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Review of Salmon Troll Fisheries in Southern British Columbia

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REVIEW OF SALMON TROLL FISHERIES IN SOUTHERN BRITISH COLUMBIA[1]

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ABSTRACT

This paper reviews regulations, catch and effort for southern British Columbia salmon troll fisheries, and international aspects of managing these fisheries.

Trolling chinook and coho salmon for commercial sale began in British Columbia before 1920. The troll fishery intensified after 1951 and the greatest troll catches of these species were experienced in the 1970s. Troll catches of pink and sockeye were of minor importance until the mid-1960s.

In British Columbia south of Cape Caution, trollers harvest salmon in three areas, Georgia Strait, Johnstone Strait and the west coast of Vancouver Island. Prior to 1978, B.C. and Washington trollers took sizable catches from waters off each others west coasts where there is a complicated mixture of Canadian and United States stocks of chinook and coho. This was responsible for considerable cooperative management and research concerning troll fisheries by both countries. However, this complexity at times led to international controversy. In 1985, the southern B.C. troll fishery was an important element leading to conclusion of negotiations for a comprehensive Pacific Salmon Agreement between Canada and the United States.

In the years immediately prior to signing the agreement, and in 1985, B.C. troll fisheries were increasingly regulated to conserve chinook salmon and to allocate pink and sockeye salmon. In spite of significant curtailment of fishing times and areas, overall troll catches and catch per unit effort have increased. Trollers increased catches by increasing their harvest of sockeye, pink and chum, while chinook and coho harvest fell.

Key words: Pacific salmon, commercial troll fishing, regulations, international management, catch and effort.

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RÉSUMÉ

Cet article passe en revue les règlements, les prises et l'effort de capture en ce qui concerne la pêche à la traîne du saumon au sud de la Colombie-Britannique et les aspects internationaux relatifs à la gestion de cette pêche.

La pêche à la traîne du saumon quinnat et du saumon coho à des fins commerciales a commencé en Colombie-Britannique avant 1920. La pêche à la traîne s'est intensifiée après 1951 et les plus fortes prises de ces espèces à la traîne ont été enregistrées dans les années 70. Les prises à la traîne de saumon rose et de saumon rouge ont été d'une importance mineure jusqu'au milieu des années 60.

En Colombie-Britannique, au sud du Cap Caution, les pêcheurs à la traîne capturent du saumon dans trois secteurs qui sont le détroit de Géorgie, le détroit de Johnstone et la côte ouest de l'île Vancouver. Avant 1978, les pêcheurs à la traîne de la C.-B. et de l'Etat de Washington ont récolté des prises assez importantes dans les eaux situées au large de chacune des autres côtes occidentales où il y a un mélange complexe de stocks canadiens et américains de saumon quinnat et de saumon coho. Cela a amené d'importantes activités conjointes de gestion et de recherche des deux pays concernant la pêche à la traîne. Cependant, cette complexité a provoqué à certains moments une polémique au niveau international. En 1985, la pêche à la traîne au sud de la C.-B. a été un élément important qui a conduit à la conclusion de négociations pour une entente globale sur le saumon du Pacifique entre le Canada et les Etats-Unis.

Dans les années précédant immédiatement la signature de l'entente et en 1985, on a réglementé de plus en plus la pêche à la traîne en C.-B. afin de préserver le saumon quinnat et d'attribuer des allocations pour le saumon rouge et le saumon rose. En dépit d'une réduction importante des périodes et des zones de pêche, il y a eu dans l'ensemble augmentation des prises à la traîne et des captures par unité d'effort. Les pêcheurs à la traîne ont accru leurs prises en pêchant davantage de saumons rouges, roses et kétas tandis que les prises de saumons quinnats et cohos ont diminué.

Mots-clés: saumon du Pacifique, pêche commerciale à la traîne, règlements, gestion internationale, prises et effort de pêche.

REVIEW OF SALMON TROLL FISHERIES IN SOUTHERN BRITISH COLUMBIA

1.0 INTRODUCTION

Troll caught salmon are a valuable commercial product for which there is a high demand in domestic and world markets. Trolling in British Columbia to supply these markets began as a row boat operation using handlines with single lures in the early part of this century (Milne 1964). Today the fleet is composed of technologically advanced small vessels, each vessel using up to six steel lines and up to 40 leaders with lures per line. In pace with improved technology, B.C. trollers in the last 35 years have steadily increased catches and catch per unit effort.

Many Canadian and United States stocks of chinook and coho, the traditional species caught by trollers, mix in the major trolling areas of B.C., Alaska, Washington and Oregon (Anon 1984a, 1984b; Argue et al. 1983; Fraidenburg and Lincoln 1985). Increasing troll exploitation of these stocks soon became a matter of concern to Canada and the United States (Anon 1948a, 1957, 1969; Cleaver 1969). As a result, the need for joint regulation of troll fisheries has been a controversial source of discussion between the two countries since the 1940s.

Conservation needs for these species have been expressed in a number of reports (eg. Argue et al. 1983; Fraidenburg and Lincoln 1985; Hankin and Healey 1986; Healey 1982; Hilborn 1984; Milne 1964) and were an important factor leading to signature of the Pacific Salmon Treaty between Canada and the United States early in 1985. After many years of conflict, the Treaty provided a framework for cooperative development of effective regulations to conserve chinook and coho stocks from both countries.

In view of major regulatory changes to B.C. troll fisheries that resulted from the Salmon Treaty, it was considered important to document past regulations, trends in catch, effort and catch success, and the effects of past international arrangements on the troll fishery. This report addresses these subjects for three troll fisheries in southern British Columbia: Georgia Strait (areas 13-20, 28, 29), Johnstone Strait (areas 111, 11-12), and the west coast of Vancouver Island (areas 121-127, 21-27) (Figure 1). Detailed catch statistics are presented for 1951 to 1985 and historical aspects of trolling since 1900 are discussed.

1.1 Historical Background

Trolling with lures was a traditional fishing method of Pacific Coast Indians, and it is known that troll fisheries

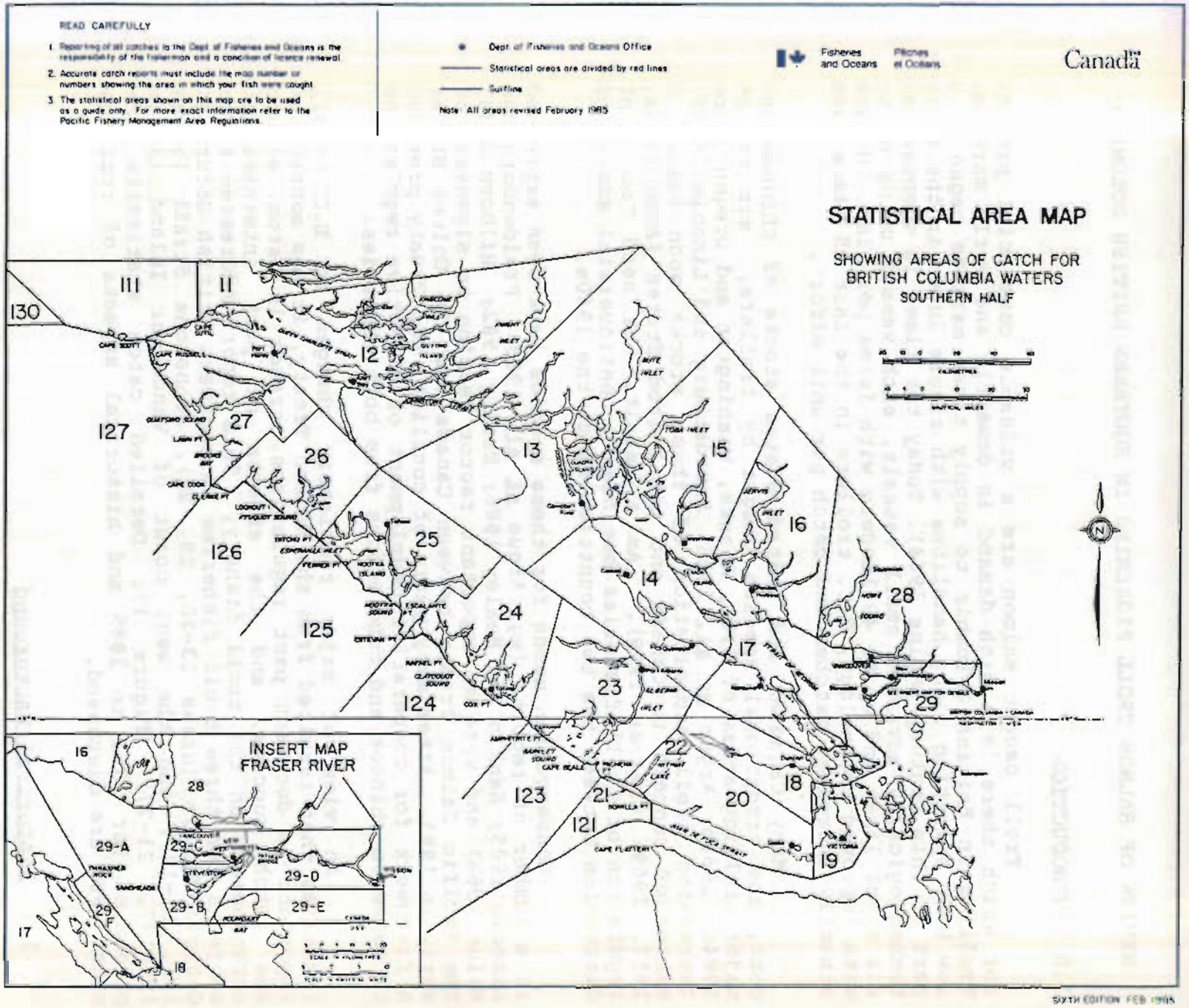

Figure 1. Map showing current British Columbia statistical areas south of Cape Caution. Portions of areas seaward of the surfline are indicated by addition of 100 to the number of the area. The surfline is the solid heavy line along the west coast of Vancouver Island.

became an important element in the commercial fishery very early in the present century, although records of commercial catches by troll gear are not available prior to 1920. In the beginning, commercial fishing was conducted by handlining from rowboats. The Haida Indians were skilled salmon fishermen and early accounts of hook and line fishing (Forrester and Forrester 1975) concentrated on their activities in northern British Columbia, particularly around the Queen Charlotte Islands where large chinook were caught to satisfy the demand for "mild cure" salmon by fish processing establishments in Prince Rupert. The Haidas were the principal participants in the early northern fishery but were soon joined by white men, particularly Scandinavians. By 1913, a fishery of over 400 boats was operating in the northern area (Dept. Mar. Fish. Ann. Rept. 1913-1914). At about the same time, an active troll fishery was developing in southern British Columbia. By 1910, small power boats were operating in the open ocean at the entrance to Juan de Fuca Strait (Milne 1964); by 1918 these vessels were using power gurdies.

Annual Reports of the Fisheries Department provide estimates of the numbers of salmon caught by gear by species beginning in 1920. To illustrate the general growth of the British Columbia troll fishery following this date, Figure 2 shows annual catches of troll-caught chinook salmon in British Columbia from 1920 through 1984 (1934-1936 catches of approximately one million chinook judged in error and omitted from the graph).

In the State of Washington, trolling for salmon also developed on a commercial basis in the early 1900s. Rounsefell and Kellez (1938) noted that by 1908 Washington State trollers were fishing well into Juan de Fuca Strait and that by 1911 they were operating in the open ocean off Cape Flattery. Commercial trolling began in Alaska at about the same time. Unfortunately, troll catch information is not available for Washington State before 1927; data for Alaska are available from 1905 onward. Catches for Washington and the southeastern portion of Alaska are included in Figure 2.

The data in Figure 2 illustrate that active development of the coast-wide troll fishery reached its peak prior to 1955 in Washington and Alaska, but not until the 1970s in B.C. By the 1920s, the migratory stocks of chinook and coho, the principal targets of the troll fishery, were harvested by a more or less continuous band of small vessels stretching from Yakutat in Southeast Alaska southward to the Sacramento River in southern California. The stocks fished in this fishery represent a complicated mixture originating in widely scattered natal streams (Anon 1984a, Fraidenburg and Lincoln 1985). For example, the majority of the chinook salmon caught in Alaska are bound either

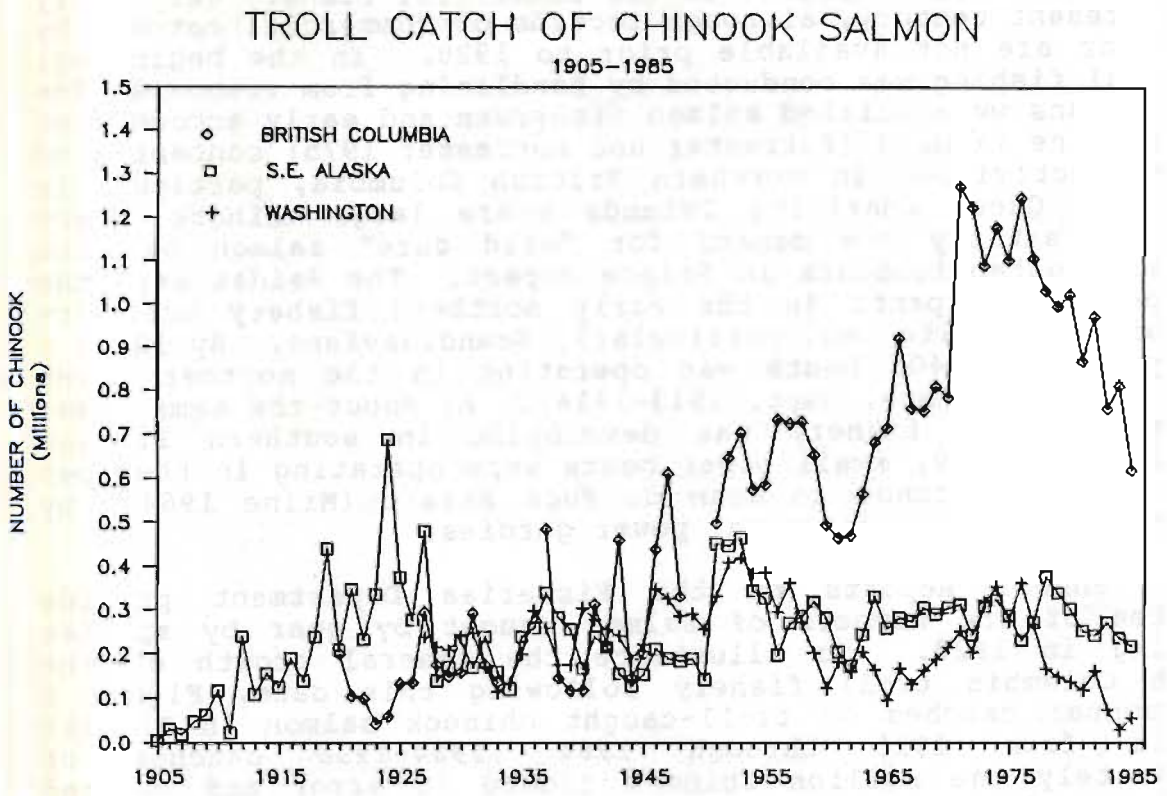

Figure 2. Historical troll catch of chinook (pieces) in British Columbia, Washington and southeast Alaska. Data sources: British Columbia, 1920-1962, Milne (1964); 1963-1985, PBS salmon catch data base. Washington, 1927-1959, Shepard et al. (1985); 1960-1982, WDF (1961-1983), 1983-1985 (Heather Fletcher, DFO, pers. comm.). Southeast Alaska, 1904-1927, Shepard et al. (1985); 1928-1950, Parker and Kirkness (1956); 1951-1980, (M.P. Shepard, unpub. data); 1981-1982, ADFG (1982-1983); 1983-1985, (Heather Fletcher, DFO, pers. comm.).

for the rivers of Canada or of Washington State. Most of the chinook and coho taken in Canada's productive troll fishery off the west coast of Vancouver Island are bound for rivers in Washington and Oregon. These factors created serious management problems and international controversy.

The present report concentrates on the troll fishery of southern British Columbia. In considering the particulars of this fishery, it is useful to keep in mind its intrinsic relationship to fisheries in adjacent waters and the fact that the stocks it exploits are subject to fishing over a broad range of the Pacific coasts of the United States and Canada.

The fisheries described herein harvest only a portion of the allowable catch from each stock. Thus, the reader will find little discussion of the status of these stocks, or of precise stock composition and timing in fisheries. Such topics are most appropriately dealt with in stock assessment reports, rather than in a historical review.

2.0 DESCRIPTION OF TROLLING

2.1 Troll Vessels and Fishing Methods

Troll vessels vary greatly in size, although the majority are between 20 and 50 feet in overall length (6-15 m). In Georgia Strait, some troll fishermen license small fiberglass "sport" vessels for mooching salmon with hand held rods and reels (Argue *et al.* 1983). Most troll vessels, however, are in the 35 to 45 ft (11-14 m) range (Figure 3), carry six trolling lines and six gurdies run by hydraulic power. These vessels are manned by a skipper and a deckhand. There also are a sizable number of troll-gillnet combination vessels, somewhat smaller than the standard trollers, that carry a gillnet drum in addition to four to six trolling lines (Figure 4). Most vessels are equipped with several sophisticated echo sounders for fish finding, radios for communication, an automatic pilot and other standard navigation equipment including Loran-C.

Troll vessels can be grouped into three categories on the basis of length of fishing trip. Day boats generally carry small amounts of ice and deliver catches each day. Sales slips for these vessels typically show one day of fishing. Trip boats carry large quantities of ice and remain at sea for about two weeks, or until they have a full load of salmon (approximately 7 tonnes for a 13 m vessel). These fishermen commonly record the total length of their trip on the sales slip, including running time and weather days. Freezer vessels stay at sea for longer periods, sometimes up to one month, since freezers have replaced

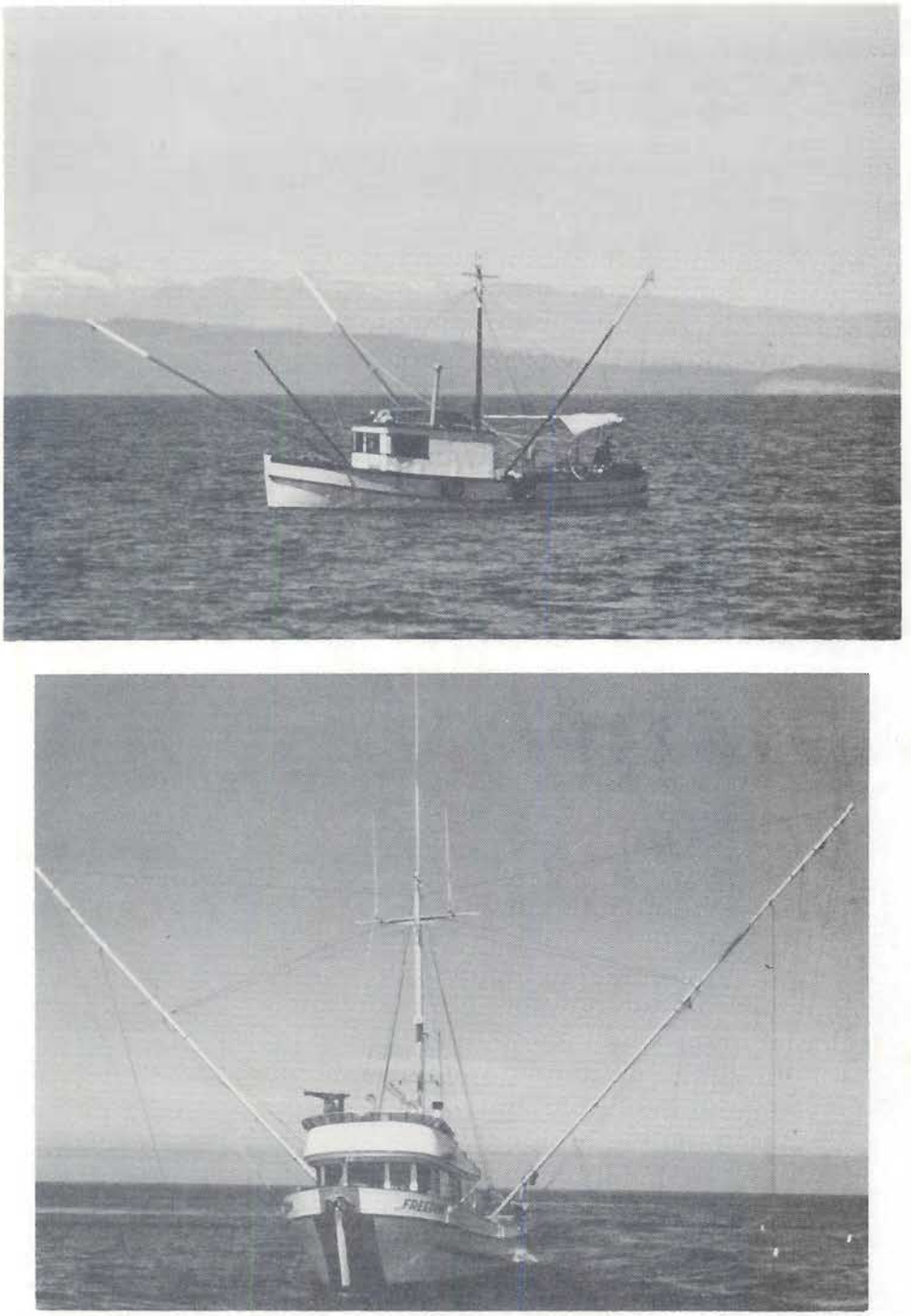

Figure 3. Salmon troll vessels. Vessel in upper photograph is fishing with bow poles.

Figure 4. A salmon gillnet-troll combination vessel.

ice as the means of catch preservation. Beginning in 1971, separate catch statistics became available for freezer vessels. It should be noted that dates recorded in the DFO statistical system for ice and freezer troller catch and effort are the dates fishermen delivered their catches; these are the dates used to present weekly statistics in this report.

In principle, trolling is simply the capture of salmon that are susceptible to the "food-like" qualities that lures simulate (Argue 1970). In practice, trolling techniques are extremely complicated. The features of lures that motivate salmon to strike certain types and not others are poorly understood. Salmon feeding patterns and food preferences vary with sexual maturity and size amongst the species, but the precise physiological basis for diurnal/seasonal changes in feeding are poorly understood. This often translates into contradictory results from controlled field experiments. Pitre (1970) found that large lures, ie. plugs, caught a higher proportion of large chinook than did spoons. On the other hand, Argue (1970) found that three vessels fishing identical arrangements of two terminal gear types (spoons and hootchie-dodgers) in the same areas and at the same times caught significantly different species and size compositions of salmon. He concluded that factors other than the terminal gear influenced catch rates and composition of the catch (eg. fishing speed, fishing depth, gear handling). Shardlow (1980) found evidence that behavioural interaction between individual salmon in a school could also affect catch rates and that trollers could key in on these behaviour patterns in order to improve catches.

In the final analysis, troll fishermen experiment with many parameters - lures, lure spacing on lines, length of leaders, trolling speed, depth, fishing times and areas - in order to develop a combination that "works" for the individual and his vessel. Thus the terminal gear layout shown in Figure 5 illustrates some of the general components in the trollers fishing arsenal, not what particular fisherman currently use.

2.2 Distribution and Number of Troll Vessels

2.2.1 Vessel distribution

The distribution of trollers fishing at any particular time is difficult to estimate from fishery statistics since sales slips make no provision for recording catch and fishing days from more than one statistical area. Overflights are one means used to establish vessel distribution and daily fleet size. Between 1965 and 1970, flights were conducted during the trolling season by the Department of Fisheries and Oceans (DFO) (Argue and

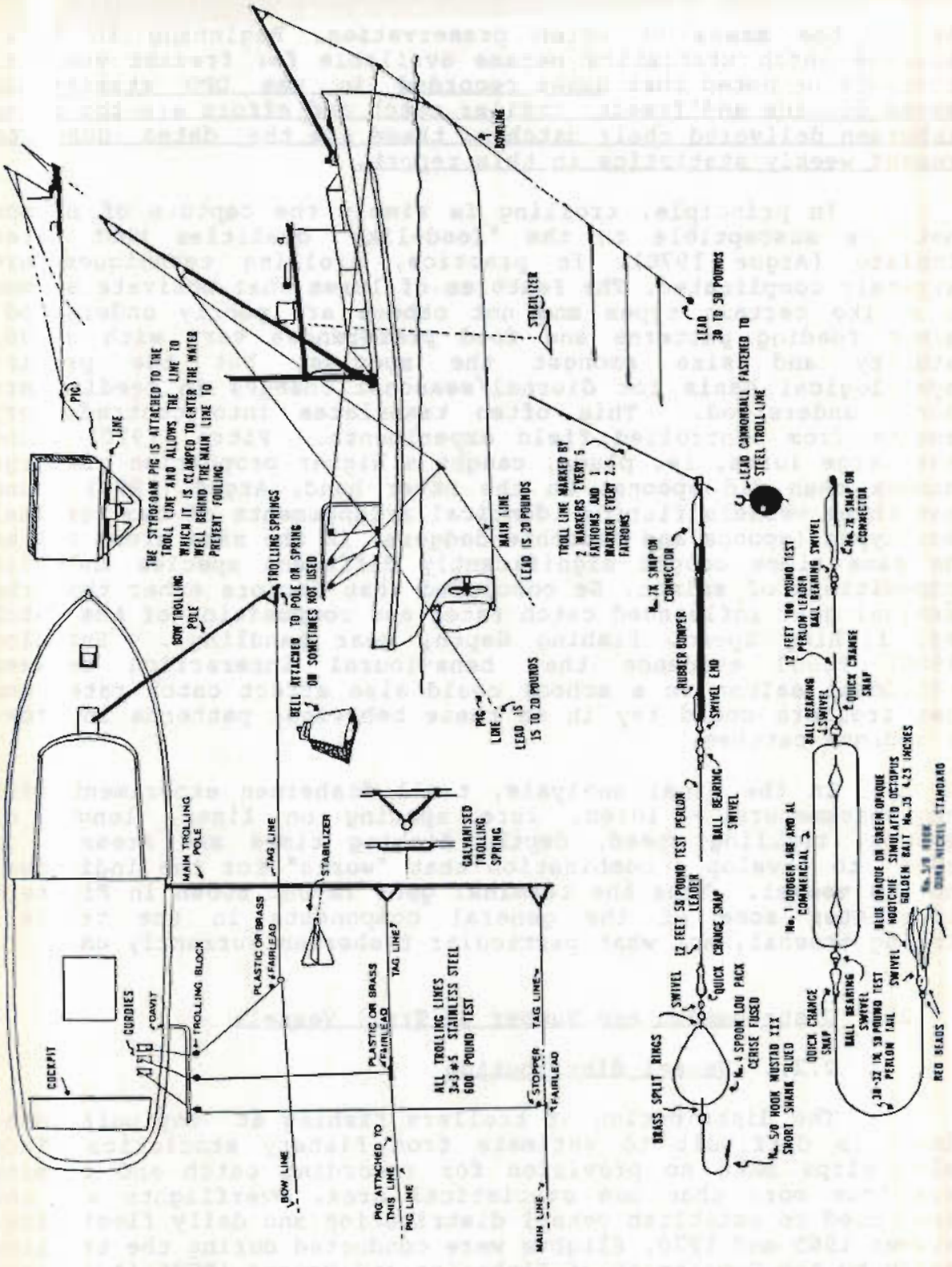

Figure 5. Troller design from Milne (1964) and examples of troll lures and lure rigging from Argue (1970).

Pitre 1972). Flights were timed to observe the fleet when the maximum number of vessels was expected to be fishing (0700 to 1300 hours). Data from 1969 for the west coast of Vancouver Island and from 1970 for Georgia Strait are discussed below. These were the only overflight data available prior to 1980. For comparison with these early data we use 1983-1985 troll vessel counts obtained by DFO observers on surveillance flights by the Department of National Defense (west coast of Vancouver Island) (Bruce Cahusac, DFO, unpub. data) and troll counts obtained during sport gear overflights for the Georgia Strait Creel Survey (Tom Hoyt, DFO, unpub. data).

Vessel distributions are presented in Figures 7 to 13, by statistical area for the west coast, and by groups of management subareas (Table 1) for Georgia Strait. The figures also present cumulative catch curves for major salmon species in the catch, numbers of troll vessels reporting salmon landings each week (see Section 2.2.3), and for comparison, weekly vessel counts from overflights.

2.2.1.1 Trolling seasons

Troll vessel distributions are shown in the figures for seasons that are defined by the salmon species that dominate the catch. Prior to 1984, the chinook season included the period from the opening of the chinook season (April 15) to the opening of the coho season (in June). In 1984, chinook and coho seasons opened on the same date, July 1. Coho usually dominate the catch from the coho season opening until approximately the end of August, except in years when pink and Adams River sockeye salmon are abundant, in which case these species usually dominate the catch from late July to late August. In the captions to Figures 7 to 13, the species name illustrates the dominant species in the catch and the date or date range refers to the overflight timing. For chinook and coho, we generally include at least one illustration of the fleet distribution soon after the season opening since fleet size is generally greatest at this time.

2.2.1.2 Georgia Strait

Different areas were used to record the fishing patterns of Georgia Strait trollers in each of the survey years (1970, 1983-1985). These were standardized (Appendix Table 1) by visual inspection to the current management subareas (Figure 6).

In Georgia Strait, prior to 1984, season opening dates for chinook and coho were separate (chinook April 15, coho July 1), and the distributions of trollers in the first weeks after

Table 1. Combinations of management subareas used to present troll vessel distributions in Georgia Strait.

Combined Area	Statistical Subareas
North Gulf	13-18, 13-20, 13-23, 13-1 - 13-15 15-2 - 15-5, 14-13
Texada and Denman Is.	16-22, 14-5 - 14-14, 16-20, 16-21
Jervis In. and Malaspina Strait	14-3, 15-1, 16-1 - 16-19
Qualicum Beach to Nanaimo	14-1, 14-2, 14-4, 17-12, 17-13, 17-18 - 17-21
Fraser R. dropoff, middle S. Gulf, Stuart Channel	17-1 - 17-11, 17-17, 29-1 - 29-7
S. Gulf Is., Active Pass, and Juan de Strait	18-1 - 18-11, 19-1 - 19-4, 20-5 - 20-7

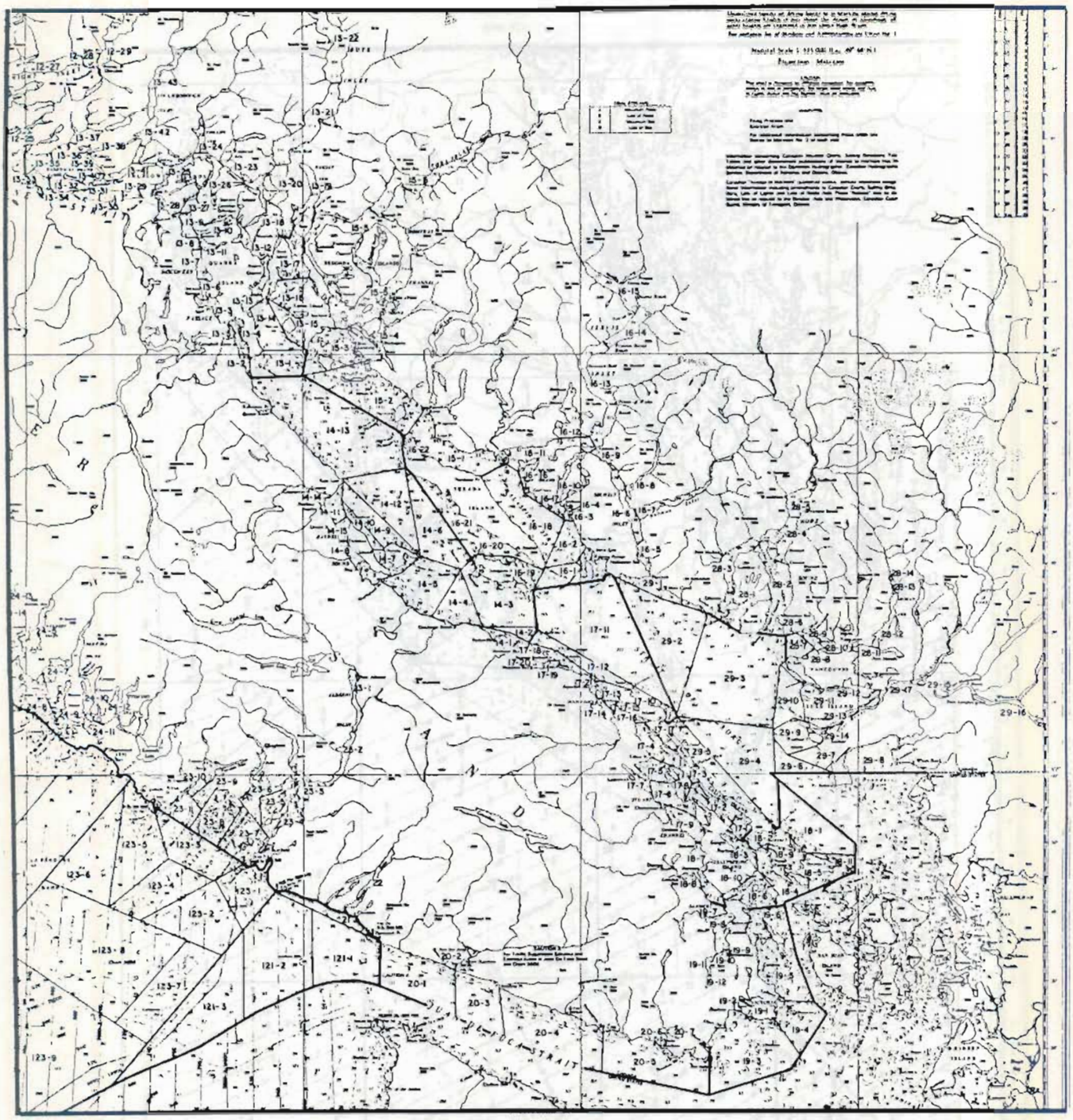

Figure 6. Current management subareas in British Columbia south of Cape Caution. Continued.

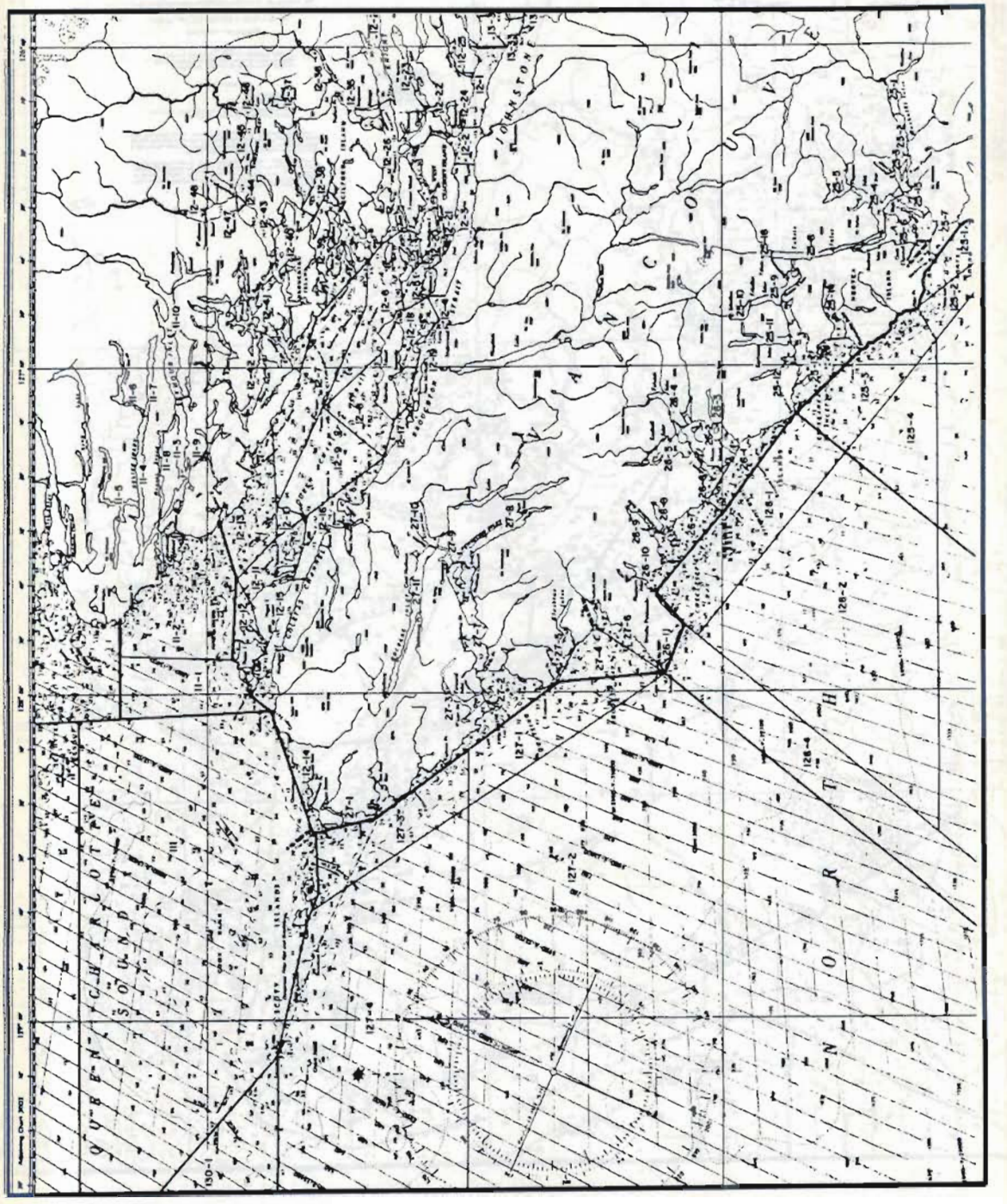

Figure 6. Continued.

