pacific salmon and steelhead as shown by tagging experiments, 1956-1989. (INPFC Doc.) FRI-UW-9009. Fish. Res. Inst., Univ. Washington, Seattle. 57 pp.

Neave, F., T. Yonemori, and R.G. Bakkala. 1976. Distribution and origin of chum salmon in offshore waters of the North Pacific Ocean. Int. N. Pac. Fish. Comm., Bull. 35. 79 pp.

Ogura, M., and K. Takagi. 1987. Difference in area of distribution between salmon and flying squid based on data collected by Japanese salmon research vessels, 1983-1986. (INPFC Doc.) Fisheries Agency of Japan, Tokyo. 7 pp.

Okazaki, T. 1983. Distribution and seasonal abundance of *Salmo gairdneri* and *Salmo mykiss* in the North Pacific Ocean. Japan. J. Ichthyol. 30:235-246.

Okazaki, T. 1984. Age composition, growth, sex ratio, and gonad development of *Salmo gairdneri* and *Salmo mykiss* in the North Pacific. Japan. J. Ichthyol. 31:23-37.

Shepard, M.P., A.C. Hartt, and T. Yonemori. 1968. Chum salmon in offshore waters. Int. N. Pac. Fish. Comm. Bull 25. 69 pp.

Sutherland, D.F. 1973. Distribution, seasonal abundance, and some biological features of steelhead trout, *Salmo gairdneri*, in the North Pacific Ocean. Fish. Bull. 71:787-826.

Takagi, K. 1961. The seasonal change of gonad weight of sockeye and chum salmon in the North Pacific Ocean, especially with reference to mature and immature fish. Bull. Hokkaido Reg. Fish. Res. Lab. 23:17-34.

Takagi, K. 1983. Differences in areas of distribution between salmon and flying squid. (INPFC Doc.) Fisheries Agency of Japan, Tokyo. 10 pp.

Takagi, K., K.V. Aro, A.C. Hartt, and M.B. Dell. 1981. Distribution and origin of pink salmon (*Oncorhynchus gorbuscha*) in offshore waters of the North Pacific Ocean. Int. N. Pac. Fish. Comm., Bull. 40. 195 pp.

U.S. Department of Interior. 1981. Dworshak National Fish Hatchery. U.S. Fish Wildl. Serv. and U.S. Army Corps Engin., Walla Walla Dist., Ahsahka, Idaho.

Walker, R.V. 1991. Research vessel salmonid CPUE in relation to the northern boundary of the squid driftnet fishery. (INPFC Doc.) FRI-UW-9118. Fish. Res. Inst., Univ. Washington, Seattle. 7 pp.

Walker, R.V., and R.L. Burgner. 1985. Surface temperatures and distribution of steelhead trout (*Salmo* spp.) relative to the boundaries of the Japanese drift gillnet fishery for flying squid (*Ommastrephes bartrami*). (INPFC Doc.) FRI-UW-8505. Fish. Res. Inst., Univ. Washington, Seattle. 12 pp.

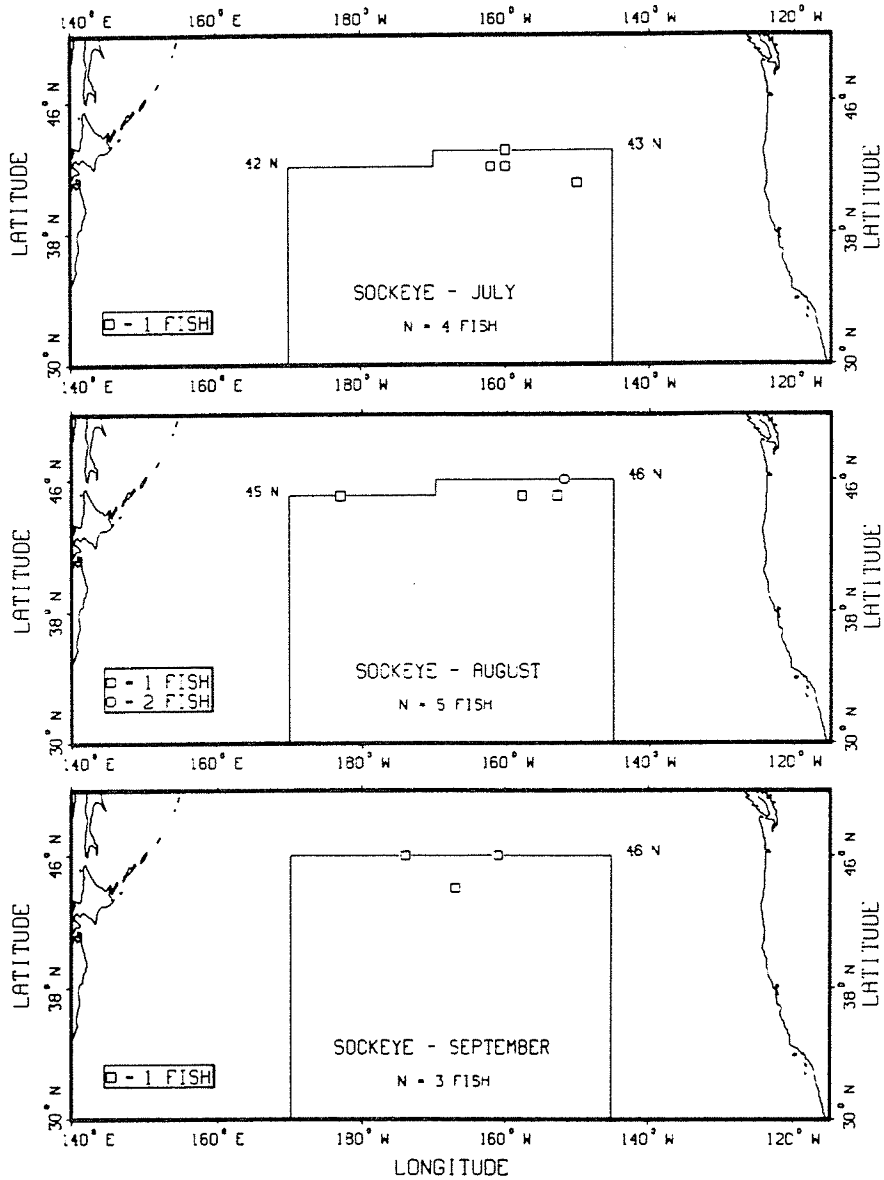

Fig. 1. Spatial and temporal distribution of sockeye salmon *O. nerka* in biological samples collected by Canadian, Japanese, and U.S. observers on board Japanese squid driftnet vessels in 1990. The east, west, and northern boundaries of the fishery area are indicated by lines. N = total sample size.

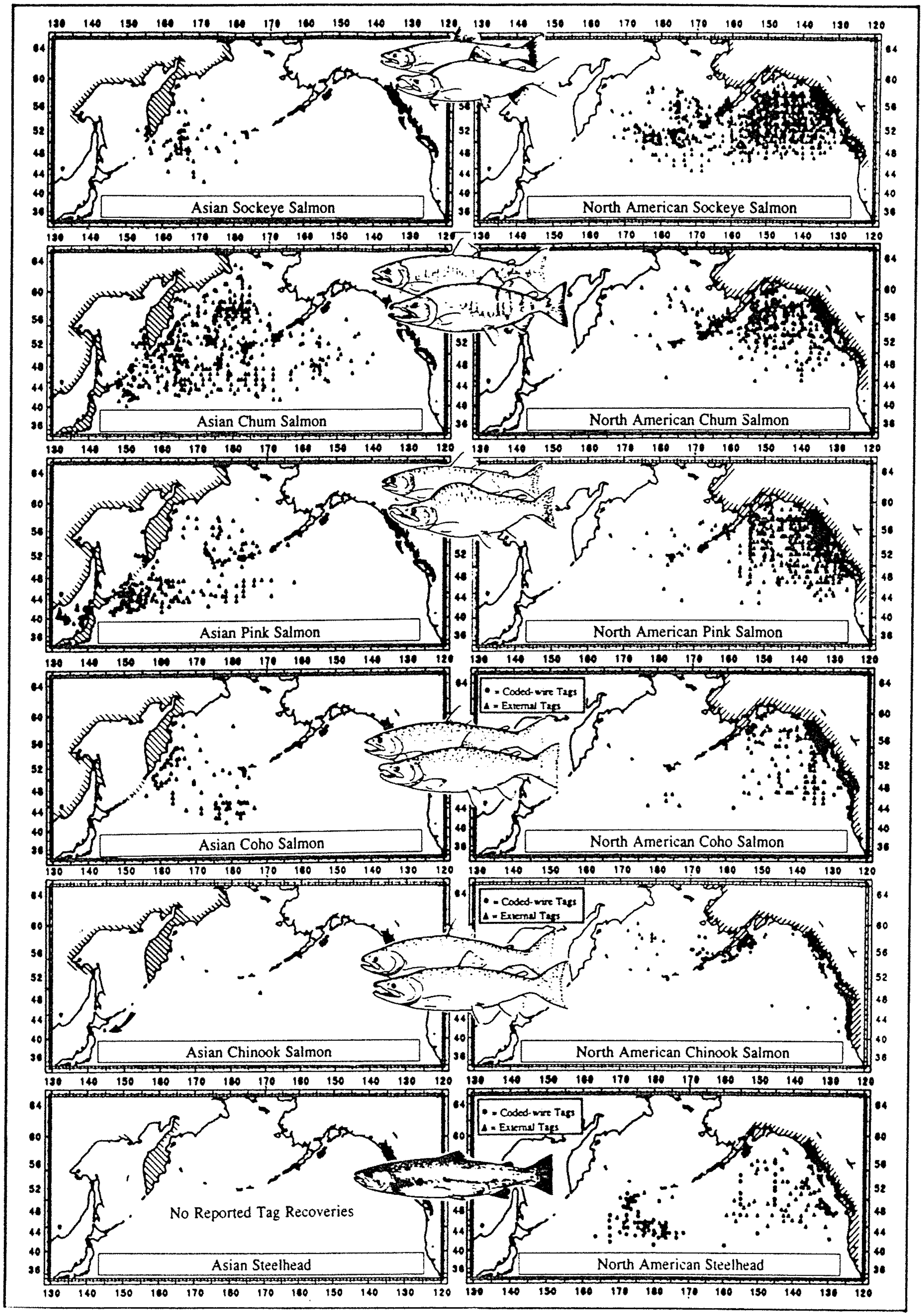

Fig. 2. Known ocean ranges of Asian and North American Pacific salmon and steelhead *Oncorhynchus* spp. as shown by tagging experiments, 1956-1989 (Myers et al. 1990).

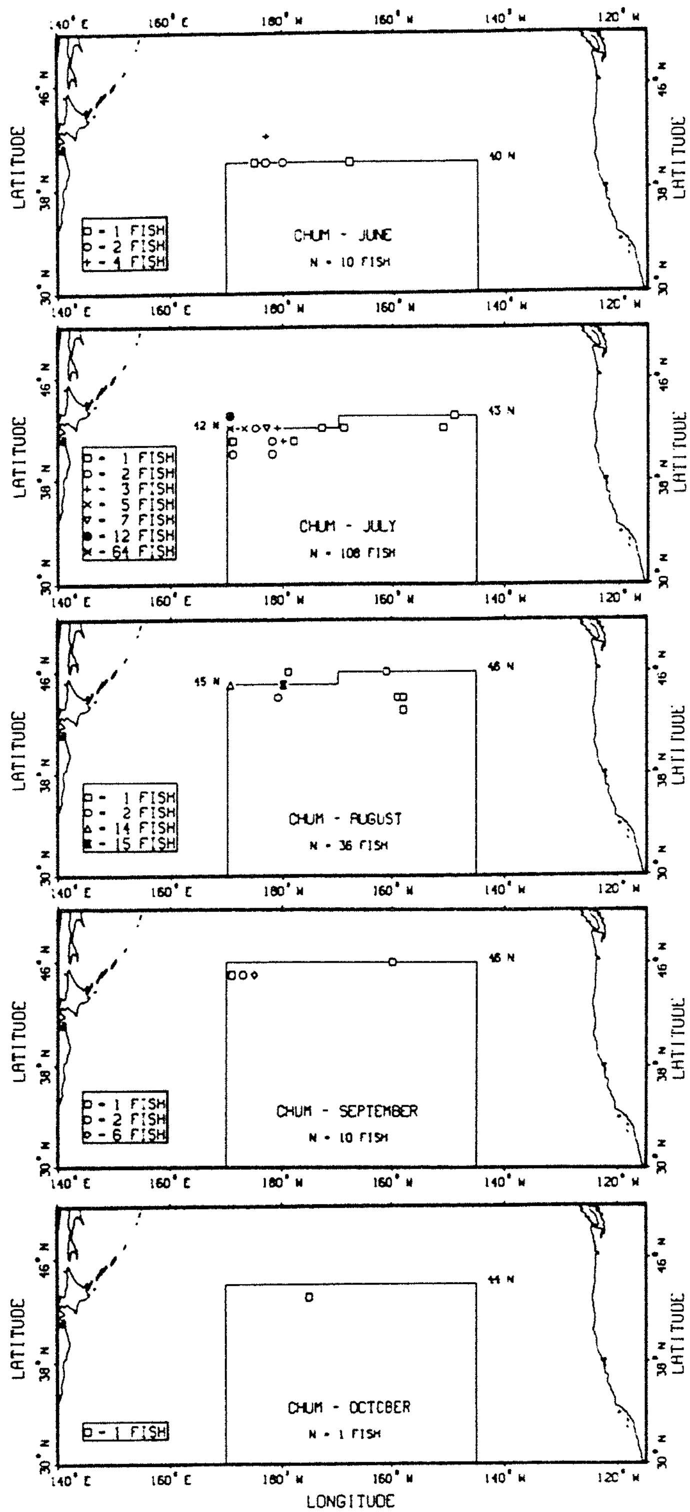

Fig.3. Spatial and temporal distribution of chum salmon *O. keta* in biological samples collected by Canadian, Japanese, and U.S. observers on board Japanese squid driftnet vessels in 1990. The east, west, and northern boundaries of the fishery area are indicated by lines. N = total sample size.

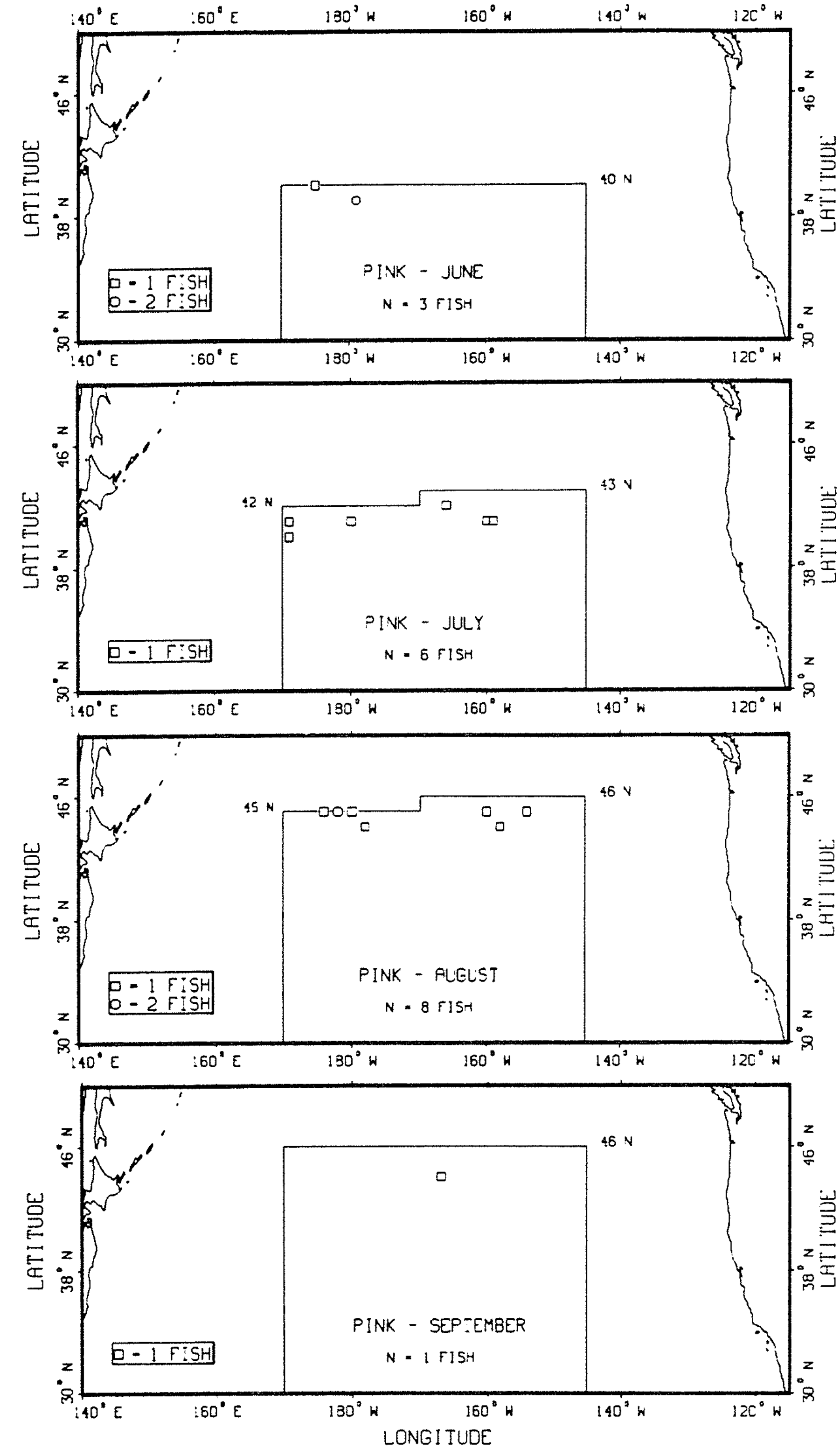

Fig. 4. Spatial and temporal distribution of pink salmon *O. gorbuscha* in biological samples collected by Canadian, Japanese, and U.S. observers on board Japanese squid driftnet vessels in 1990. The east, west, and northern boundaries of the fishery area are indicated by lines. N = total sample size.

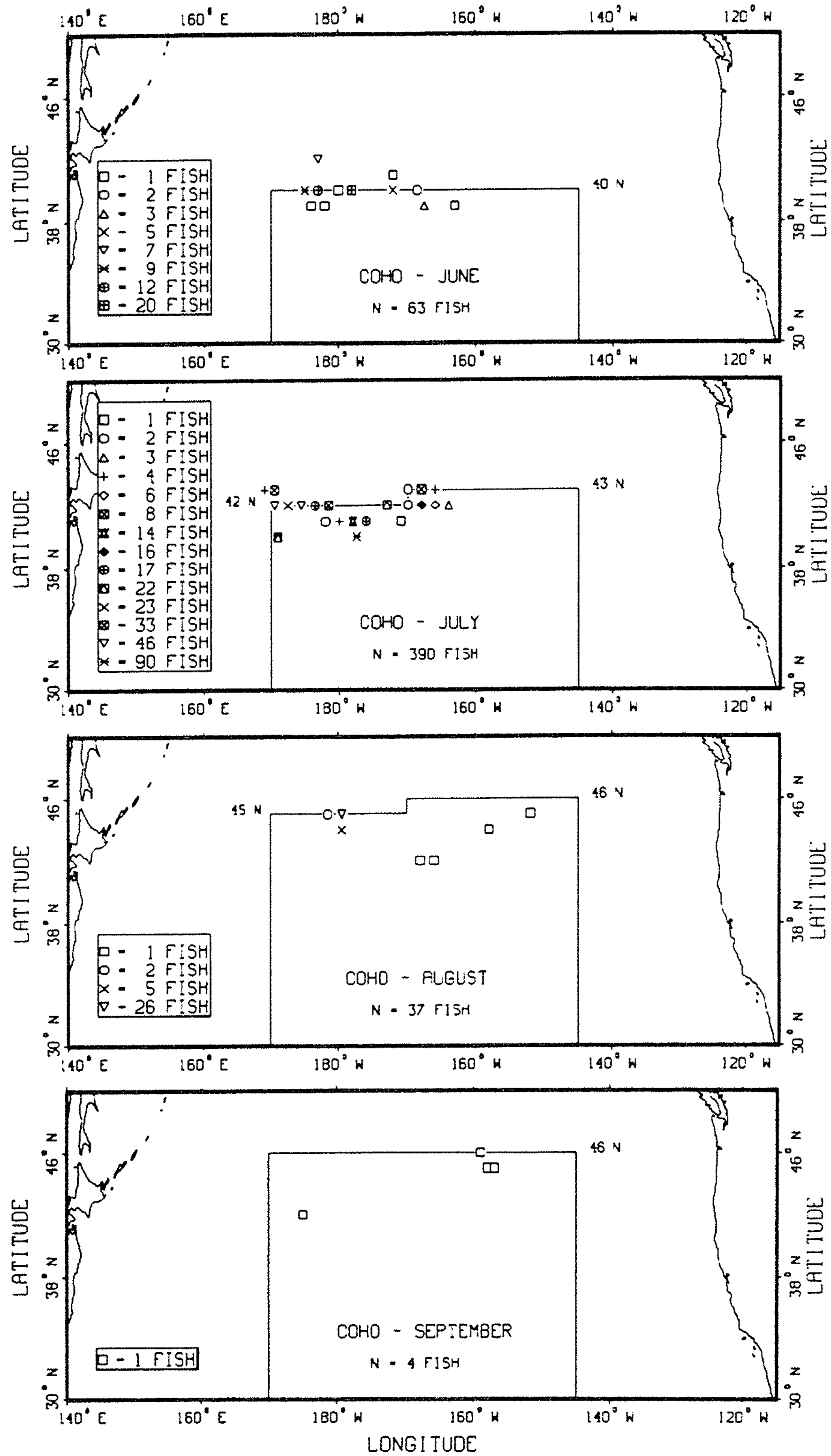

Fig. 5. Spatial and temporal distribution of coho salmon *O. kisutch* in biological samples collected by Canadian, Japanese, and U.S. observers on board Japanese squid driftnet vessels in 1990. The east, west, and northern boundaries of the fishery area are indicated by lines. N = total sample size.