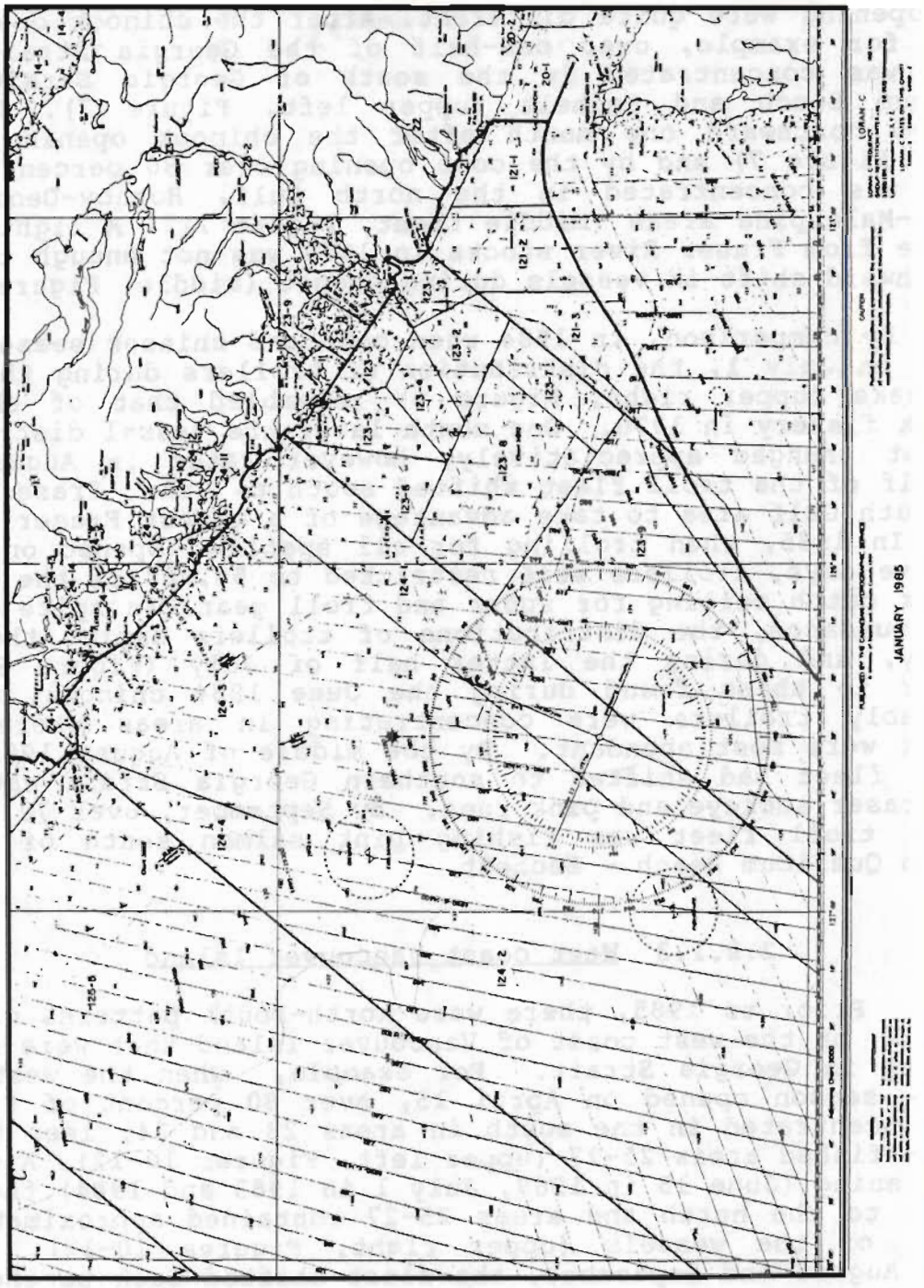

Figure 6. Continued.

each opening were quite different. After the chinook opening in 1970, for example, over one-half of the Georgia Strait troll fleet was concentrated in the south of Georgia Strait below Qualicum Beach and Sechelt (upper left, Figure 7). Trollers shifted northward one month after the chinook opening (upper right, Figure 7) and by the coho opening over 80 percent of the fleet was concentrated in the north Gulf, Hornby-Denman and Jervis-Malaspina areas (middle right, Figure 7). A light run of sockeye from Fraser River stocks in 1970 was not enough to cause a southward shift in vessels during August (middle, Figure 7).

By comparison, in 1984 when coho and chinook seasons both opened on July 1, the distribution of trollers during the first two weeks (upper right, Figure 8) resembled that of the June chinook fishery in 1970. One month later the vessel distribution had not changed appreciatively, however later in August over one-half of the troll fleet shifted south to the Fraser River-mid south Gulf area to take advantage of a modest Fraser sockeye run. In 1985, when trolling for all species opened on July 1 for five days, trollers were restricted to 50,000 of the 275,000 chinook catch ceiling for sport and troll gear. In spite of high coho abundance, the distributions of trollers during the first fishery, and during the latter half of July (Figure 9) were similar to those found during the June 1984 chinook fishery. Presumably trollers were concentrating in areas where large chinook were most abundant. By the middle of August 1985, most of the fleet had shifted to southern Georgia Strait waters to fish Fraser sockeye and pink runs. By September, over 70 percent of the troll fleet was fishing pink salmon south of a line between Qualicum Beach - Sechelt.

2.2.1.3 West coast Vancouver Island

Prior to 1985, there were north-south patterns of fleet movement on the west coast of Vancouver Island that were similar to those in Georgia Strait. For example, when the west coast chinook season opened on April 15, over 80 percent of trollers were concentrated in the south in areas 23 and 24; less than 15 percent fished areas 25-27 (upper left, Figures 10-12). After the coho opening (June 15 in 1969, July 1 in 1983 and 1984) the fleet shifted to the north and areas 25-27 contained approximately 30 percent of the vessels (upper right, Figures 10-12). Then, during August and September, the fleet shifted back to the south and tended to be more evenly distributed amongst areas 21, 23 and 24.

The chinook season remained closed until May 7 in 1985. On this date the major change in vessel distribution from previous chinook openings was the relatively high percentage

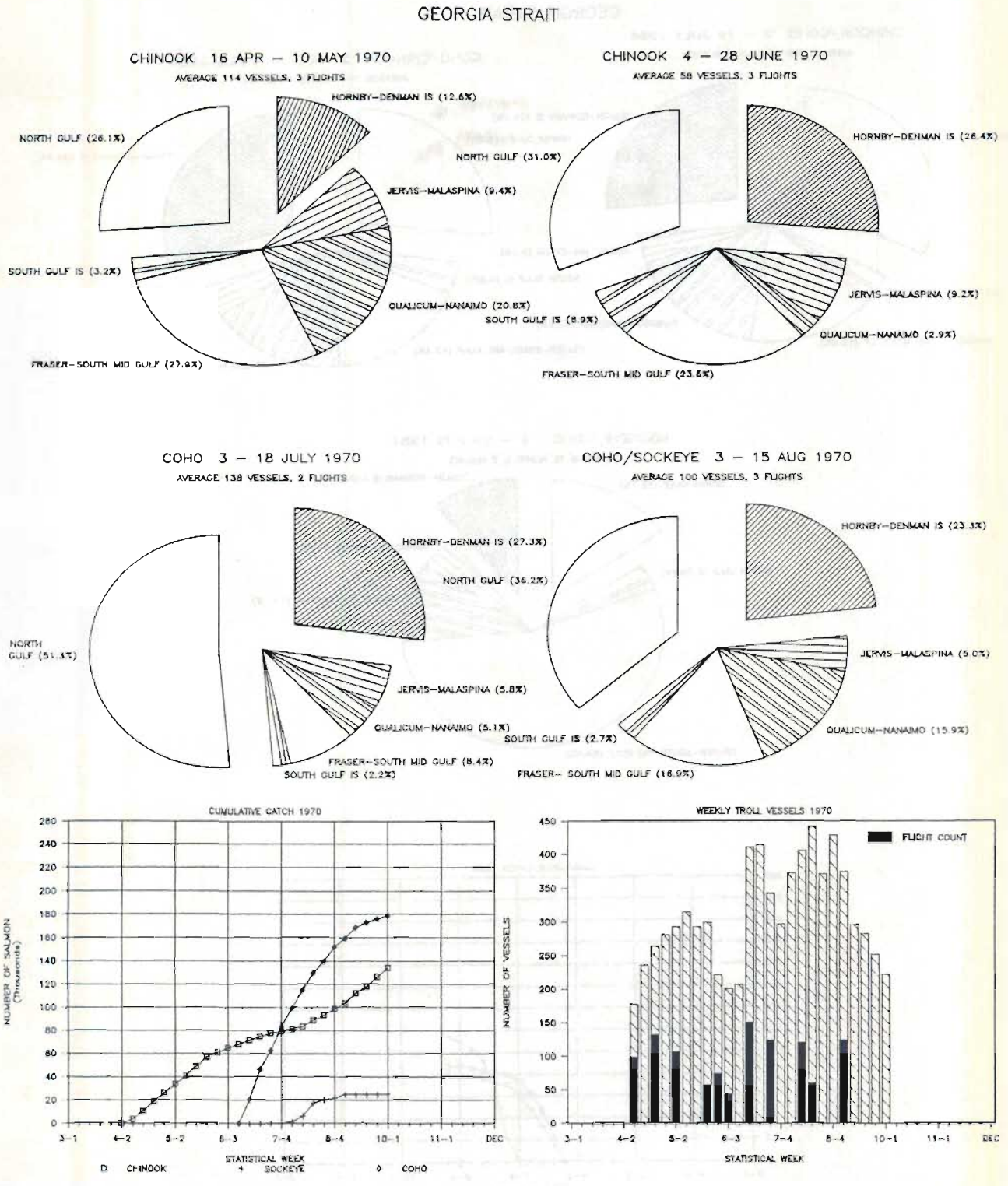

Figure 7. Distributions of troll vessels in Georgia Strait based on overflights in 1970 (pie graphs). Numbers of vessels fishing at least once per week from sales slip data are compared with average vessel counts from overflight data (lower right graph). Cumulative troll catch presented for comparison with overflight data (lower left graph). Dominant species in the catch and flight time period head each pie graph.

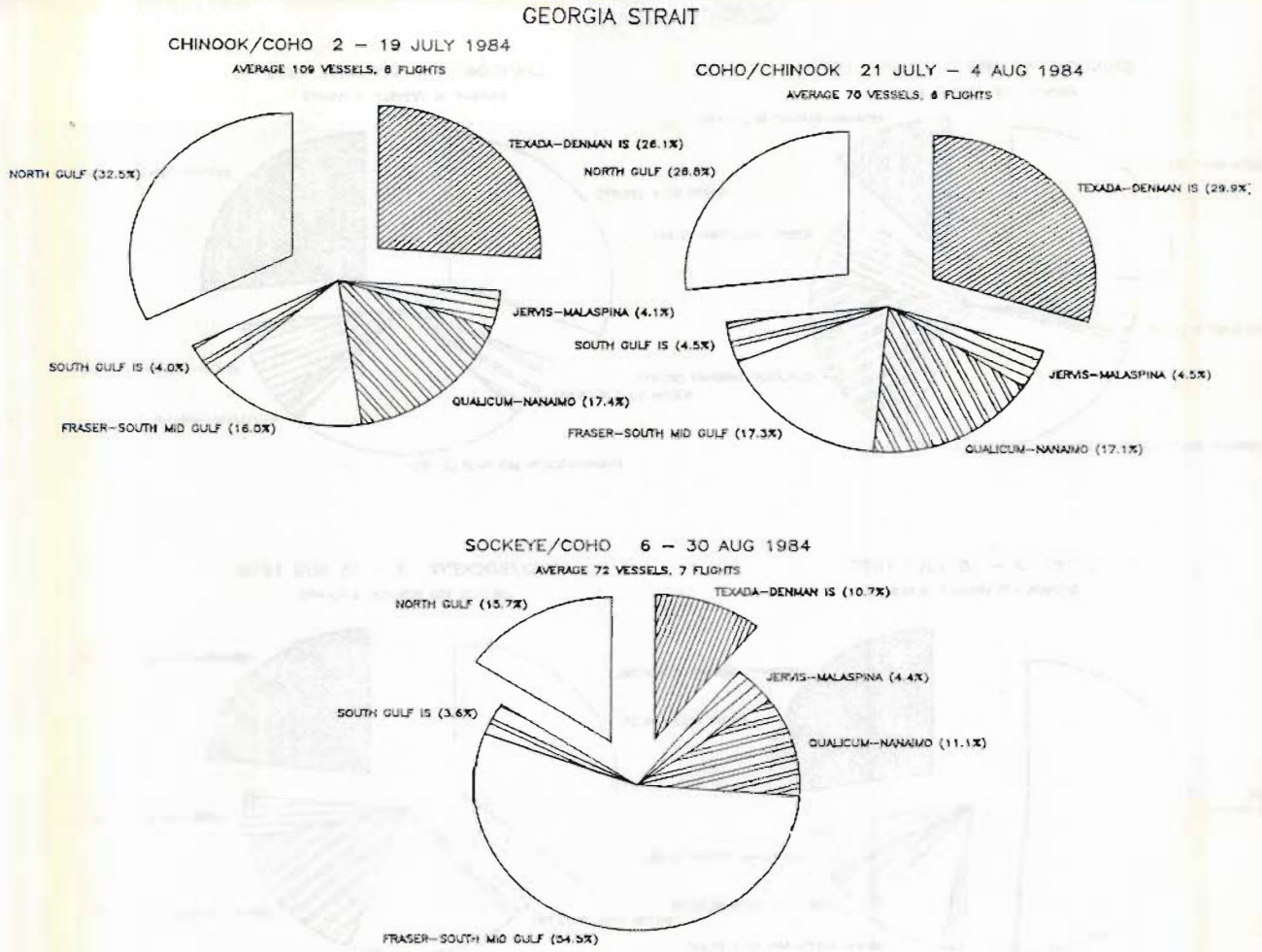

Figure 8. Distributions of troll vessels in Georgia Strait based on overflights in 1984 (pie graphs). Cumulative troll catch presented for comparison with overflight data. Dominant species in the catch and flight time period head each pie graph.

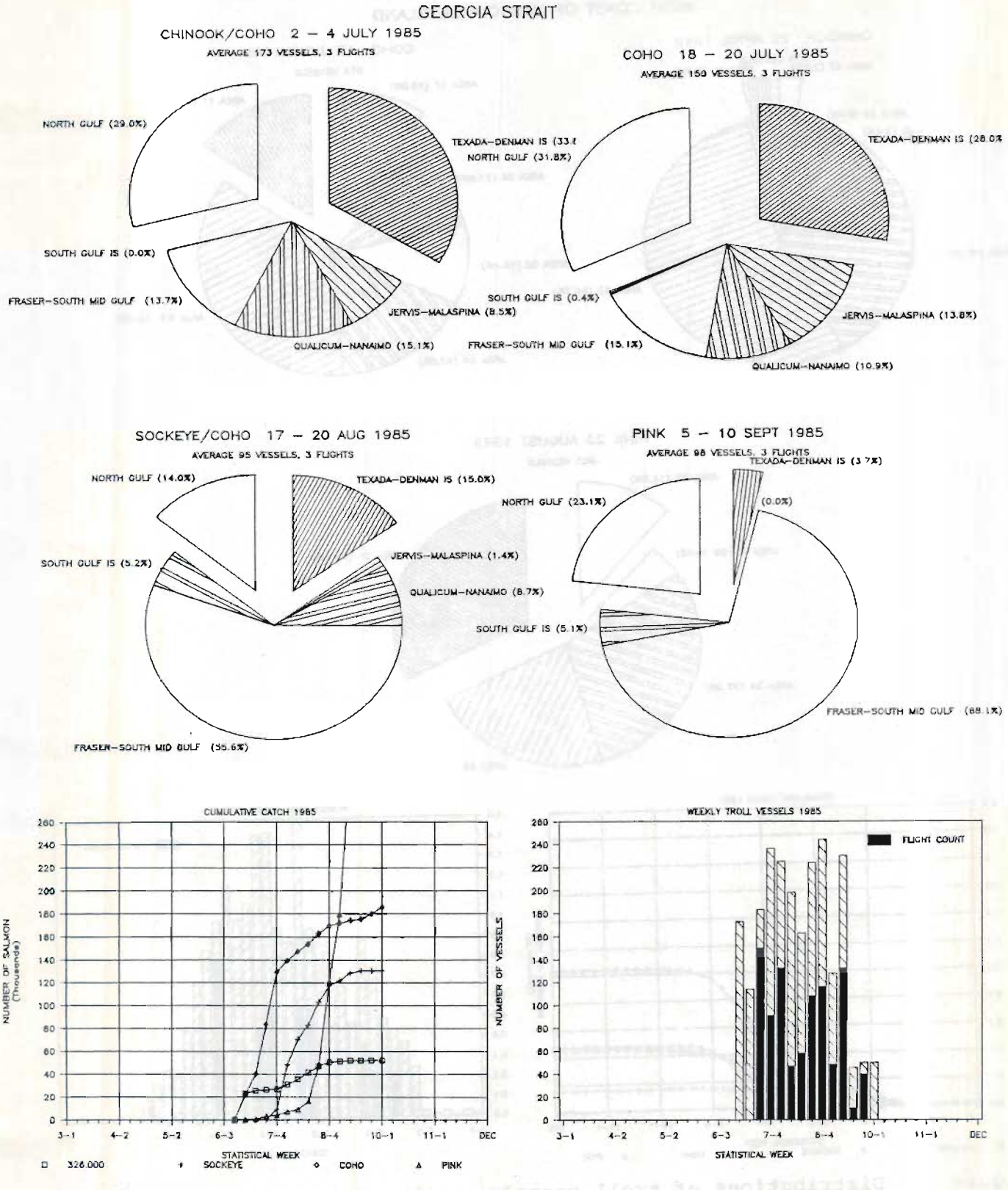

Figure 9. Distributions of troll vessels in Georgia Strait based on overflights in 1985 (pie graphs). Numbers of vessels fishing at least once per week from sales slip data are compared with average vessel counts from overflight data (lower right graph). Cumulative troll catch presented for comparison with overflight data (lower left graph). Dominant species in the catch and flight time period head each pie graph.

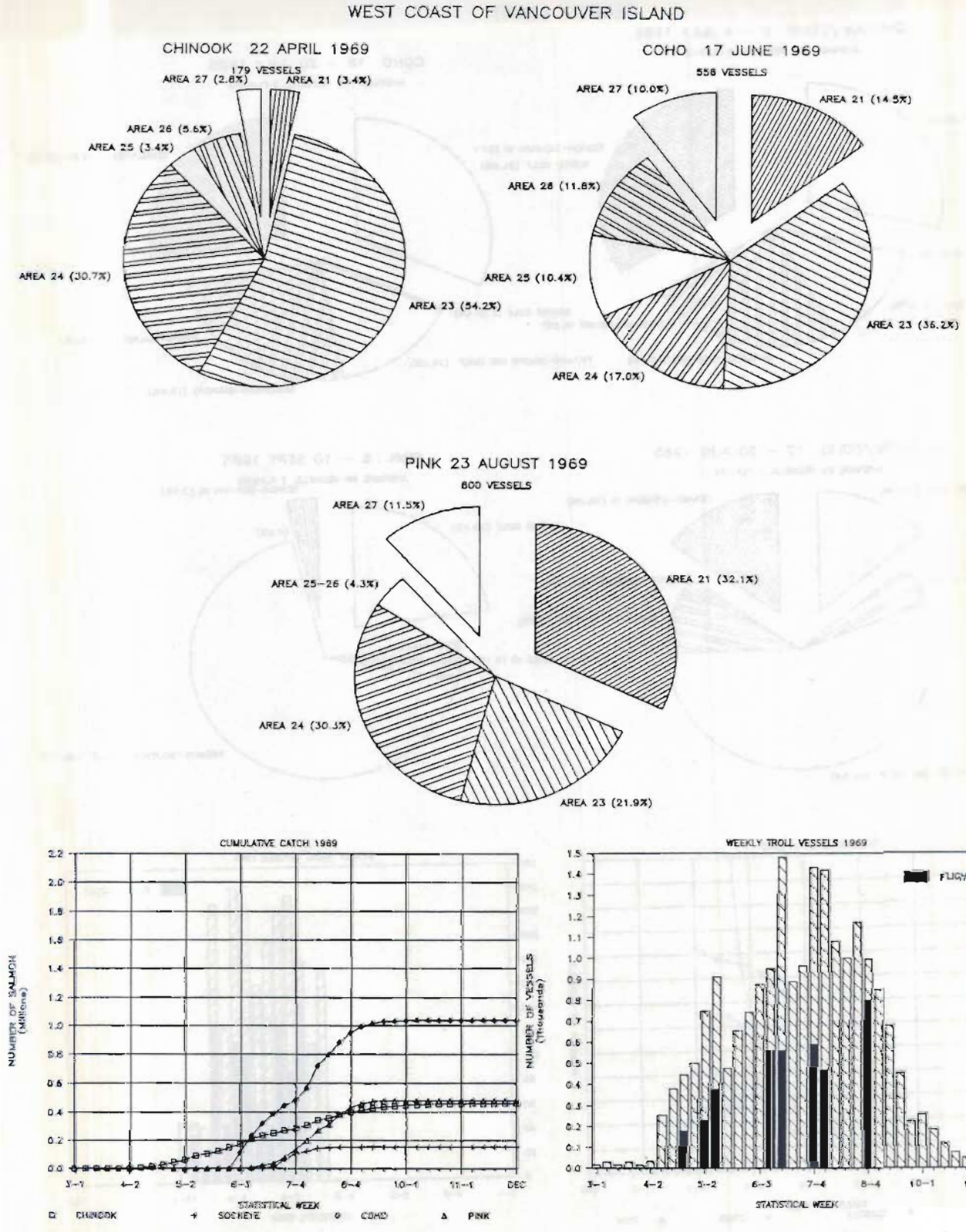

Figure 10. Distributions of troll vessels on the west coast of Vancouver Island based on overflights in 1969 (pie graphs). Numbers of vessels fishing at least once per week from sales slip data are compared with average vessel counts from overflight data (lower right graph). Cumulative troll catch presented for comparison with overflight data (lower left graph). Dominant species in the catch and flight time period head each pie graph.

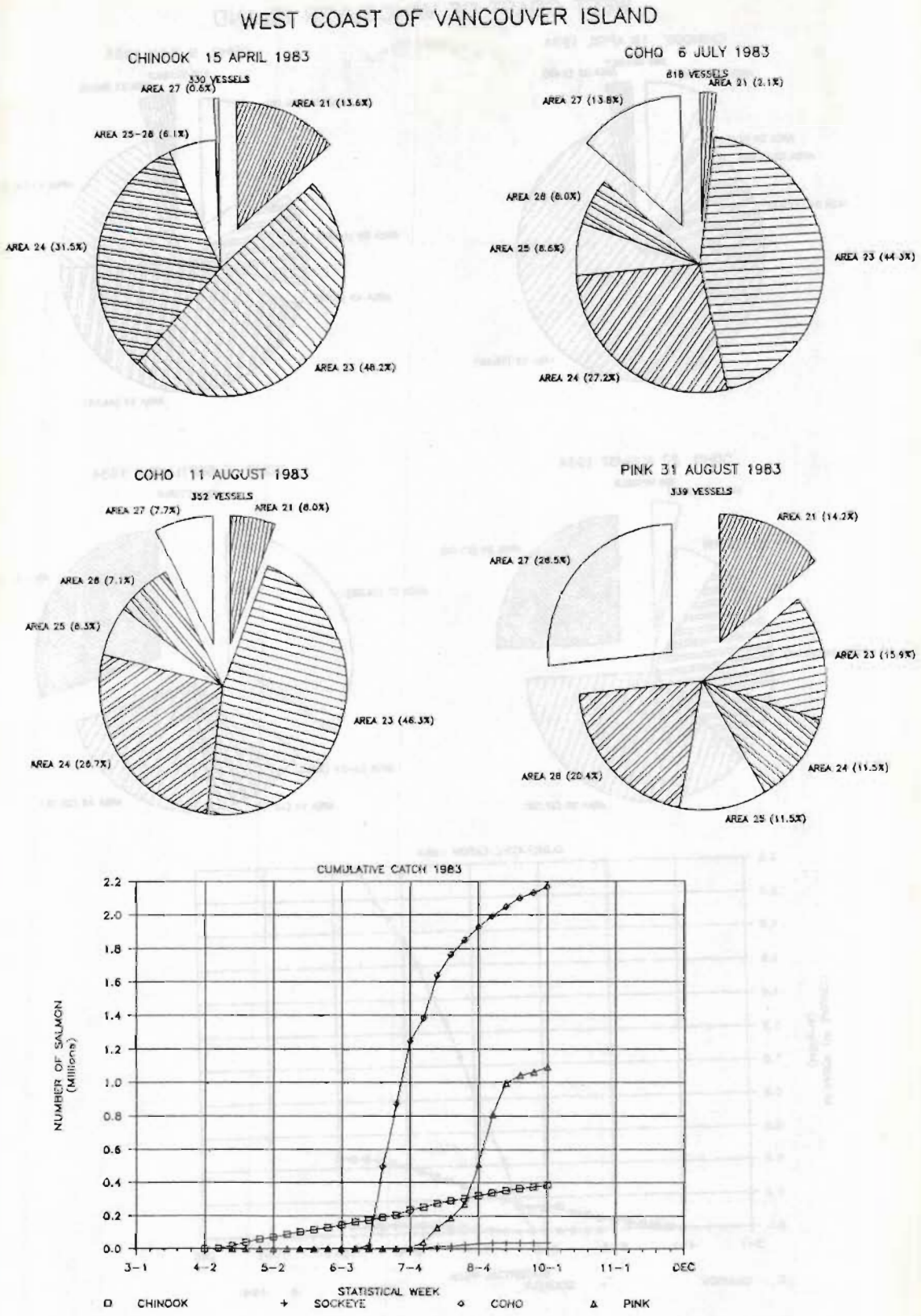

Figure 11. Distributions of troll vessels on the west coast of Vancouver Island based on overflights in 1983 (pie graphs). Cumulative troll catch presented for comparison with overflight data. Dominant species in the catch and flight time period head each pie graph.

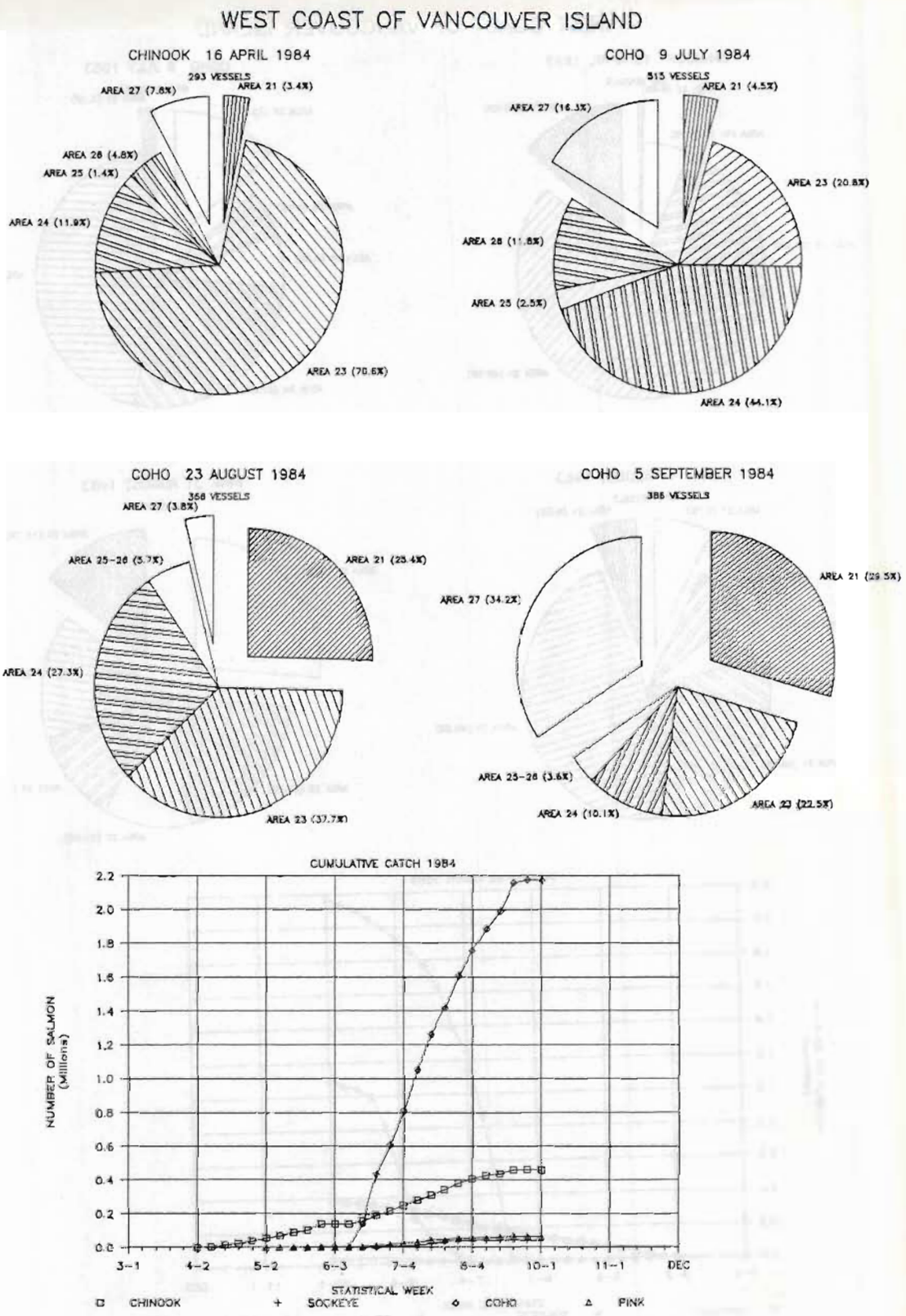

Figure 12. Distributions of troll vessels on the west coast of Vancouver Island based on overflights in 1984 (pie graphs). Cumulative troll catch presented for comparison with overflight data. Dominant species in the catch and flight time period head each pie graph.

(22%) of vessels in area 27. Pink and sockeye runs were strong in 1985 and a large percentage of the pink run (English et al. 1987) migrated to inside waters via Johnstone Strait. As in previous years, one-third of the troll fleet fished areas 21 and 27 in August to catch pink and sockeye during their migration to Fraser River spawning grounds (middle graphs, Figure 13).

2.2.2 Troll licenses

The numbers of licensed troll and troll-gillnet vessels that report salmon troll landings on the whole B.C. coast have decreased in the last six years (Table 2). These trends are likely representative for southern B.C. since approximately three quarters of the B.C. troll catch is from these waters. If we assume that in the last six years the troll fleet operating in southern B.C. has been proportional to the troll catch in southern B.C., then the total number of vessels trolling in southern B.C. has ranged from 1,459 (1984) to 2,289 (1981).

2.2.3 Number of vessels on the grounds

The lower right graphs in Figure 7, 9, 10 and 13 show weekly troll fleet sizes based on sales slip statistics, and the average of troll vessel counts from weekly overflights. Counts based on sales slips were extracted from the PBS data base (Wong 1983). These equal the number of unique vessel license numbers in each week's complement of sales slips. This is assumed to measure the number of vessels that fished at least one day in a particular week. For comparison with sales slip estimates, overflight counts of troll vessels have been plotted on the graphs. Flight counts are presented for the statistical week[1] after the flight in order to adjust for vessels at sea at the time of the flight that delivered after the week of the flight. This adjustment was not considered necessary for Georgia Strait because most trollers deliver their catch each day. Sales slip estimates of fleet size were not available for 1983 and 1984.

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1. A statistical week, by definition, runs for seven days from Sunday to Saturday, therefore calendar dates for each statistical week change every year. These are presented in Appendix Table 2 for years listed in Tables 7-13 and for years in figures with monthly catch statistics. Note that DFO uses a fixed number of statistical weeks per month. Graphs in this report use month number followed by a dash and then week number to illustrate statistical weeks.

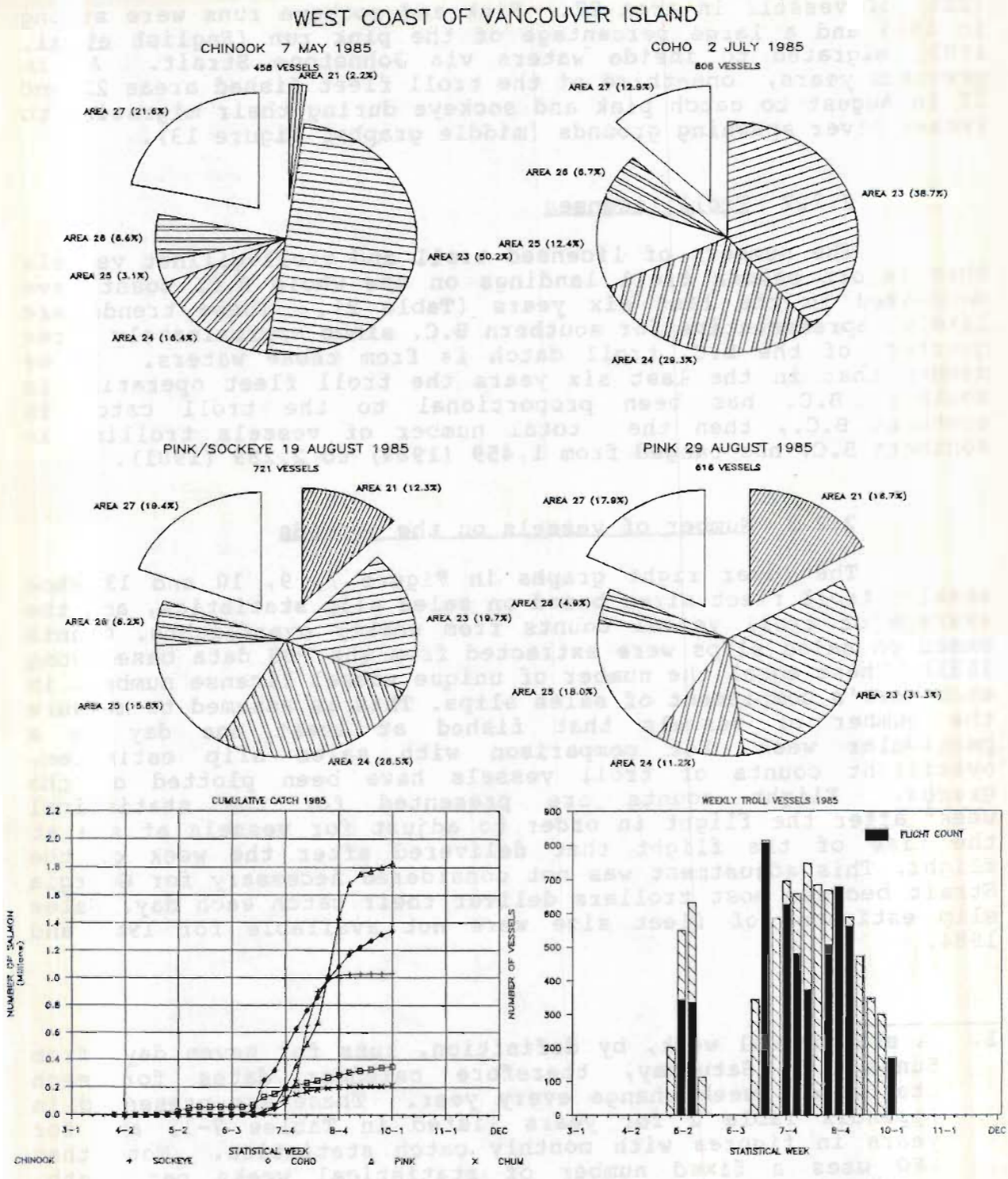

Figure 13. Distributions of troll vessels on the west coast of Vancouver Island based on overflights in 1985 (pie graphs). Numbers of vessels fishing at least once per week from sales slip data are compared with average vessel counts from overflight data (lower right graph). Cumulative troll catch presented for comparison with overflight data (lower left graph). Dominant species in the catch and flight time period head each pie graph.

Table 2. Number of licensed troll vessels in British Columbia reporting salmon landings, by gear class, 1967-1985.*

Year	Salmon Troll	Salmon Gillnet & Troll	Total
1967	2,271	1,143	3,414
1968	2,292	1,101	3,393
1969	2,330	687	3,017
1970	2,224	953	3,177
1971	2,133	900	3,033
1972	2,029	750	2,779
1973	1,669	838	2,507
1974	1,659	794	2,453
1975	1,670	933	2,603
1976	1,722	1,015	2,737
1977	1,753	1,065	2,818
1978	1,796	1,182	2,978
1979	1,929	988	2,917
1980	1,648	1,323	2,971
1981	1,541	1,237	2,778
1982	1,638	1,020	2,658
1983	1,702	990	2,692
1984	1,471	1,113	2,584
1985	1,376	885	2,261

* Source: DFO, Regional Planning and Economics Branch, unpublished data.

Figure 14, based on sales slip data, presents the average number of days trollers fished each week (days fishing divided by vessel count) during weeks when the fleet was the largest. These weeks generally occurred between the fourth week of April (4-4) and third week of May (5-3) in the chinook season, between weeks 6-3 and 7-3 in the coho season and between weeks 8-9 and 9-3 in the sockeye/pink season. Figure 15 presents peak weekly fleet size based on sales slip data for these weeks during chinook, coho and pink/sockeye seasons.

Several features are of interest on the figures. First, it is clear that overflights usually underestimate the numbers of vessels that fish each week. This is not surprising as at the time of flights some fishermen were undoubtedly off the grounds delivering catches, or else were in port for reasons such as vessel breakdowns, days off, etc. Second, there has been an increase in the proportion of vessels fishing at the time of flights between 1969/1970 and 1985. Table 3 presents vessel counts from the two data sources for the west coast and Georgia Strait. In Georgia Strait, overflight counts in 1970 averaged 32 percent of the weekly fleets estimated from sales slips. This compares with 48 percent of the weekly fleet in 1985. On the west coast, overflight counts averaged 61 percent of the weekly fleet in 1969, compared to 80 percent in 1985. The 1985 proportions were significantly higher ($P<0.05$) based on G-tests of independence (Sokal and Rohlf 1969). These results suggest that trollers were fishing "harder" in 1985, which is not surprising considering that the trolling season in 1985 was the shortest on record.

The trends in average days fishing each week in Figure 14 support the idea that trollers are now fishing for a greater proportion of each week. Slopes of regressions of days fishing per vessel per week on years (excluding 1985) were significant ($P<0.01$) for the chinook and coho seasons in Georgia Strait, for the coho season in Johnstone Strait ($P<0.01$); and for all three seasons on the west coast ($P<0.01$, except $P<0.1$ for chinook). As well, the average days fished per vessel per week, divided by seven, appears to be a reasonable estimate of the proportion of the average weekly fleet that one would expect to find fishing each day. For example, in Georgia Strait, 1970, 2.8 days/ 7 days = 0.40 vs 0.32; 1985, 3.6/7 = 0.51 vs 0.48; and on the west coast, 1969, 4/7 = 0.57 vs 0.61; 1985, 6.3/7 = 0.9 vs 0.80).

2.2.3.1 Maximum troll fleet size

The maximum weekly troll fleet in Georgia Strait during chinook, coho and sockeye/pink seasons fluctuated from 250 to 650 vessels between 1967 and 1980 (Figure 15). In 1981, after

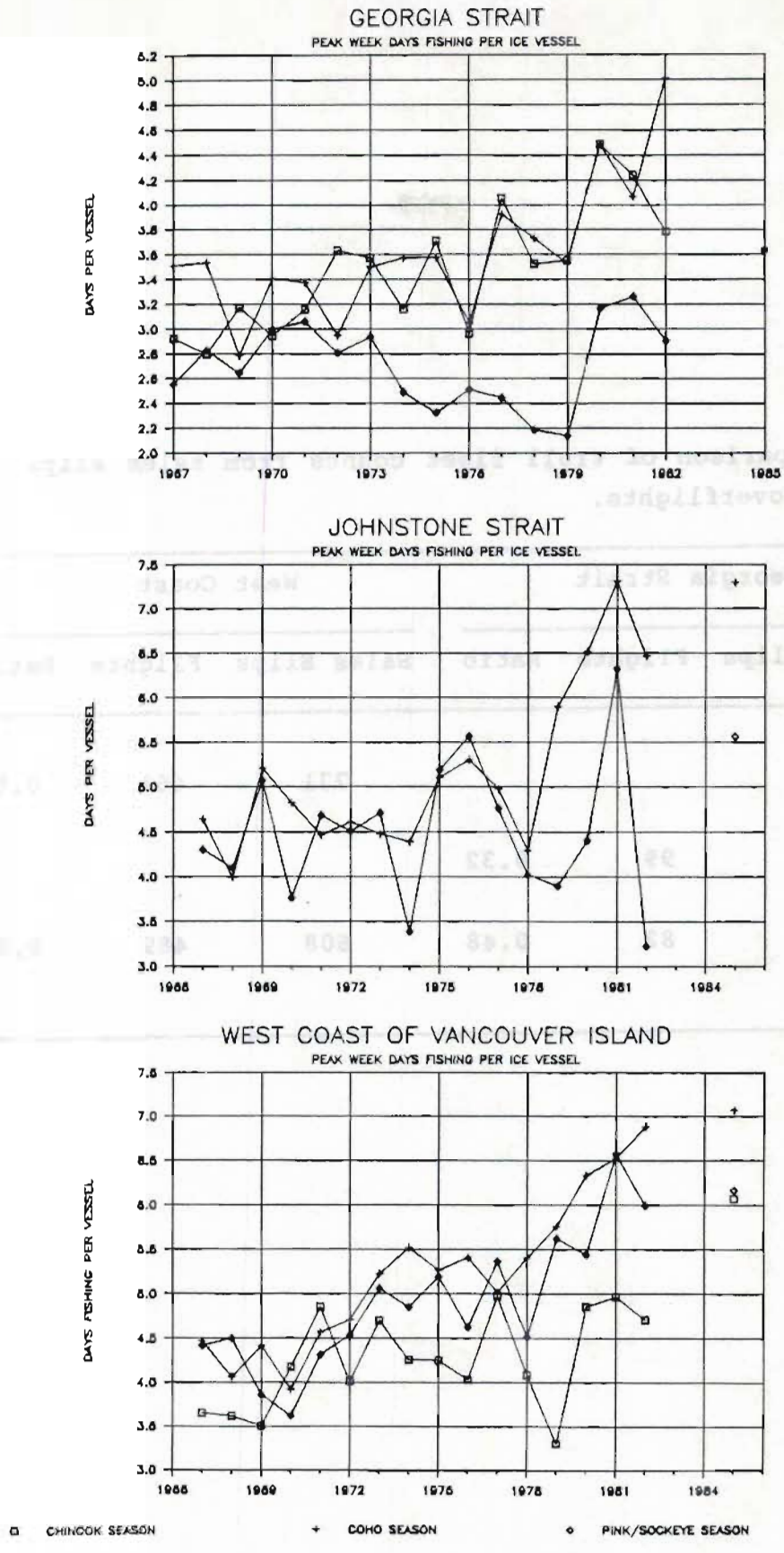

Figure 14. Average number of days fishing per troll vessel per week during peak weeks (weeks of maximum fleet size) of the chinook, coho and sockeye/pink seasons, 1967-1982, 1985.

Table 3. Comparison of troll fleet counts from sales slips and from overflights.

Year	Georgia Strait			West Coast		
	Sales Slips	Flights	Ratio	Sales Slips	Flights	Ratio
1969				771	469	0.61
1970	312	99	0.32			
1985	175	82	0.48	608	489	0.80

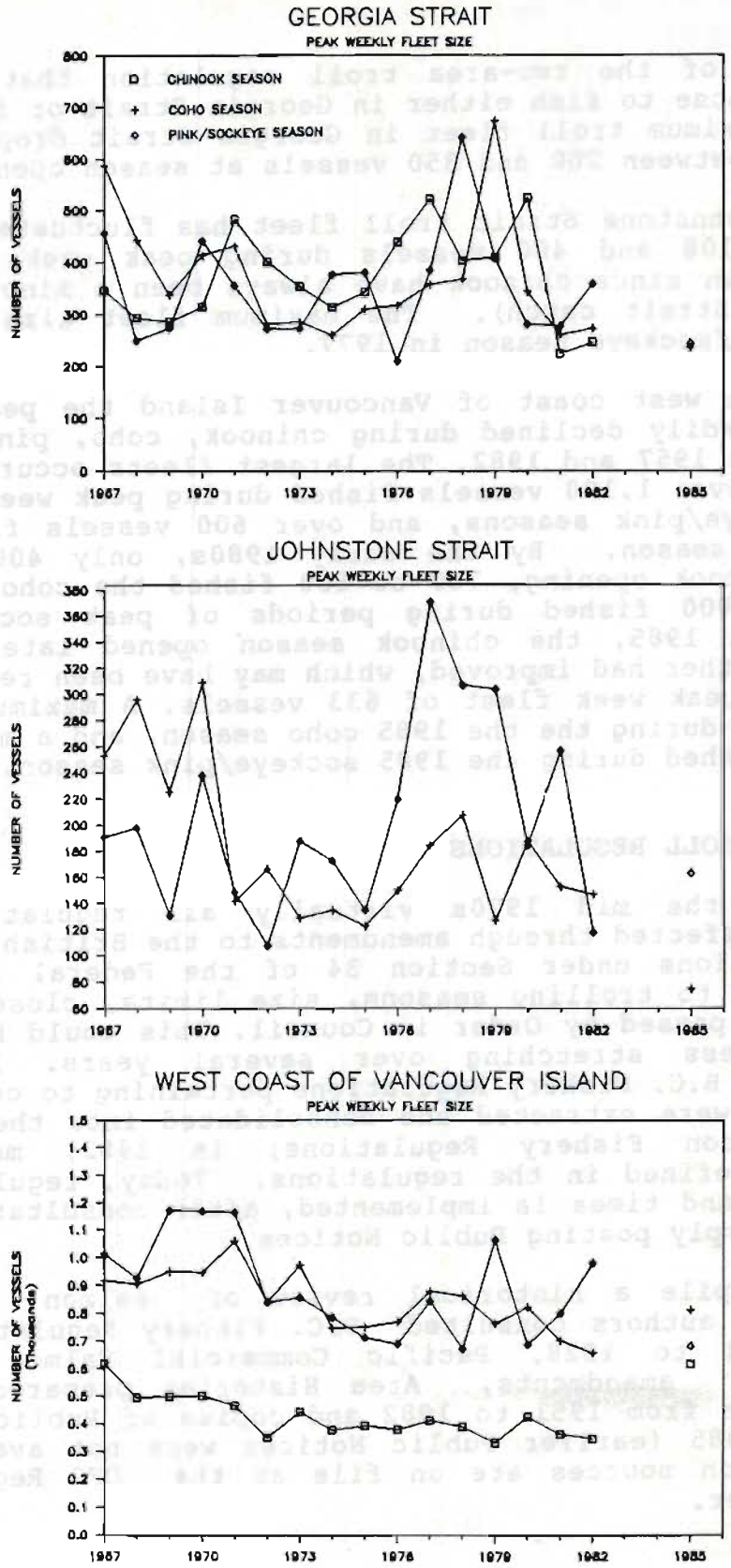

Figure 15. Number of troll vessels fishing during peak weeks (weeks of maximum fleet size) of the chinook, coho and sockeye/pink seasons, 1967-1982, 1985.

implementation of the two-area troll regulation that required trollers to choose to fish either in Georgia Strait or in outside waters, the maximum troll fleet in Georgia Strait dropped about 30 percent to between 200 and 350 vessels at season openings.

The Johnstone Strait troll fleet has fluctuated between approximately 100 and 400 vessels during peak weeks (chinook season not shown since chinook have always been a minor part of the Johnstone Strait catch). The maximum fleet size occurred during the pink/sockeye season in 1977.

On the west coast of Vancouver Island the peak weekly fleet size steadily declined during chinook, coho, pink/sockeye seasons between 1967 and 1982. The largest fleets occurred prior to 1972, when over 1,100 vessels fished during peak weeks of the coho and sockeye/pink seasons, and over 600 vessels fished the early chinook season. By the early 1980s, only 400 vessels fished the chinook opening, 700 to 800 fished the coho opening, and 700 to 1,000 fished during periods of peak sockeye/pink abundance. In 1985, the chinook season opened later in the spring when weather had improved, which may have been responsible for the large peak week fleet of 633 vessels. A maximum of 815 trollers fished during the the 1985 coho season, and a maximum of 669 trollers fished during the 1985 sockeye/pink season.

3.0 DOMESTIC TROLL REGULATIONS

Until the mid 1970s virtually all regulations for trolling were effected through amendments to the British Columbia Fishery Regulations under Section 34 of the Federal Fisheries Act. Amendments to trolling seasons, size limits, closed areas, etc. had to be passed by Order in Council. This could be a time consuming process stretching over several years. In 1977, sections of the B.C. Fishery Regulations pertaining to commercial salmon fishing were extracted and consolidated into the Pacific Commercial Salmon Fishery Regulations; in 1982, management subareas were defined in the regulations. Today, regulation of trolling areas and times is implemented, after consultation with industry, by simply posting Public Notices.

To compile a historical review of salmon trolling regulations the authors consulted B.C. Fishery Regulations and amendments back to 1928, Pacific Commercial Salmon Fishery Regulations and amendments, Area Histories prepared by DFO Fishery Officers from 1951 to 1982 and copies of Public Notices from 1979 to 1985 (earlier Public Notices were not available). These information sources are on file at the DFO Regulations Unit in Vancouver.

3.1 Seasons and Non-retention Periods

Seven-day-per-week trolling seasons for coho and chinook and non retention periods for sockeye, pink and chum are summarized for Georgia Strait in Table 4. Footnotes to the table describe atypical regulations. A symbol in the table for a statistical week denotes closure for the full week, or non-retention for the week in cases where trolling was open for specified species. Seasons and non-retention periods are only presented when there was a date change. For example, the coho season is shown for 1965 because in this year it was reduced to July 1 - September 30 from June 15 - November 30. No attempt has been made to document weekly troll openings in areas where trolling and net fishing times and areas were coordinated (areas 12, 13, southern 17, eastern 18, 20, 29). Nor do we present the large number of 1985 openings and closures for subdivisions of Georgia Strait, Johnstone Strait, and the west coast of Vancouver Island. These were necessary to ensure that troll catch allocations were met and have been covered in detail by Shardlow et al. (1986). Tables 5 to 8 are in the same format as Table 4.

Trolling seasons/non-retention periods for Johnstone Strait are summarized in Table 5 for waters of area 11 inside the surfline, and in Table 6 for waters of area 12. The surfline is the solid black line in Figure 1 passing from Cape Flattery at the entrance to Juan de Fuca Strait along the west shore of Vancouver Island to Cape Sutil and thence due north to the southern tip of Calvert Island (see Section 5.3.3). Trolling seasons/non-retention periods for waters outside the surfline in area 11 (area 111 on Figure 1) generally are the same as those for the west coast of Vancouver Island outside the surfline (Table 7). Table 8 summarizes trolling periods inside the surfline on the west coast of Vancouver Island. Appendix Table 3 lists calendar dates for 1951-1984 seasons and non-retention periods that are illustrated in Tables 4 to 8.

We caution that some season/non-retention regulations may be omitted or in error. Records of trolling regulations from Public Notices and Area Histories were often incomplete and contradictory, and full sets of Public Notices for years prior to 1979 were hard to find. In short, the available information was not sufficient to be certain that all season/non-retention regulations for approximately the last decade are accurately represented in this report.

3.1.1 Coho

We found the first mention of a B.C. coho season in the fishery regulations for 1928. These specified a closed season for commercial harvest of "coho or blueback" from January 1 to

Table 4. Commercial troll seasons for Georgia Strait (areas 13-20, 28, 29) since 1951. The years denote the first year of a particular season (1951 is the starting year); years with similar seasons are omitted. **** denotes closed seasons/non-retention for coho and and closed seasons for chinook, sockeye, pink and chum; '''' denotes non-retention of sockeye and pink; ++++ denotes non-retention of pink; oooo denotes non-retention of chum; ---- denotes non-retention of sockeye, pink and chum; xxxx denotes non-retention of chinook; #### denotes non-retention of chinook and pink. Months are divided into statistical weeks.

Year	Jan 12345	Feb 1234	Mar 1234	Apr 12345	May 1234	Jun 1234	Jul 12345	Aug 1234	Sep 1234	Oct 12345	Nov 1234	Dec 1234	Year
						COHO							
1951	*****	****	****	*****	***							****	1951
1956	*****	****	****	*****	****	*						****	1956
1965	*****	****	****	*****	****	****				****	****	****	1965
1984	*****	****	****	*****	****	****			****	*****	****	****	1984
1985	*****	****	****	*****	****	****	* *			****	****	****	1985
						CHINOOK, SOCKEYE, PINK, CHUM							
1951	****											****	1951
1965	*****									****	****	****	1965
1966	*****	****	****	**						****	****	****	1966
1978	*****	****	****	*				**		*****	****	****	1978
1979	*****	****	****	**				+++	o	o****	****	****	1979
1980	*****	****	****	**			-----		--	****	****	****	1980
1981	*****	****	****	**						****	****	****	1981
1984	*****	****	****	*****	****	****			****	*****	****	****	1984
1985	*****	****	****	*****	****	****	*x*		x###	#****	****	****	1985
Year	12345 Jan	1234 Feb	1234 Mar	12345 Apr	1234 May	1234 Jun	12345 Jul	1234 Aug	1234 Sep	12345 Oct	1234 Nov	1234 Dec	Year

Footnotes:

- December - January closure for chinook often waived before 1970.
- Coho season opened June 6 in 1960 and June 18 in 1978 because coho larger than normal,
- Trolling prohibited on weekends July 11 to September 3 in 1969,
- Pink non-retention in area 13 from April 15 to June 15 and July 11 to August 15 in 1971, and from August 27 to September 17 in 1979; chum non-retention in area 13 from September 22 to 30 in 1979 and from September 8 to 30 in 1980,
- Area 13 closed to all trolling to conserve pinks August 20-26 in 1979,
- Southern area 13 and area 14 closed to all trolling from June 23 to 30 in 1979 due to a high incidence of coho shakers,
- Northern area 13 troll fishery often opened only during times and in areas opened to net fishing; usually area 12 non-retention regulations applied to northern area 13,
- Since 1962, trolling during IPSFC control period (usually June through September) in area 29 and in portions of areas 17 and 18 within the Convention Area only allowed during times when net fishing allowed in area 29,
- Since 1975, trolling in area 29 prior to IPSFC control only allowed when area 29 opened to net fishing for chinook, except 1982, 1984 and 1985 when April-June troll fishery in area 29 was closed,
- Appendix Table 3 contains dates for 1951-1984 season/non-retention regulations. Shardlow et al. (1986) describe 1985 regulations.

Table 5. Commercial troll seasons for Johnstone Strait (area 11 inside the surfline) since 1951. The years denote the first year of a particular season (1951 is the starting year); years with similar seasons are omitted. **** denotes closed seasons/non-retention for coho and closed seasons for chinook, sockeye, pink and chum; ==== denotes non-retention of sockeye; ++++ denotes non-retention of pink; oooo denotes non-retention of chum; '''' denotes non-retention of sockeye and pink; ---- denotes non-retention of sockeye, pink and chum. Months are divided into statistical weeks.

Year	Jan 12345	Feb 1234	Mar 1234	Apr 12345	May 1234	Jun 1234	Jul 12345	Aug 1234	Sep 1234	Oct 12345	Nov 1234	Dec 1234	Year
							COHO						
1951	*****	****	****	*****	***							****	1951
1952	*****	****	****	*****	****	**						***	1952
1973	*****	****	****	*****	****	**	**					***	1973
1974	*****	****	****	*****	****	*	***					****	1974
1976	*****	****	****	*****	****	**						***	1976
1977	*****	****	****	*****	****	**	***					***	1977
1978	*****	****	****	*****	****	* *	***					****	1978
1979	*****	****	****	*****	****	* *	***	**				****	1979
1980	*****	****	****	*****	****	**	***					***	1980
1981	*****	****	****	*****	****	****				****	****	****	1981
1983	*****	****	****	*****	****	****				****	****	****	1983
1984	*****	****	****	*****	****	****			*	*****	****	****	1984
1985	*****	****	****	*****	****	****			* *	*****	****	****	1985
							CHINOOK, SOCKEYE, PINK, CHUM						
1951	****											****	1951
1971	*****						==' +	+++				***	1971
1972	*****											***	1972
1973	*****						**					***	1973
1974	****						***					****	1974
1976	*****											***	1976
1977	*****						***					***	1977
1978	****					*	***	' '				****	1978
1979	*****	****	****	**		*	***=	**	oo	ooooo	oooo	****	1979
1980	*****	****	****	**			***	====	oo	ooooo	oooo	o***	1980
1981	*****	****	****	**			-----	----	-	****	****	****	1981
1982	*****	****	****	**					----	-****	****	****	1982
1983	*****	****	****	**		**	---			****	****	****	1983
1984	*****	****	****	*****	****	****			*	*****	****	****	1984
1985	*****	****	****	*****	+++*	****	+++	=	*=-*	*****	****	****	1985
Year	Jan 12345	Feb 1234	Mar 1234	Apr 12345	May 1234	Jun 1234	Jul 12345	Aug 1234	Sep 1234	Oct 12345	Nov 1234	Dec 1234	Year

Footnotes:

- Area 111 on the same troll regulations as areas outside the surf line on the west coast of Vancouver Island,
- December - January closure for chinook often waived before 1970,
- Appendix Table 3 contains dates for 1951-1984 season/non-retention regulations. Shardlow et al. (1986) describe 1985 regulations in detail.

Table 6. Commercial troll seasons for Johnstone Strait (area 12) since 1951. The years denote the first year of a particular season (1951 is the starting year); years with similar seasons are omitted. **** denote closed seasons/non-retention for coho and closed seasons for chinook, sockeye, pink and chum; ++++ non-retention of pink; ==== denotes non-retention of sockeye; **** denotes non-retention of sockeye and pink; oooo denotes non-retention of chum; ---- denotes non-retention of sockeye, pink and chum. Months are divided into statistical weeks.

Year	Jan 12345	Feb 1234	Mar 1234	Apr 12345	May 1234	Jun 1234	Jul 12345	Aug 1234	Sep 1234	Oct 12345	Nov 1234	Dec 1234	Year
						COHO							
1951	*****	****	****	*****	***							****	1951
1952	*****	****	****	*****	****	**						***	1952
1981	*****	****	****	*****	****	****				****	****	****	1981
1984	*****	****	****	*****	****	****			*	*****	****	****	1984
1985	*****	****	****	*****	****	****			*	*****	****	****	1985
						CHINOOK, SOCKEYE, PINK, CHUM							
1951	****											****	1951
1971	*****						+++	++				***	1971
1972	*****											***	1972
1978	*****	****	****	**				..	+			****	1978
1979	*****	****	****	**				++++	+ooo	ooooo	oooo	****	1979
1980	*****	****	****	**---	----	----	-----	----	-ooo	ooooo	oooo	****	1980
1981	*****	****	****	**---	----	----	-----	----	----	-****	****	****	1981
1984	*****	****	****	*****	****	****	-----	----	---*	*****	****	****	1984
1985	*****	****	****	*****	****	****	-----	----	---*	*****	****	****	1985
Year	Jan 12345	Feb 1234	Mar 1234	Apr 12345	May 1234	Jun 1234	Jul 12345	Aug 1234	Sep 1234	Oct 12345	Nov 1234	Dec 1234	Year

Footnotes:

- December - January closure on chinook often waived before 1970,
- Trollers on sockeye non-retention in northern portion of area 12 from July 8 to 29, 1979,
- Since 1980, only a few small subareas of area 12 have been open to trolling for seven days per week; the remainder of area 12 only opens to trolling in areas and at times when net fishing is allowed. Trolling may continue past the traditional troll closing dates for chinook and coho if net fishing is allowed,
- Trollers usually may retain sockeye, pink or chum when net fisheries are open in area 12,
- The northern portion of area 13 ("overlap" portion of area 13) is usually on the same troll regulations as area 12,
- Appendix Table 3 contains dates for 1951-1984 season/non-retention regulations. Shardlow et al. (1986) describe 1985 regulations in detail.

Table 7. Commercial troll seasons for the west coast of Vancouver Island (areas 121-127) outside the surfline since 1951. The years denote the first year of a particular season (1951 is the starting year); years with similar seasons are omitted. **** denote closed seasons/non-retention for coho and closed seasons for chinook, sockeye, pink and chum; ==== denotes non-retention of sockeye; '''' denotes non-retention of sockeye and pink; ---- denotes non-retention of sockeye, pink and chum; ++++ denotes non-retention of pink. Months are divided into statistical weeks.

Year	Jan 12345	Feb 1234	Mar 1234	Apr 12345	May 1234	Jun 1234	Jul 12345	Aug 1234	Sep 1234	Oct 12345	Nov 1234	Dec 1234	Year
						COHO							
1951	*****	****	****	*****	***							****	1951
1952	*****	****	****	*****	****	**						***	1952
1957	*****	****	****	*****	****	*					****	****	1957
1981	*****	****	****	*****	****	****				****	****	****	1981
1984	*****	****	****	*****	****	****			*	*****	****	****	1984
1985	*****	****	****	*****	****	****				****	****	****	1985
						CHINOOK, SOCKEYE, PINK, CHUM							
1951	****											****	1951
1957	*****	****	****	**							****	****	1957
1978	*****	****	****	*				==			****	****	1978
1979	*****	****	****	**							****	****	1979
1981	*****	****	****	**						****	****	****	1981
1982	*****	****	****	**				=		****	****	****	1982
1983	*****	****	****	**		.	....			****	****	****	1983
1984	*****	****	****	**		**			*	*****	****	****	1984
1985	*****	****	****	*****	*	****	+	=	'=--	*****	****	****	1985
Year	Jan 12345	Feb 1234	Mar 1234	Apr 12345	May 1234	Jun 1234	Jul 12345	Aug 1234	Sep 1234	Oct 12345	Nov 1234	Dec 1234	Year

Footnotes:

- Area 111 generally on the same season/non-retention regulations as areas 121-127,
- December - January closure on chinook often waived before 1957,
- Areas 123 and 127 closed August 14-19, 1982, area 121 closed August 14-23, 1982, and area 123 on sockeye non-retention August 20-23, to reduce the catch of sockeye,
- Areas north of 49°N latitude opened to retention of sockeye and pink on July 25, 1983,
- Appendix Table 3 contains dates for 1951-1984 season/non-retention regulations. Shardlow et al. (1986) describe 1985 regulations in detail.

Table 8. Commercial troll seasons for the west coast of Vancouver Island (areas 21-27) inside the surfline since 1951. The years denote the first year of a particular season (1951 is the starting year); years with similar seasons are omitted. **** denote closed seasons/ non-retention for coho and closed seasons for chinook, sockeye, pink and chum; non-retention periods for sockeye, pink and chum generally are the same as shown on Table 7 for the west coast of Vancouver Island outside the surf line; [[[[denotes closure of areas 26; >>>> denotes closure of areas 25-26; <<<< denotes closure of areas 24-27. Months are divided into statistical weeks.

Year	Jan 12345	Feb 1234	Mar 1234	Apr 12345	May 1234	Jun 1234	Jul 12345	Aug 1234	Sep 1234	Oct 12345	Nov 1234	Dec 1234	Year
						COHO							
1951	*****	****	****	*****	***							****	1951
1952	*****	****	****	*****	****	**						***	1952
1981	*****	****	****	*****	****	****				****	****	****	1981
1984	*****	****	****	*****	****	****			*	*****	****	****	1984
1985	*****	****	****	*****	****	****				****	****	****	1985
						CHINOOK, SOCKEYE, PINK, CHUM							
1951	****											****	1951
1977	*****	[[[[	[[[[	[[								***	1977
1978	****>	>>>>	>>>>	>								****	1978
1979	****<	<<<<	<<<<	<<								****	1979
1981	*****	<<<<	<<<<	<<						****	****	****	1981
1982	*****	****	****	**						****	****	****	1982
1984	*****	****	****	**		**			*	*****	****	****	1984
1985	*****	****	****	*****	*	****				*****	****	****	1985
Year	Jan 12345	Feb 1234	Mar 1234	Apr 12345	May 1234	Jun 1234	Jul 12345	Aug 1234	Sep 1234	Oct 12345	Nov 1234	Dec 1234	Year

Footnotes:

- December - January closure on chinook often waived before 1978 (1982 in area 23),
- Area 20-1 on same troll regulations as waters inside surfline on west coast of Vancouver Island, except trolling only during net openings since 1971 during annual period of IPSFC control (usually late July to early September), and since 1979 during remainder of the season (except 1983),
- Appendix Table 3 contains dates for 1951-1984 season/non-retention regulation changes. Shardlow et al. (1986) describe 1985 regulations in detail.

May 15, although the closure only applied to Georgia Strait between Cape Mudge at Campbell River and Trial Island off Victoria. In 1951, the coho season in Georgia Strait ran from June 1 to November 30; this was shortened to June 15-November 30 in 1956; and to July 1-September 30 in 1965 (Anon 1965). On the remainder of the B.C. coast the coho season was June 1 - November 30 until 1952 when Canada agreed to adopt the United States opening date of June 15 (see Section 5.3.1). In 1957, after the First Conference on Coordination of Fishing Regulations between Canada and the United States (Anon 1957), Canada adopted the U.S. closing date of October 31 for all trolling outside the surfline.

Between 1966 and 1979 the coho season in southern B.C. essentially remained unchanged. In 1981, the Johnstone Strait troll fishery was closed on September 30 for all species, the same closing date as in Georgia Strait; the west coast remained open until October 31. Then, in 1981, the coho opening and closing dates were standardized in all areas to July 1 - September 30. The troll closing date was advanced in 1984 to August 31 in Georgia Strait and to September 19 elsewhere. The 1985 coho season closed on September 16 in Johnstone Strait and on September 30 elsewhere.

3.1.2 Chinook

Until 1957, the chinook trolling season lasted ten months in all B.C waters and it was not unusual for one or both months of the December-January closed period to be waived to allow trollers to harvest "winter springs". After the 1957 Conference on Coordination of Fishing Regulations between Canada and the United States, the chinook season was reduced to April 15 to October 31 in B.C. waters outside the surfline. Waters inside the surfline remained open for ten months and the winter closure was usually waived before 1970.

In 1965, concern over increasing harvest of immature age two chinook during the winter fishery resulted in closure of Georgia Strait on September 30 rather than November 30 (Anon 1965). The following year the Georgia Strait chinook opening was delayed until April 15. Waters of Johnstone Strait inside the surfline continued to remain open for ten months (Tables 5 and 6) until 1981 when the season was brought in line with that for Georgia Strait. The ten month season inside the surfline on the west coast of Vancouver Island lasted until the end of 1981 in areas 23 and 24 (1980 in area 27, 1978 in areas 25-26). In 1982, waters inside and outside the surfline on the west coast had the same chinook season (Tables 7 and 8). June-July closures in area 11 during the 1970s (Table 5) were to conserve area 10-11 sockeye stocks.

The draft Canada-U.S. Salmon Treaty that was initialed by both countries in 1983 stipulated major reductions in chinook catch for several Pacific coast fisheries, including Canadian

troll and sport fisheries. In 1984, as part of interim management arrangements with the United States, Canada shortened the Georgia Strait and Johnstone Strait chinook seasons to under three months (July 1 to August 31 in Georgia Strait and July 1 to September 19 in Johnstone Strait) to conserve chinook. The chinook opening for the west coast of Vancouver Island fishery was not delayed, but a June 15 to 30 closure was implemented, and the season was closed to all species on September 19 instead of September 30.

In 1985, Canada and the United States ratified the Salmon Treaty. As a result, west coast troll and Georgia Strait troll/sport fisheries for chinook were placed under catch ceilings (360,000 on the west coast and 275,000 in Georgia Strait) and chinook seasons were further curtailed. Just before the 1985 season opened, the Minister of Fisheries announced that trollers in Georgia Strait would be allocated 50,000 of the 275,000 troll-sport catch ceiling (Shardlow et al. 1986). Trolling periods for chinook were limited to July 1-5 and July 28-August 31. On the west coast and in Johnstone Strait, trollers fished chinook from May 7-24 and from July 1-Sept. 25 (Sept. 16 in Johnstone Strait). Thus 1985 chinook seasons lasted just over one month in Georgia Strait and just over three months on the west coast and in Johnstone Strait. Georgia Strait trollers were required to release chinook from July 11 to 14, July 18 to 27 and during September so that strong runs of coho, pink and sockeye could be harvested without exceeding the chinook catch ceiling.

3.1.3 Non-retention of sockeye, pink and chum

Non-retention regulations are one means of simultaneously harvesting some species while conserving others. These regulations have also been used to keep trollers within within specified allocations of the total allowable catch of a species (eg. sockeye and pink on the west coast in 1985). The obvious disadvantage of non-retention regulations is mortality of released fish due to injury from hooking and handling. Non-retention regulations are usually waived if the regulated area opens to net fishing.

The most extensive non-retention regulations have been applied to Johnstone Strait trollers (Tables 5 and 6). The first such regulation was in 1971 when the return of pink salmon to Johnstone Strait was not expected to satisfy escapement requirements. As a conservation measure, trollers and purse seiners in areas 11, 12 and 13 discarded pinks during July and August (Zyblut 1971, Zyblut and Anderson 1973). Since 1980, area 12 trollers generally have been required to discard sockeye, pink and chum except during net fishing times.

Sockeye non-retention regulations were implemented in 1978 on the west coast of Vancouver Island to reduce the troll harvest of Adams River sockeye. Area closures (see Table 7 footnotes) and a short non-retention period were applied again in

1982 to limit harvest of Adams River sockeye. In 1983 on the west coast there was a period of non-retention for pinks; and in 1985 trollers were under non-retention regulations for sockeye, pink and chum.

3.2 Size Limits

Prior to 1957, size limits for all commercially caught salmon were three pounds (1.4 kg) round weight and 2.5 pounds (1.1 kg) dressed weight with the head on (Tables 9 and 10).[2] The equivalent fork length of this weight limit is approximately 48 cm. Prior to 1983, the minimum size limit for coho generally was waived at the beginning of the season when many coho in their second ocean year were just below the size limit, then was re-implemented before September 1 to prevent harvest of small coho in their first ocean year.

In 1957, as a result of the Conference on Coordination of Fishing Regulations, a 26 inch (66 cm) minimum size limit (total length) was placed on troll caught chinook outside the surfline. The 26-in limit was extended to west coast waters inside the surfline in 1972, and to inside surfline waters of Johnstone Strait in 1978. The Georgia Strait minimum size limit for chinook remained three lb round, 2.5 lb dressed, for four more years. In 1983, a 54 cm (21 in) fork length limit was applied to troll caught chinook in Georgia Strait and the 26 in total length limit outside Georgia Strait was changed to 62 cm fork length.

Other salmon species were switched in 1983 from the 3 lb weight limit to an equivalent 48 cm fork length limit. The 48 cm minimum size limit is reduced to 30 cm for part of the season to allow harvest of small but mature coho, sockeye, pink and chum. This is an alternative to waiving the minimum size limit each year on these species.

3.3 Closed Areas

Until recently there were few areas closed to trolling. For example, in 1951 only Cowichan Bay, Saanich Inlet, Comox Harbour and Horseshoe Bay, all in Georgia Strait, were closed year round to trolling (and all other commercial salmon fishing). In 1967, a strong sports lobby resulted in closure of area 19 and area 20 east of Sheringham Point to all commercial salmon fishing

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2. Salmon caught and released because they are smaller than the size limit or because they are caught "out-of-season" are called shakers.

Table 9. Commercial troll size limits for salmon caught in Georgia Strait (areas 13-20, 28, 29) since 1951.

Year	Chinook	Coho	Other Species
1951	- 3 lb round weight (2.5 lb dressed)	- 3 lb round weight (2.5 lb dressed) - size limit usually waived Jun 1-Jul 31	- 3 lb round weight (2.5 lb dressed)
1983	- 54 cm fork length (44 cm head off), except 48 cm fork length (40 cm head off) prior to June 23 in 1983 only	- 48 cm fork length (40 cm head off), except 30 cm fork length (26 cm head off) July 1 to Aug 31	- 48 cm fork length (40 cm head off), except pink and sockeye 30 cm fork length (26 head off) July 1 to December 31

Table 10. Commercial troll size limits for salmon caught on the West Coast of Vancouver Island and Johnstone Strait (areas 21-27 and 11-12 inside and outside the surfline) since 1951.

Year		Chinook	Coho	Other Species
1951	Inside	- 3 lb round weight (2.5 lb dressed)	- 3 lb round weight (2.5 lb dressed) - size limit usually waived Jun 1-Jul 31	- 3 lb round wt. (2.5 lb dressed)
	Outside	- as above	- as above	- as above
1957	Outside	- 26 in total length (18.5 in head off)		
1972	Inside	- 26 in total length (18.5 in head off) on the west coast of Vancouver I.		
1978	Inside	- 26 in total (20 in head off) Johnstone Strait on the west coast Vancouver Island		
	Outside	- as above		
1983	Inside	- 62 cm fork length (51 cm head off)	- 48 cm fork length (40 cm head off), except 30 cm fork length (26 cm head off) from Jul 1 to Aug 31	- 48 cm fork ln. (40 cm head off) except pink and sockeye 30 cm fork ln. (26 cm head off) from Jul 1 to Dec 31
	Outside	- as above	- as above	- as above

(Argue 1970, 1971); and the following year Howe Sound and Burrard Inlet were closed to commercial salmon fishing (Argue et al. 1983). In addition to these closures there have been an increasing number of seasonal closures to various south coast areas (mostly inlets) to conserve weak chinook stocks returning to spawn. Figure 16 illustrates current closed areas (some seasonal closures omitted due to map scale).

In 1985, stringent regulations were necessary to keep the Georgia Strait troll fleet within its allocation of 50,000 chinook and still allow trollers to harvest strong runs of the other species. Between July 11 and August 23, trollers were restricted to waters seaward of the 55 and 100 fathom depth contours to minimize incidental chinook catches while still allowing harvest of coho, sockeye and pinks. Figure 16 illustrates the approximate boundaries of the 1985 "beach" closure (Shardlow et al. 1986).

On the west coast of Vancouver Island in 1977, 1978, 1981 and 1985 there were closures of portions of areas 121 and 123 (Figure 17) to reduce the catch of shaker chinook and coho. Closures of portions of Swiftsure Bank in 1978 and 1981 were based on catch results by fishermen under charter to DFO. Shaker monitoring was conducted again in 1982 but no closures resulted. In 1985, a portion of area 121 was closed to trolling between May 7 and July 15 due to the high incidence of shaker chinook in this area. The area was reopened later so trollers could harvest Fraser sockeye and pink. As well in 1985, DFO, in consultation with troll fishermen, closed a large portion of the La Perouse Bank (Big Bank) to slow the troll catch of chinook so that the west coast quota would not be exceeded before sockeye, pink and coho stocks could be harvested.

There was a one week closure (June 23-30) of area 14 in 1979 during the chinook season due to a high incidence of coho shakers.

3.4 Other Regulations

Table 11 lists miscellaneous troll fishing regulations and the year each regulation went into effect.

3.4.1 Coordination of net and troll fisheries

Salmon net fisheries in areas 18-20, 29 and in portions of area 17 are regulated by the Pacific Salmon Commission (International Pacific Salmon Fisheries Commission prior to 1985) during most of the summer salmon season. These were the first

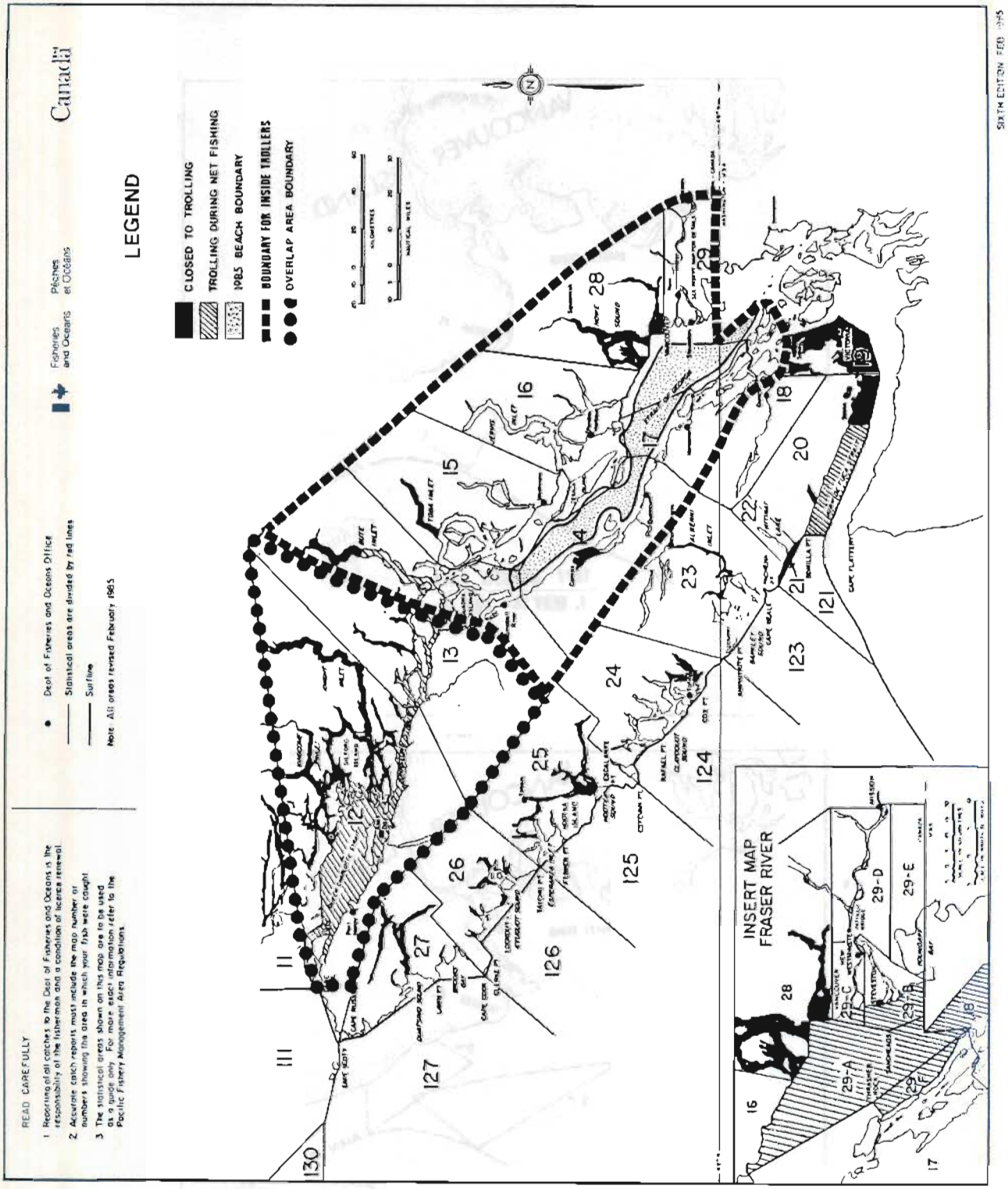


Figure 16. Map of southern British Columbia showing seasonal and permanent closed areas to trolling, areas where trolling only permitted during times of net fishing, 1985 beach boundary (trolling permitted seaward of the boundary), and boundaries where inside trollers are licensed to fish (boundary for inside trollers), and where inside and outside trollers are licensed to fish (overlap area boundary).