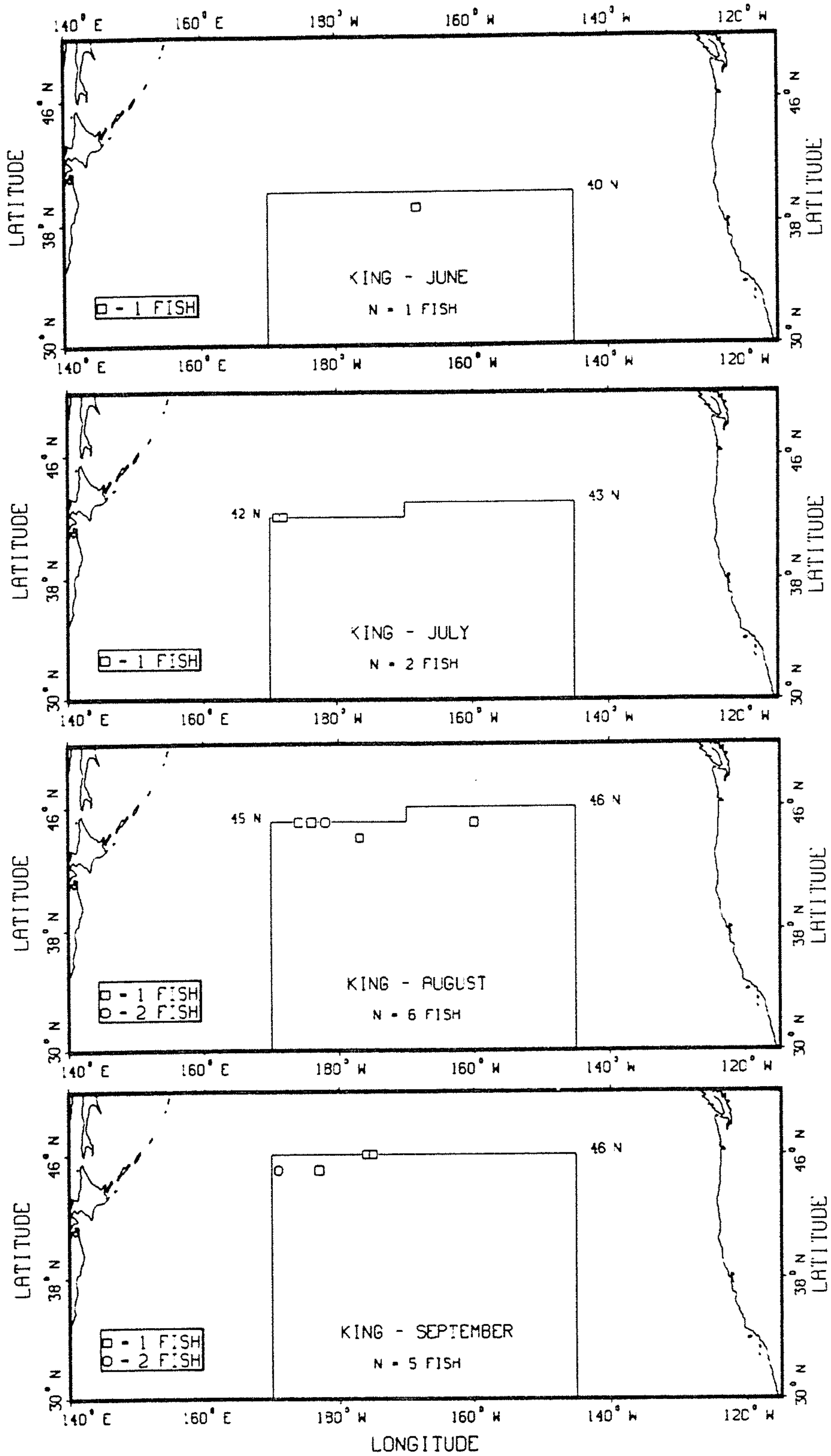

Fig. 6. Spatial and temporal distribution of chinook salmon *O. tshawytscha* in biological samples collected by Canadian, Japanese, and U.S. observers on board Japanese squid driftnet vessels in 1990. The east, west, and northern boundaries of the fishery area are indicated by lines. N = total sample size.

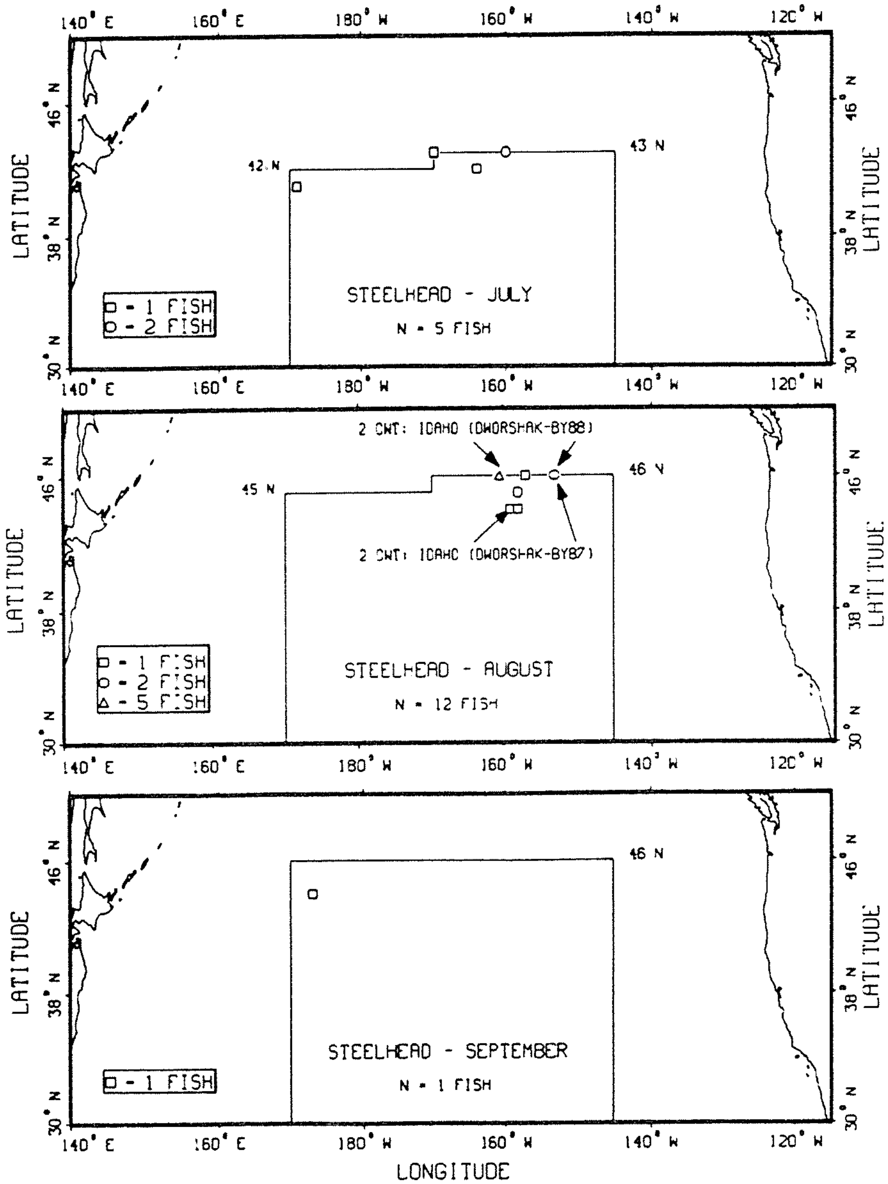

Fig. 7. Spatial and temporal distribution of steelhead trout *O. mykiss* in biological samples collected by Canadian, Japanese, and U.S. observers on board Japanese squid driftnet vessels in 1990. The east, west, and northern boundaries of the fishery area are indicated by lines. N = total sample size. Arrows indicate recovery locations of coded-wire tagged (CWT) steelhead.

Table 1. Comparison of U.S. observer identification of species from visual examination of fish and Fisheries Research Institute (FRI) identification of species from visual examination of scales in biological samples of salmonids collected from the Japanese squid driftnet fishery in 1990. Unid. = species not identified by observer.

	Observer ID			FRI ID	% Unid. or Identified
Species	Species	No. of fish	% of total	No. of fish	incorrectly
Sockeye	Sockeye	1	16.7	6	83.3
	Chinook	2	33.3		
	Coho	2	33.3		
	Pink	1	16.7		
Chum	Chum	41	36.2	113	63.8
	Chinook	4	3.5		
	Coho	59	52.2		
	Sockeye	1	0.8		
	Unid.	8	7.1		
Pink	Pink	8	72.7	11	27.3
	Chinook	2	18.2		
	Steelhead	1	9.1		
Coho	Coho	163	51.3	318	48.7
	Chinook	65	20.4		
	Chum	25	7.9		
	Unid.	65	20.4		
Chinook	Chinook	8	80.0	10	20.0
	Sockeye	1	10.0		
	Unid.	1	10.0		
Steelhead	Steelhead	5	50.0	10	50.0
	Chinook	3	30.0		
	Coho	2	20.0		
Total				468	51.7

APPENDIX

LIST OF VARIABLES

VARIABLE	DESCRIPTION
SOURCE	Country of observer: A=United States, C=Canada, J=Japan
IDOBS	Observer species identification
IDFRI	FRI species identification
FW	Number of Freshwater Annuli
OC	Number of Ocean Annuli
FL	Fork length (mm)
SEX	F=female, M=male, U=unidentified
GW	Gonad weight (g), <1 g=very small
MON	Month of catch
PER	10-day period of the month: PER 1=1 to 10, PER 2=11 to 20, PER 3=21 to 30
YR	Year of catch
DLT	Degrees north latitude
DLN	Degrees longitude
DIR	Contains "E", "W" for east or west longitude
SST	Sea surface temperature at start of set

Appendix Table 1. Sockeye salmon data collected by observers in 1990 from the Japanese squid driftnet fishery.

SOURCE	IDOBS	IDFRI	FW	OC	FL	SEX	GW	MON	PER	YR	DLT	DLN	DIR	SST
C	SOCK	SOCK	1	2	530	M	005	07	1	90	42	162	W	14.9
C	SOCK	SOCK	2	2	515	M	054	07	1	90	42	160	W	14.7
J	CHUM	SOCK	2	3	590	F		07	1	90	40	151	W	14.0
A	COHO	SOCK	1	2	707	M	011	07	3	90	42	160	W	15.4
A	KING	SOCK	1	2	634	U		08	1	90	45	154	W	13.4
A	KING	SOCK	1	2	580	F		08	1	90	45	153	W	13.0
A	PINK	SOCK	2	2	530	M	065	08	2	90	44	177	E	15.2
A	COHO	SOCK	1	3	570	M		08	2	90	45	152	W	12.9
J	COHO	SOCK	2	3	710	M		08	3	90	45	159	W	14.4
J	SOCK	SOCK	1	2	572	F		09	1	90	43	168	W	15.6
A	SOCK	SOCK	1	2	614	F	040	09	1	90	45	162	W	14.8
J	SOCK	SOCK	1	2	453	M		09	2	90	45	175	W	14.5

Appendix Table 2. Chum salmon data collected by observers in 1990 from the Japanese squid driftnet fishery.