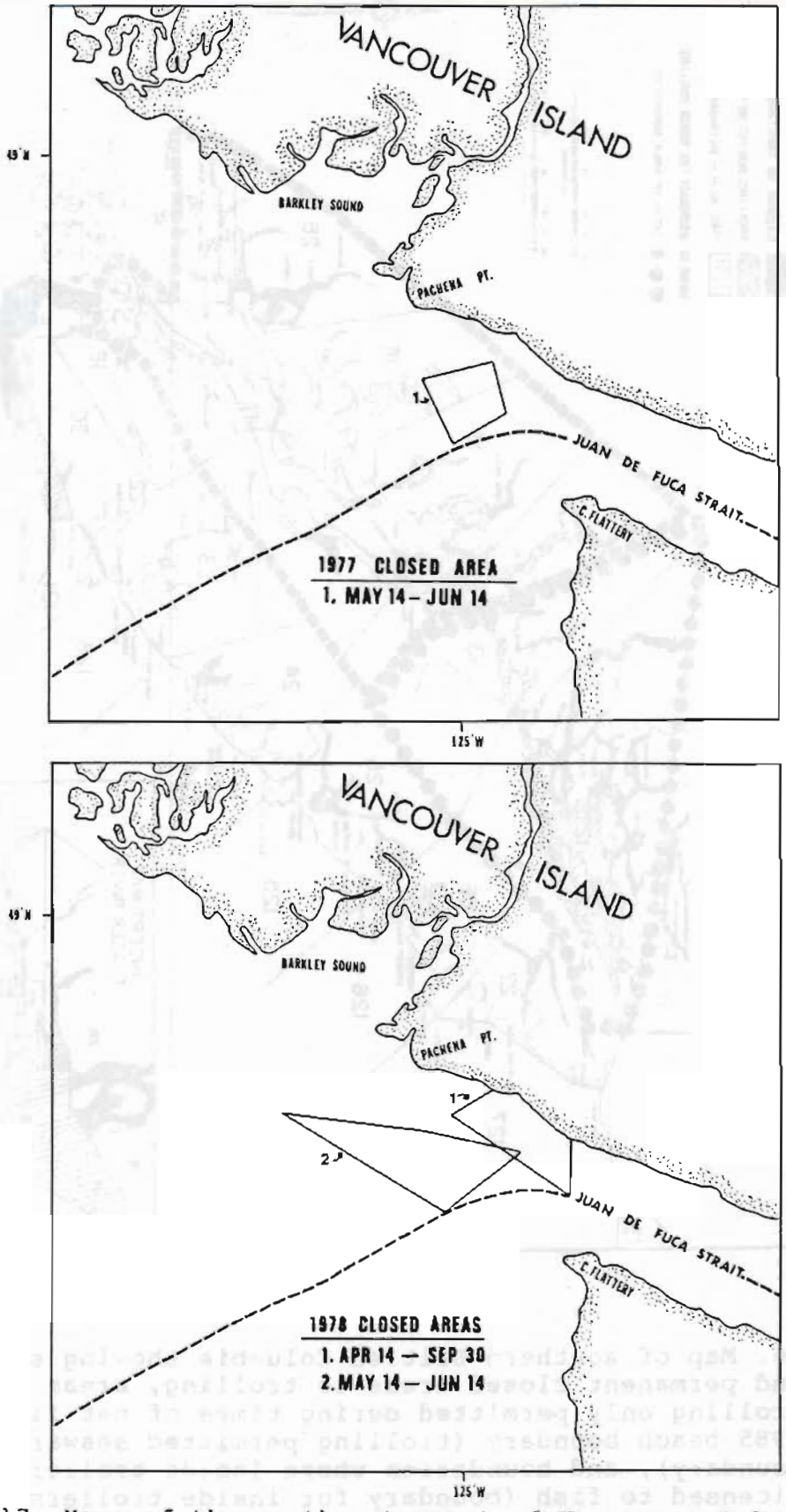
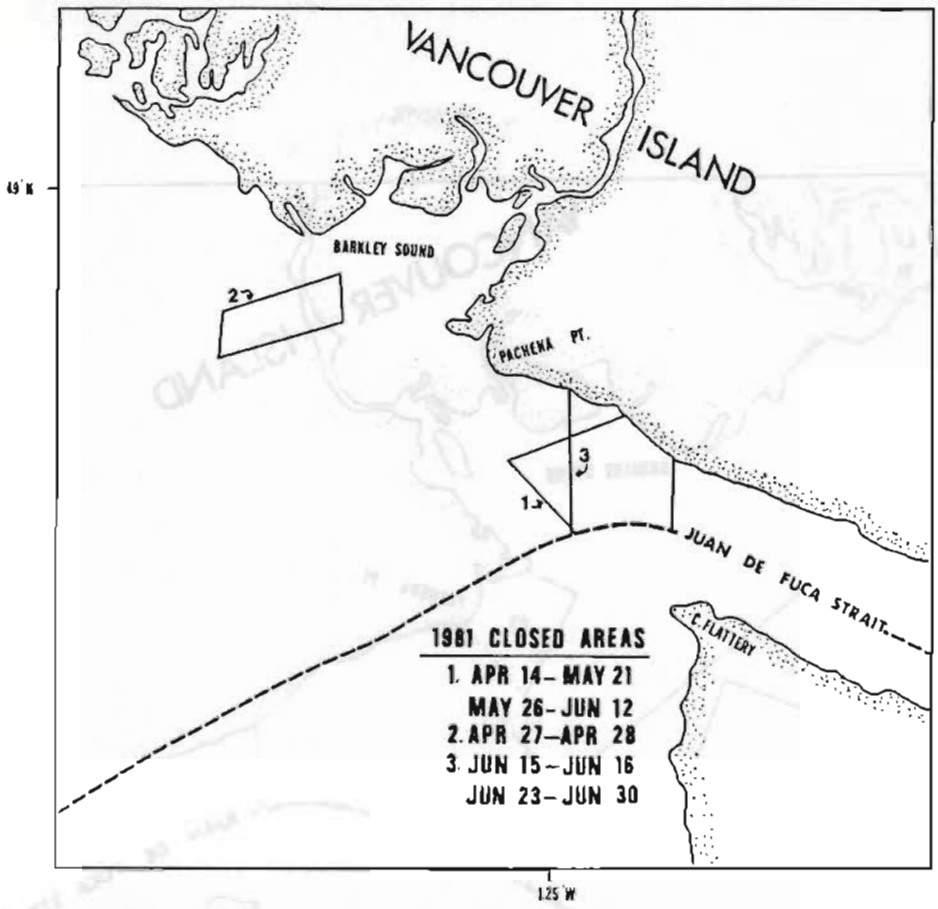


Figure 17. Maps of the southwest coast of Vancouver Island showing areas closed to reduce shaker catch in 1977, 1978, 1981 and 1985, and areas closed in 1985 (areas 2 and 3) to slow the chinook catch. Continued.



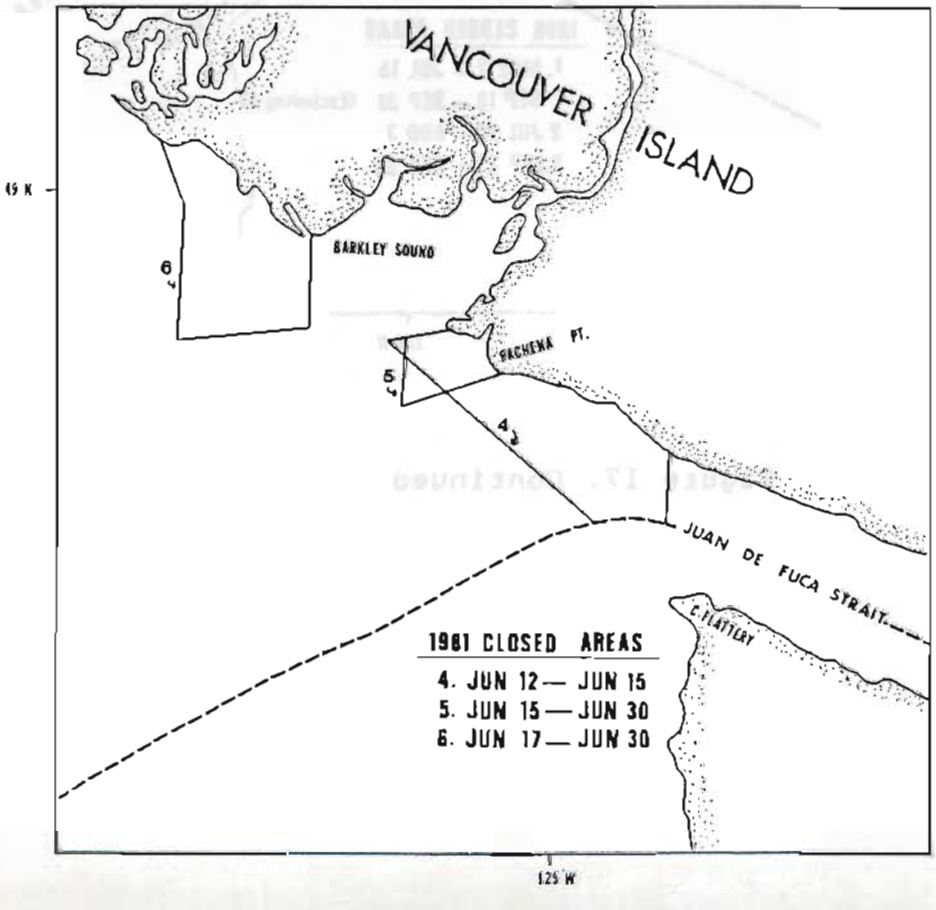


Figure 17. Continued.

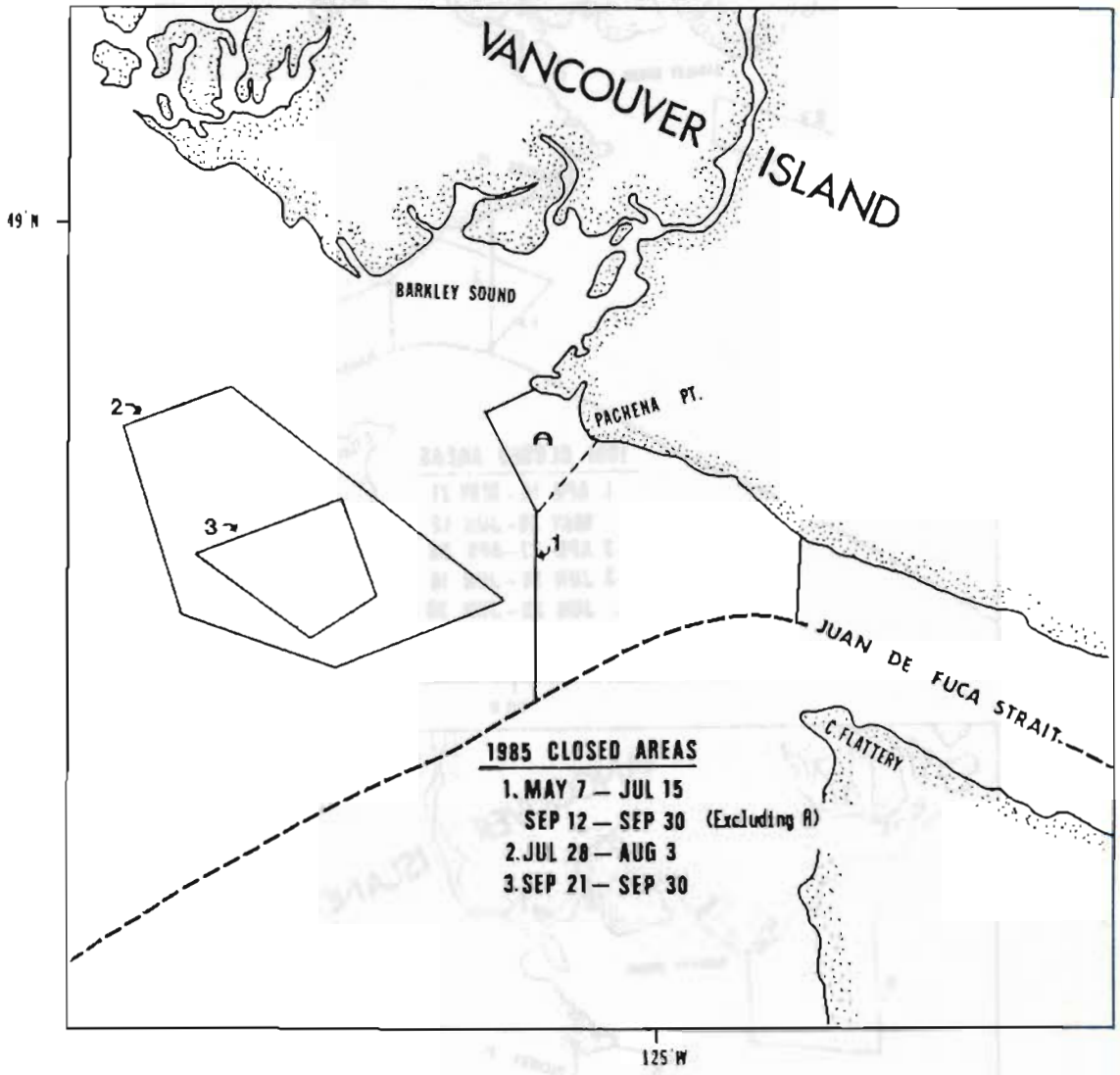


Figure 17. Continued.

Table 11. Miscellaneous troll fishing regulations for salmon since 1951.

Year	Regulation
1957 -	In 1957 the surf line was established for the outer west coast of British Columbia (Figure 1). Salmon net fishing was prohibited seaward of this line. Separate troll seasons and size limits established for chinook and coho seaward and inside of this line,
1962 -	During IPSFC regulatory control in area 29 and in portions of areas 17 and 18 within the Convention Area trolling only open at times that gillnet fishing allowed,
1971 -	During IPSFC regulatory control trolling in area 20 only open at times that gillnet fishing allowed,
1975 -	Prior to IPSFC regulatory period trolling in area 29 only open at times area 29 open to gill net fishing,
1979 -	Troll vessels restricted to a maximum of four troll lines on gurdies in areas 13 - 18, 29,
1979 -	Prior to July 29 in 1979 troll vessels shall not catch and retain in any day more pink salmon than 25 percent of the total number of chinook and coho salmon caught by that vessel on that day,
1980 -	Trolling in areas 12 and northern area 13 only open at times and in areas that salmon net fishing allowed except for a few small subareas open seven days per week,
1981 -	Prior to July 29, 1981 troll vessels prohibited from catching and retaining in any day more pink salmon than 33 percent of the total number of chinook and coho salmon caught by that vessel on that day,
1981 -	Troll vessels restricted to a maximum of six troll lines and installed gurdies in all areas,
1981 -	Troll vessels restricted to barbless hooks on all lures except plugs prior to July 1 (only enforced on the west coast of Vancouver Island),
1981 -	Each year owners of troll vessels elect to license vessels for fishing in either the Inside Troll Area or in the Outside Troll Area (Figure 16). Both groups may troll in the Overlap Area. Troll vessels licensed to troll in the Inside Troll Area can not be used to gillnet salmon in any waters (amended to gillnetting in any waters from Jan 1 to Sept 30 in 1982).

areas in which trollers and net fishermen were placed under the same area and time periods regulations (area 20 in 1971 and area 29 in 1962) (IPSFC Annual Reports). This action resulted from the growing expertise of trollers catching sockeye and pink salmon from Fraser River runs.

Starting in 1975, prior to IPSFC control (before July), trollers in area 29 were restricted by DFO to the same fishing times as gillnet fishermen in area 29 (Fraser et al. 1982). Thereafter, whenever the early season gillnet fishery in area 29 remained closed (eg. 1981), trolling in area 29 also closed.

It was not until 1980 that trolling in area 12 and northern area 13 was consistently placed under net fishing regulations. Since that time there have been only a few small management subareas open to "seven-day-per-week" trolling. These are typically subareas 12-10 and 12-13, called the Deserters group, and subareas such as 12-23 and 13-21. Trollers fishing these subareas generally may not retain sockeye, pink and chum except at times that these species are open to net fishing in nearby subareas.

3.4.2 Gear Regulations

Trollers have seldom had their terminal gear regulated in part because little is known of the selective properties of, for example, lures and lure spacing, and also because enforcement of terminal gear regulations is difficult. Since 1951 there have only been three such regulations. In 1979, trollers fishing in Georgia Strait were restricted to fishing no more than four lines and gurdies. This restriction was amended in 1981 to six lines and gurdies for the whole B.C. coast. Also in 1981, barbed hooks were prohibited between January 1 and June 30 on all lures except plugs, even though U.S. studies provided no conclusive evidence that use of barbless hooks would result in a net increase to troll catches (Butler and Loeffel 1972).

In 1985, representatives of trollers and DFO recommended that trollers not use terminal gear that was effective for sockeye and pink, called "red gear" by fishermen, during periods of non-retention for these species. On August 31 trollers were requested by DFO to stop using red gear. DFO radioed the fleet that red gear was "a troll configuration specifically intended to catch pink salmon and does not pertain to the colour of plugs, spoons, etc." This was not specific enough for enforcement purposes, nor did fishermen clearly understand what DFO meant by red gear. As a result, the red gear restriction was soon dropped by DFO.

3.4.3 Incidental catch

As a conservation measure in 1979 and 1981, trollers were placed on incidental catch limits for pink salmon on the west coast of Vancouver Island and in area 111. For 1979, DFO specified that no more than 25 percent (33 percent in 1981) of the catch in numbers could be pinks. These were difficult regulations to enforce.

3.4.4 Two-area troll

For many years DFO had proposed a trolling license that would restrict the Georgia Strait fleet to those vessels that, for one reason or another, seldom fished on the west coast of Vancouver Island or elsewhere in B.C and thus depended on Georgia Strait trolling for the majority of their earnings from fishing (Anon 1971). This proposal, dubbed the two-area troll license, was supported by most "Georgia Strait" trollers, but was resisted by "west coast" trollers who fished the season openings in Georgia Strait when chinook and coho were most abundant, and then left to fish outside waters. The two-area proposal was designed to eliminate this practice by requiring trollers to elect, each year, whether they would fish inside Georgia Strait or elsewhere. If they elected to troll in Georgia Strait, they could also troll in an "overlap" area that included upper Johnstone Strait (Figure 16).

In 1981, the two-area troll proposal was finally implemented in a regulation package that included amended coho seasons for the west coast troll fishery, reductions to daily and seasonal bag limits on sport caught chinook, and an increase in the sport chinook size limit from 30 cm fork length to 46 cm fork length. Prior to implementation, DFO had stated that the two-area troll license would: decrease the build-up of troll effort at the season openings for chinook and coho; result in a 30 percent reduction in annual troll effort in Georgia Strait; increase the average weight of troll caught chinook by one or two pounds; and increase the per vessel catches by 8 to 12 percent.

In 1982, the second year of the two-area license, 341 vessels obtained licenses to troll Georgia Strait; only 263 obtained Georgia Strait licenses in 1985 (DFO Regional Economics and Planning Branch, unpub. data). The decline between 1982 and 1985 was largely due to loss of trollers whose B licenses had expired.

4.0 TROLL CATCH AND EFFORT

The purpose of this section is to present trends in catch and effort for 1951 through 1985. Annual catch and effort data were obtained from the salmon catch statistics data base (Wong 1983) on the VAX computer at the Pacific Biological Station (PBS) in Nanaimo, and from various publications containing annual catch statistics for 1951 to 1962. Some of the numerical catch estimates for 1951 to 1962 in the PBS data base are inaccurate (Argue et al. 1986 MS) and 1985 data were preliminary as of March 12, 1986. Appendix Tables 4 to 10 contain annual troll catch, in numbers and tonnes, for each salmon species, average weight of the catch of each species, and troll effort. The unit of troll effort, as recorded on sales slips, is one day spent trolling by a vessel.

Data are presented for Georgia Strait (statistical areas 13-20, 28, 29), Johnstone Strait (areas 111, 11-12), the west coast of Vancouver Island (areas 121-127, 21-27), the southwest coast of Vancouver Island (areas 121-124, 21-24), the northwest coast of Vancouver Island (areas 125-127, 25-27), waters off Washington and Oregon (area C), and Juan de Fuca Strait (area 20). Sources of annual catch statistics are listed in footnotes to the Appendix Tables.

4.1 Numbers Caught

In the last four years catches of chinook (Figure 18) have declined in Georgia Strait (Appendix Table 4) and on the west coast (Appendix Table 6). In Johnstone Strait (Appendix Table 5), chinook catches also declined, however chinook caught in Johnstone Strait are such a minor part of the total Johnstone Strait catch by trollers (Figure 18) that the decline was of little consequence to the fishery. Peak years of chinook catch in Georgia Strait were 1957-1959 (maximum catch 198,00), 1971-1972 (287,000), and 1976-1981 (274,000). Johnstone Strait chinook catches also peaked during these periods with the highest catch (63,000) occurring in 1977. On the west coast, peak chinook catches occurred during 1955-1957 (523,000), 1965-1967 (523,000), 1971-1978 (656,000) and in 1982 (544,000). Lower chinook abundance (Anon 1984a) was undoubtedly partially responsible for recent catch declines. However, changes to troll seasons, size limits (Georgia Strait), fishing areas (Johnstone Strait) and introduction of the two-area troll license that reduced early season fishing pressure in Georgia Strait, have also contributed to reduced chinook catches.

As mentioned earlier, chinook catch ceilings were placed on 1985 troll fisheries in Georgia Strait and on the west coast

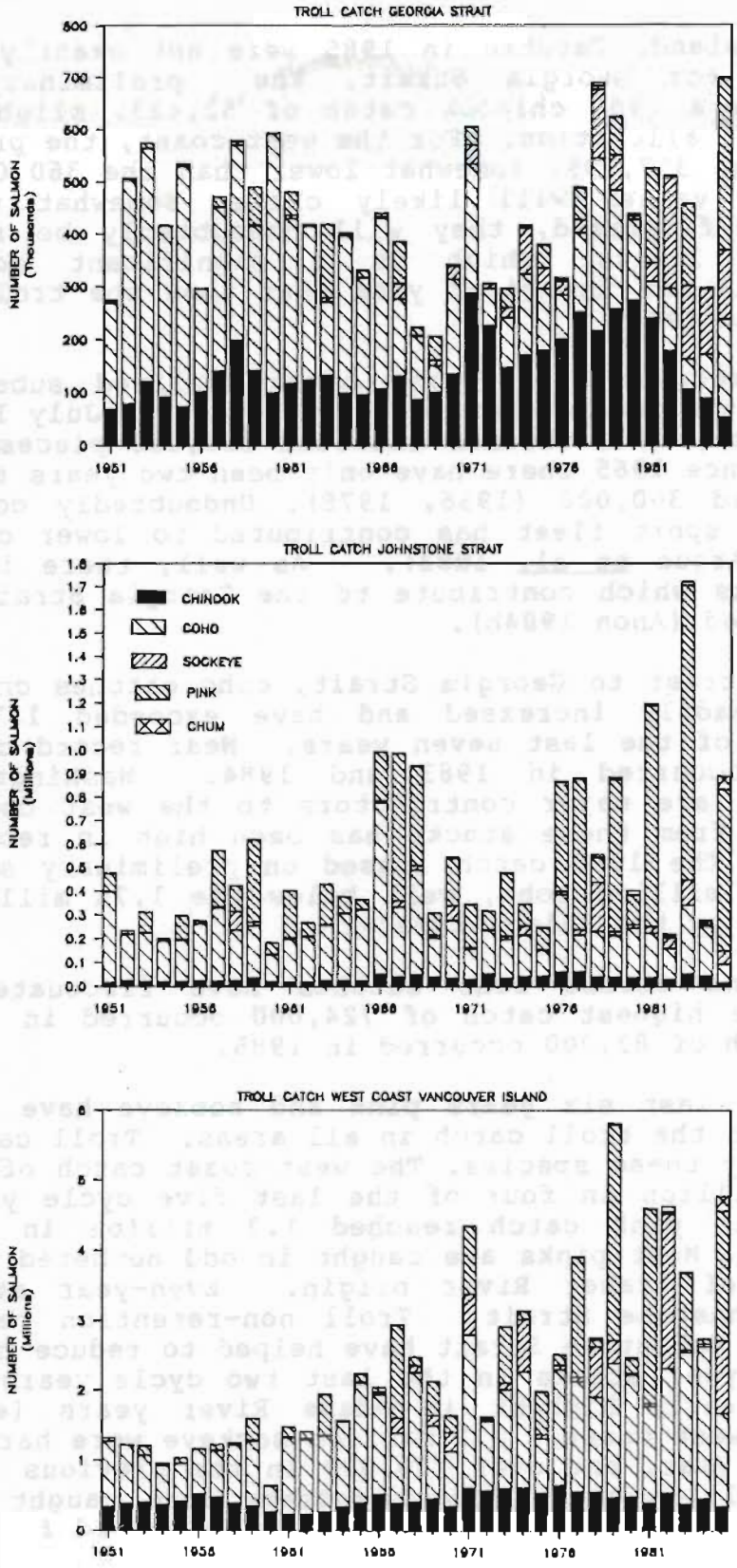


Figure 18. Annual troll catch (pieces) of each salmon species, 1951-1985.

of Vancouver Island. Catches in 1985 were not exactly equal to these limits. For Georgia Strait, the preliminary troll statistics show a 1985 chinook catch of 52,413, slightly above the 50,000 troll allocation. For the west coast, the preliminary catch figure was 357,799, somewhat lower than the 360,000 limit. Although catch values will likely change somewhat when 1985 statistics are finalized, they will undoubtedly be reasonably close to the limits, which is a significant achievement considering this was the first year that that the troll fishery was actively managed.

The Georgia Strait coho catch declined substantially after delay of the season opening by two weeks to July 1 in 1965. Before that date, coho catches exceeded 300,000 pieces in eight of 14 years; since 1965 there have only been two years that troll catches exceeded 300,000 (1966, 1978). Undoubtedly competition with the large sport fleet has contributed to lower catches in recent years (Argue et al. 1983). As well, there is concern that coho stocks which contribute to the Georgia Strait fishery are now depressed (Anon 1984b).

In contrast to Georgia Strait, coho catches on the west coast have steadily increased and have exceeded 1.7 million pieces in five of the last seven years. Near record catches of 2.17 million occurred in 1983 and 1984. Washington State hatchery stocks are major contributors to the west coast catch and production from these stocks has been high in recent years (Anon 1984b). The 1985 catch, based on preliminary sales slip data, was 1.40 million coho, well below the 1.75 million catch ceiling imposed by the Salmon Treaty.

Johnstone Strait coho catches have fluctuated widely since 1951. The highest catch of 724,000 occurred in 1966, and the lowest catch of 83,000 occurred in 1985.

In the last six years pink and sockeye have increased substantially in the troll catch in all areas. Troll catches now are dominated by these species. The west coast catch of pink has exceeded 1.7 million in four of the last five cycle years. The Johnstone Strait pink catch reached 1.3 million in 1983 and 648,000 in 1985. Most pinks are caught in odd numbered years and are primarily of Fraser River origin. Even-year stocks are mostly from Johnstone Strait. Troll non-retention regulations and closures in Johnstone Strait have helped to reduce harvest of depressed even-year stocks in the last two cycle years. Sockeye catches are usually highest in Adams River years (eg. 1978, 1982). On the west coast, 2.2 million sockeye were harvested in the 1982 cycle year, and over 700,000 in the previous two cycle years. One million early Stuart sockeye were caught in 1985; this was the second highest sockeye catch on record for the west

coast. Georgia Strait and Johnstone Strait sockeye catches are about an order of magnitude less than west coast catches. The highest catches in both these areas occurred on Adams River years- 212,000 in 1982 in Georgia Strait, and 205,000 in 1978 in Johnstone Strait.

Troll catches of chum salmon have increased substantially on the west coast and in Johnstone Strait. In 1985, for example, west coast trollers harvested 216,000 chum and Johnstone Strait trollers harvested 59,000 chum. This suggests that trollers are beginning to target on chum. The chum run to Georgia Strait peaks in late October after the troll season has closed.

4.2 Tonnes Caught

Figure 19 presents catches, in tonnes, of chinook and coho combined, and of pink, sockeye and chum combined, for Georgia Strait, Johnstone Strait and the west coast of Vancouver Island. The graphs illustrate the dramatic increase in contribution of sockeye, pink and chum to recent troll catches.

By far the largest catches of chinook and coho occur on the west coast of Vancouver Island. Here, the combined catch of these species has been in the vicinity of 5,000 tonnes for the last 35 years. Troll catches of pink, sockeye and chum reached the 5,000 tonne level in four of the last seven years (1979, 1981, 1982, 1985).

In Georgia Strait, the combined chinook and coho catch has fluctuated widely, from over 1,000 tonnes in the 1950s and 1970s, to lows of approximately 400 tonnes in the mid-1960s and again since 1982. Pink and sockeye have clearly filled the gap. (Appendix Table 4). Since 1981, these two species have contributed over one-half of the average catch of 1,050 tonnes in Georgia Strait.

In Johnstone Strait, pinks alone have contributed over 60 percent of the weight of the catch in odd years since 1977. Until 1983, sockeye catches of 100 tonnes or more in Johnstone Strait occurred only on Adams River years (5 of the last 8) (Appendix Table 5). In 1983, 255 tonnes of sockeye were taken by trollers and in 1985, 120 tonnes of sockeye were trolled. The chum catch by Johnstone Strait trollers was 172 tonnes in 1985.

4.3 Catch, Effort and Catch per Unit Effort

Total troll catch (tonnes), troll effort (fishing days), and troll catch per unit effort (CPUE) are presented for Georgia

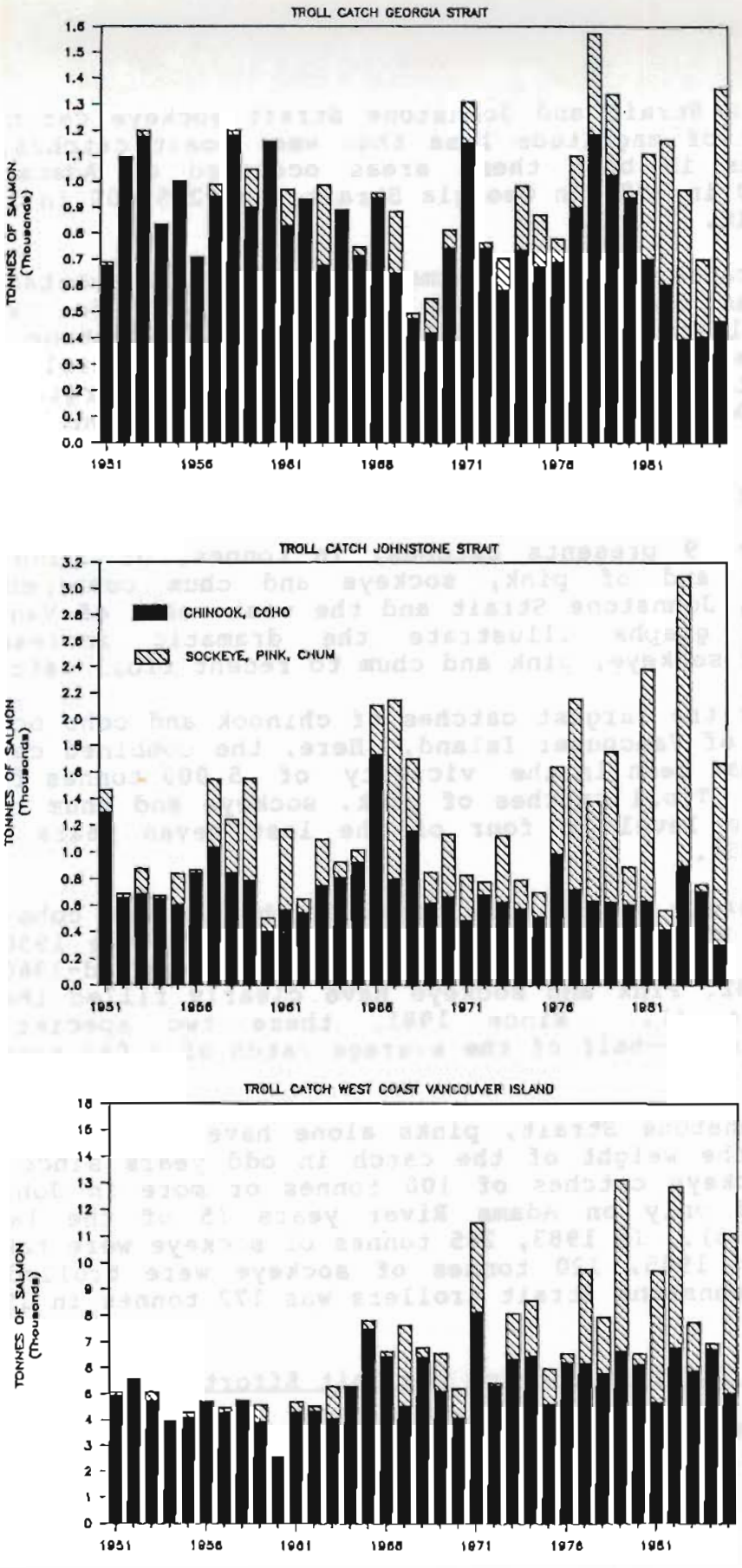


Figure 19. Annual troll catch (tonnes) of chinook-coho and sockeye-pink-chum, 1951-1985.

Strait, Johnstone Strait and the west coast of Vancouver Island in Figures 20, 21, and 22, respectively. These graphs illustrate major changes in the three troll fisheries.

In Georgia Strait, troll effort declined 80 per cent over the 1951 to 1985 period. Troll effort dropped in stages, first after the 1965 coho season change, then in 1981 after introduction of the two-area troll license, and finally in 1984 and 1985 when the troll season and fishing area were greatly reduced. Beginning in 1966, troll CPUE (kilograms per fishing day) began a steady upward climb and then, after 1981, increased dramatically to over 100 kg per day in 1984 and 1985. We speculate that increased CPUE is in part a result of regulation changes, particularly since 1980, which reduced competition amongst trollers and hence increased CPUE. Other contributing factors are increased efficiency of troll vessels, and refocusing of troll effort from coho and chinook to pink and sockeye. The latter species are in high abundance for short periods and thus provide the opportunity for large harvests with relatively little fishing effort. In brief, Georgia Strait trollers have maintained high catch levels in spite of major regulation changes.

Trends in catch, effort and CPUE are not so clear in Johnstone Strait. Data in Figure 21 does suggest, however, that even with greatly reduced fishing time and area in the last six years, troll catch and CPUE have not declined. CPUE has fluctuated with abundance of odd-year Fraser River pink stocks since 1977.

There have been wide fluctuations in CPUE by west coast trollers since the mid-1960s (Figure 22). These fluctuations coincide with increased dependence on pink and sockeye that vary greatly in abundance each year. In contrast to Johnstone Strait, west coast catch and CPUE steadily increased between 1960 and 1982. West coast troll effort has decreased substantially since 1979. Closures were partially responsible for decreased west coast effort in 1984 and 1985. However, there also has been a decline in the number of licensed troll vessels (Table 2). The correlation between total B.C. troll fleet size and days fishing by trollers on the west coast (Figure 22a) suggests that reduced fleet size also may be responsible for the recent decline in west coast effort (English *et al.* 1987).

4.3.1 Catch per day fishing

Figure 23 presents graphs of catch in kilograms per troll fishing day (CPUE) for each salmon species and each area.

Georgia Strait chinook CPUE rose from less than 10 kg

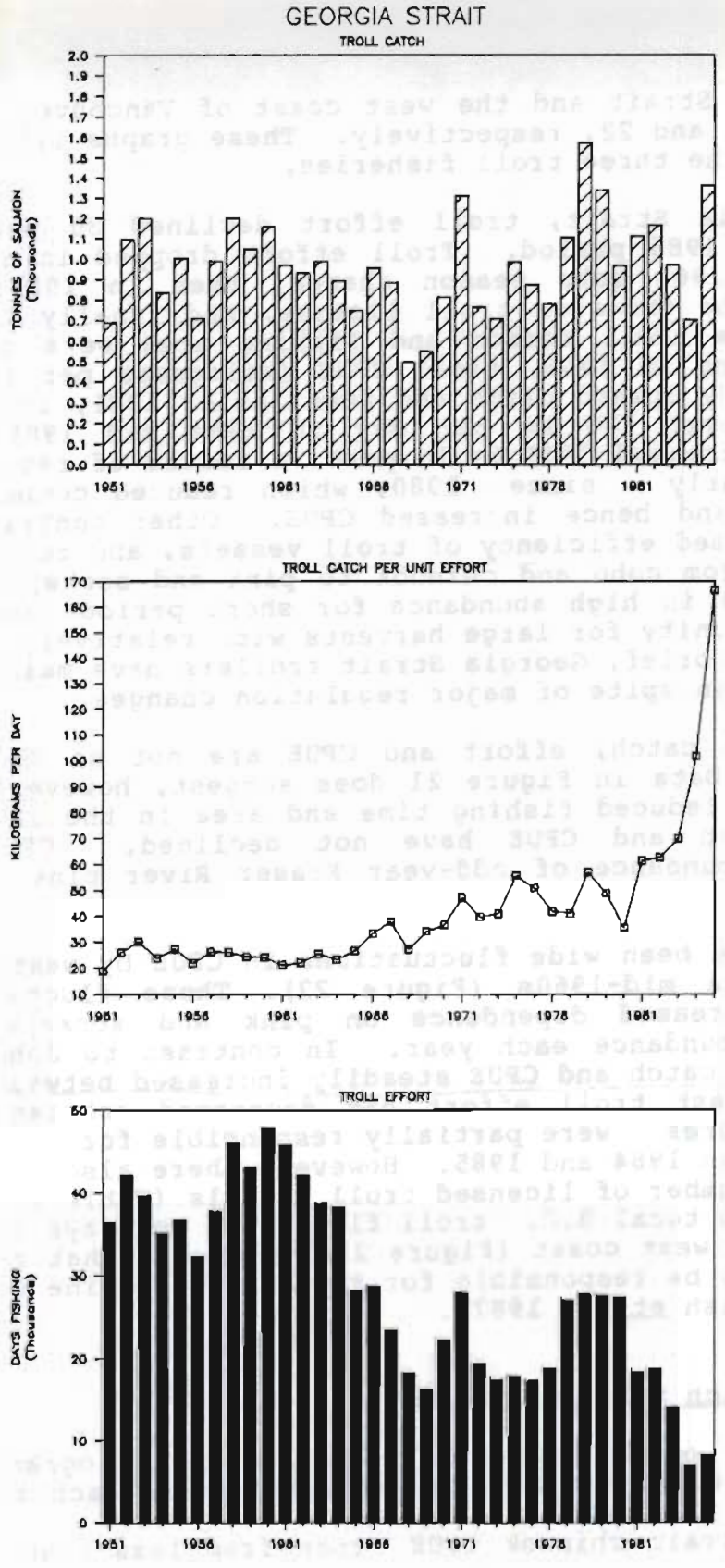


Figure 20. Total annual salmon troll catch (tonnes), catch per day fishing and days fishing for Georgia Strait, 1951-1985.

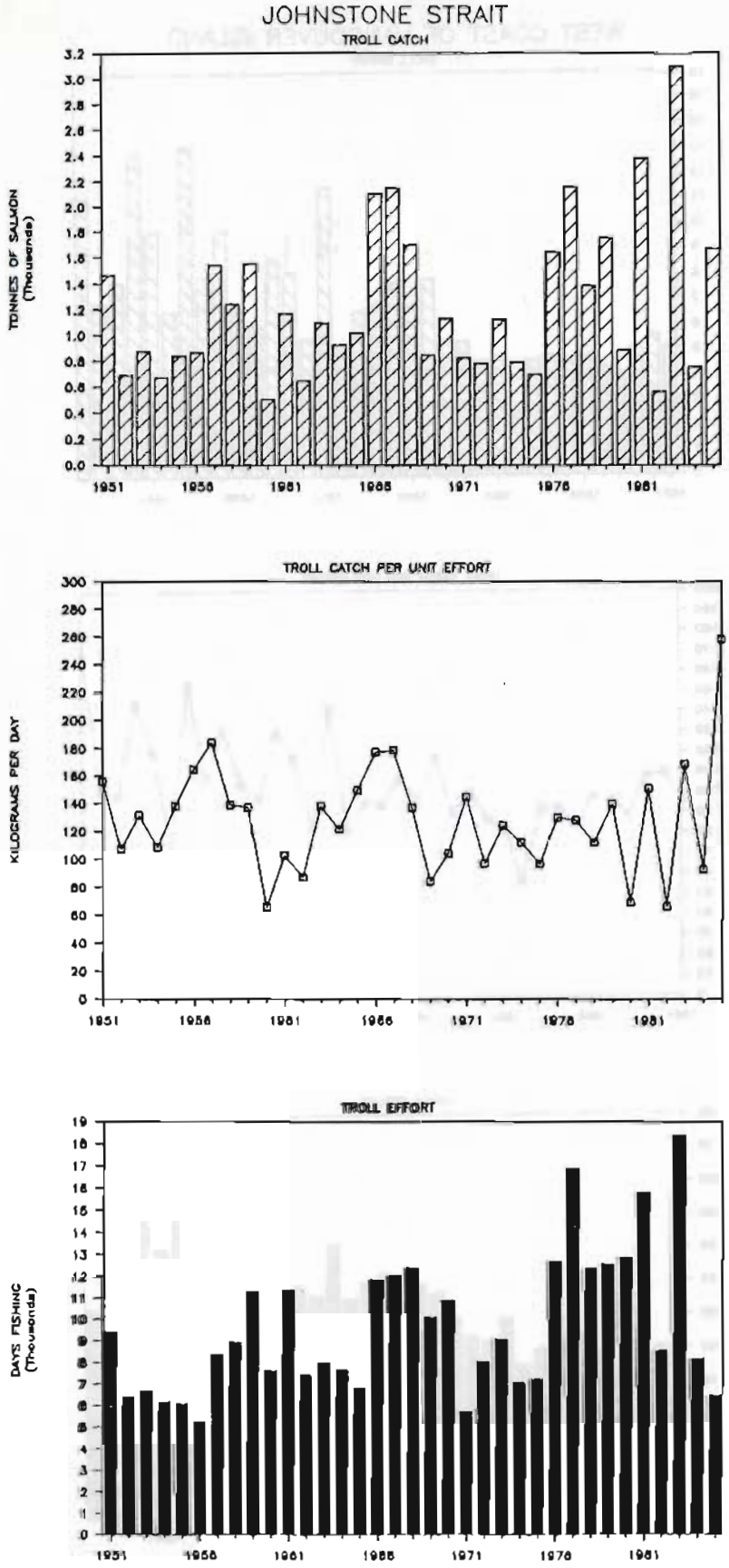


Figure 21. Total annual salmon troll catch (tonnes), catch per day fishing and days fishing for Johnstone Strait, 1951-1985.

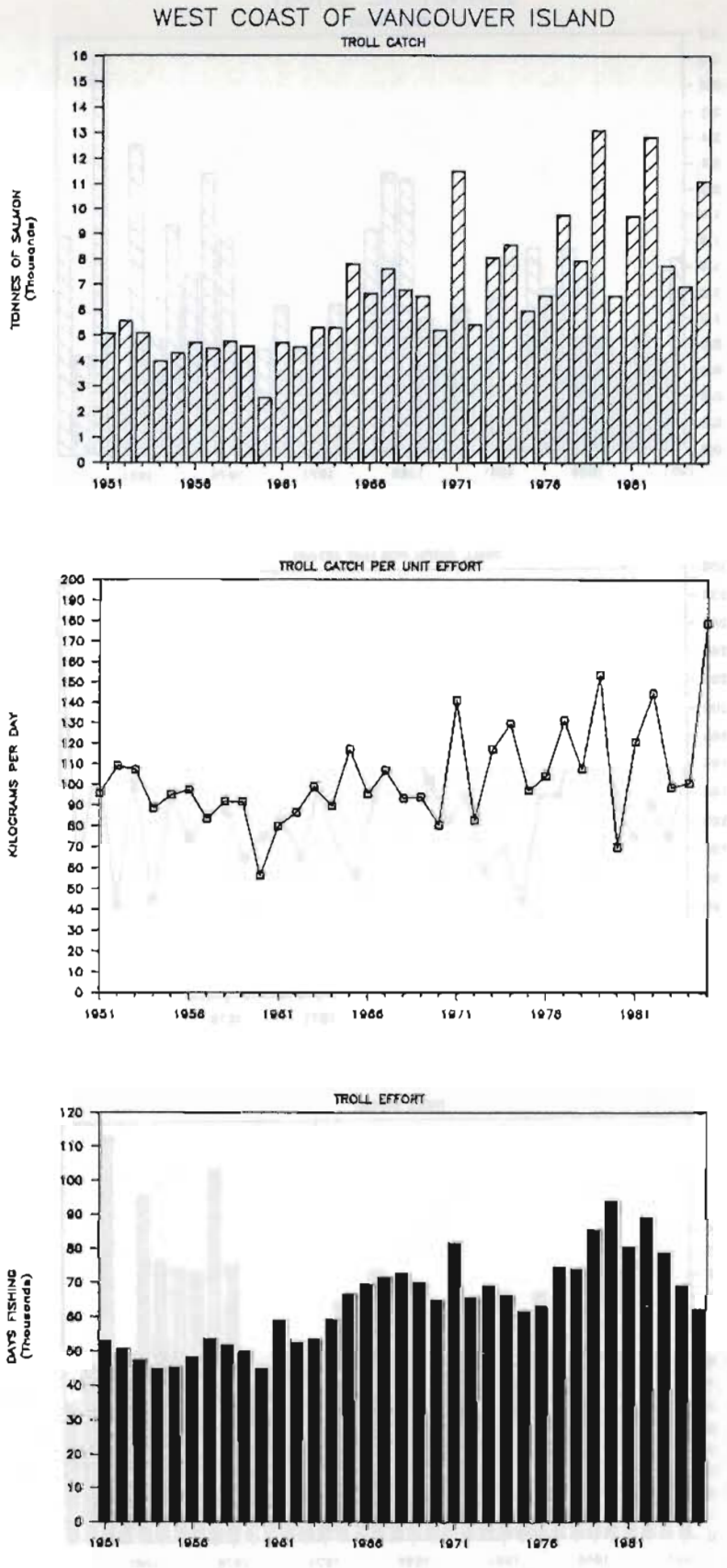


Figure 22. Total annual salmon troll catch (tonnes), catch per day fishing and days fishing for the west coast of Vancouver Island, 1951-1985.

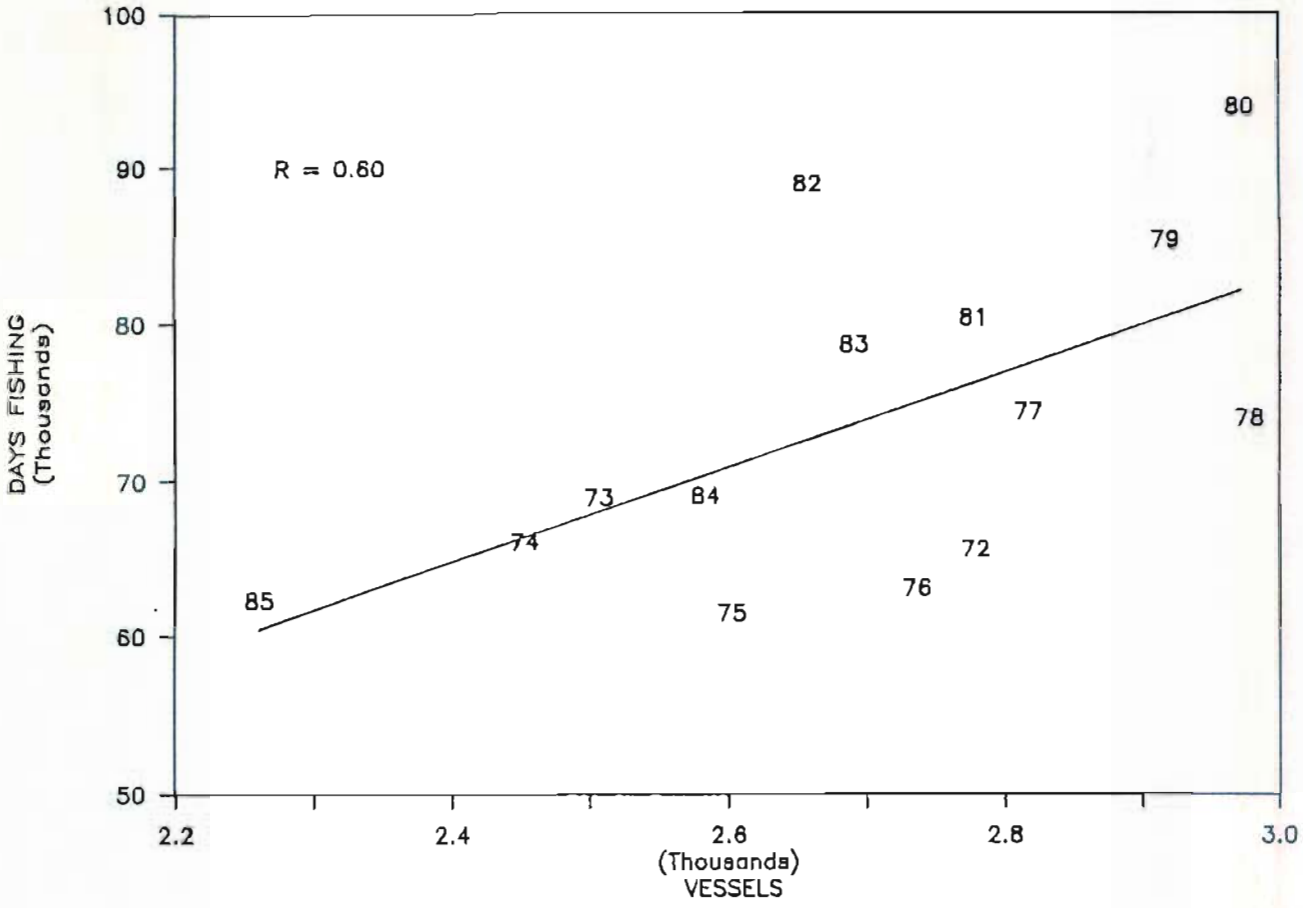


Figure 22a. Relationship between numbers of licensed trollers in British Columbia and troll effort (days fishing) for the west coast of Vancouver Island, 1967-1985. The solid line is the regression line ($p < 0.01$) and R is the correlation coefficient.

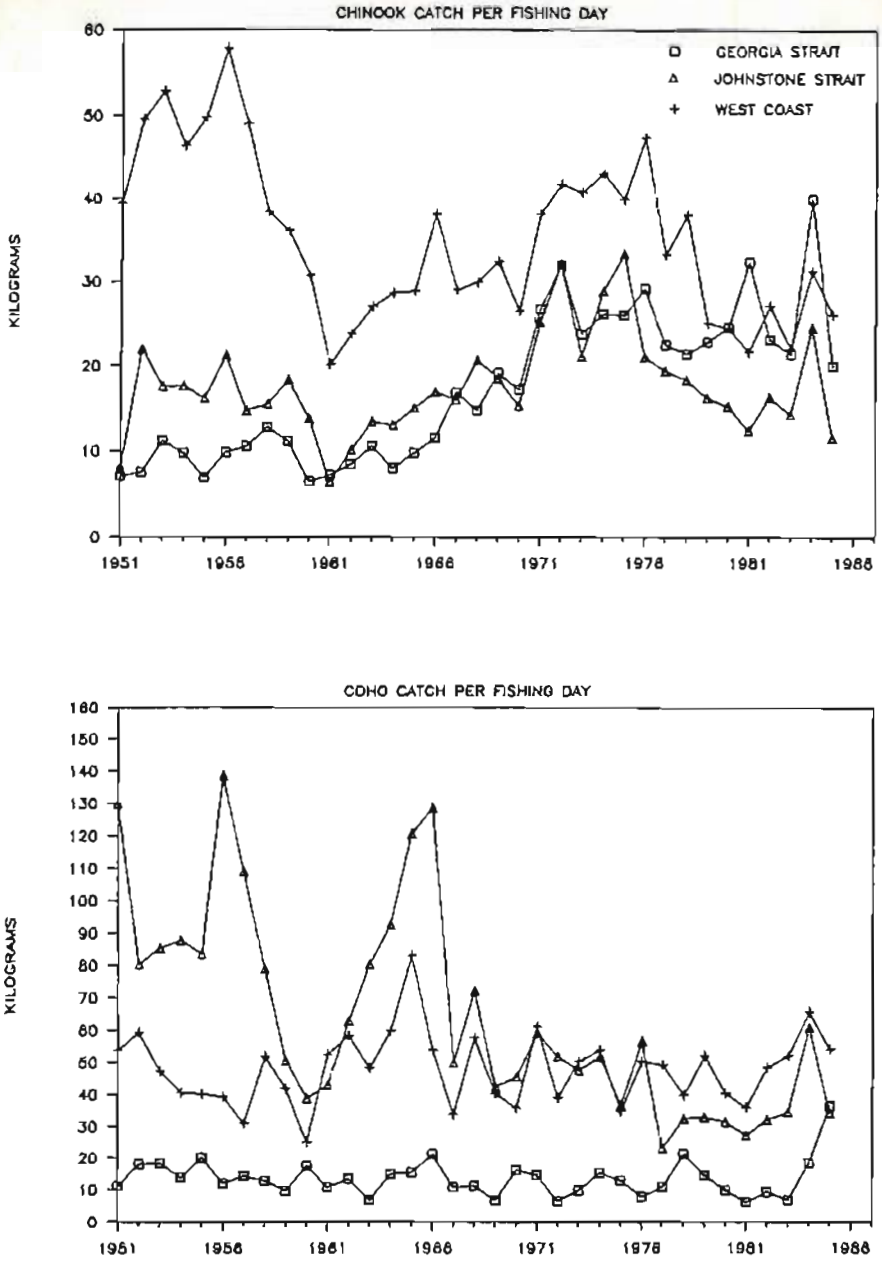


Figure 23. Annual troll catch (kg) of each salmon species per fishing day, 1951-1985. Continued.

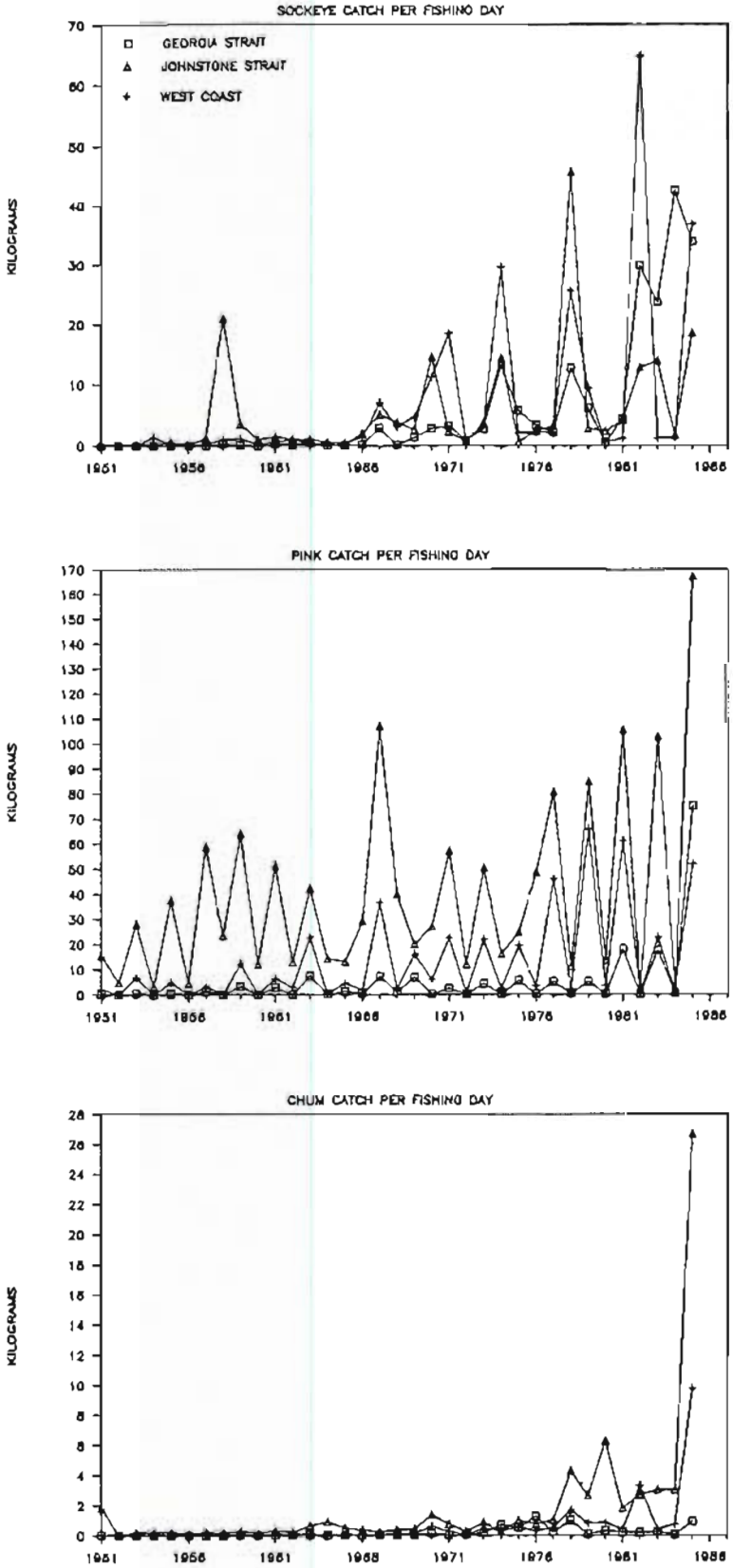


Figure 23. Continued.

per day prior to 1966 to just over 30 kg per day in 1980. During this period effort showed little trend (Figure 20). Since chinook stock sizes declined over this period (Anon 1984a, Argue et al. 1983, Fraser et al. 1982), increased chinook CPUE likely represents improved efficiency of the Georgia Strait troll fleet. Increased early season fishing in the Strait by more efficient "west coast" trollers during the 1970s undoubtedly contributed to the rising CPUE trend. After June 15, most of these vessels left Georgia Strait for other fishing areas (Anon 1971).

West coast chinook CPUE declined over the same period that Georgia Strait CPUE increased. In the last seven years chinook CPUEs in Georgia Strait and on the west coast have been similar, between 30 and 40 kg per day. Chinook CPUE in Johnstone Strait has varied greatly; since 1982 it has averaged around 15 kg per day, about one-half of west coast and Georgia Strait levels.

Coho CPUE fluctuated widely in Johnstone Strait prior to 1966. Peak values of over 130 kg per day in 1956 and 1966 have not been approached in the last 20 years. Johnstone Strait CPUE generally has been intermediate between that on the west coast and that in Georgia Strait. West coast and Georgia Strait coho CPUEs have remained relatively constant, between 30 and 80 kg and 10 and 25 kg, respectively. In 1985, Georgia Strait CPUE exceeded 30 kg per day.

Sockeye and pink CPUEs are highest in years of abundant Fraser River runs. Annual CPUEs for sockeye may reach 60 kg per day and values over 100 kg per day are common for pinks. Pink CPUE usually has been lowest in Georgia Strait, highest in Johnstone Strait and intermediate on the west coast. In 1985, pink CPUE in Georgia Strait exceeded that for the west coast, and pink CPUE in Johnstone Strait was the highest on record (160 kg). Sockeye CPUEs are more similar amongst the three areas. The trend toward increased sockeye CPUE over the last 15 years is most pronounced in Georgia Strait. Chum CPUEs only recently exceeded 10 kg per day in Johnstone Strait and on the west coast.

In Figure 24, total CPUEs are compared amongst the three areas. Record CPUEs occurred in each area in 1985. Georgia Strait and west coast of Vancouver Island CPUEs were just under 180 kg per day and Johnstone Strait CPUE reached 260 kg per day. The most interesting feature of this graph is the steady climb in Georgia Strait CPUE. Since 1983, Georgia Strait trollers have been as productive as their counterparts in other areas. This arose in spite of major troll regulation changes and stiff competition from the sport fishery.

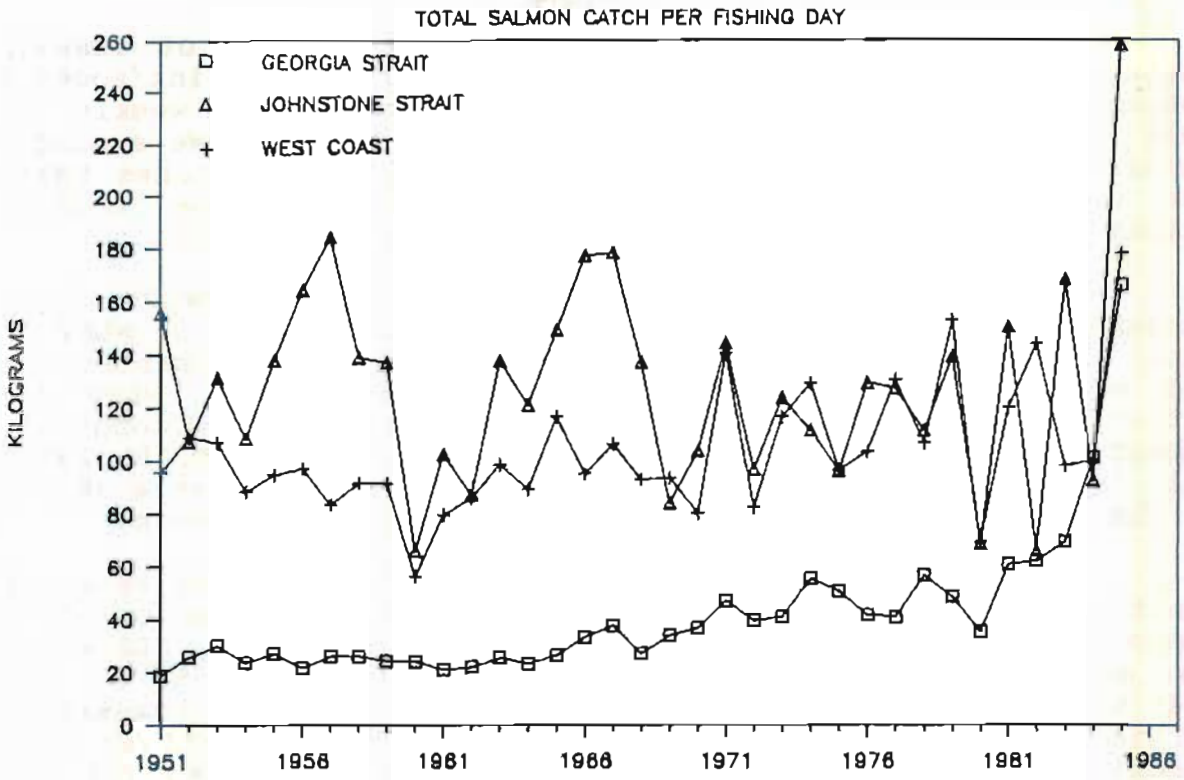


Figure 24. Comparison of total annual salmon troll catch (kg) per day fishing amongst Georgia Strait, Johnstone Strait and west coast of Vancouver Island areas, 1951-1985.

4.3.2 Catch per ice vessel

In Section 2.2.3 we explained how numbers of vessels fishing peak weeks during the chinook, coho and pink/sockeye seasons were calculated. In Figure 25 we present the weekly ice troll landings per vessel for each of these seasons. We excluded freezer trollers because their landings represent catches taken over a period of a month or more, whereas most ice trollers deliver catches taken over a period of less than 14 days.

Weekly landings in kilograms per vessel (WLPV) have increased in Georgia Strait since 1967. Regressions of WLPV on years (1967-1982) were all significant ($P<0.05$). Vessel counts were not available for 1983 and 1984, and chinook WLPV was omitted for 1985 because chinook and coho seasons were combined. Highest Georgia Strait WLPVs (>400 kg) occurred during the 1974, 1981, 1982 and 1985 sockeye/pink seasons. 1985 WLPVs were 382 kg for the coho season and 757 kg for the sockeye/pink season.

Regressions of Johnstone Strait WLPVs on years were not significant. Chinook WLPV was omitted because of the relative unimportance of chinook to Johnstone Strait trollers. WLPVs for coho and sockeye/pink seasons since 1979 averaged 596 kg and 1,445 kg, respectively, approximately twice that for comparable Georgia Strait seasons. 1985 Johnstone Strait WLPVs were approximately 900 kg for the coho season and 2,300 kg for the sockeye/pink season.

West coast Vancouver Island WLPVs have been lowest during the chinook season. Since 1967, chinook WlPVs have been fairly constant, around 200 kg per vessel. Coho and pink/sockeye WLPVs have increased over the 1967-1982 period (regressions were significant $P<0.01$). In 1985, chinook season WLPV was 200 kg, coho season WLPV was 1,105 kg and sockeye/pink season WLPV was 1,726 kg.

Recent increases in WLPV during coho and sockeye/pink seasons suggests that troll vessels have become more effective catching these species.

4.4 Average Weight

The average weights of chinook and pink have decreased in all areas since 1951 (Figure 26). Regressions of average size on year (1951-1982) were all significant ($P<0.05$). Coho declined in average size on the west coast and in Johnstone Strait by about two lb (one kg) over the last 35 years, but have not declined in average size in Georgia Strait. Between 1951 and 1982, chinook declined by approximately four lb (two kg) in each

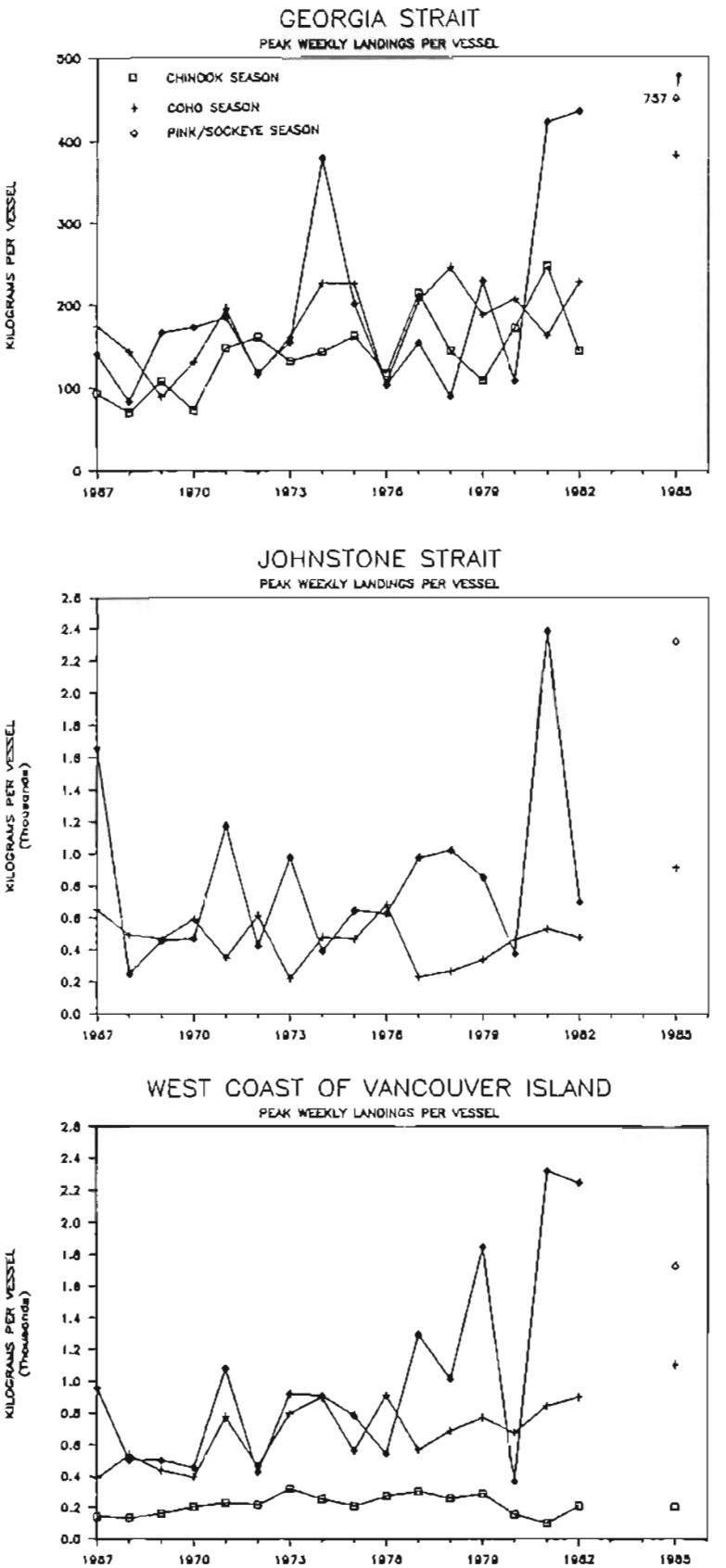


Figure 25. Total salmon landings (kg) per troll vessel during peak weeks of the chinook, coho and sockeye/pink seasons, 1967-1985.

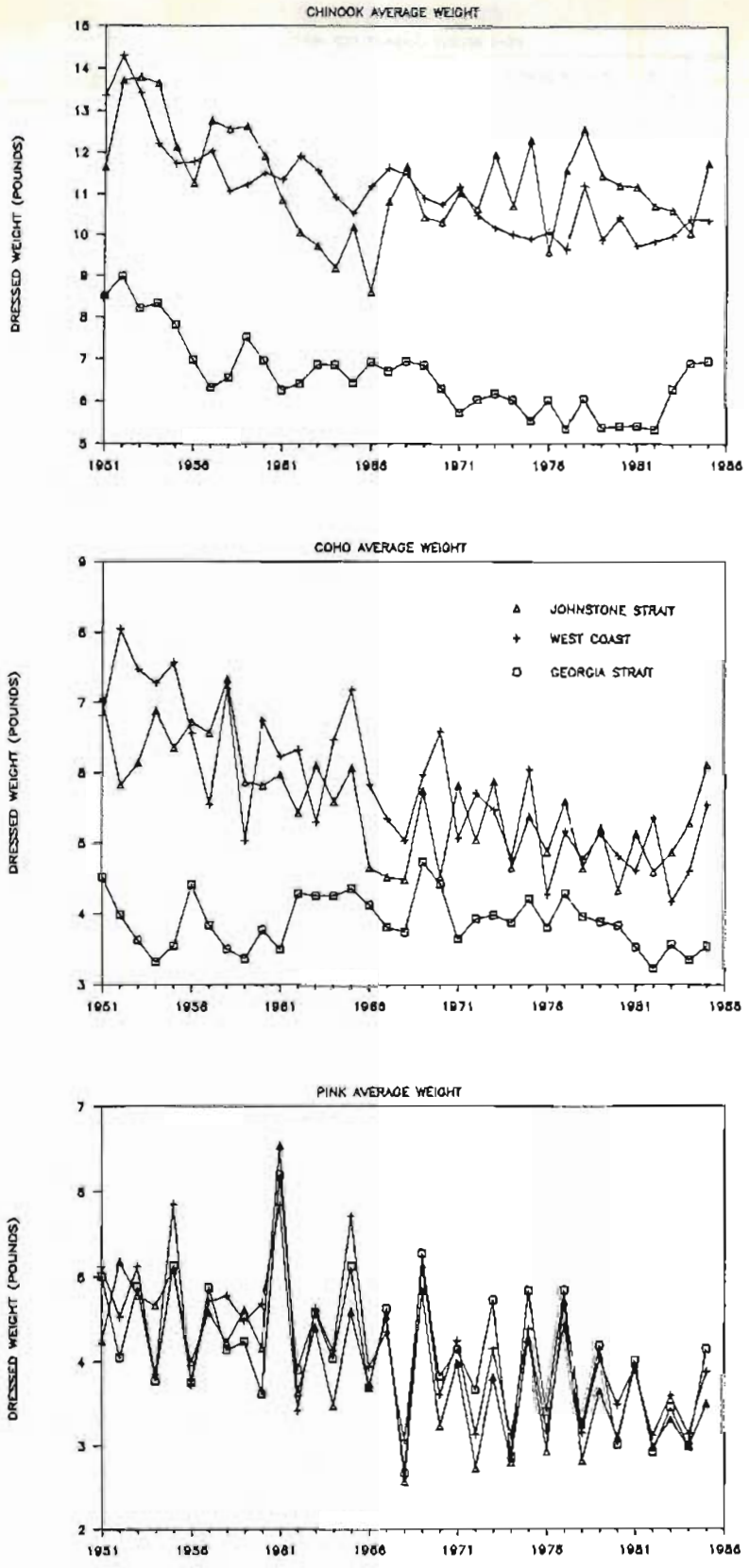


Figure 26. Trends in annual average weight (lb) of troll caught chinook, coho and pink salmon, 1951-1985.

area.

Chinook average size in Georgia Strait has increased by several pounds since 1983, but did not increase in 1981 and 1982 as predicted to result from the two-area troll license. The increase in 1983 was undoubtedly due to the larger minimum size limit (54 cm vs 48 cm). The delayed opening in 1984 and 1985 (July 1 instead of April 15) contributed to the size increase by allowing all chinook age classes to grow for an extra month and one-half.

Ricker (1981) suggested several mechanisms that would cause decreases in average size, for example increased exploitation which decreases the average age (size) of fish in the catch, and a gradual shift in the timing of exploitation to early months of the season before salmon have had a chance to grow. The latter phenomenon occurred after 1970 in the Georgia Strait chinook fishery, but does not appear to have been a factor with respect to west coast fisheries (Section 4.6.3). Perhaps of more concern are genetic mechanisms which reduce size. It is not known to what degree troll gear is size selective, although the fact that chinook and coho are recruited to the size limit during the season provides a mechanism for size selection since the fastest growing fish are subject to the most exploitation once they are recruited. Thus if slower growing parents tend to produce slower growing offspring, this would contribute to decreased average size of the catch over a number of generations.

4.5 Comparison of Freezer and Ice Trollers

Figure 27 shows that the proportion of the total troll catch contributed by freezer trollers has increased at a steady rate in all areas since 1971. On the west coast, freezer trollers now account for one quarter of the catch. Freezer trollers account for approximately 12 percent of the Johnstone Strait catch, but only two percent of the Georgia Strait catch. Freezer trollers harvest similar proportions of the catch of each species (Figure 28).

Figure 29 contrasts freezer and ice troller catch per fishing day. In most years freezer troller CPUE was substantially higher than ice troller CPUE. Clearly, greater participation in the troll fishery by freezer trollers in the last fifteen years is one of the reasons why overall troll CPUE has increased.

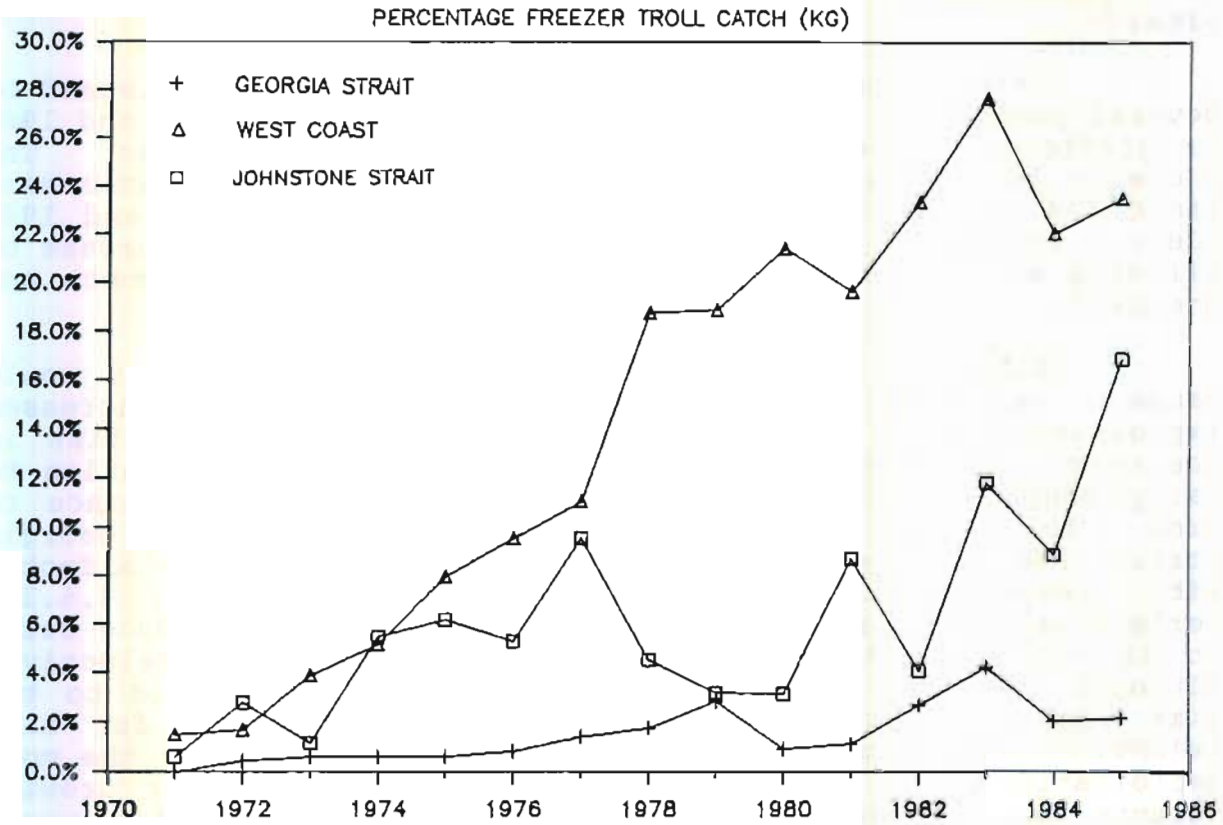


Figure 27. Percentage of total annual salmon troll catch (tonnes) taken by freezer troll vessels, 1971-1985.