SOURCE	IDOBS	IDFRI	FW	OC	HLS	FL	SEX	GW	MON	PER	YR	DLT	DLN	DIR	SST
A	CHUM	CHUM	0	3	1	610	U		06	1	90	39	169	W	13.0
J	CHUM	CHUM	0	3	1	560	F		06	3	90	39	175	E	15.5
J	CHUM	CHUM	0	3	1	610	U		06	3	90	39	176	E	14.2
A	KING	CHUM	0	3	1	590	F		06	3	90	39	176	E	13.0
A	COHO	CHUM	0	3	0	390	F		06	3	90	41	177	E	12.9
A	COHO	CHUM	0	3	0	476	F		06	3	90	41	177	E	12.9
A	COHO	CHUM	0	2	0	488	F		06	3	90	41	177	E	12.9
A	UNID	CHUM	0	3	1	540	F	052	06	3	90	41	177	E	12.8
J	CHUM	CHUM	0	2	0	462	M		06	3	90	39	180	W	13.5
J	CHUM	CHUM	0	2	0	458	F		06	3	90	39	180	W	13.5
C	CHUM	CHUM	0	2	0	475	F		07	1	90	43	169	E	14.0
C	CHUM	CHUM	0	2	0	540	M		07	1	90	43	169	E	14.0
C	CHUM	CHUM	0	3	0	525	F		07	1	90	43	169	E	14.0
C	CHUM	CHUM	0	3	0	545	F		07	1	90	43	169	E	14.0
C	CHUM	CHUM	0	3	0	450	M		07	1	90	43	169	E	14.0
C	CHUM	CHUM	0	2	0	495	M		07	1	90	43	169	E	13.3
C	CHUM	CHUM	0	3	1	615	M		07	1	90	43	169	E	13.3
C	CHUM	CHUM	0	3	1	615	M		07	1	90	43	169	E	13.3
C	CHUM	CHUM	0	3	0	550	M		07	1	90	43	169	E	13.3
C	CHUM	CHUM	0	2	1	630	F		07	1	90	43	169	E	13.3
C	CHUM	CHUM	0	4	1	595	F		07	1	90	41	170	E	14.9
J	CHUM	CHUM	0	3	1	542	M		07	1	90	41	170	E	12.6
C	CHUM	CHUM	0	3	0	708	M	033	07	1	90	41	170	E	15.4
C	CHUM	CHUM	0	3	0	685	M	022	07	1	90	41	170	E	15.0
C	CHUM	CHUM	0	3	1	575	M	013	07	1	90	41	170	E	15.0
C	CHUM	CHUM	0	3	1	595	F	074	07	1	90	41	170	E	15.0
C	CHUM	CHUM	0	3	0	615	F	068	07	1	90	41	170	E	15.0
C	CHUM	CHUM	0	6	1	645	M	145	07	1	90	41	170	E	15.0
C	CHUM	CHUM	0	3	0	655	F	071	07	1	90	41	170	E	15.0
C	CHUM	CHUM	0	3	0	650	F	088	07	1	90	41	170	E	15.0
C	CHUM	CHUM	0	3	1	655	M	072	07	1	90	41	170	E	15.0
A	UNID	CHUM	0	3	1	590	U	<1	07	1	90	42	170	E	15.5
C	CHUM	CHUM	0	3	0	540	M		07	1	90	43	170	E	13.8
C	CHUM	CHUM	0	2	0	505	M		07	1	90	43	170	E	13.8
A	COHO	CHUM	0	3	0	578	M		07	1	90	40	170	E	12.8
A	COHO	CHUM	0	3	1	577	F		07	1	90	40	170	E	12.8
J	CHUM	CHUM	0	3	0	600	M		07	1	90	41	175	E	12.4
J	COHO	CHUM	0	3	0	640	F		07	1	90	41	175	E	12.4
A	KING	CHUM	0	3	0	530	F		07	1	90	41	176	E	13.0
A	KING	CHUM	0	3	1	610	M		07	1	90	41	176	E	13.0
A	COHO	CHUM	0	3	0	578	M		07	1	90	41	177	E	13.1
J	CHUM	CHUM	0	4	0	543	F		07	1	90	41	177	E	13.5
A	CHUM	CHUM	0	3	0	630	F		07	1	90	41	177	E	12.9
J	CHUM	CHUM	0	4	0	616	M		07	1	90	41	177	E	12.8
J	CHUM	CHUM	0	4	0	645	M		07	1	90	41	177	E	12.8
J	CHUM	CHUM	0	4	1	550	M		07	1	90	40	178	E	15.4
J	CHUM	CHUM	0	2	1	500	M		07	1	90	40	178	E	15.4
J	CHUM	CHUM	0	2	0	520	M		07	1	90	41	178	E	13.7
J	CHUM	CHUM	0	3	1	600	F		07	1	90	41	178	E	13.8
A	UNID	CHUM	0	3	0	550	U		07	1	90	41	179	E	13.5
J	CHUM	CHUM	0	4	1	534	F		07	1	90	40	179	E	13.8
J	CHUM	CHUM	0	2	0	460	M		07	1	90	40	180	W	14.0

Appendix Table 2 cont'd.

J	CHUM	CHUM	0	2	1	514	F		07	1	90	40	180	W	14.0
J	CHUM	CHUM	0	3	1	565	F		07	1	90	40	178	W	15.2
A	CHUM	CHUM	0	3	0	524	F	014	07	1	90	41	173	W	15.0
A	COHO	CHUM	0	4	0	520	F	164	07	1	90	42	169	W	16.0
J	CHUM	CHUM	0	3	0	646	M		07	1	90	41	152	W	13.5
A	COHO	CHUM	0	4	1	557	U		07	2	90	41	170	E	16.0
A	COHO	CHUM	0	3	0	660	U		07	2	90	41	170	E	15.1
A	COHO	CHUM	0	3	0	620	U		07	2	90	41	170	E	15.1
A	COHO	CHUM	0	2	0	535	U		07	2	90	41	170	E	15.1
A	COHO	CHUM	0	3	1	695	U		07	2	90	41	170	E	15.1
A	COHO	CHUM	0	3	0	660	U		07	2	90	41	170	E	15.1
A	COHO	CHUM	0	3	0	660	U		07	2	90	41	170	E	15.1
A	COHO	CHUM	0	3	0	660	U		07	2	90	41	170	E	15.1
A	COHO	CHUM	0	4	1	000	U		07	2	90	41	170	E	15.1
A	COHO	CHUM	0	3	0	635	U		07	2	90	41	170	E	15.1
A	COHO	CHUM	0	4	1	630	U		07	2	90	41	170	E	15.1
A	COHO	CHUM	0	3	0	630	U		07	2	90	41	170	E	15.1
A	COHO	CHUM	0	3	0	630	U		07	2	90	41	170	E	15.1
A	SOCK	CHUM	0	3	1	540	U		07	2	90	41	170	E	15.1
A	COHO	CHUM	0	3	1	685	U		07	2	90	41	170	E	15.1
A	COHO	CHUM	0	3	1	650	U		07	2	90	41	170	E	15.1
A	CHUM	CHUM	0	2	0	540	M		07	2	90	41	170	E	13.7
A	CHUM	CHUM	0	4	1	600	F	115	07	2	90	41	171	E	13.2
A	CHUM	CHUM	0	3	1	550	M	003	07	2	90	41	171	E	13.2
A	CHUM	CHUM	0	2	1	550	M	004	07	2	90	41	171	E	13.2
A	CHUM	CHUM	0	3	0	590	F	106	07	2	90	41	171	E	13.2
A	CHUM	CHUM	0	2	0	510	M	003	07	2	90	41	171	E	13.2
A	CHUM	CHUM	0	3	0	530	F	020	07	2	90	41	171	E	13.2
A	CHUM	CHUM	0	3	0	590	F	138	07	2	90	41	171	E	13.2
A	KING	CHUM	0	2	0	532	M	003	07	2	90	41	173	E	13.4
A	COHO	CHUM	0	3	0	640	M		07	2	90	41	175	E	13.0
A	COHO	CHUM	0	3	0	610	M		07	2	90	41	175	E	13.0
J	CHUM	CHUM	0	4	0	570	M		07	2	90	42	149	W	14.6
A	COHO	CHUM	0	3	0	685	U		07	3	90	41	170	E	14.5
A	COHO	CHUM	0	3	1	700	U		07	3	90	41	170	E	14.5
A	COHO	CHUM	0	4	1	790	U		07	3	90	41	170	E	14.5
A	COHO	CHUM	0	3	1	670	U		07	3	90	41	170	E	14.5
A	COHO	CHUM	0	3	1	660	U		07	3	90	41	170	E	14.5
A	COHO	CHUM	0	3	1	610	U		07	3	90	41	170	E	15.6
A	COHO	CHUM	0	3	0	600	M		07	3	90	41	170	E	14.0
A	COHO	CHUM	0	3	0	590	U		07	3	90	41	170	E	14.0
A	COHO	CHUM	0	2	1	490	U		07	3	90	41	170	E	14.0
A	COHO	CHUM	0	4	0	640	U		07	3	90	41	170	E	14.0
A	COHO	CHUM	0	2	0	530	U		07	3	90	41	170	E	14.0
A	COHO	CHUM	0	2	0	57C	U		07	3	90	41	170	E	14.0
A	COHO	CHUM	0	3	0	550	U		07	3	90	41	170	E	14.0
A	COHO	CHUM	0	4	1	570	U		07	3	90	41	170	E	14.0
A	COHO	CHUM	0	3	1	600	U		07	3	90	41	170	E	14.0
A	COHO	CHUM	0	3	1	650	U		07	3	90	41	170	E	14.0
A	COHO	CHUM	0	2	0	570	U		07	3	90	41	170	E	14.0
A	COHO	CHUM	0	2	0	560	U		07	3	90	41	170	E	14.0
A	COHO	CHUM	0	3	1	650	U		07	3	90	41	170	E	14.0
A	COHO	CHUM	0	3	1	640	U		07	3	90	41	170	E	14.0
A	COHO	CHUM	0	2	0	550	U		07	3	90	41	170	E	14.0
A	COHO	CHUM	0	3	1	610	U		07	3	90	41	170	E	14.0
A	COHO	CHUM	0	2	0	570	U		07	3	90	41	170	E	14.0
A	COHO	CHUM	0	3	0	590	U		07	3	90	41	170	E	14.0

Appendix Table 2 cont'd.