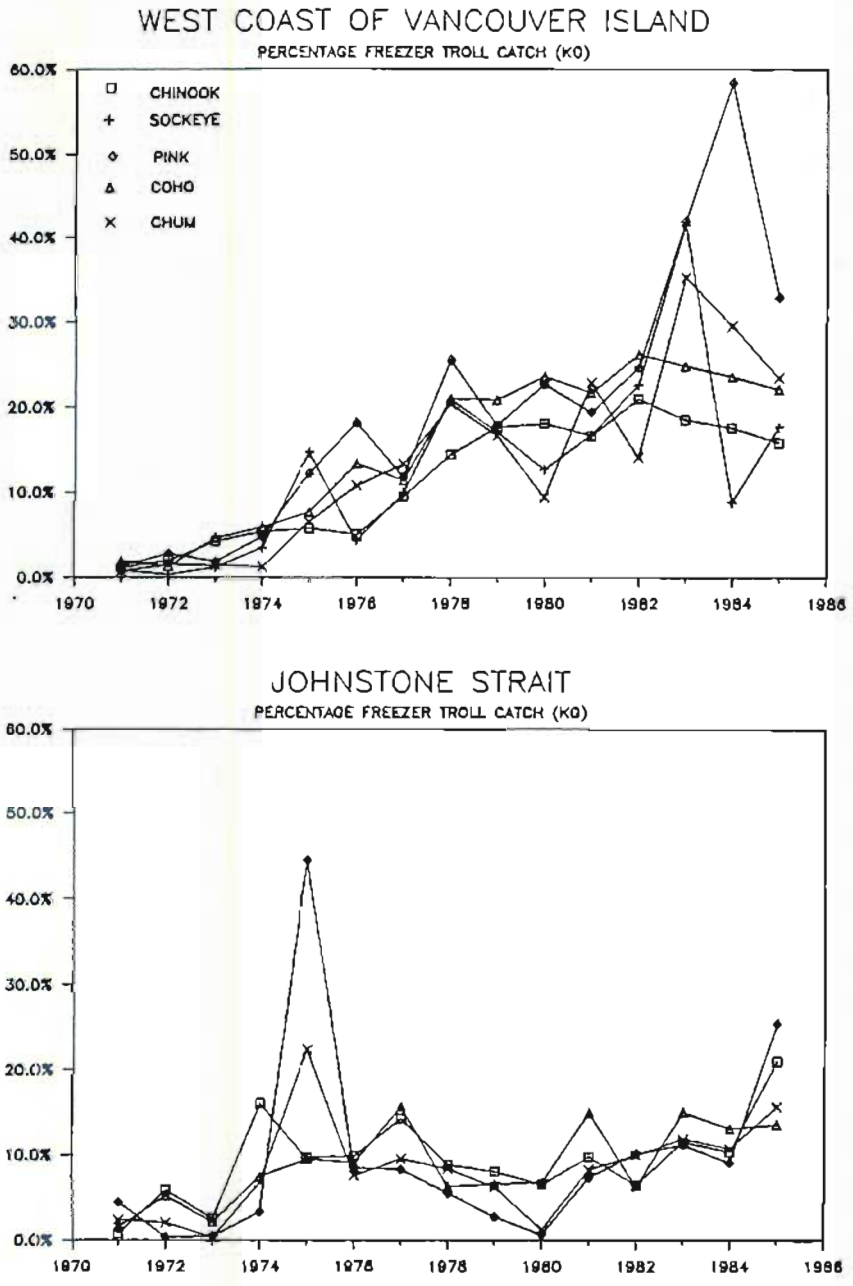


Figure 28. Percentage of annual troll catch of each salmon species taken by freezer troll vessels, 1971-1985.

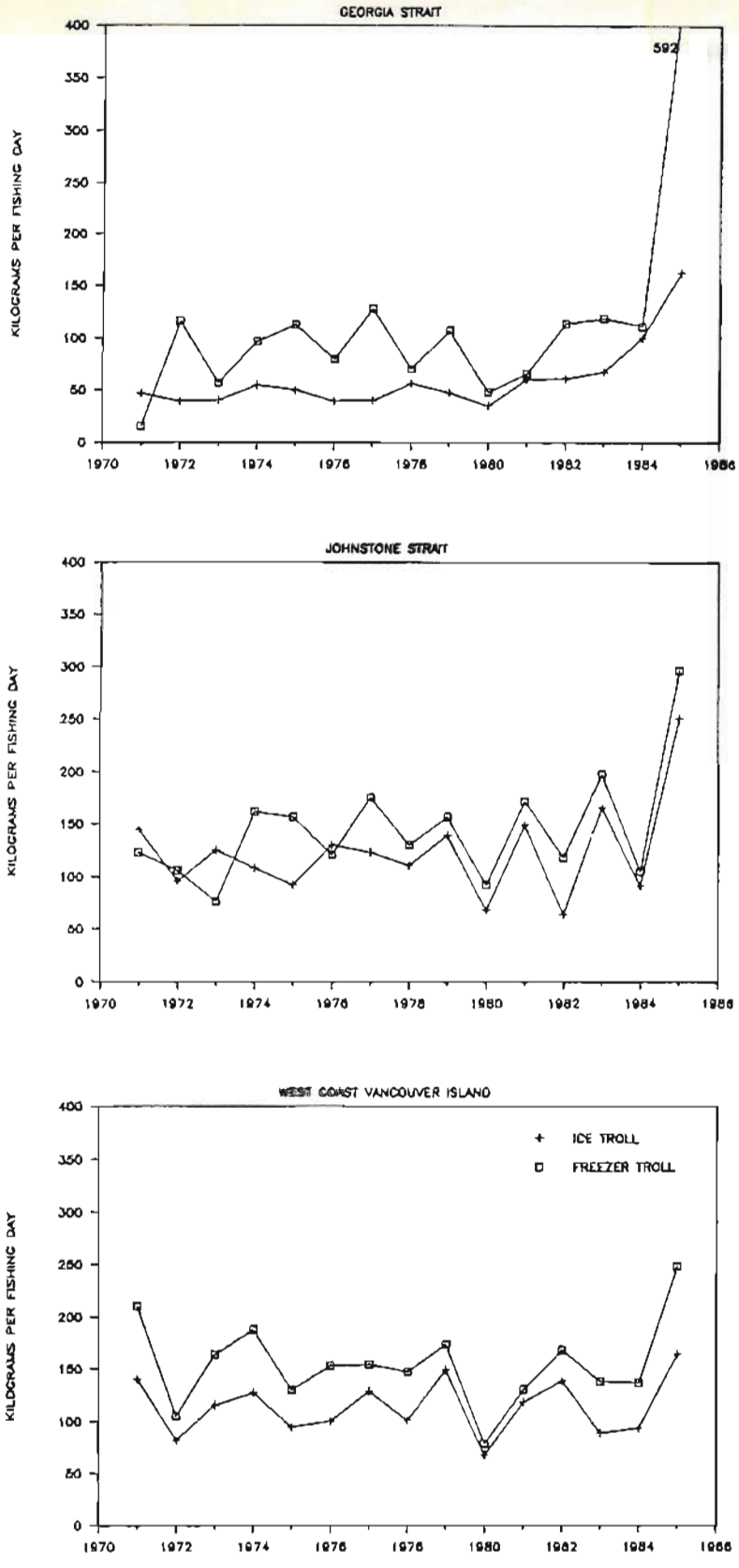


Figure 29. Comparison of total annual salmon catch per day fishing between ice and freezer troll vessels, 1971-1985.

4.6 Seasonal Catch and Effort Patterns

The PBS data base was the source for weekly statistics in the following graphs.

To illustrate seasonal patterns we chose data from 1963, 1967, 1970, 1977, 1984 and 1985. 1985 was included because it was the first year that the troll fishery was restricted to catch quotas for chinook and coho; 1963 was the first year in the PBS data base for which weekly catch in pieces and effort were available; 1967 was the first year that weekly catch in kilograms was available.

It should be noted that weeks represent the week during which the catch was delivered, not necessarily the week when fish were caught. As mentioned earlier, delivery and catch week are the same in Georgia Strait because most trollers deliver catches once each day. On the west coast and in Johnstone Strait, delivery week is on average one week after the catch week due to the preponderance of trip boats in these fleets (Paul Starr, DFO, pers. comm.).

Catch and effort for 1963 and 1967 in the PBS data base are combined for January, February and December; March, April and November catch and effort are not broken down by week. In the graphs, combined statistics for January, February and December, when fisheries occurred in these months, are shown on the right of the graph above December. March and November catch and effort were evenly split amongst weeks in each month. In Johnstone Strait, where chinook are not an important part of the catch, April catch and effort for 1963 and 1967 were evenly split amongst weeks. In the other areas, ten percent of April catch and effort was allocated to weeks one and two and the remaining 90 percent to weeks three, four and five.

The figures for each area proceed in sequence. First are graphs of weekly fishing effort (days fishing). Next are graphs of weekly CPUE (kg per day fishing) for each species. We chose ice boats for CPUE data since their catch is spread over less time than that of freezer boats. CPUE graphs are followed by graphs of cumulative catch (landings) of each species by ice and freezer vessels combined. These are followed by graphs of average fish weight from ice troll landings.

4.6.1 Georgia Strait

Prior to 1971, peak trolling effort in Georgia Strait occurred at the coho season opening. This was the pattern as early as 1951 (Anon 1965). 1963 and 1970 were typical of this

pattern (upper graph, Figure 30), with exception of the effect of a strike by net fishermen, shoreworkers and tendermen from July 12 to August 3, 1963 (Marshall 1970). Trollers, although not on strike, had to reduce effort during July because tendermen and shoreworkers would not handle troll catches. Trollers began shifting effort to April and May in the 1960s. By 1977, the peak in troll effort soon after the April 15 chinook opening had become well established. By 1980, the early season effort peak was far greater than the peak at the opening of the coho season (middle graph, Figure 30). The two-area troll license was intended to end the effort build-up on small chinook during April and May. Its implementation in 1981 achieved a 60 percent reduction in April-May effort and reduced the effort peak at the July 1 opening of the coho season by 30 percent (middle graph, Figure 30). Georgia Strait effort patterns in 1984 and 1985 (lower graph, Figure 30) were much different, a result of July 1 openings for all species and various area closures (Shardlow et al. 1986).

Seasonal trends in CPUE are similar for coho and chinook (Figure 31). CPUEs are highest at season openings and fall rapidly thereafter. Chinook CPUEs appear to stabilize at low levels after the coho opening. Coho CPUEs have occasionally been very high at the end of the season, perhaps due to misreporting of catch by late returning trip boats from outside areas. It is noteworthy that chinook CPUEs in 1984 and 1985, when the season opening was July 1, were more than double CPUEs during years with April 15 openings. Sockeye and pink CPUEs build rapidly to peak levels (>150 kg per day), then usually fall to zero before the season closes. The latter patterns are what would be expected from migrating salmon that stay in an area for short periods. Sockeye CPUEs tend to peak during mid-August, but relatively high CPUEs occasionally occur in late September. Pink CPUEs peak during late August or early September. The peak chum CPUE of 130 kg per day was recorded during week 10-1 in 1984.

The patterns of cumulative catch in numbers (Figure 32) illustrate some of the earlier points regarding timing of the fishery. For example, the date on which one-half of the chinook catch was taken was much earlier in 1977, compared to 1963. In 1984, although the chinook opening was delayed to July 1, 50 percent of the catch was taken on approximately the same date as in 1963. Chinook catch timing in 1985 was the latest on record, even though over one-half of the 50,000 catch limit was taken during the first five day fishery in July. Coho catches have similar timing amongst years. Usually more than 60 percent of the catch has been landed by the last week of July. By the end of August it is normal for 80 to 90 percent of the chinook, coho and sockeye catches to have been taken, and for 50 to 70 percent of the pink catch to have been taken.

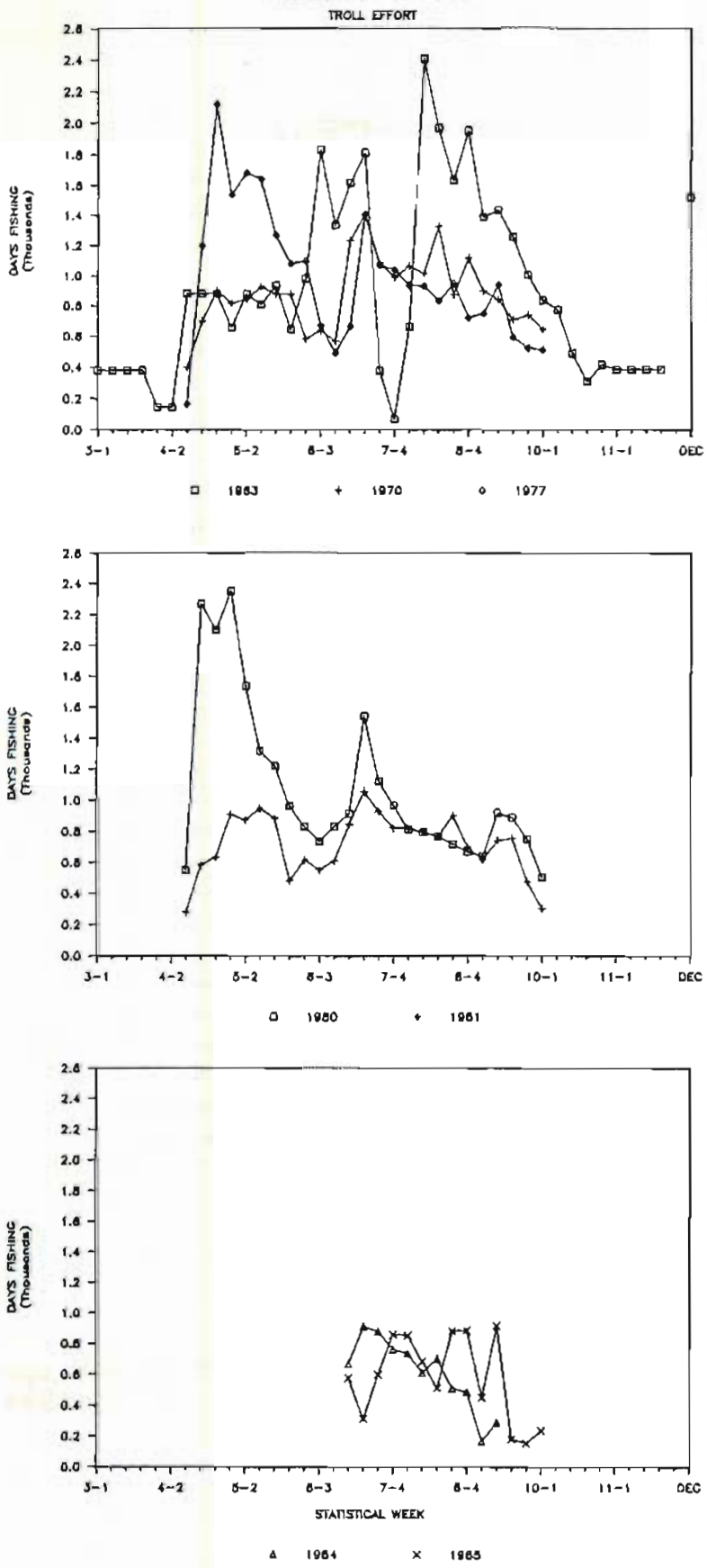


Figure 30. Weekly days fishing by trollers as reported on sales slips for Georgia Strait, 1963, 1970, 1977, 1980, 1981, 1984 and 1985. Effort for December on upper graph includes January and February effort.

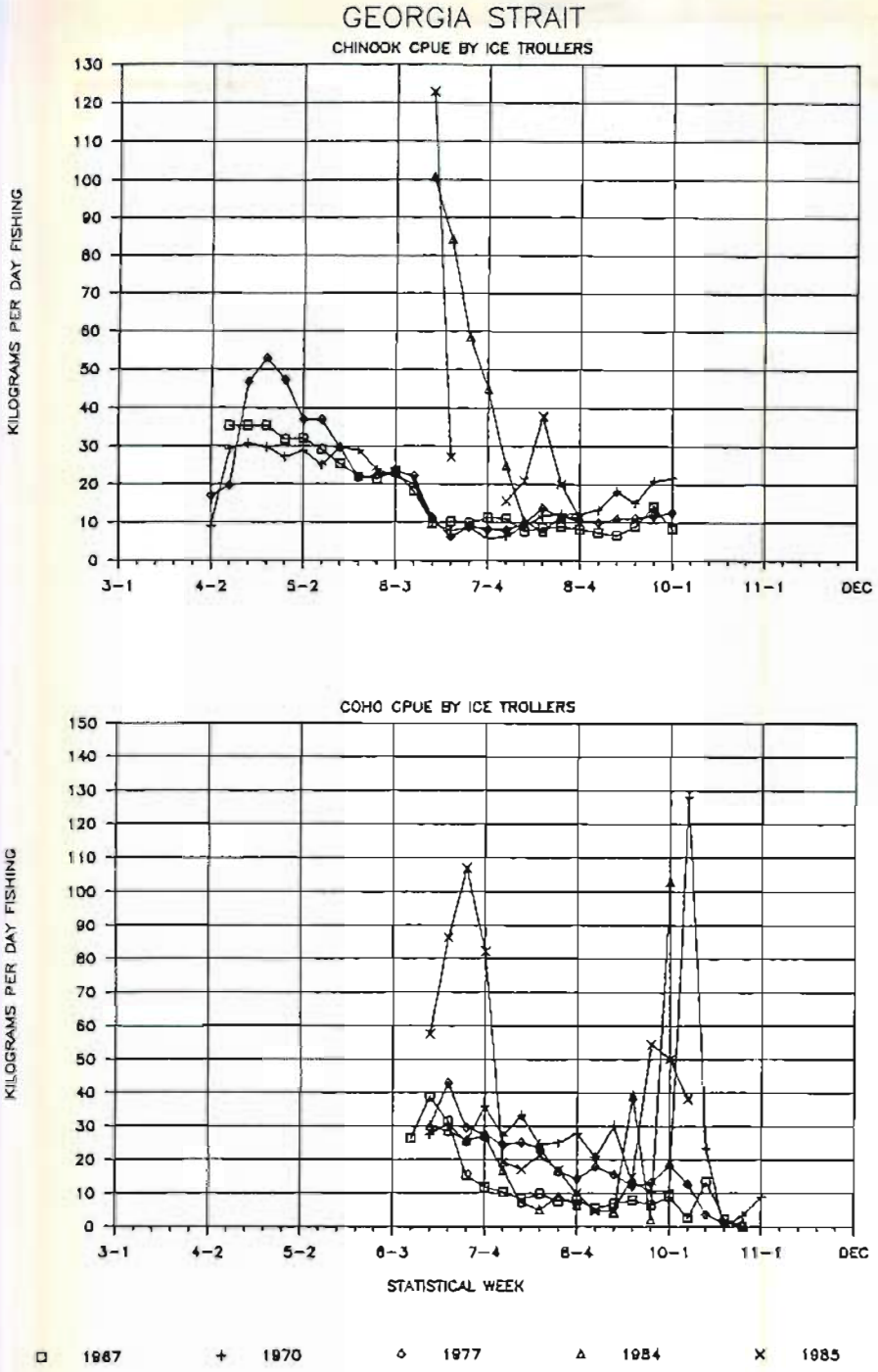


Figure 31. Weekly ice troll catch (kg) of each salmon species per day fishing for Georgia Strait, 1967, 1970, 1977, 1984, 1985. Continued.

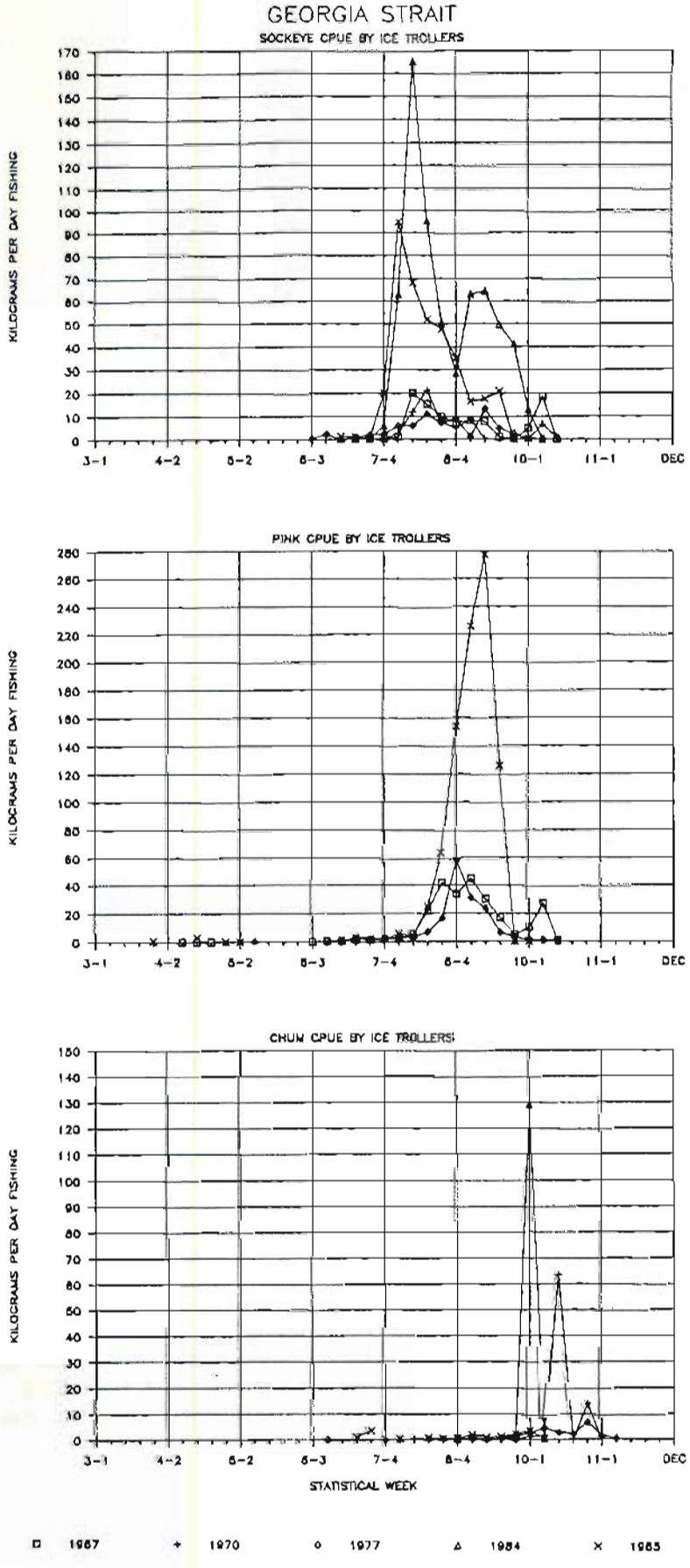


Figure 31. Continued.

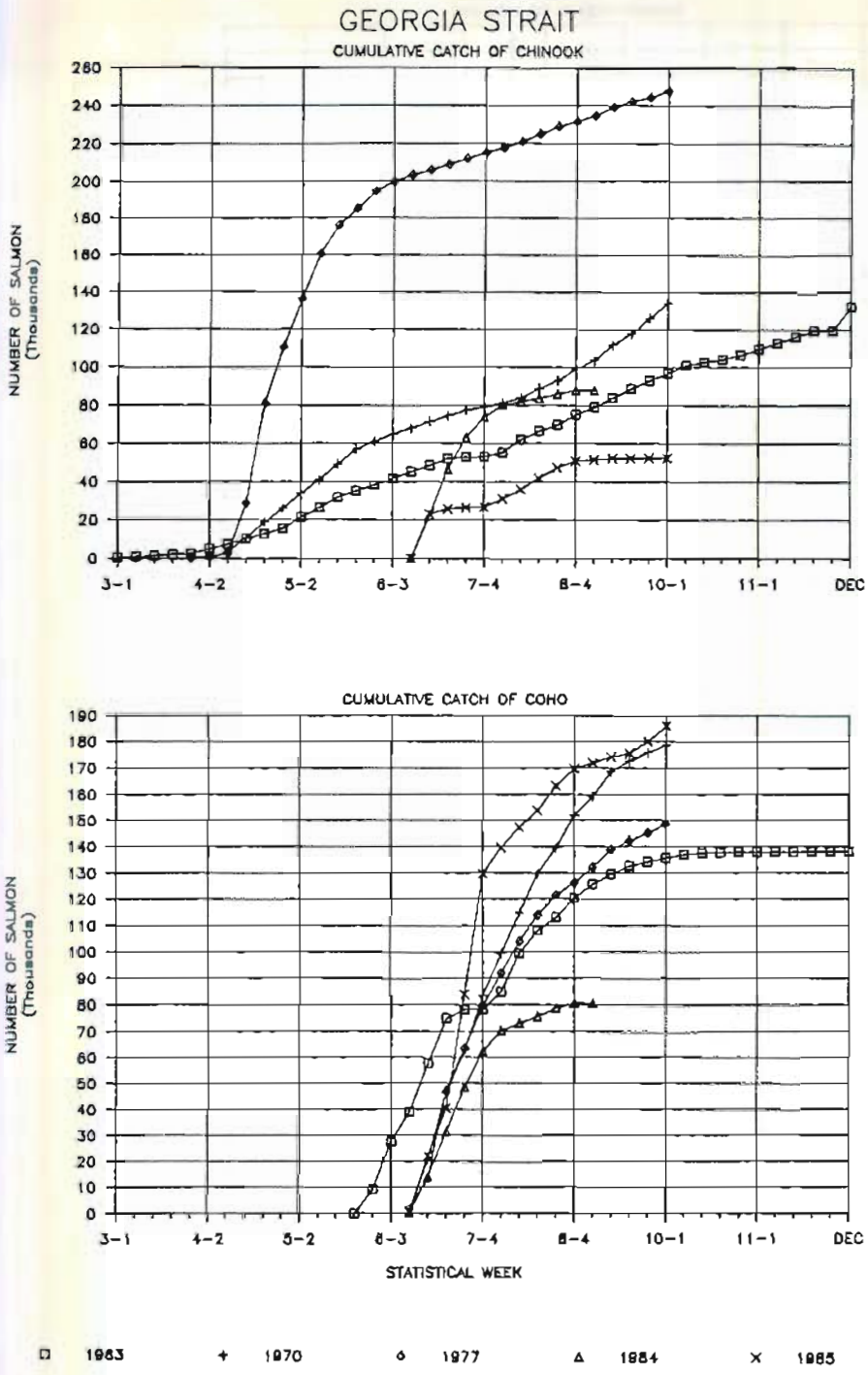


Figure 32. Cumulative weekly landings (pieces) of each salmon species caught by trollers in Georgia Strait, 1963, 1970, 1977, 1984, 1985. Catch for December includes January and Febraury catch. Continued.

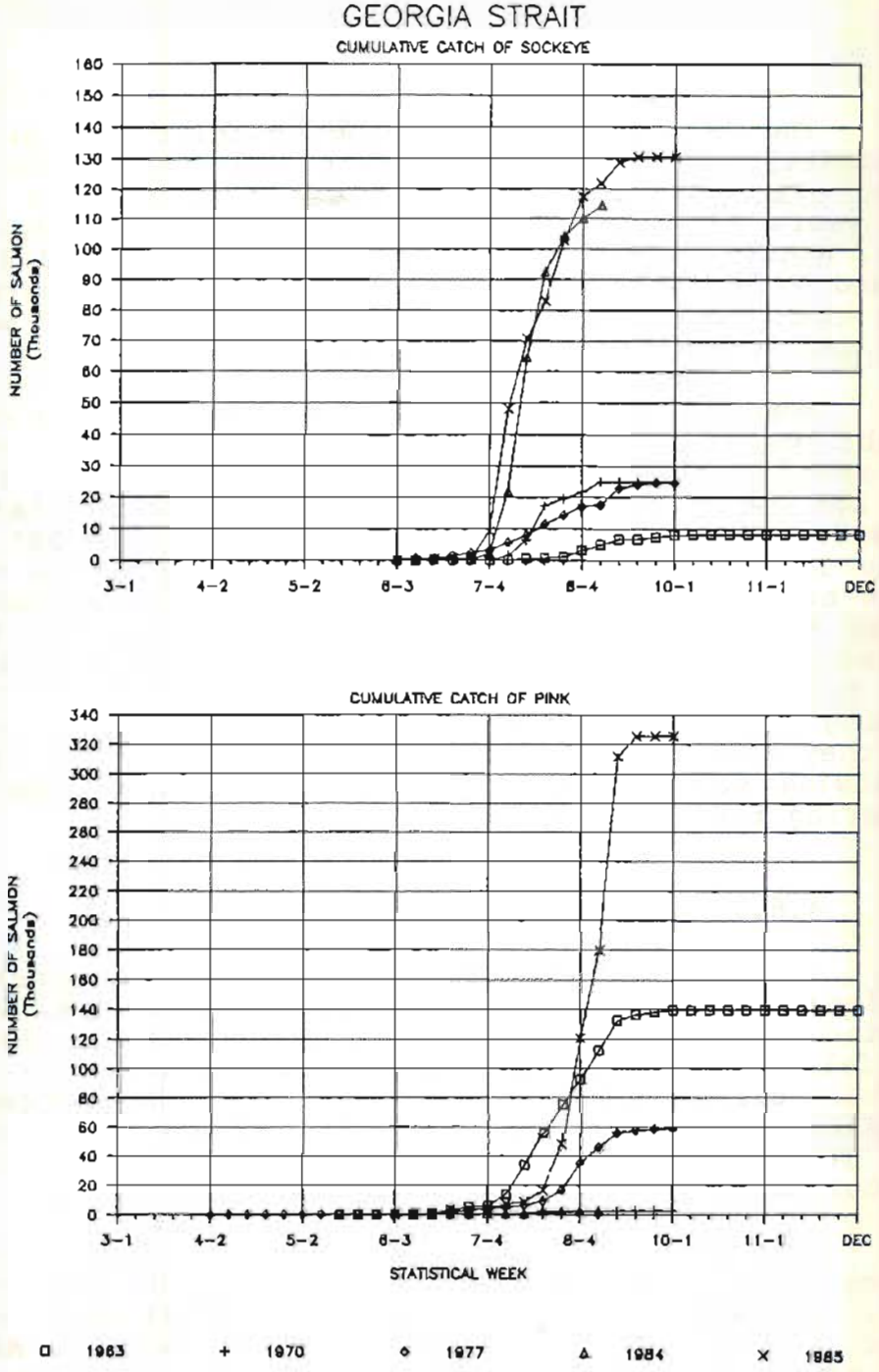


Figure 32. Continued.

The January-February-December chinook catch in 1963 was approximately 12,000 chinook. This was a high catch for that period. From the PBS data base we found that in the previous seven years the winter catch had ranged from 2,700 to 5,200 pieces. Winter CPUE was 23 kg per day in 1963, 22 kg per day in 1964 and 24 kg per day in 1965. These values were similar to values that occurred during June (Figure 31), and were about 10 kg per day lower than CPUEs in April.

Before 1983 the average weight of chinook increased through May (Figures 33) as ocean age three chinook grew and older aged chinook entered the catch, and decreased thereafter as ocean age two fish were recruited to the size limit (Argue et al. 1976, 1977). The increased size limit in 1983 stopped the decline in average weight through September since most age two chinook are less than 54 cm at this time. Coho steadily increase in size through growth from July through August. By September coho usually have doubled in size. The presence of exceptionally large coho during October may represent an influx of coho returning from west coast and Johnstone Strait rearing areas where they reach larger sizes (Figures 37 and 41) by the end of the growing season. Sockeye and pink salmon also increase in size during the trolling season.

4.6.2 Johnstone Strait

Prior to 1984, trolling effort in Johnstone Strait, which includes area 11 waters outside the surfline, peaked at the beginning of the coho season and then later in the summer or early fall when sockeye and pink runs hit the area (Figure 34). The fall effort peaks were generally the largest. Troll regulation changes in 1984 and 1985 (Table 6, Shardlow et al. 1986) reduced troll effort and resulted in a more even distribution of effort over the shortened season.

Coho CPUE in Johnstone Strait declines as the season advances (Figure 35), similar to the coho CPUE pattern in Georgia Strait. Chinook CPUEs in Johnstone Strait are variable but without consistent trend from the first week in March through July, afterward chinook CPUEs generally decline. Levels of chinook CPUE in Johnstone Strait and Georgia Strait are similar (20-50 kg during peak weeks), but Johnstone Strait coho CPUEs in some years are more than double those in Georgia Strait (90 kg versus 40 kg during peak weeks). Sockeye CPUE peaks during mid-August. Pink CPUE peaks during late August, about one week earlier than in Georgia Strait. Pink CPUEs during weeks of peak abundance generally exceed 300 kg per fishing day, the highest of the three study areas. In 1985, chum CPUE exceeded 70 kg during

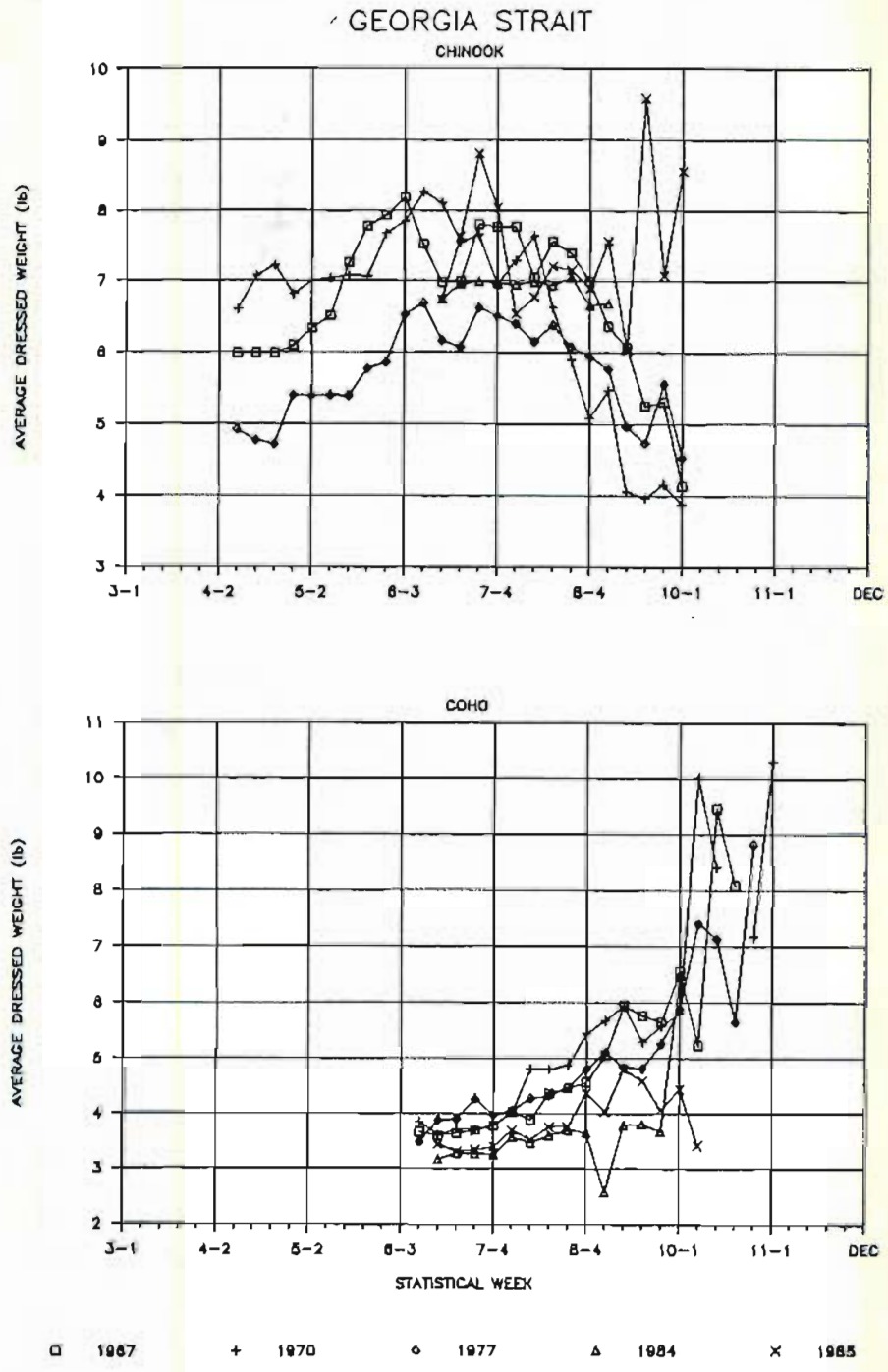


Figure 33. Average weight (lb) of each salmon species in the weekly ice troll landings for Georgia Strait, 1967, 1970, 1977, 1984, 1985. Continued.

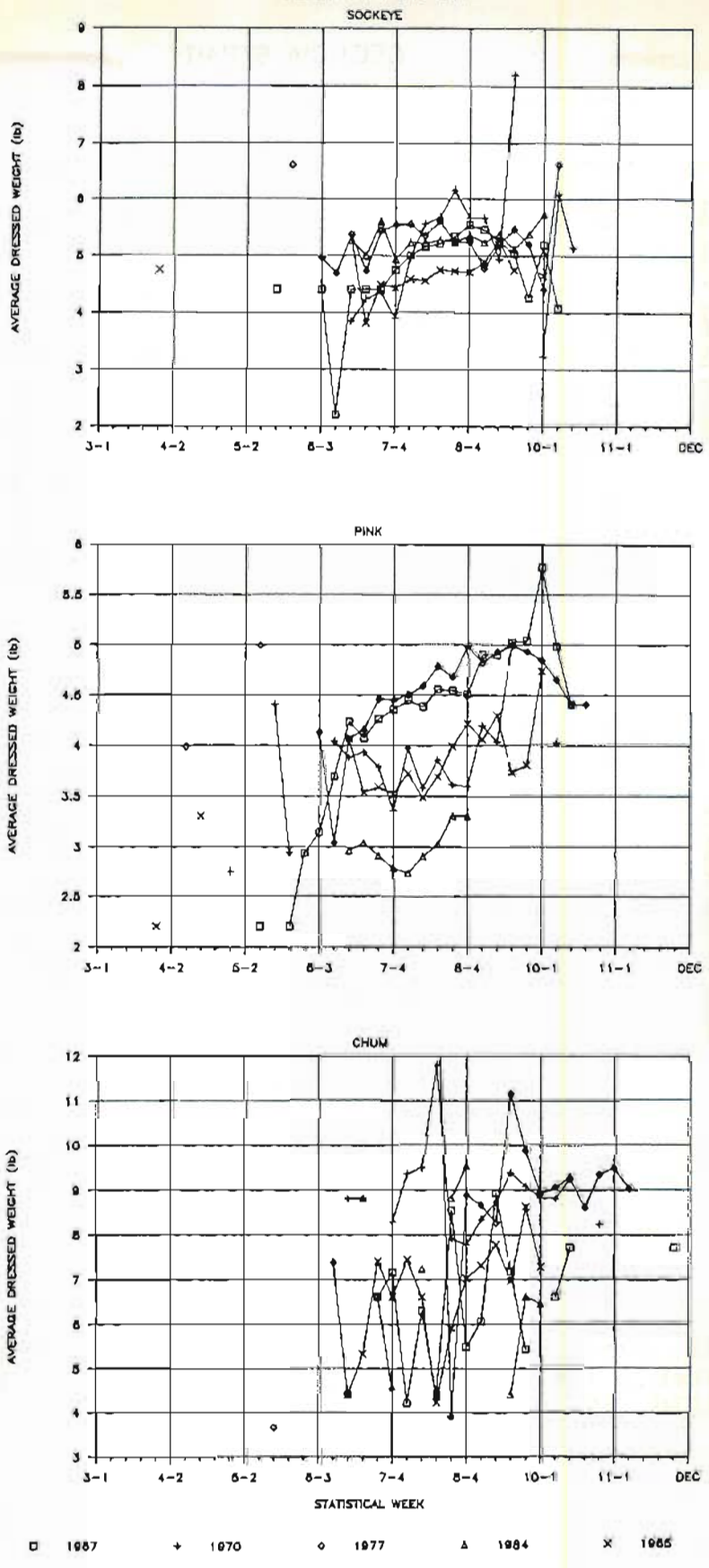


Figure 33. Continued.

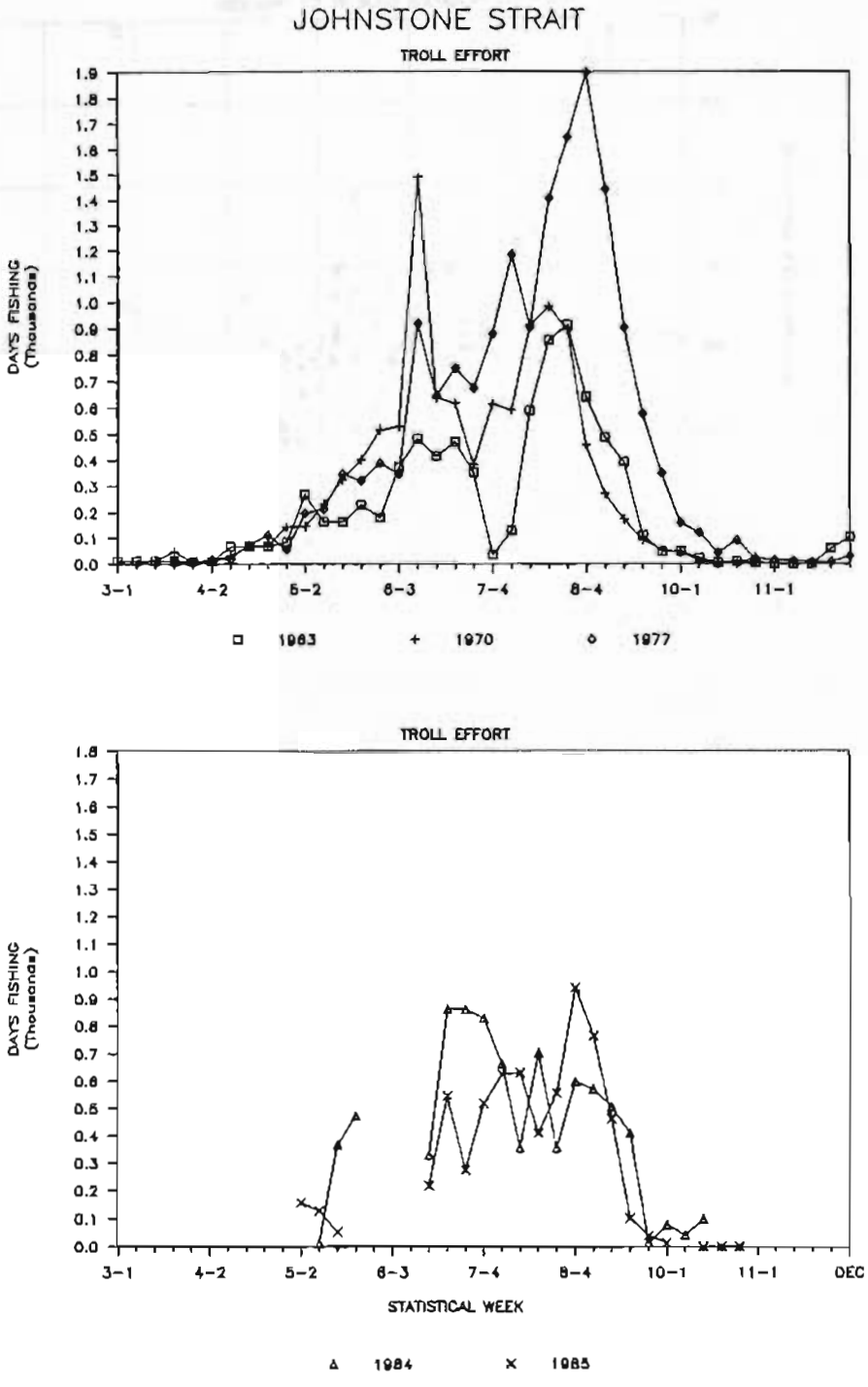


Figure 34. Weekly days fishing by trollers as reported on sales slips for Johnstone Strait, 1963, 1970, 1977, 1984, 1985. Effort for December on upper graph includes January and February effort.

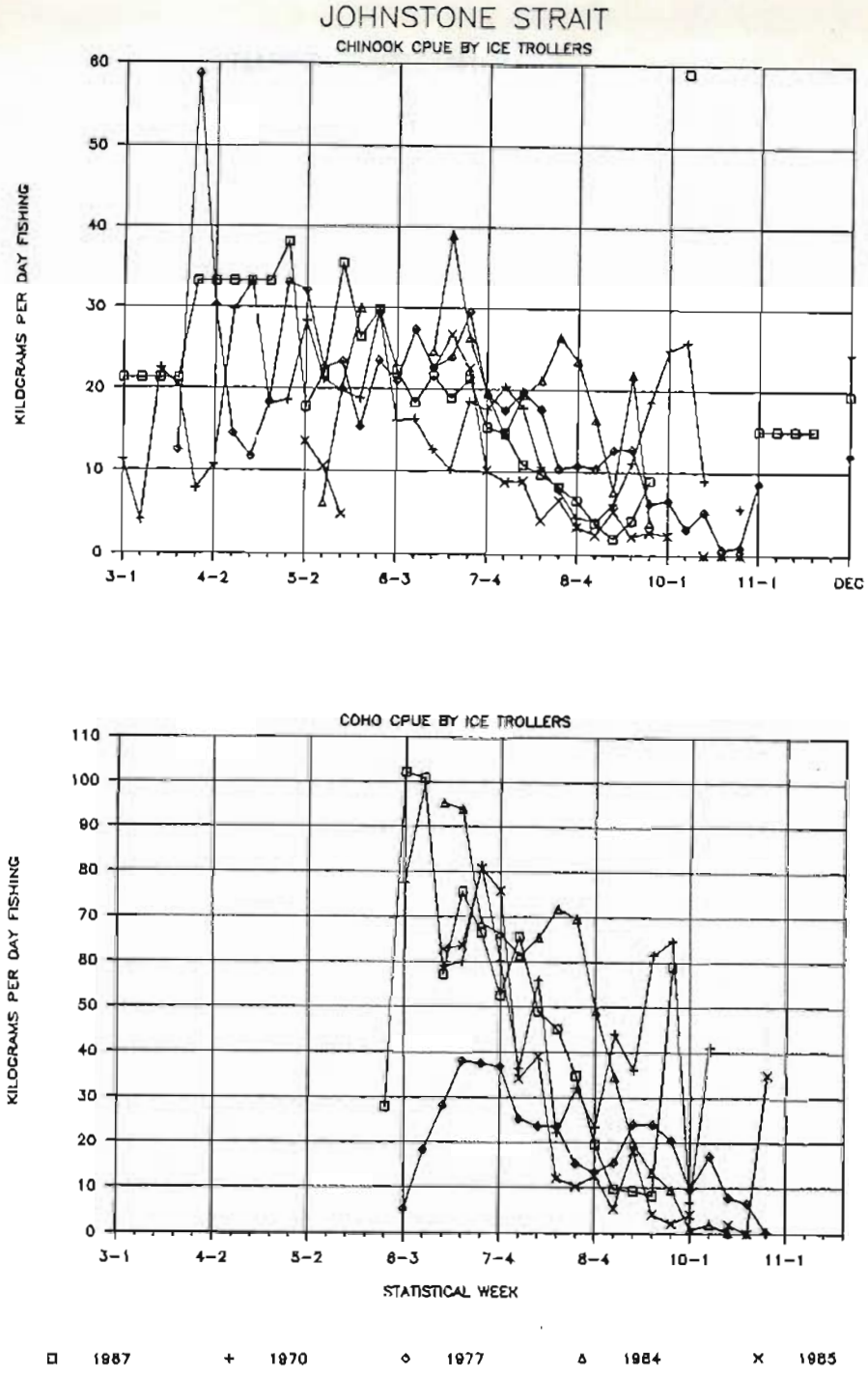


Figure 35. Weekly ice troll catch (kg) of each salmon species per day fishing for Johnstone Strait, 1967, 1970, 1977, 1984, 1985. CPUE for December on upper graph includes CPUE for January and February. Continued.

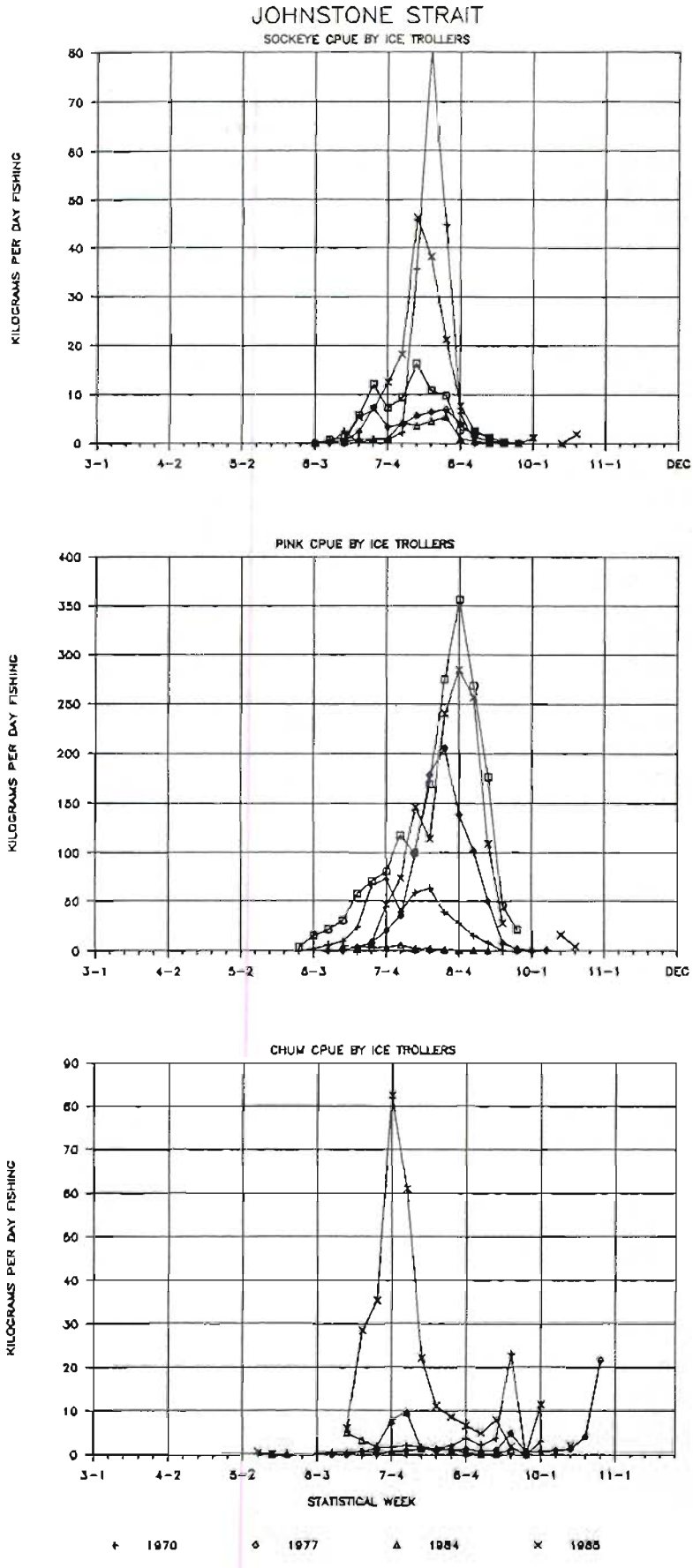


Figure 35. Continued.

weeks 7-4 and 7-5, by far the highest of the three areas.

One-half of chinook and coho catches are usually landed by the end of July (Figure 36), and occasionally as early as the first week in July (eg. 1970). Pink and sockeye catches accumulate rapidly during August and early September.

In years when the winter chinook fishery was open (1963, 1967, 1970 and 1977 on the graphs) the chinook catch was very small (usually < 500 chinook) although CPUEs were close to March-July levels (Figure 35).

Prior to 1978, chinook average weight at the end of the season and occasionally early in the season was less than 7 lb (3.2 kg) (Figure 37). The average size of chinook during June and July, 9 to 13 lb, was about three pounds (1.5 kg) heavier than during comparable months in Georgia Strait. In 1978, the 26 in size limit was applied to troll caught chinook in Johnstone Strait and average size no longer dropped at the ends of the season. Coho appear to increase in size at a more rapid rate in Johnstone Strait than in Georgia Strait. For example, coho start at 3-4.5 lb (1.3-2.0 kg) in both areas but by the beginning of September coho are usually between 7 and 9 pounds (3.2-4.1 kg) in Johnstone Strait as compared to 4 to 6 lb (1.8-2.7 kg) in Georgia Strait. Sockeye and pink increase in size by several pounds in Johnstone Strait during the period of their spawning migrations.

4.6.3 West coast of Vancouver Island

Trolling effort on the west coast built gradually after the April 15 chinook opening (Figure 38). In 1985, and in years prior, effort peaked during late July or early August, toward the middle of the coho season and while sockeye/pink abundance was building. The 1963 strike greatly reduced troll effort around this period. By mid-September, effort has dropped to one-half that of peak weeks. By the end of October, in years prior to 1981, fishing effort was less than five percent of that during peak weeks. Effort inside the surfline from November through March, mostly in areas 23 and 24, at most reached a level of several hundred days fishing per week. In the last two years overall effort patterns have remained similar to those of previous years.

Chinook CPUEs are higher on the west coast of Vancouver Island than in Georgia or Johnstone Straits. West coast CPUEs steadily decline from 20 to 60 kg per day at the season opening to 5 to 30 kg per day at the end of September (Figure 39). Chinook CPUEs during years with winter fisheries were in the 20-50 kg per day range. Coho CPUE generally starts between 40

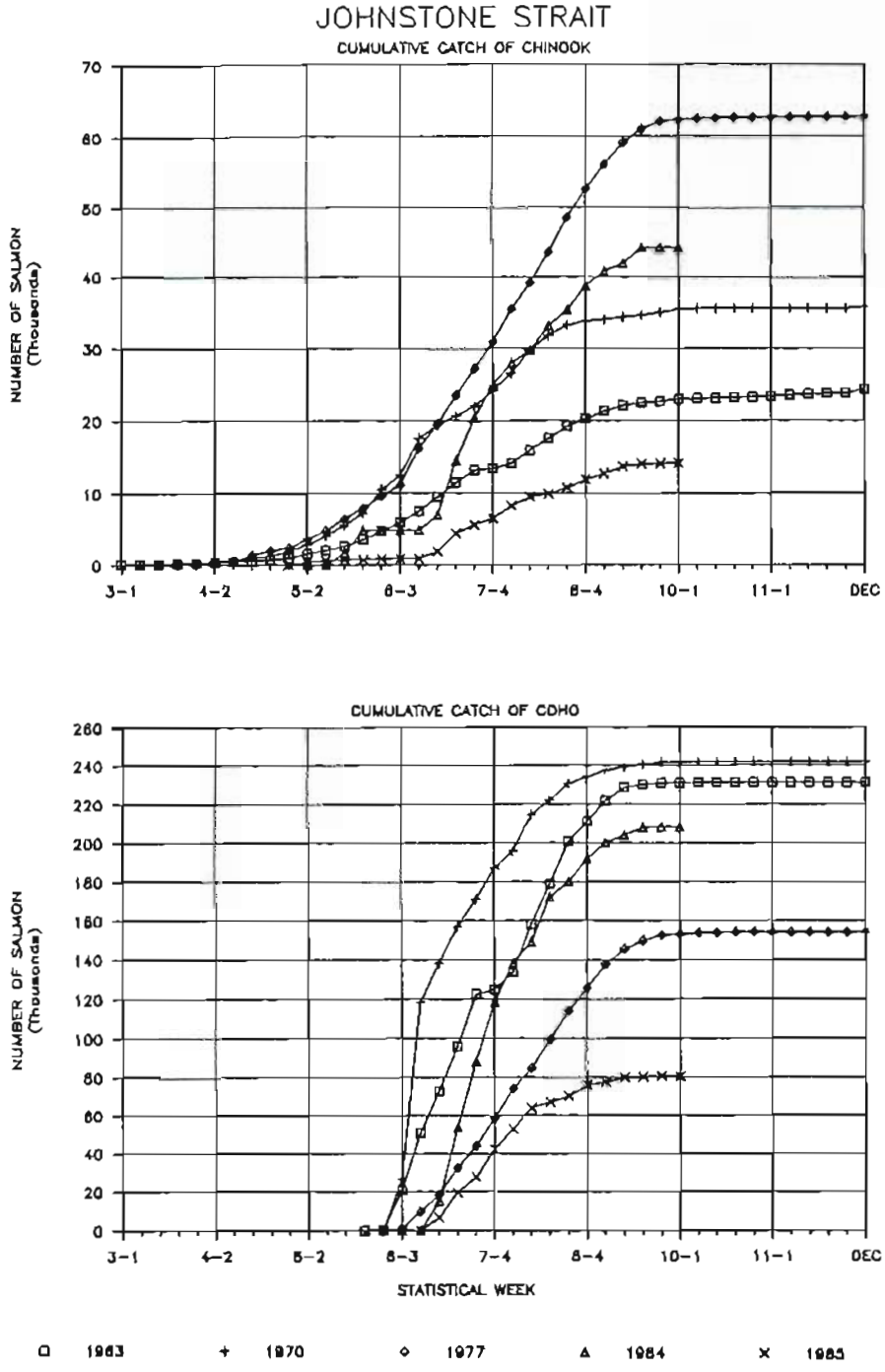


Figure 36. Cumulative weekly landings (pieces) of each salmon species caught by trollers in Johnstone Strait, 1963, 1970, 1977, 1984, 1985. Catch for December includes January and February catch. Continued.

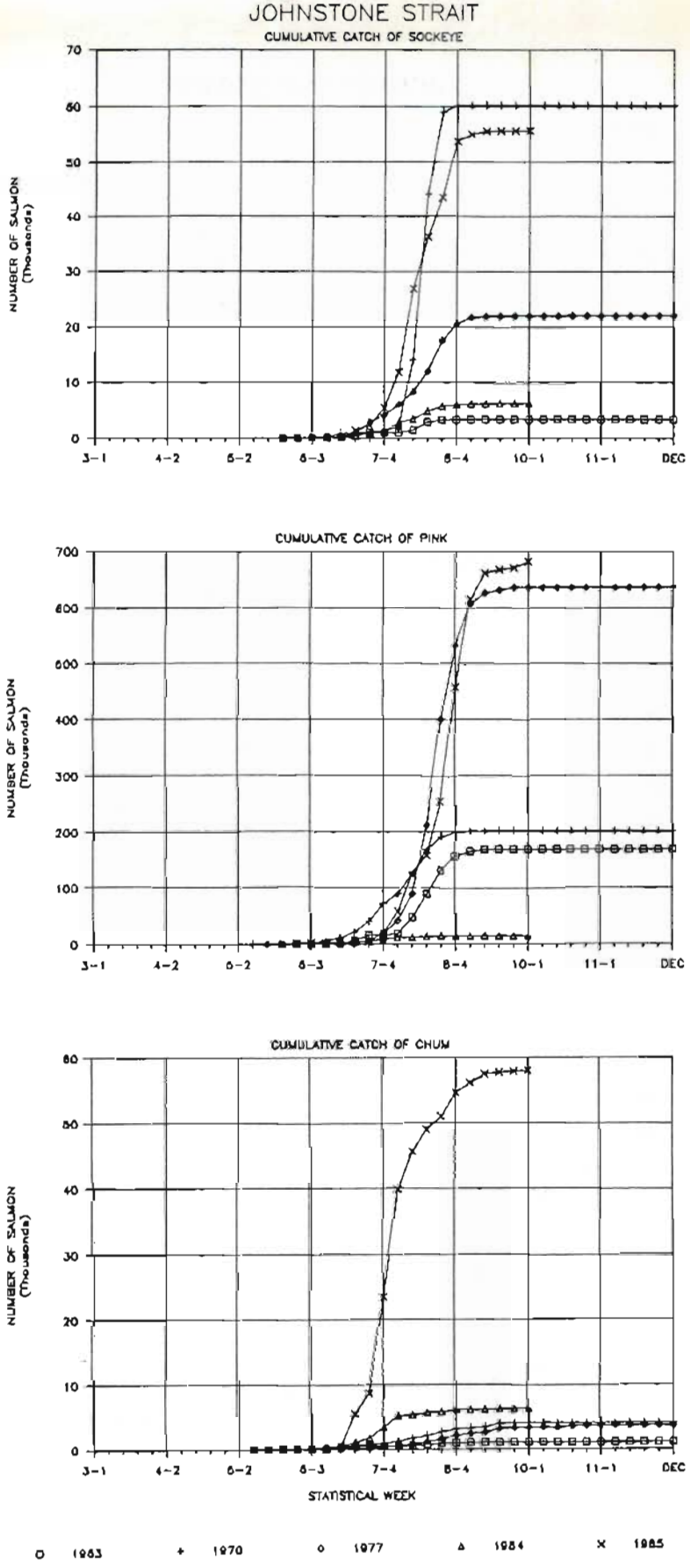


Figure 36. Continued.

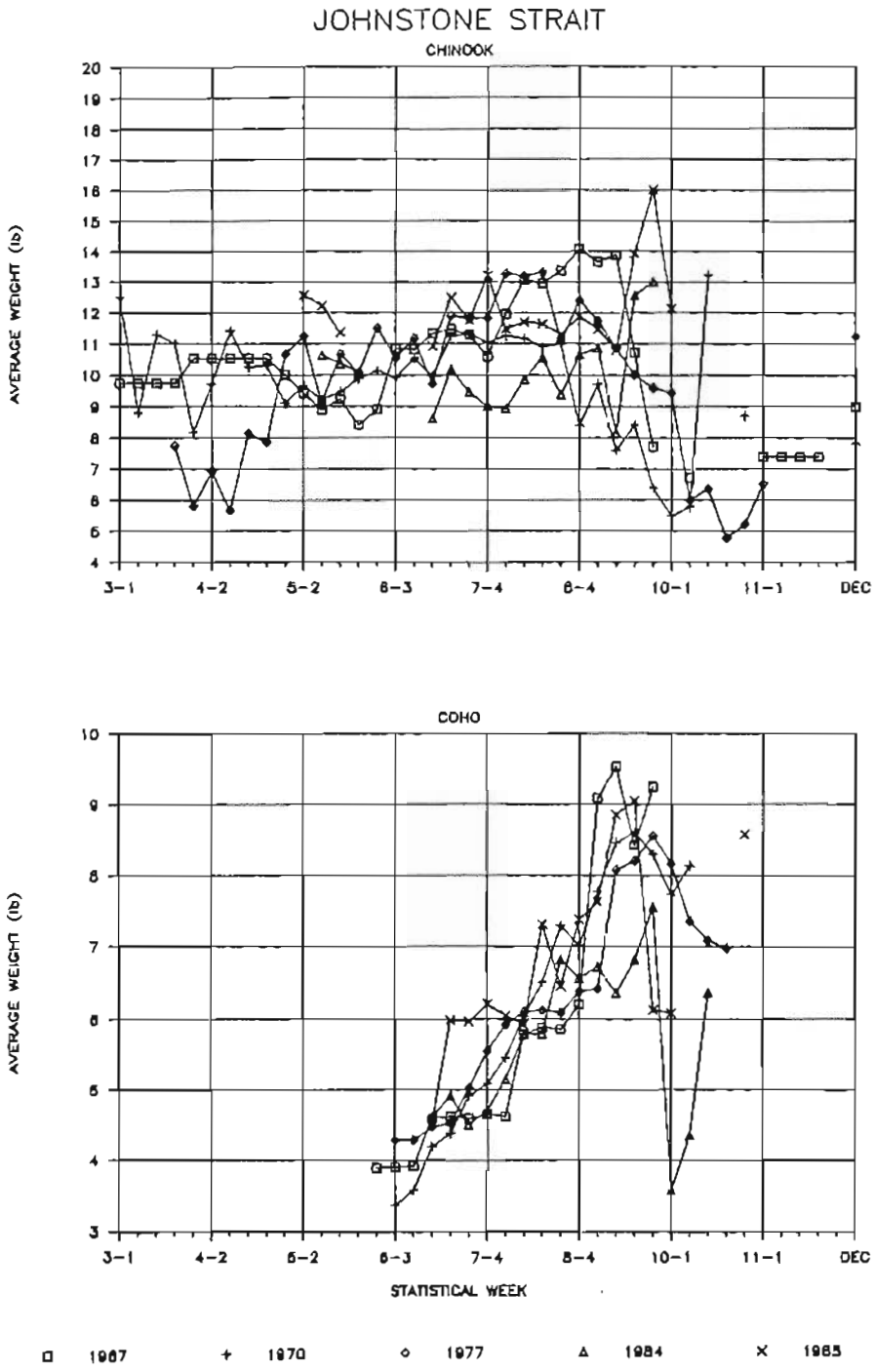


Figure 37. Average weight (lb) of each salmon species in the weekly ice troll landings for Johnstone Strait, 1967, 1970, 1977, 1984, 1985. Average weights for December on upper graph include January and February data. Continued.

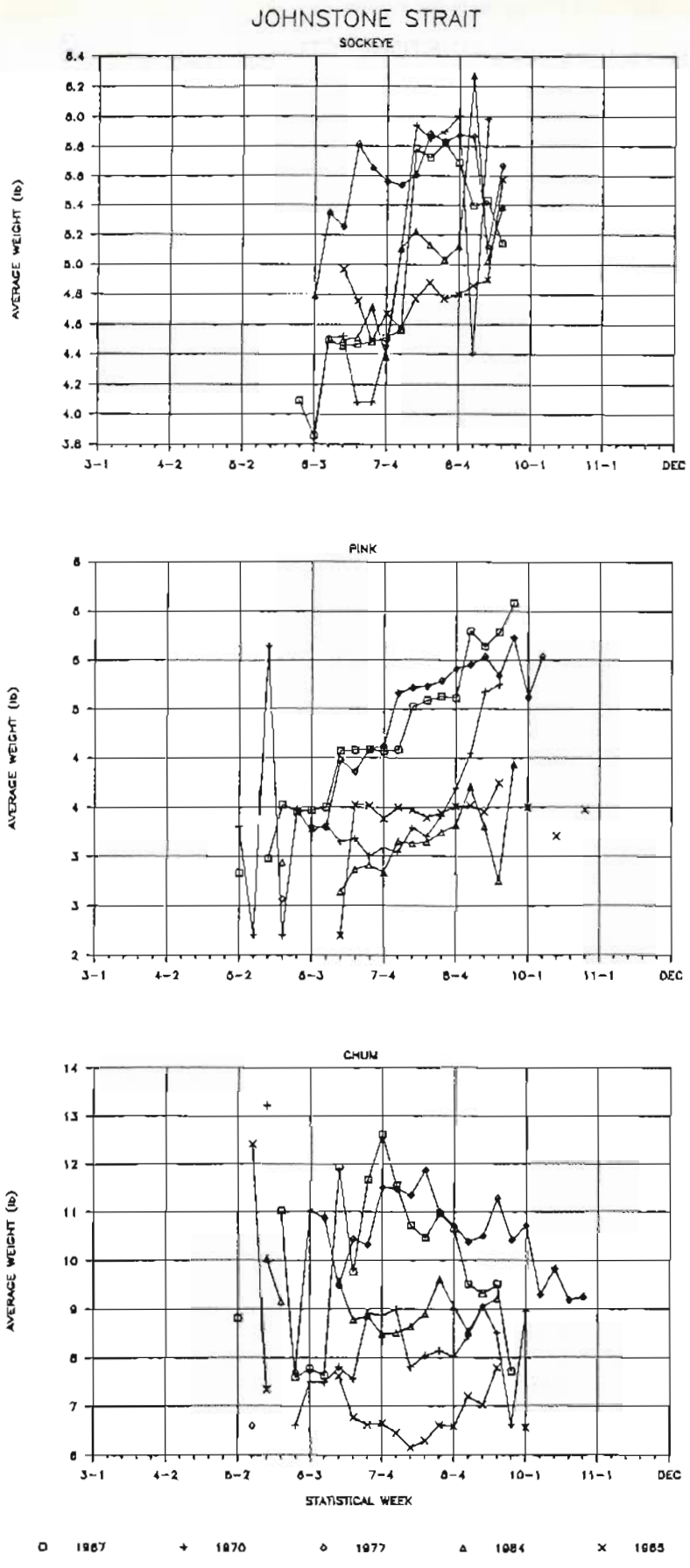


Figure 37. Continued.

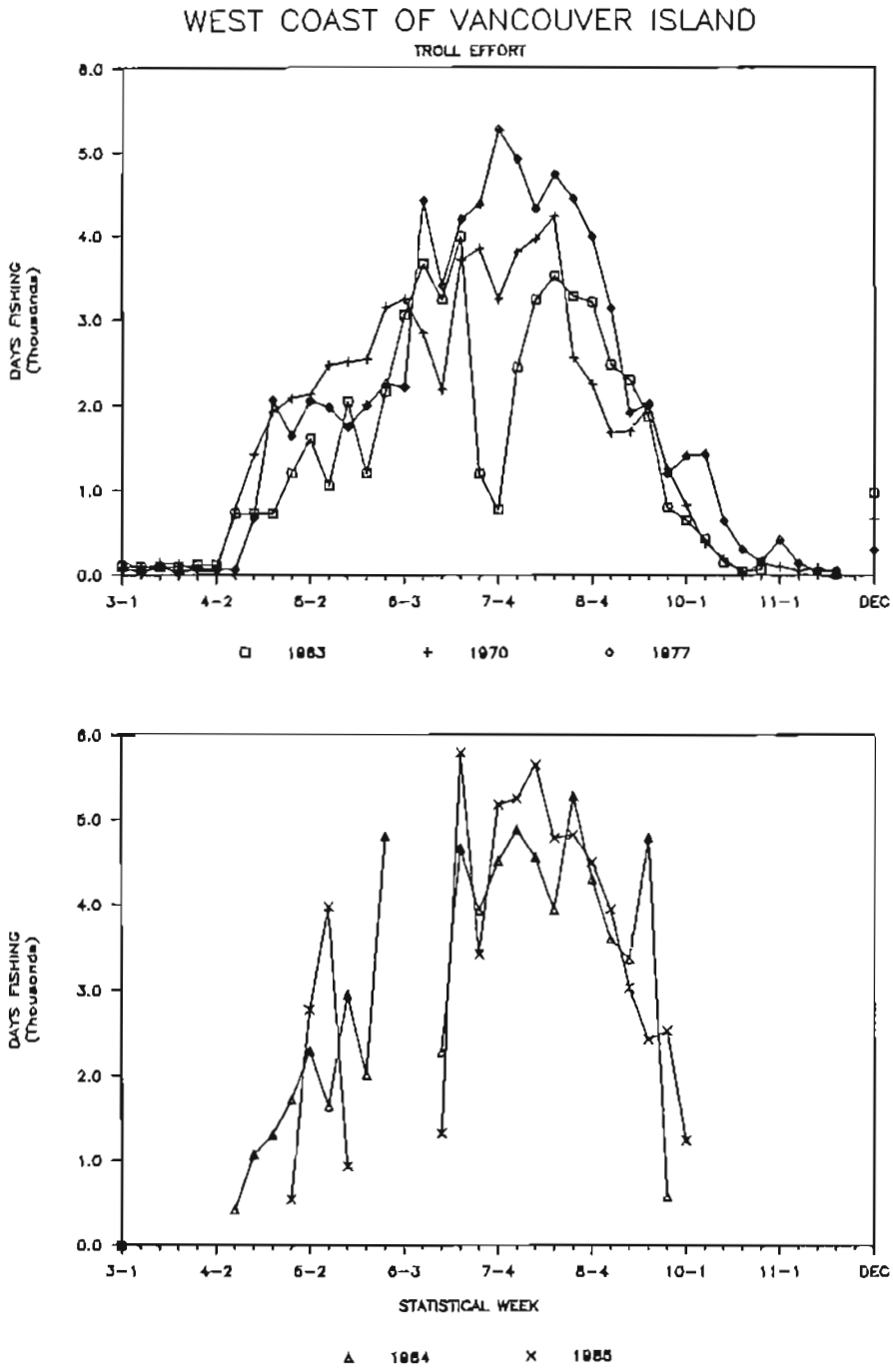


Figure 38. Weekly days fishing by trollers as reported on sales slips for the west coast of Vancouver Island, 1963, 1970, 1977, 1984, 1985. Effort for December on upper graph includes January and February effort.

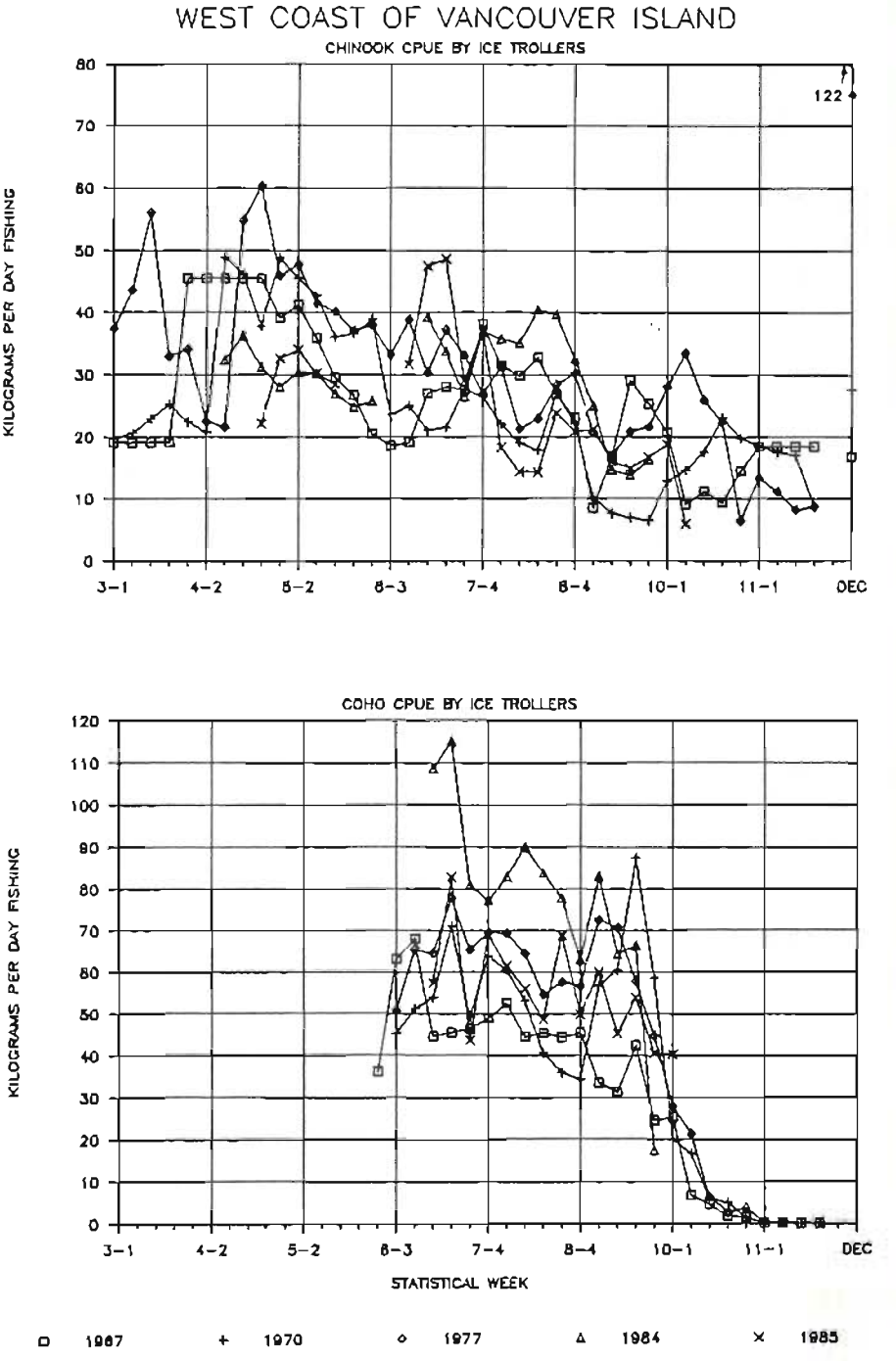


Figure 39. Weekly ice troll catch (kg) of each salmon species per day fishing for the west coast of Vancouver Island, 1967, 1970, 1977, 1984, 1985. CPUE for December on upper graph includes CPUE for January and February. Continued.