A	COHO	CHUM	0	3	1	590	U		07	3	90	41	170	E	14.0
A	COHO	CHUM	0	3	1	720	U		07	3	90	41	170	E	14.0
A	COHO	CHUM	0	4	0	630	U		07	3	90	41	170	E	14.0
A	COHO	CHUM	0	3	0	670	U		07	3	90	41	170	E	14.0
A	COHO	CHUM	0	3	0	730	U		07	3	90	41	170	E	14.0
A	UNID	CHUM	0	4	0	580	U		07	3	90	41	171	E	13.7
A	UNID	CHUM	0	3	0	660	U		07	3	90	41	171	E	13.7
A	COHO	CHUM	0	3	0	620	U		07	3	90	41	171	E	15.2
A	COHO	CHUM	0	3	0	575	U		07	3	90	41	171	E	15.2
C	CHUM	CHUM	0	3	0	590	M		08	1	90	44	178	E	16.5
C	CHUM	CHUM	0	2	0	477	F		08	1	90	44	178	E	16.5
A	COHO	CHUM	0	3	0	560	F		08	1	90	44	180	W	15.0
A	CHUM	CHUM	0	2	1	530	F		08	1	90	44	180	W	15.0
A	COHO	CHUM	0	3	1	570	U		08	1	90	44	180	W	15.0
A	CHUM	CHUM	0	2	1	565	U		08	1	90	44	180	W	15.0
A	CHUM	CHUM	0	3	1	560	F		08	1	90	44	180	W	15.0
A	CHUM	CHUM	0	3	1	510	F		08	1	90	44	180	W	15.0
A	CHUM	CHUM	0	2	1	540	U		08	1	90	44	180	W	15.0
A	CHUM	CHUM	0	2	1	510	U		08	1	90	44	180	W	15.0
A	CHUM	CHUM	0	3	1	510	F		08	1	90	44	180	W	15.0
A	UNID	CHUM	0	2	1	000	U		08	1	90	44	180	W	15.0
A	CHUM	CHUM	0	3	0	585	F		08	1	90	44	180	W	15.0
A	CHUM	CHUM	0	3	0	530	F		08	1	90	44	180	W	15.0
A	CHUM	CHUM	0	3	0	520	U		08	1	90	44	180	W	15.0
A	COHO	CHUM	0	3	0	584	M	016	08	1	90	43	158	W	14.1
A	COHO	CHUM	0	2	1	505	U		08	2	90	44	170	E	16.0
A	CHUM	CHUM	0	2	0	500	F	011	08	2	90	44	171	E	15.0
A	CHUM	CHUM	0	3	0	600	M	004	08	2	90	44	171	E	15.0
A	CHUM	CHUM	0	3	0	640	M	004	08	2	90	44	171	E	15.0
A	CHUM	CHUM	0	2	0	490	F	009	08	2	90	44	171	E	15.9
A	CHUM	CHUM	0	3	1	580	M	100	08	2	90	44	171	E	15.9
A	CHUM	CHUM	0	2	0	530	F	012	08	2	90	44	171	E	15.9
A	CHUM	CHUM	0	2	0	530	M	003	08	2	90	44	171	E	15.9
A	CHUM	CHUM	0	3	0	510	M	003	08	2	90	44	171	E	15.9
A	CHUM	CHUM	0	2	0	520	M	003	08	2	90	44	171	E	15.9
A	CHUM	CHUM	0	3	1	580	M	004	08	2	90	44	171	E	15.9
A	CHUM	CHUM	0	3	0	560	F	025	08	2	90	44	171	E	15.9
A	CHUM	CHUM	0	3	0	680	M	086	08	2	90	44	171	E	15.9
A	CHUM	CHUM	0	3	0	530	M	004	08	2	90	44	171	E	15.9
C	COHO	CHUM	0	3	0	585	M	006	08	2	90	45	161	W	13.1
C	COHO	CHUM	0	3	0	583	F	441	08	2	90	44	160	W	14.5
A	CHUM	CHUM	0	2	0	523	F	103	08	2	90	43	158	W	14.4
A	UNID	CHUM	0	2	0	000	M		08	3	90	44	180	W	14.9
A	UNID	CHUM	0	3	1	560	F		08	3	90	44	180	W	14.9
A	CHUM	CHUM	0	3	0	640	F		08	3	90	45	179	W	14.8
A	CHUM	CHUM	0	2	0	543	U		09	1	90	45	171	E	15.0
A	CHUM	CHUM	0	2	0	526	U		09	1	90	45	172	E	14.0
A	CHUM	CHUM	0	3	0	605	U		09	1	90	45	172	E	14.0
A	CHUM	CHUM	0	3	0	680	F		09	1	90	45	161	W	14.8
J	CHUM	CHUM	0	2	1	497	M		09	3	90	44	174	E	10.6
J	CHUM	CHUM	0	3	0	596	F		09	3	90	44	174	E	10.6
J	CHUM	CHUM	0	3	1	551	M		09	3	90	44	174	E	10.6
J	CHUM	CHUM	0	3	0	582	F		09	3	90	44	174	E	10.6
J	CHUM	CHUM	0	3	0	564	M		09	3	90	44	174	E	10.6
J	CHUM	CHUM	0	3	0	569	M		09	3	90	44	174	E	10.6
A	CHUM	CHUM	0	3	1	610	F		10	1	90	43	176	W	13.5

Appendix Table 3. Pink salmon data collected by observers in 1990 from the Japanese squid driftnet fishery.

SOURCE	IDOBS	IDFRI	FW	OC	FL	SEX	GW	MON	PER	YR	DLT	DLN	DIR	SST
A	PINK	PINK	0	1	510	M		06	1	90	39	180	W	13.4
A	PINK	PINK	0	1	510	M		06	1	90	39	180	W	13.4
J	PINK	PINK	0	1	460	F		06	3	90	39	175	E	15.5
A	PINK	PINK	0	1	512	M		07	1	90	40	170	E	12.8
C	PINK	PINK	0	1	530	M		07	1	90	40	160	W	17.0
J	PINK	PINK	0	1	572	M		07	1	90	40	180	W	14.0
C	PINK	PINK	0	1	470	M		07	1	90	41	160	W	16.1
A	PINK	PINK	0	1	460	M	058	07	2	90	41	170	E	13.7
A	PINK	PINK	0	1	440	M		07	2	90	41	167	W	15.1
J	STHD	PINK	0	1	530	M		08	2	90	44	179	E	15.2
A	PINK	PINK	0	1	440	M	083	08	2	90	44	177	E	14.8
A	PINK	PINK	0	1	000	M	025	08	2	90	44	177	E	15.0
A	PINK	PINK	0	1	477	M		08	2	90	43	158	W	14.1
A	KING	PINK	0	1	440	F		08	2	90	45	154	W	13.2
A	KING	PINK	0	1	500	M		08	2	90	44	179	W	15.7
A	STHD	PINK	0	1	500	M		08	2	90	45	160	W	13.7
C	PINK	PINK	0	1	520	F	140	08	3	90	44	175	E	14.7
J	SOCK	PINK	0	1	495	F		09	1	90	43	167	W	15.6

Appendix Table 4. Coho salmon data collected by observers in 1990 from the Japanese squid driftnet fishery.

SOURCE	IDOBS	IDFRI	FW	OC	FL	SEX	GW	MON	PER	YR	DLT	DLN	DIR	SST
A	COHO	COHO	2	1	620	F		06	1	90	39	176	E	14.0
A	KING	COHO	2	1	600	M		06	1	90	39	177	E	13.6
A	COHO	COHO	2	1	590	F		06	1	90	39	169	W	13.4
A	COHO	COHO	2	1	610	M		06	1	90	39	168	W	15.0
A	COHO	COHO	2	1	590	M		06	1	90	39	168	W	13.9
C	CHUM	COHO	2	1	562	F		06	1	90	39	163	W	12.7
A	COHO	COHO	X	1	620	F		06	2	90	39	175	E	13.9
C	COHO	COHO	2	1	561	F	036	06	2	90	39	176	E	13.0
C	COHO	COHO	2	1	617	M	037	06	2	90	39	169	W	14.7
J	CHUM	COHO	2	1	602	M		06	2	90	39	169	W	13.5
J	COHO	COHO	2	1	580	M		06	3	90	39	175	E	15.5
J	COHO	COHO	2	1	630	M		06	3	90	39	175	E	15.5
J	COHO	COHO	2	1	590	M		06	3	90	39	175	E	15.5
J	COHO	COHO	2	1	660	M		06	3	90	39	175	E	15.5
J	COHO	COHO	2	1	650	M		06	3	90	39	175	E	15.5
J	COHO	COHO	2	1	540	F		06	3	90	39	175	E	15.5
J	COHO	COHO	2	1	670	M		06	3	90	39	175	E	15.5
J	COHO	COHO	2	1	630	M		06	3	90	39	175	E	15.5
A	COHO	COHO	1	1	590	M		06	3	90	39	175	E	13.2
A	COHO	COHO	1	1	620	M		06	3	90	39	176	E	13.0
A	COHO	COHO	X	1	650	M		06	3	90	39	176	E	13.0
A	COHO	COHO	2	1	640	F		06	3	90	39	176	E	13.0
A	COHO	COHO	2	1	650	M		06	3	90	39	176	E	13.0
A	COHO	COHO	1	1	600	M		06	3	90	39	176	E	13.0
A	COHO	COHO	2	1	650	M		06	3	90	39	176	E	13.0
J	COHO	COHO	3	1	580	U		06	3	90	39	176	E	14.2
J	COHO	COHO	2	1	570	U		06	3	90	39	176	E	14.2
J	COHO	COHO	2	1	560	U		06	3	90	39	176	E	14.2
J	COHO	COHO	X	1	570	U		06	3	90	39	176	E	14.2
A	UNID	COHO	2	1	726	F		06	3	90	41	177	E	13.7
A	UNID	COHO	2	1	774	F		06	3	90	41	177	E	13.7
A	UNID	COHO	2	1	721	U		06	3	90	41	177	E	13.7
A	UNID	COHO	2	1	630	M	018	06	3	90	41	177	E	13.3
A	UNID	COHO	2	1	640	M	015	06	3	90	41	177	E	13.3
A	UNID	COHO	2	1	590	F	108	06	3	90	41	177	E	13.3
A	UNID	COHO	2	1	620	M	095	06	3	90	41	177	E	12.8
J	COHO	COHO	2	1	610	M		06	3	90	39	180	W	13.5
J	COHO	COHO	2	1	522	F		06	3	90	39	178	W	14.9
J	COHO	COHO	1	1	612	M		06	3	90	39	178	W	14.9
J	COHO	COHO	2	1	604	M		06	3	90	39	178	W	14.9
J	COHO	COHO	2	1	628	M		06	3	90	39	178	W	14.9
J	COHO	COHO	2	1	574	F		06	3	90	39	178	W	14.9
J	COHO	COHO	X	1	598	M		06	3	90	39	178	W	14.9
J	COHO	COHO	1	1	612	M		06	3	90	39	178	W	14.9
J	COHO	COHO	1	1	602	M		06	3	90	39	178	W	14.9
J	COHO	COHO	X	1	648	M		06	3	90	39	178	W	14.9
J	COHO	COHO	2	1	562	F		06	3	90	39	178	W	14.9
J	COHO	COHO	2	1	591	M		06	3	90	39	178	W	14.8
J	COHO	COHO	2	1	524	F		06	3	90	39	178	W	14.8
J	COHO	COHO	2	1	632	M		06	3	90	39	178	W	14.8
J	COHO	COHO	2	1	630	M		06	3	90	39	178	W	14.8
J	COHO	COHO	2	1	611	M		06	3	90	39	178	W	14.8

Appendix Table 4 cont'd.

J	COHO	COHO	2	1	568	F		06	3	90	39	178	W	14.8
J	COHO	COHO	2	1	592	M		06	3	90	39	178	W	14.8
J	COHO	COHO	2	1	599	M		06	3	90	39	178	W	14.8
J	COHO	COHO	2	1	604	M		06	3	90	39	178	W	14.8
J	COHO	COHO	2	1	575	F		06	3	90	39	178	W	14.8
A	KING	COHO	2	1	615	F	006	06	3	90	39	173	W	14.4
A	KING	COHO	2	1	635	M	010	06	3	90	39	173	W	14.4
A	KING	COHO	2	1	612	M	009	06	3	90	39	173	W	14.4
A	KING	COHO	1	1	634	M	036	06	3	90	39	173	W	14.4
A	KING	COHO	2	1	622	M	008	06	3	90	39	173	W	14.4
A	COHO	COHO	2	1	634	F		06	3	90	41	172	W	16.2
A	UNID	COHO	2	1	640	M	084	07	1	90	42	169	E	14.3
C	COHO	COHO	2	1	625	M		07	1	90	43	169	E	14.0
C	COHO	COHO	2	1	620	M		07	1	90	43	169	E	14.0
C	COHO	COHO	2	1	565	F		07	1	90	43	169	E	14.0
C	COHO	COHO	2	1	560	M		07	1	90	43	169	E	14.0
C	COHO	COHO	2	1	545	F		07	1	90	43	169	E	14.0
C	COHO	COHO	X	1	605	F		07	1	90	43	169	E	14.0
C	COHO	COHO	2	1	550	F		07	1	90	43	169	E	14.0
C	COHO	COHO	2	1	610	M		07	1	90	43	169	E	14.0
C	COHO	COHO	3	1	610	F		07	1	90	43	169	E	14.0
C	COHO	COHO	2	1	575	F		07	1	90	43	169	E	14.0
C	COHO	COHO	2	1	595	F		07	1	90	43	169	E	13.3
C	COHO	COHO	2	1	565	M		07	1	90	43	169	E	13.3
C	COHO	COHO	2	1	615	F		07	1	90	43	169	E	13.3
C	COHO	COHO	2	1	615	M		07	1	90	43	169	E	13.3
C	COHO	COHO	2	1	590	M		07	1	90	43	169	E	13.3
C	COHO	COHO	2	1	565	M		07	1	90	43	169	E	13.3
C	COHO	COHO	2	1	625	F		07	1	90	43	169	E	13.3
C	COHO	COHO	2	1	609	F		07	1	90	41	170	E	14.9
C	COHO	COHO	2	1	585	M		07	1	90	41	170	E	14.9
C	COHO	COHO	2	1	610	F		07	1	90	41	170	E	14.9
C	COHO	COHO	2	1	620	M		07	1	90	41	170	E	14.9
C	COHO	COHO	2	1	565	F		07	1	90	41	170	E	14.9
C	COHO	COHO	X	1	585	F		07	1	90	41	170	E	14.9
C	COHO	COHO	2	1	580	F		07	1	90	41	170	E	14.9
C	COHO	COHO	2	1	585	F		07	1	90	41	170	E	14.9
C	COHO	COHO	2	1	595	M		07	1	90	41	170	E	14.9
C	COHO	COHO	2	1	600	F		07	1	90	41	170	E	14.9
C	COHO	COHO	X	1	630	F		07	1	90	41	170	E	14.9
C	COHO	COHO	2	1	610	M		07	1	90	41	170	E	14.9
C	COHO	COHO	2	1	575	M		07	1	90	41	170	E	14.9
C	COHO	COHO	2	1	640	F		07	1	90	41	170	E	14.9
C	COHO	COHO	2	1	610	M		07	1	90	41	170	E	14.9
J	COHO	COHO	2	1	648	M		07	1	90	41	170	E	12.6
C	COHO	COHO	2	1	610	M	052	07	1	90	41	170	E	15.4
C	COHO	COHO	2	1	570	M	041	07	1	90	41	170	E	15.0
C	COHO	COHO	1	1	645	F	095	07	1	90	41	170	E	15.0
C	COHO	COHO	2	1	595	F	074	07	1	90	41	170	E	15.0
C	COHO	COHO	2	1	590	M	040	07	1	90	41	170	E	15.0
C	COHO	COHO	2	1	560	F	085	07	1	90	41	170	E	15.0
C	COHO	COHO	X	1	660	M		07	1	90	43	170	E	13.8
C	COHO	COHO	2	1	595	F		07	1	90	43	170	E	13.8
C	COHO	COHO	2	1	600	M		07	1	90	43	170	E	13.8
C	COHO	COHO	2	1	595	M		07	1	90	43	170	E	13.8
C	COHO	COHO	X	1	575	F		07	1	90	43	170	E	13.8
C	COHO	COHO	2	1	575	M		07	1	90	43	170	E	13.8

Appendix Table 4 cont'd.

C	COHO	COHO	2	1	510	M		07	1	90	43	170	E	13.8
C	COHO	COHO	2	1	525	F		07	1	90	43	170	E	13.8
C	COHO	COHO	2	1	635	F		07	1	90	43	170	E	13.8
C	COHO	COHO	2	1	565	F		07	1	90	43	170	E	13.8
A	COHO	COHO	2	1	578	F		07	1	90	40	170	E	12.8
A	COHO	COHO	2	1	576	F		07	1	90	40	170	E	12.8
A	COHO	COHO	2	1	619	M		07	1	90	40	170	E	12.8
A	UNID	COHO	2	1	000	U		07	1	90	40	170	E	12.8
A	COHO	COHO	2	1	544	F		07	1	90	40	170	E	12.8
A	COHO	COHO	1	1	541	F		07	1	90	40	170	E	12.8
A	COHO	COHO	2	1	612	M		07	1	90	40	170	E	12.8
A	COHO	COHO	2	1	612	M		07	1	90	40	170	E	12.8
A	COHO	COHO	2	1	587	F		07	1	90	40	170	E	12.8
A	COHO	COHO	2	1	601	M		07	1	90	40	170	E	12.8
A	COHO	COHO	2	1	583	F		07	1	90	40	170	E	12.8
A	COHO	COHO	2	1	577	F		07	1	90	40	170	E	12.8
A	COHO	COHO	X	1	570	M		07	1	90	40	170	E	12.8
A	COHO	COHO	2	1	634	F		07	1	90	40	170	E	12.8
A	COHO	COHO	1	1	582	F		07	1	90	40	170	E	12.8
A	COHO	COHO	2	1	581	F		07	1	90	40	170	E	12.8
A	COHO	COHO	2	1	609	M		07	1	90	40	170	E	12.8
A	COHO	COHO	2	1	572	F		07	1	90	40	170	E	12.8
A	COHO	COHO	1	1	556	M		07	1	90	40	170	E	12.8
A	COHO	COHO	X	1	570	F		07	1	90	40	170	E	12.8
A	COHO	COHO	2	1	575	M		07	1	90	40	170	E	12.8
A	COHO	COHO	X	1	645	M		07	1	90	40	170	E	12.8
C	COHO	COHO	2	1	570	F	079	07	1	90	42	170	E	13.1
C	COHO	COHO	2	1	625	M	056	07	1	90	42	170	E	13.1
C	COHO	COHO	2	1	590	F	062	07	1	90	42	170	E	13.1
C	COHO	COHO	2	1	520	M		07	1	90	42	170	E	13.1
C	COHO	COHO	2	1	615	M		07	1	90	42	170	E	13.1
C	COHO	COHO	2	1	580	F		07	1	90	42	170	E	13.1
J	COHO	COHO	2	1	641	M		07	1	90	41	171	E	13.3
J	COHO	COHO	2	1	632	M		07	1	90	41	171	E	14.2
J	COHO	COHO	2	1	560	M		07	1	90	41	175	E	12.4
J	COHO	COHO	2	1	590	F		07	1	90	41	175	E	12.4
J	COHO	COHO	2	1	610	F		07	1	90	41	175	E	12.4
J	COHO	COHO	2	1	615	F		07	1	90	41	175	E	12.4
J	COHO	COHO	2	1	584	F		07	1	90	41	177	E	13.6
A	CHUM	COHO	2	1	640	M	040	07	1	90	41	177	E	12.8
A	CHUM	COHO	2	1	570	M	084	07	1	90	41	177	E	13.1
A	UNID	COHO	2	1	000	M		07	1	90	41	177	E	13.1
A	KING	COHO	2	1	600	U		07	1	90	41	178	E	13.4
J	COHO	COHO	3	1	585	F		07	1	90	41	178	E	13.7
J	COHO	COHO	1	1	620	M		07	1	90	41	178	E	13.8
A	KING	COHO	2	1	620	U		07	1	90	41	179	E	13.5
A	KING	COHO	2	1	620	U		07	1	90	41	179	E	13.5
A	KING	COHO	2	1	610	U		07	1	90	41	179	E	13.5
A	KING	COHO	1	1	560	U		07	1	90	41	179	E	13.5
J	COHO	COHO	2	1	590	U		07	1	90	40	179	E	13.1
J	COHO	COHO	2	1	610	U		07	1	90	40	179	E	13.1
J	COHO	COHO	2	1	601	F		07	1	90	40	179	E	14.2
J	COHO	COHO	2	1	621	M		07	1	90	40	180	W	14.0
J	COHO	COHO	X	1	590	M		07	1	90	40	178	W	15.2
J	COHO	COHO	2	1	622	M		07	1	90	41	178	W	15.0
J	COHO	COHO	2	1	562	F		07	1	90	41	178	W	15.0
J	COHO	COHO	2	1	640	M		07	1	90	41	178	W	15.0

Appendix Table 4 cont'd.

J	COHO	COHO	1	1	610	M	07	1	90	40	178	W	14.2
J	COHO	COHO	2	1	598	M	07	1	90	40	178	W	14.2
J	COHO	COHO	2	1	612	M	07	1	90	40	178	W	14.2
J	COHO	COHO	2	1	578	M	07	1	90	40	178	W	14.2
J	COHO	COHO	2	1	596	M	07	1	90	40	178	W	14.2
J	COHO	COHO	2	1	615	M	07	1	90	40	178	W	14.2
J	COHO	COHO	2	1	612	M	07	1	90	40	178	W	14.2
J	COHO	COHO	2	1	610	M	07	1	90	40	178	W	14.2
J	COHO	COHO	2	1	598	M	07	1	90	40	178	W	14.2
J	COHO	COHO	2	1	608	M	07	1	90	40	178	W	14.2
A	UNID	COHO	2	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	2	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	2	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	3	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	3	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	2	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	3	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	X	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	X	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	X	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	X	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	2	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	X	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	2	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	2	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	2	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	X	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	1	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	1	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	X	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	X	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	X	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	X	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	1	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	2	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	2	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	1	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	X	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	X	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	2	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	X	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	X	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	1	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	2	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	2	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	1	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	2	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	2	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	2	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	X	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	X	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	X	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	X	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	X	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	2	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	2	1	000	U	07	1	90	40	178	W	15.3
A	UNID	COHO	1	1	000	U	07	1	90	40	178	W	15.3

Appendix Table 4 cont'd.

A	UNID	COHO	2	1	000	U	07	1	90	40	178	W	15.3
A	COHO	COHO	2	1	670	M	07	1	90	40	178	W	15.3
A	COHO	COHO	2	1	640	M	07	1	90	40	178	W	15.3
A	COHO	COHO	2	1	580	M	07	1	90	40	178	W	15.3
A	COHO	COHO	2	1	600	F	07	1	90	40	178	W	15.3
A	COHO	COHO	2	1	590	M	07	1	90	40	178	W	15.3
A	COHO	COHO	2	1	610	M	07	1	90	40	178	W	15.3
A	COHO	COHO	2	1	620	M	07	1	90	40	178	W	15.3
A	COHO	COHO	2	1	630	M	07	1	90	40	178	W	15.3
A	COHO	COHO	2	1	580	F	07	1	90	40	178	W	15.3
A	COHO	COHO	2	1	570	F	07	1	90	40	178	W	15.3
A	COHO	COHO	1	1	620	M	07	1	90	40	178	W	15.3
A	COHO	COHO	2	1	650	M	07	1	90	40	178	W	15.3
A	COHO	COHO	2	1	590	F	07	1	90	40	178	W	15.3
A	COHO	COHO	2	1	630	M	07	1	90	40	178	W	15.3
A	COHO	COHO	2	1	610	F	07	1	90	40	178	W	15.3
A	COHO	COHO	2	1	600	F	07	1	90	40	178	W	15.3
A	COHO	COHO	2	1	640	M	07	1	90	40	178	W	15.3
A	COHO	COHO	2	1	620	M	07	1	90	40	178	W	15.3
A	COHO	COHO	X	1	570	F	07	1	90	40	178	W	15.3
A	COHO	COHO	X	1	630	M	07	1	90	40	178	W	15.3
A	COHO	COHO	X	1	650	M	07	1	90	40	178	W	15.3
A	COHO	COHO	X	1	620	F	07	1	90	40	178	W	15.3
A	COHO	COHO	2	1	660	M	07	1	90	40	178	W	15.3
A	COHO	COHO	X	1	600	M	07	1	90	40	178	W	15.3
A	COHO	COHO	X	1	640	M	07	1	90	40	178	W	15.3
A	COHO	COHO	2	1	630	M	07	1	90	40	178	W	15.3
A	COHO	COHO	X	1	630	M	07	1	90	40	178	W	15.3
A	COHO	COHO	2	1	610	M	07	1	90	40	178	W	15.3
A	COHO	COHO	2	1	580	M	07	1	90	40	178	W	15.3
A	COHO	COHO	2	1	660	M	07	1	90	40	178	W	15.3
A	COHO	COHO	1	1	610	M	07	1	90	40	178	W	15.3
A	COHO	COHO	2	1	570	M	07	1	90	40	178	W	15.3
A	COHO	COHO	1	1	550	M	07	1	90	40	178	W	15.3
A	COHO	COHO	2	1	540	M	07	1	90	40	178	W	15.3
A	COHO	COHO	2	1	610	M	07	1	90	40	178	W	15.3
A	COHO	COHO	2	1	650	M	07	1	90	40	178	W	15.3
A	COHO	COHO	1	1	600	F	07	1	90	40	178	W	15.0
A	COHO	COHO	X	1	595	U	07	1	90	40	178	W	15.0
A	KING	COHO	2	1	605	M	07	1	90	40	178	W	15.0
A	COHO	COHO	1	1	590	F	07	1	90	40	178	W	16.2
A	COHO	COHO	2	1	580	M	07	1	90	40	178	W	16.2
A	COHO	COHO	2	1	630	F	07	1	90	40	178	W	16.2
A	UNID	COHO	2	1	000	U	07	1	90	40	178	W	16.1
A	UNID	COHO	2	1	000	U	07	1	90	40	178	W	16.1
A	UNID	COHO	2	1	000	U	07	1	90	40	178	W	16.1
A	COHO	COHO	2	1	590	M	07	1	90	41	176	W	15.3
A	COHO	COHO	2	1	600	M	07	1	90	41	176	W	15.3
A	COHO	COHO	X	1	600	F	07	1	90	41	176	W	15.3
A	COHO	COHO	2	1	590	M	07	1	90	41	176	W	15.3
A	COHO	COHO	2	1	610	M	07	1	90	41	176	W	15.3
A	COHO	COHO	2	1	610	M	07	1	90	41	176	W	15.3
A	COHO	COHO	2	1	630	M	07	1	90	41	176	W	15.3
A	COHO	COHO	2	1	610	M	07	1	90	41	176	W	15.3
A	COHO	COHO	2	1	630	M	07	1	90	41	176	W	15.3
A	COHO	COHO	2	1	610	M	07	1	90	41	176	W	15.3
A	COHO	COHO	2	1	630	M	07	1	90	41	176	W	15.3

Appendix Table 4 cont'd.

A	COHO	COHO	2	1	630	F		07	1	90	41	176	W	15.3
A	COHO	COHO	2	1	630	M		07	1	90	41	176	W	15.3
A	COHO	COHO	2	1	600	M		07	1	90	41	176	W	15.3
A	KING	COHO	2	1	640	M	020	07	1	90	41	173	W	15.0
A	KING	COHO	2	1	634	F	042	07	1	90	41	173	W	15.0
A	KING	COHO	2	1	642	F	043	07	1	90	41	173	W	15.0
A	KING	COHO	2	1	599	F	027	07	1	90	41	173	W	15.0
A	KING	COHO	2	1	624	M	025	07	1	90	41	173	W	15.0
A	KING	COHO	2	1	619	M	007	07	1	90	41	173	W	15.0
A	KING	COHO	2	1	610	M	010	07	1	90	41	173	W	15.0
A	KING	COHO	2	1	606	F	044	07	1	90	41	173	W	15.0
A	KING	COHO	2	1	568	M	014	07	1	90	41	173	W	15.0
A	KING	COHO	2	1	614	F	024	07	1	90	41	173	W	15.0
A	CHUM	COHO	2	1	630	M	068	07	1	90	41	173	W	15.0
A	CHUM	COHO	1	1	620	M	040	07	1	90	41	173	W	15.0
A	CHUM	COHO	X	1	640	M	030	07	1	90	41	173	W	15.0
A	CHUM	COHO	3	1	630	M	050	07	1	90	41	173	W	15.0
A	CHUM	COHO	2	1	630	F	120	07	1	90	41	173	W	15.0
A	CHUM	COHO	2	1	610	F	080	07	1	90	41	173	W	15.0
A	CHUM	COHO	2	1	600	M	045	07	1	90	41	173	W	15.0
A	CHUM	COHO	2	1	640	M	015	07	1	90	41	173	W	15.0
A	CHUM	COHO	2	1	570	F	048	07	1	90	41	173	W	15.0
A	CHUM	COHO	2	1	610	M	028	07	1	90	41	173	W	15.0
A	CHUM	COHO	2	1	650	M	026	07	1	90	41	173	W	15.0
J	COHO	COHO	2	1	582	F	048	07	1	90	41	171	W	16.5
A	COHO	COHO	2	1	602	M	028	07	1	90	41	171	W	16.6
A	COHO	COHO	2	1	570	F	071	07	1	90	42	170	W	15.1
A	COHO	COHO	2	1	590	M	027	07	1	90	42	169	W	15.2
A	COHO	COHO	2	1	570	F	043	07	1	90	42	169	W	15.2
A	COHO	COHO	2	1	480	F	032	07	1	90	42	169	W	15.2
A	COHO	COHO	2	1	570	M	013	07	1	90	42	169	W	15.2
A	COHO	COHO	2	1	600	M	037	07	1	90	42	169	W	15.2
A	COHO	COHO	2	1	580	M	019	07	1	90	42	169	W	15.2
A	COHO	COHO	2	1	612	F	021	07	1	90	42	169	W	13.4
A	COHO	COHO	2	1	638	M	053	07	1	90	42	169	W	13.4
A	COHO	COHO	2	1	570	F		07	1	90	41	169	W	15.6
A	COHO	COHO	X	1	630	M		07	1	90	41	169	W	15.6
A	COHO	COHO	2	1	630	F		07	1	90	41	169	W	15.6
A	COHO	COHO	2	1	590	U		07	1	90	41	169	W	15.6
A	COHO	COHO	X	1	615	U		07	1	90	41	169	W	15.6
A	COHO	COHO	2	1	600	M		07	1	90	41	169	W	15.6
C	COHO	COHO	2	1	622	M		07	1	90	41	169	W	15.6
C	COHO	COHO	2	1	592	F		07	1	90	41	169	W	15.6
A	COHO	COHO	2	1	540	M		07	1	90	41	168	W	16.0
A	COHO	COHO	1	1	580	M		07	1	90	41	168	W	15.9
A	COHO	COHO	2	1	580	F		07	1	90	41	168	W	15.9
A	CHUM	COHO	2	1	000	U		07	1	90	41	168	W	15.6
A	CHUM	COHO	2	1	000	U		07	1	90	41	168	W	15.6
A	COHO	COHO	2	1	550	F		07	1	90	41	167	W	16.1
A	COHO	COHO	2	1	610	F		07	1	90	41	167	W	16.1
A	COHO	COHO	2	1	590	F		07	1	90	41	167	W	16.1
A	COHO	COHO	2	1	610	U		07	1	90	42	167	W	14.1
A	COHO	COHO	2	1	570	F		07	1	90	42	167	W	14.1
C	COHO	COHO	2	1	610	F		07	1	90	41	167	W	15.7
C	COHO	COHO	2	1	650	M		07	1	90	41	167	W	16.5
A	CHUM	COHO	2	1	605	F		07	1	90	42	166	W	16.6
A	CHUM	COHO	2	1	604	F		07	1	90	42	166	W	16.6

Appendix Table 4 cont'd.

A	CHUM	COHO	2	1	616	U		07	1	90	42	166	W	16.5
A	CHUM	COHO	1	1	602	M		07	1	90	42	166	W	16.5
A	CHUM	COHO	2	1	643	M		07	1	90	42	166	W	15.6
A	CHUM	COHO	2	1	632	F		07	1	90	42	166	W	16.3
A	UNID	COHO	2	1	600	M	094	07	2	90	42	168	E	12.9
A	UNID	COHO	1	1	580	F	076	07	2	90	42	168	E	12.9
A	UNID	COHO	2	1	600	F	120	07	2	90	42	168	E	12.9
A	UNID	COHO	1	1	610	F	084	07	2	90	42	168	E	12.9
A	COHO	COHO	2	1	630	U		07	2	90	41	170	E	15.1
A	COHO	COHO	2	1	000	U		07	2	90	41	170	E	15.1
A	COHO	COHO	2	1	670	U		07	2	90	41	170	E	15.1
A	COHO	COHO	2	1	690	U		07	2	90	41	170	E	15.1
A	CHUM	COHO	2	1	580	F	101	07	2	90	41	171	E	13.2
J	COHO	COHO	1	1	592	F		07	2	90	41	171	E	14.6
J	COHO	COHO	1	1	598	F		07	2	90	41	171	E	14.9
A	KING	COHO	2	1	638	M	017	07	2	90	41	171	E	14.0
A	KING	COHO	2	1	622	M	023	07	2	90	41	171	E	14.0
A	KING	COHO	2	1	635	M	014	07	2	90	41	171	E	14.0
A	KING	COHO	2	1	640	M	031	07	2	90	41	171	E	14.0
J	COHO	COHO	2	1	610	U		07	2	90	41	171	E	14.0
J	COHO	COHO	2	1	590	U		07	2	90	41	171	E	14.0
J	COHO	COHO	2	1	590	U		07	2	90	41	171	E	14.0
J	COHO	COHO	2	1	590	U		07	2	90	41	171	E	14.0
J	COHO	COHO	1	1	600	U		07	2	90	41	171	E	14.0
J	COHO	COHO	X	1	580	U		07	2	90	41	171	E	14.0
J	COHO	COHO	2	1	590	U		07	2	90	41	171	E	14.0
J	COHO	COHO	2	1	590	U		07	2	90	41	171	E	14.0
J	COHO	COHO	2	1	590	U		07	2	90	41	171	E	14.0
J	COHO	COHO	2	1	600	U		07	2	90	41	171	E	14.0
A	KING	COHO	2	1	610	M	007	07	2	90	41	173	E	13.4
A	KING	COHO	2	1	572	M	028	07	2	90	41	173	E	13.4
A	KING	COHO	1	1	543	M	013	07	2	90	41	173	E	13.4
A	KING	COHO	2	1	590	F	033	07	2	90	41	173	E	13.4
A	KING	COHO	2	1	596	M	047	07	2	90	41	173	E	13.4
A	KING	COHO	2	1	625	M	017	07	2	90	41	173	E	13.4
A	KING	COHO	2	1	650	F	047	07	2	90	41	173	E	13.4
A	KING	COHO	1	1	638	M	008	07	2	90	41	173	E	13.4
A	KING	COHO	2	1	680	M	019	07	2	90	41	173	E	13.4
A	KING	COHO	2	1	683	M	057	07	2	90	41	173	E	13.4
J	COHO	COHO	2	1	590	M		07	2	90	41	173	E	15.3
J	COHO	COHO	2	1	635	F		07	2	90	41	173	E	15.3
J	COHO	COHO	1	1	560	U		07	2	90	41	173	E	14.0
J	COHO	COHO	1	1	580	U		07	2	90	41	173	E	14.0
J	COHO	COHO	1	1	600	U		07	2	90	41	173	E	14.0
J	COHO	COHO	2	1	591	U		07	2	90	41	173	E	14.0
J	COHO	COHO	2	1	590	U		07	2	90	41	173	E	14.0
J	COHO	COHO	X	1	580	U		07	2	90	41	173	E	14.0
J	COHO	COHO	2	1	580	U		07	2	90	41	173	E	14.0
J	COHO	COHO	1	1	590	U		07	2	90	41	173	E	14.0
J	COHO	COHO	2	1	590	U		07	2	90	41	173	E	14.0
J	COHO	COHO	x	1	580	U		07	2	90	41	173	E	14.0
J	COHO	COHO	2	1	590	U		07	2	90	41	173	E	14.0
J	COHO	COHO	2	1	590	U		07	2	90	41	173	E	14.0
J	COHO	COHO	2	1	580	U		07	2	90	41	173	E	14.0
J	COHO	COHO	2	1	580	U		07	2	90	41	173	E	14.0
J	COHO	COHO	2	1	600	U		07	2	90	41	173	E	14.0
J	COHO	COHO	2	1	590	U		07	2	90	41	173	E	14.0

Appendix Table 4 cont'd.

J	COHO	COHO	2	1	590	U		07	2	90	41	173	E	14.0
J	COHO	COHO	2	1	580	U		07	2	90	41	173	E	14.0
J	COHO	COHO	2	1	590	U		07	2	90	41	173	E	14.0
J	COHO	COHO	2	1	590	U		07	2	90	41	173	E	14.0
A	COHO	COHO	2	1	620	F		07	2	90	41	174	E	12.9
A	KING	COHO	X	1	620	U		07	2	90	41	174	E	13.5
A	CHUM	COHO	2	1	620	M	050	07	2	90	41	174	E	14.0
A	CHUM	COHO	2	1	590	F	126	07	2	90	41	174	E	14.0
A	CHUM	COHO	2	1	600	F	080	07	2	90	41	174	E	14.0
J	COHO	COHO	2	1	620	M		07	2	90	41	175	E	12.8
J	COHO	COHO	2	1	610	F		07	2	90	41	175	E	12.8
J	COHO	COHO	2	1	620	M		07	2	90	41	175	E	12.8
A	COHO	COHO	2	1	630	M		07	2	90	41	175	E	13.2
A	KING	COHO	2	1	610	U		07	2	90	41	175	E	12.7
A	KING	COHO	2	1	630	U		07	2	90	41	175	E	12.7
A	KING	COHO	X	1	610	U		07	2	90	41	175	E	12.7
A	KING	COHO	2	1	660	U		07	2	90	41	175	E	12.7
A	KING	COHO	2	1	660	U		07	2	90	41	175	E	12.7
A	KING	COHO	2	1	630	U		07	2	90	41	175	E	12.7
A	KING	COHO	X	1	590	U		07	2	90	41	175	E	12.7
A	KING	COHO	2	1	590	U		07	2	90	41	175	E	12.7
A	KING	COHO	2	1	590	U		07	2	90	41	175	E	12.7
A	KING	COHO	2	1	630	U		07	2	90	41	175	E	12.7
A	KING	COHO	2	1	610	U		07	2	90	41	175	E	12.7
A	KING	COHO	2	1	650	U		07	2	90	41	175	E	12.7
A	KING	COHO	2	1	640	U		07	2	90	41	175	E	12.7
A	COHO	COHO	2	1	630	M		07	2	90	41	175	E	13.0
A	COHO	COHO	2	1	650	M		07	2	90	41	175	E	13.0
A	COHO	COHO	2	1	650	M		07	2	90	41	175	E	13.0
A	COHO	COHO	2	1	610	M		07	2	90	41	175	E	13.0
A	COHO	COHO	2	1	640	F		07	2	90	41	175	E	13.0
A	COHO	COHO	2	1	600	M		07	2	90	41	175	E	13.0
A	COHO	COHO	1	1	620	F		07	2	90	41	175	E	13.0
A	KING	COHO	X	1	570	U		07	2	90	41	175	E	13.0
A	KING	COHO	2	1	610	U		07	2	90	41	175	E	13.0
A	KING	COHO	2	1	620	U		07	2	90	41	175	E	13.0
A	KING	COHO	2	1	630	U		07	2	90	41	175	E	13.0
A	KING	COHO	2	1	610	U		07	2	90	41	175	E	13.0
A	KING	COHO	2	1	590	U		07	2	90	41	175	E	13.0
A	KING	COHO	X	1	590	U		07	2	90	41	175	E	13.0
J	COHO	COHO	2	1	590	F		07	2	90	41	173	W	16.8
A	COHO	COHO	3	1	656	F	098	07	2	90	42	170	W	13.4
A	COHO	COHO	2	1	634	M	042	07	2	90	42	170	W	13.4
A	KING	COHO	2	1	620	F		07	2	90	42	168	W	15.0
A	COHO	COHO	2	1	610	M		07	2	90	42	168	W	15.0
C	COHO	COHO	1	1	596	M	040	07	2	90	42	164	W	14.6
A	COHO	COHO	2	1	620	U		07	3	90	41	170	E	14.0
A	COHO	COHO	2	1	650	U		07	3	90	41	170	E	14.0
A	KING	COHO	2	1	630	U		07	3	90	41	171	E	13.7
A	KING	COHO	2	1	640	U		07	3	90	41	171	E	13.7
A	KING	COHO	2	1	675	U		07	3	90	41	171	E	13.7
A	KING	COHO	3	1	600	U		07	3	90	41	171	E	13.7
A	KING	COHO	2	1	620	U		07	3	90	41	171	E	13.7
A	KING	COHO	2	1	650	U		07	3	90	41	171	E	13.7
A	COHO	COHO	2	1	560	U		07	3	90	41	171	E	15.2
A	COHO	COHO	2	1	500	U		07	3	90	41	171	E	15.2
A	COHO	COHO	2	1	600	U		07	3	90	41	171	E	15.2

Appendix Table 4 cont'd.

J	COHO	COHO	1	1	614	F		07	3	90	41	177	E	15.0
J	COHO	COHO	X	1	560	M		07	3	90	41	177	E	14.6
C	UNID	COHO	2	1	637	F	140	08	1	90	44	178	E	15.3
C	COHO	COHO	2	1	575	F		08	1	90	44	178	E	15.7
A	COHO	COHO	1	1	510	M		08	1	90	44	180	W	15.0
C	COHO	COHO	2	1	580	F		08	1	90	44	180	W	15.5
C	COHO	COHO	2	1	605	M		08	1	90	44	180	W	15.5
C	COHO	COHO	2	1	645	F		08	1	90	44	180	W	15.5
C	COHO	COHO	2	1	610	F		08	1	90	44	180	W	15.5
A	COHO	COHO	2	1	635	F		08	1	90	44	180	W	15.0
A	COHO	COHO	2	1	630	M		08	1	90	44	180	W	15.0
A	COHO	COHO	2	1	570	M		08	1	90	44	180	W	15.0
A	COHO	COHO	2	1	595	F		08	1	90	44	180	W	15.0
A	COHO	COHO	3	1	560	F		08	1	90	44	180	W	15.0
A	COHO	COHO	2	1	570	F		08	1	90	44	180	W	15.0
A	COHO	COHO	2	1	580	M		08	1	90	44	180	W	15.0
A	COHO	COHO	3	1	590	U		08	1	90	44	180	W	15.0
A	COHO	COHO	2	1	650	M		08	1	90	44	180	W	15.0
A	COHO	COHO	X	1	600	F		08	1	90	44	180	W	15.0
A	COHO	COHO	2	1	615	M		08	1	90	44	180	W	15.0
A	COHO	COHO	2	1	595	M		08	1	90	44	180	W	15.0
A	COHO	COHO	2	1	610	F		08	1	90	44	180	W	15.0
A	COHO	COHO	2	1	580	M		08	1	90	44	180	W	15.0
A	COHO	COHO	2	1	590	F		08	1	90	44	180	W	15.0
A	COHO	COHO	X	1	620	F		08	1	90	44	180	W	15.0
A	COHO	COHO	2	1	560	M		08	1	90	44	180	W	15.0
A	COHO	COHO	2	1	600	M		08	1	90	44	180	W	15.0
A	COHO	COHO	2	1	685	M		08	1	90	44	180	W	15.0
A	KING	COHO	2	1	710	M		08	1	90	44	180	W	14.4
A	COHO	COHO	2	1	657	F		08	1	90	44	180	W	15.1
C	COHO	COHO	2	1	655	F	055	08	1	90	43	180	W	16.3
A	COHO	COHO	2	1	590	M		08	1	90	44	179	W	15.0
A	COHO	COHO	2	1	590	F	140	08	1	90	44	179	W	14.2
A	COHO	COHO	2	1	600	F	125	08	1	90	44	179	W	14.2
J	COHO	COHO	1	1	560	M		08	1	90	41	168	W	15.6
J	COHO	COHO	2	1	640	M		08	1	90	41	167	W	16.9
A	COHO	COHO	1	1	632	M	020	08	1	90	44	159	W	13.4
J	COHO	COHO	1	1	670	M		08	1	90	45	152	W	13.7
A	COHO	COHO	0	1	496	M		08	3	90	44	180	W	14.0
A	COHO	COHO	2	1	688	F		09	1	90	45	159	W	14.2
A	COHO	COHO	2	1	717	F	396	09	1	90	45	158	W	14.1
A	COHO	COHO	3	1	748	M	279	09	1	90	45	158	W	15.0
C	CHUM	COHO	2	1	653	F	585	09	3	90	42	175	E	13.8

Appendix Table 5. King salmon data collected by observers in 1990 from the Japanese squid driftnet fishery.

SOURCE	IDOBS	IDFRI	FW	OC	FL	SEX	GW	MON	PER	YR	DLT	DLN	DIR	SST
A	KING	KING	1	2	600	M	180	06	3	90	39	169	W	18.5
A	KING	KING	1	2	820	U		07	3	90	41	170	E	14.0
A	KING	KING	X	3	810	U		07	3	90	41	171	E	13.7
C	UNID	KING	X	2	820	M	007	08	1	90	44	178	E	15.3
C	UNID	KING	1	3	870	M	009	08	1	90	44	178	E	15.3
C	KING	KING	1	2	649	F	003	08	1	90	43	178	W	15.7
A	SOCK	KING	1	1	690	F		08	2	90	45	160	W	13.2
A	KING	KING	1	3	914	M		08	3	90	44	174	E	15.0
A	KING	KING	1	3	944	M		08	3	90	44	176	E	14.9
A	KING	KING	1	3	746	F		09	1	90	45	171	E	15.0
A	KING	KING	1	2	710	F		09	1	90	45	171	E	15.0
A	UNID	KING	X	3	000	U		09	1	90	45	177	E	13.5
J	KING	KING	X	4	834	M		09	1	90	45	175	W	14.5
A	KING	KING	1	2	660	M		09	2	90	45	177	W	14.6

Appendix Table 6. Steelhead data collected by observers in 1990 from the Japanese squid driftnet fishery.

SOURCE	IDOBS	IDFRI	FW	OC	FL	SEX	GW	MON	PER	YR	DLT	DLN	DIR	SST
A	STHD	STHD	3	2	557	M	002	07	1	90	42	161	W	15.2
A	STHD	STHD	1	2	634	M	003	07	1	90	42	161	W	15.2
A	STHD	STHD	3	2	760	F	039	07	2	90	41	170	E	13.7
A	STHD	STHD	1	2	604	F	004	07	2	90	42	170	W	13.4
J	STHD	STHD	X	2	590	F		07	2	90	42	164	W	14.7
C	STHD	STHD*	1	2	850	M	017	08	1	90	44	160	W	13.2
C	STHD	STHD	2	2	890	F	103	08	1	90	44	158	W	13.2
C	STHD	STHD	X	X	609	F	013	08	2	90	45	161	W	13.1
C	STHD	STHD	X	2	771	M	030	08	2	90	45	161	W	13.1
A	KING	STHD*	1	1	670	M		08	2	90	45	161	W	13.2
A	KING	STHD	1	2	790	M		08	2	90	45	161	W	13.2
A	KING	STHD	1	1	670	F		08	2	90	45	160	W	12.8
J	KING	STHD	1	1	630	M		08	2	90	45	159	W	13.0
J	KING	STHD	1	1	612	M		08	2	90	45	159	W	13.0
A	COHO	STHD*	1	2	940	U		08	2	90	45	153	W	12.8
A	COHO	STHD*	X	1	600	U		08	2	90	45	153	W	12.8
J	STHD	STHD	X	3	685	M		08	3	90	45	158	W	14.4
A	STHD	STHD	2	1	654	F	004	09	3	90	44	173	E	10.6

*Coded-wire tagged, USFWS Dworshak hatchery, Snake River, Idaho (Dahlberg et al. 1991).