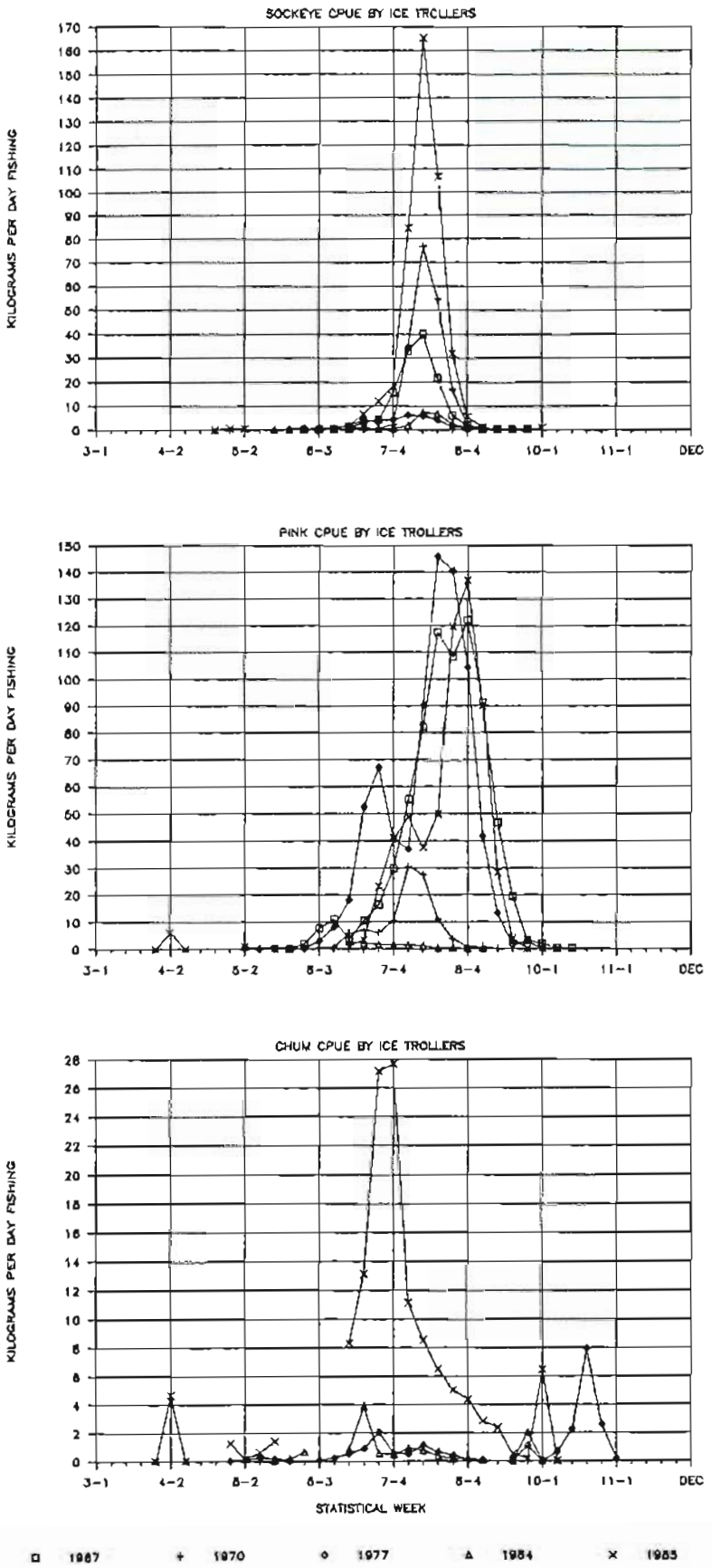


Figure 39. Continued.

and 100 kg per day at the season opening, then declines to 20 to 40 kg per day at the end of September. Few coho are taken during October. Periods of high (40-165 kg) sockeye CPUEs were of short duration in the example years; peak CPUEs all occurred in week 8-1. Sockeye CPUEs are usually at low levels by the end of week 8-3, about one month earlier than in Georgia Strait. Periods of high pink catch success (80 plus kg per day) extend over several weeks, from mid August to the second week of September. In 1985, chum CPUE was highest (28 kg) during week 7-4, the same peak week as in Johnstone Strait.

Figure 40 presents curves of cumulative catch for each species. The dates by which 50 percent of the west coast chinook catch have been landed have generally occurred during July, between weeks 7-2 and 7-4. 1970 was an exception when 50 percent of the chinook catch was landed by week 6-3. The 50 percent date for the coho catch usually occurs within one month to six weeks of the season opening, that is during the last three weeks of July. The cumulative catch curves for sockeye, pink and chum are all much steeper than those for coho and chinook. Almost all of the catch of these species occurs in August.

Seasonal patterns of chinook average weight (Figure 41) are similar to those in Georgia Strait, but chinook are heavier on the west coast due to the larger size limit. Coho on the west coast increased in size from 3-4.5 lb (1.4-2.0 kg) at the season opening to five to 10 lb (2.3-4.5 kg) by week 10-1. This was similar to the pattern in Johnstone Strait. There were large differences in the final sizes of coho in the example years. Sockeye and pink salmon both increased in weight during the season, whereas chum varied widely in weight during the season.

4.7 Comparison of North and South Portions of the West Coast of Vancouver Island

Figures 42 through 47 present separate annual catch and effort statistics for northern (areas 125-127, 25-27) and southern (areas 121-124, 21-24) statistical areas on the west coast of Vancouver Island. Appendix Tables 7 and 8 present catch in pieces and tonnes, average fish weight, and days fishing for these two areas for 1951 to 1985.

4.7.1 Catch and effort

Figure 42 shows that area 21-24 is by far the major catch area for chinook (75% of the total west coast catch in pieces). Chinook catch in the south has fluctuated widely since 1951, but has declined in recent years from over 550,000 pieces

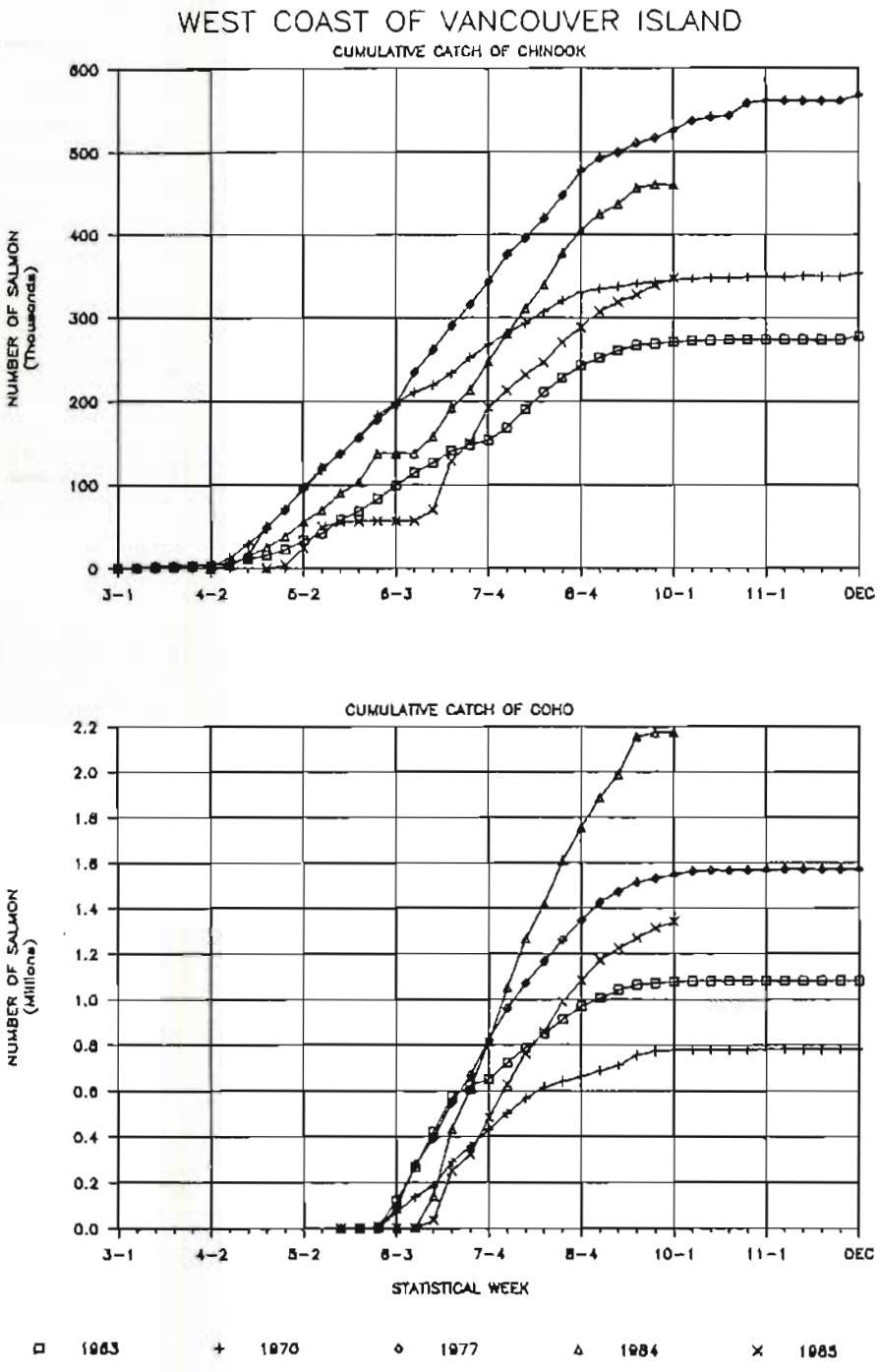


Figure 40. Cumulative weekly landings (pieces) of each salmon species caught by trollers on the west coast of Vancouver Island, 1963, 1970, 1977, 1984, 1985. Catch for December includes January and February catch. Continued.

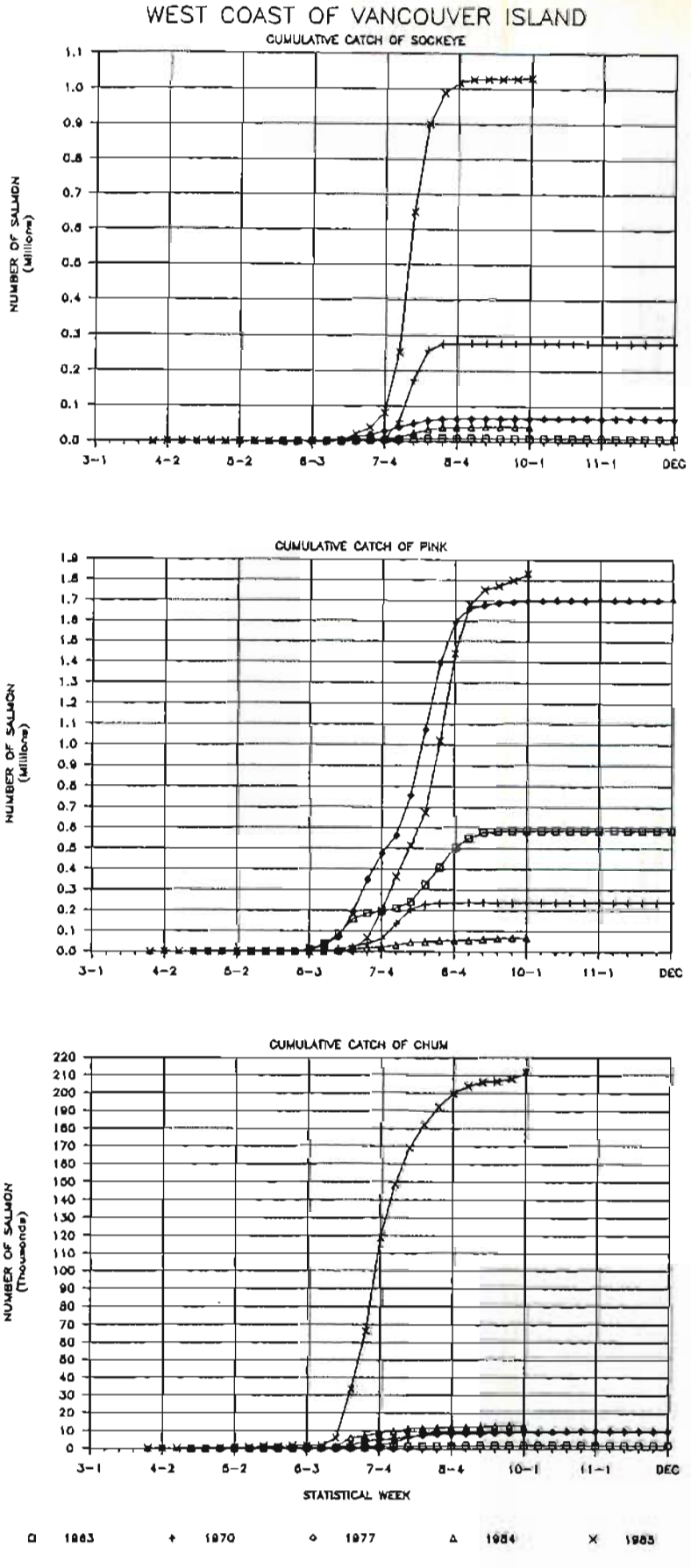


Figure 40. Continued.

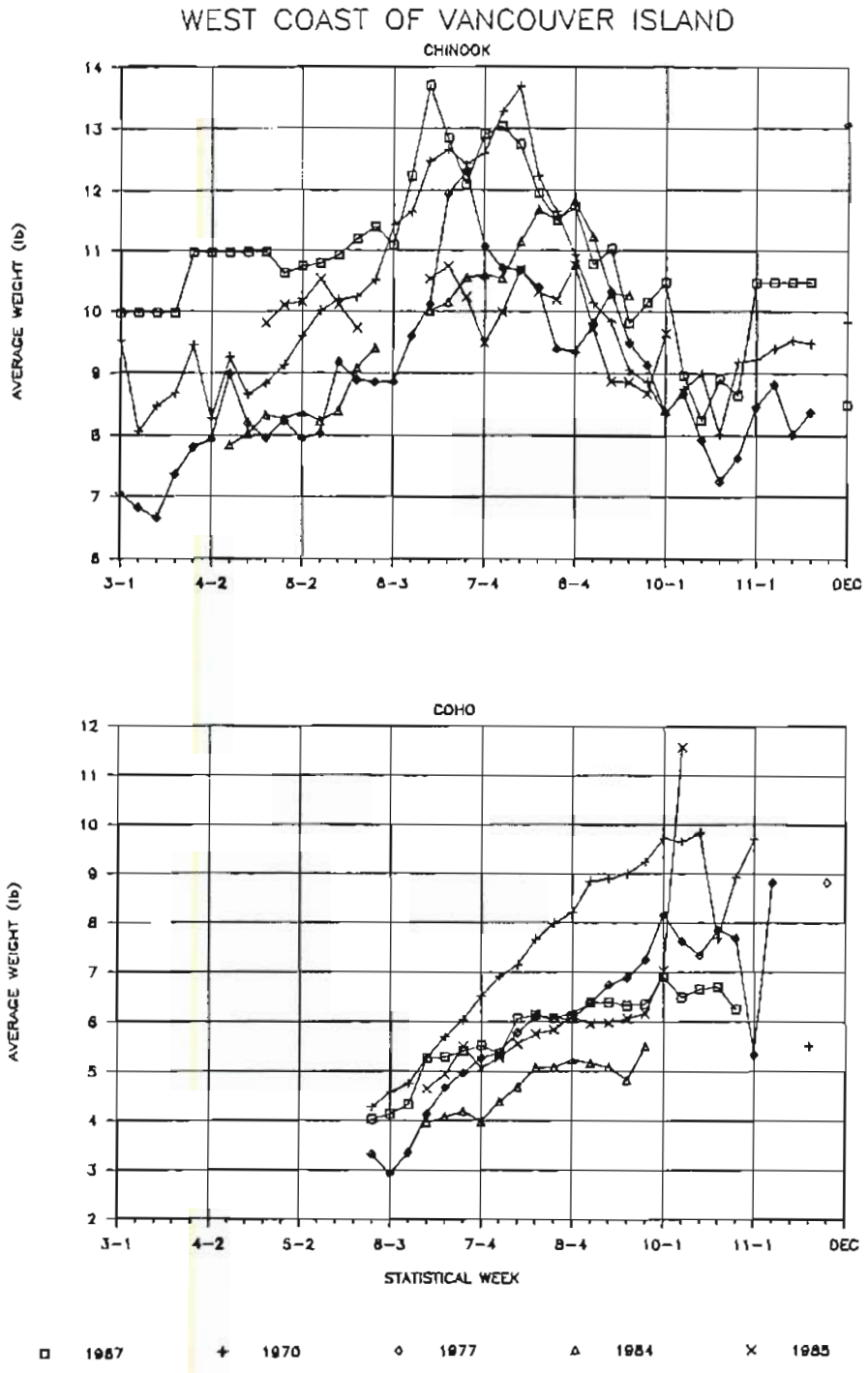


Figure 41. Average weight (lb) of each salmon species in the weekly ice troll landings for the west coast of Vancouver Island, 1967, 1970, 1977, 1984, 1985. Average weights for December include January and February data. Continued.

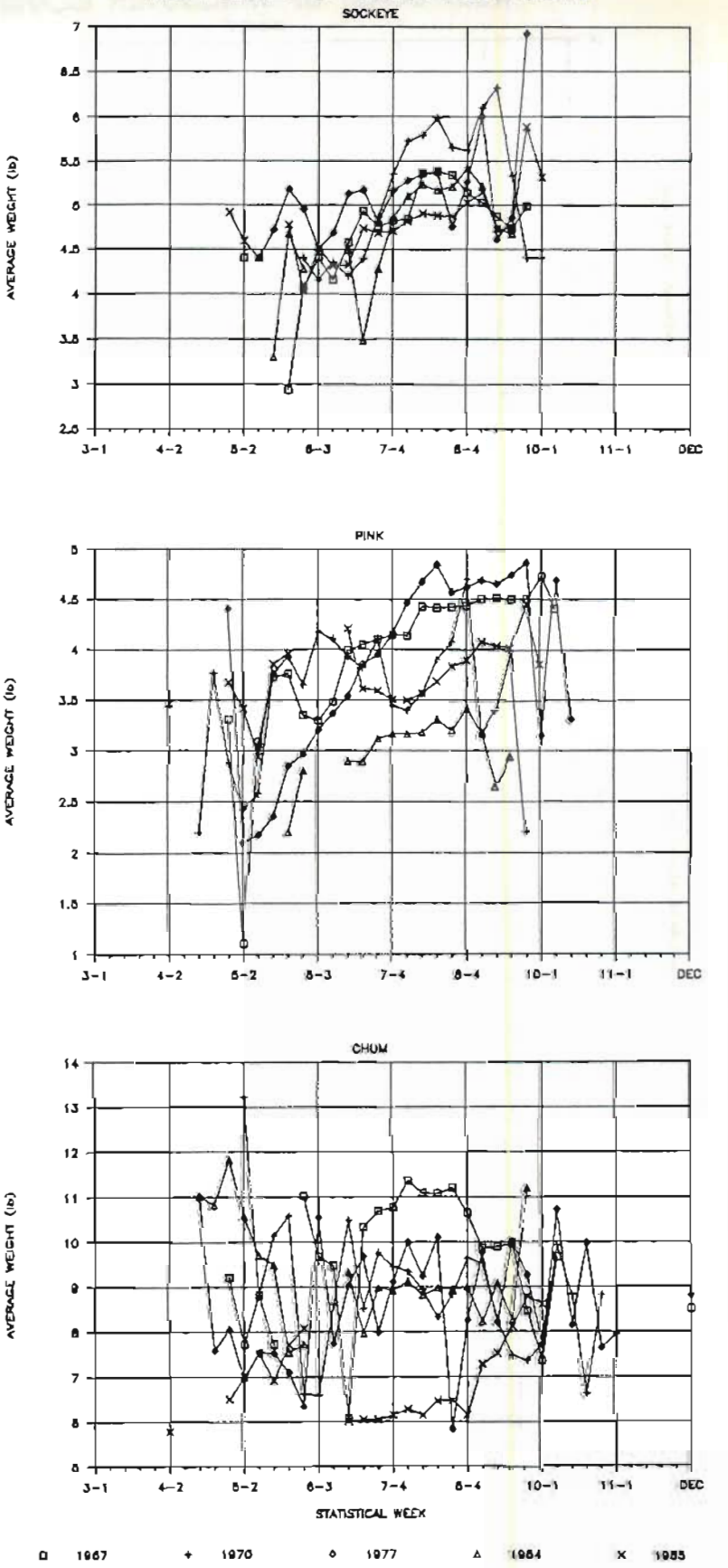


Figure 41. Continued.

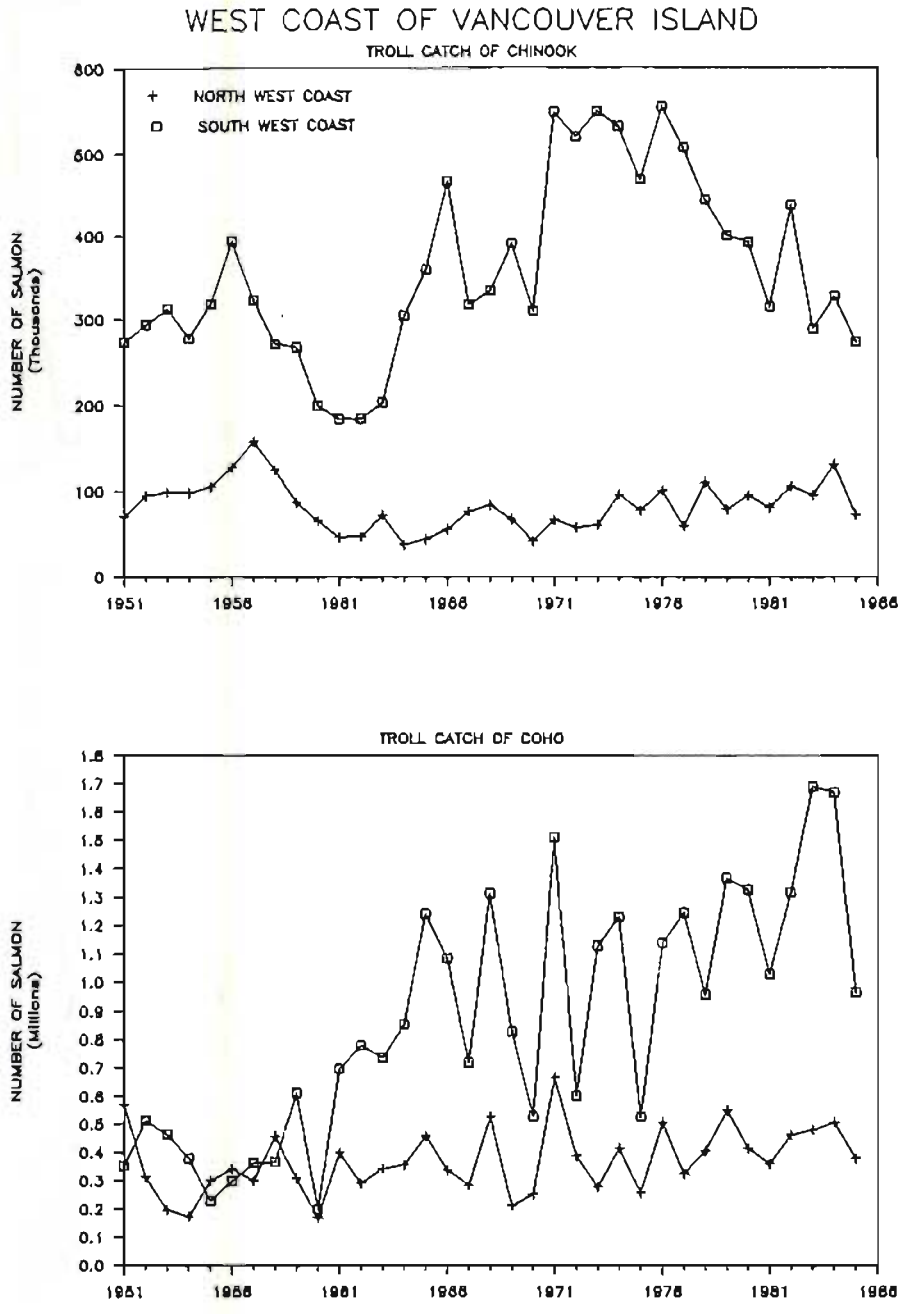


Figure 42. Annual troll catch (pieces) of each salmon species for north (areas 25-27) and south (areas 21-24) portions of the west coast of Vancouver Island, 1951-1985. Continued.

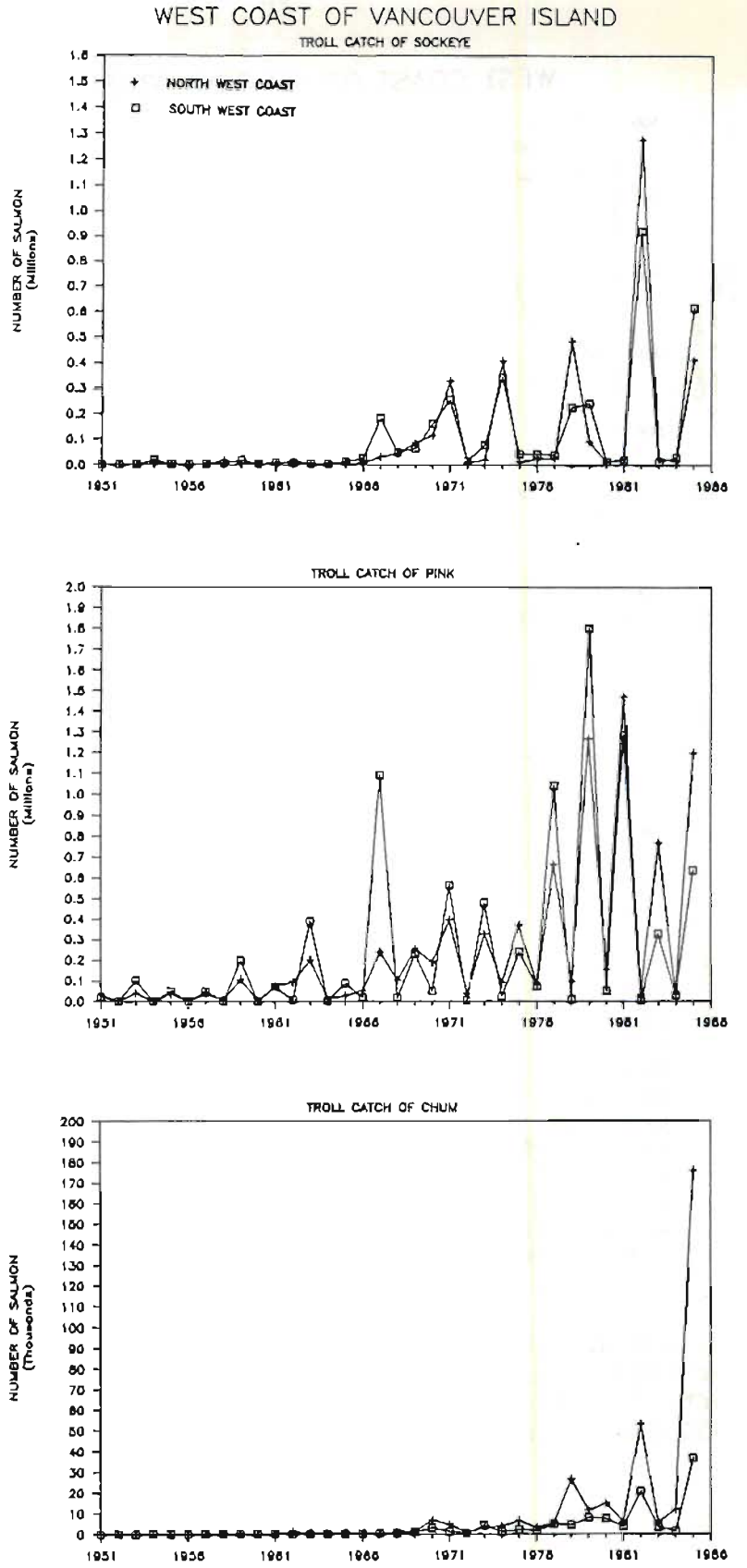


Figure 42. Continued.

in 1976 to 274,000 in 1985. In contrast, the northern catch has varied between 50,000 and 150,000 over the last 35 years, with no evidence of a long term trend. Coho catches in the south are close to three times those in the north. Coho catch climbed from under 500,000 in the south prior to 1961, to over 1.6 million in 1983 and 1984; the northern catch has varied between 200,000 and 600,000 since 1951. In contrast to coho and chinook, pink, sockeye, and chum catches have usually been highest in the north. Catches of these species have been increasing since 1961.

Figure 43 shows catch in tonnes of the traditional troll species (chinook and coho) and of sockeye, pink and chum. Chinook and coho have fallen from over 90 percent of the catch to less than 50 percent of the catch in the north, and to around two-thirds of the catch in the south. Clearly trollers in both areas are shifting to the "net" species, sockeye, pink and chum.

Figure 44 compares total catch in tonnes, total effort in days fishing and catch per day fishing for the north and south areas. Annual effort has increased in both areas since 1951. Peak effort levels occurred in the early 1980s. Total catch and CPUE also increased in both areas over the 1951-1985 period. Recent decreases in effort (1983-1985), in part due to more stringent regulations, have not been matched by declines in total catch because trollers switched more to net species, whereas the regulations were aimed primarily at reducing chinook catch.

4.7.2 Catch per unit effort

Chinook CPUEs are similar in both west coast areas (Figure 45). Highest levels (40-60 kg per day) occurred during the 1950s; current levels are around 20-30 kg per day. Trends in chinook CPUE are similar to trends in catch. Coho CPUEs were highest in the north prior to 1977, but in recent years CPUEs in the two areas have been similar. Coho CPUEs have ranged from over 100 kg per day to under 20 kg per day, with no long term trends evident. Current coho CPUEs are around 40-70 kg per day. Sockeye, pink and chum CPUEs generally have been highest in the north. CPUEs for these species have increased in both areas since 1961. Sockeye CPUEs have been highest on "Adams River" years (1974, 1978, 1982). Maximum CPUEs in the north were 120 kg per day for sockeye in 1982 and 110 kg per day for pink in 1981. The maximum CPUEs in the south were 40 kg per day for sockeye in 1982 and 55 kg per day for pink in 1979. Chum CPUEs have not exceeded 5 kg in the south, and only exceeded 5 kg per day in the north in 1982 (8 kg) and 1985 (23 kg).

Figure 46 compares the total CPUE for the two areas. Total CPUE has steadily increased in both areas since 1951 but

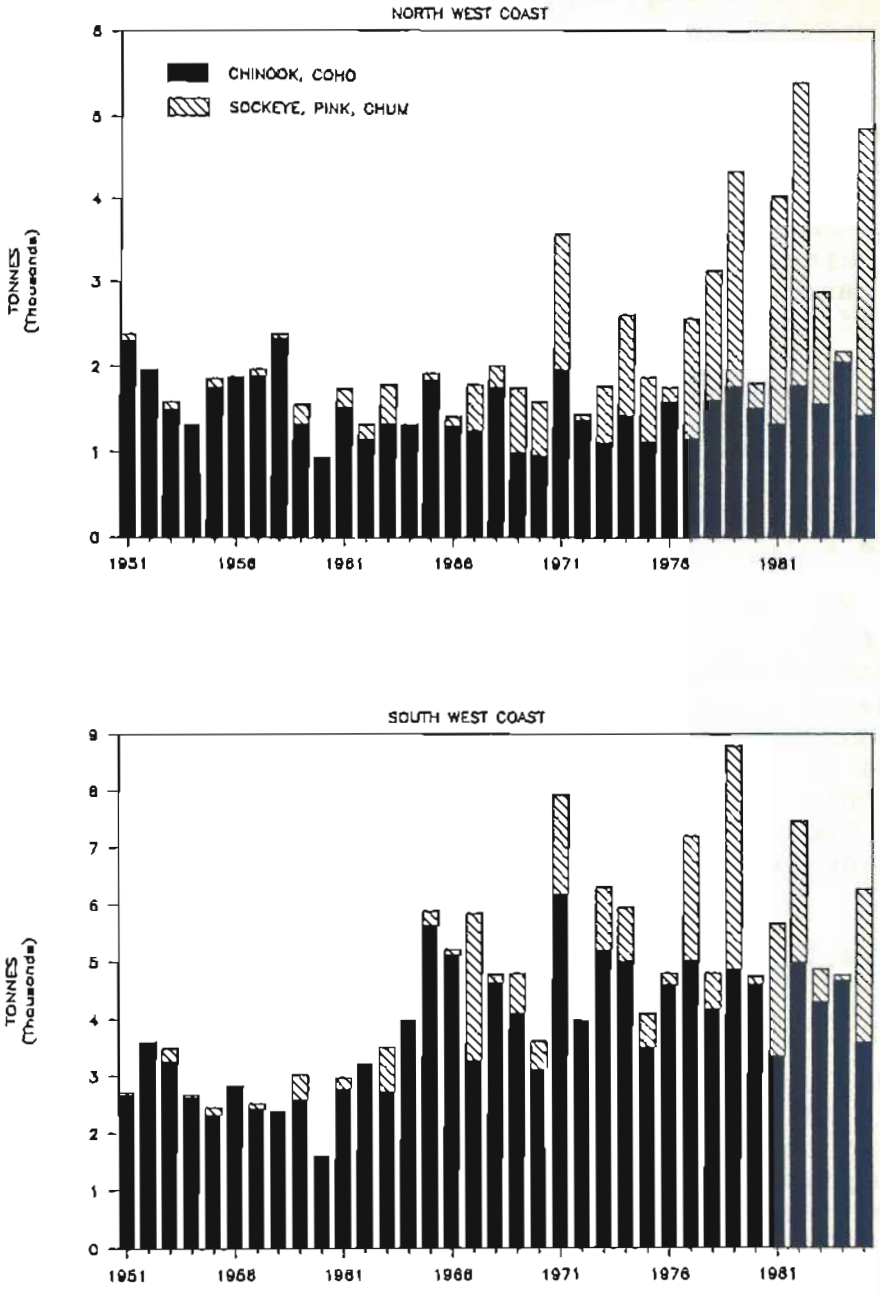


Figure 43. Annual troll catch (tonnes) of chinook-coho and sockeye-pink-chum for north (areas 25-27) and south (areas 21-24) portions of the west coast of Vancouver Island, 1951-1985.

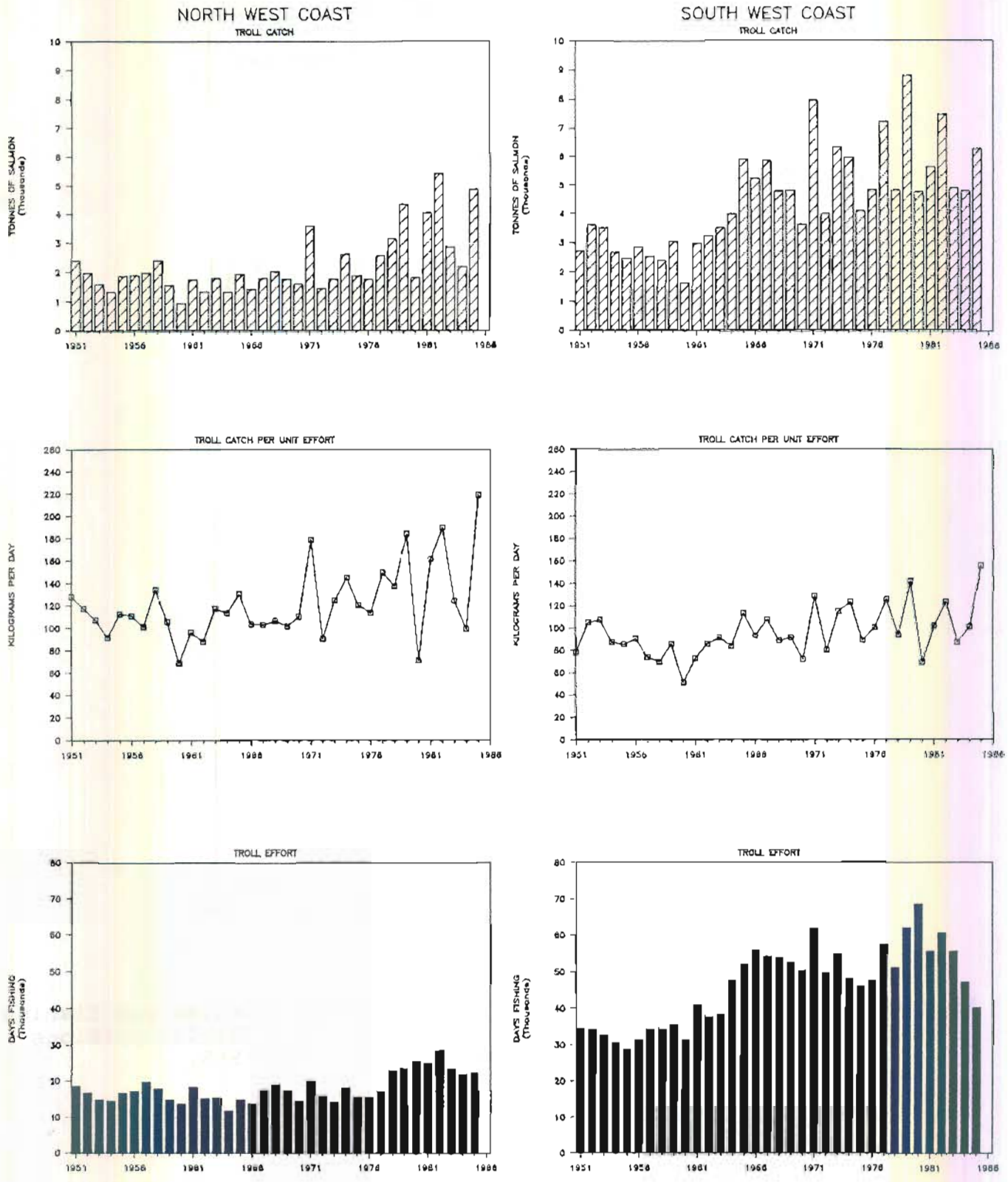


Figure 44. Total annual salmon troll catch, catch per day fishing and days fishing for north (areas 25-27) and south (areas 21-24) portions of the west coast of Vancouver Island, 1951-1985.

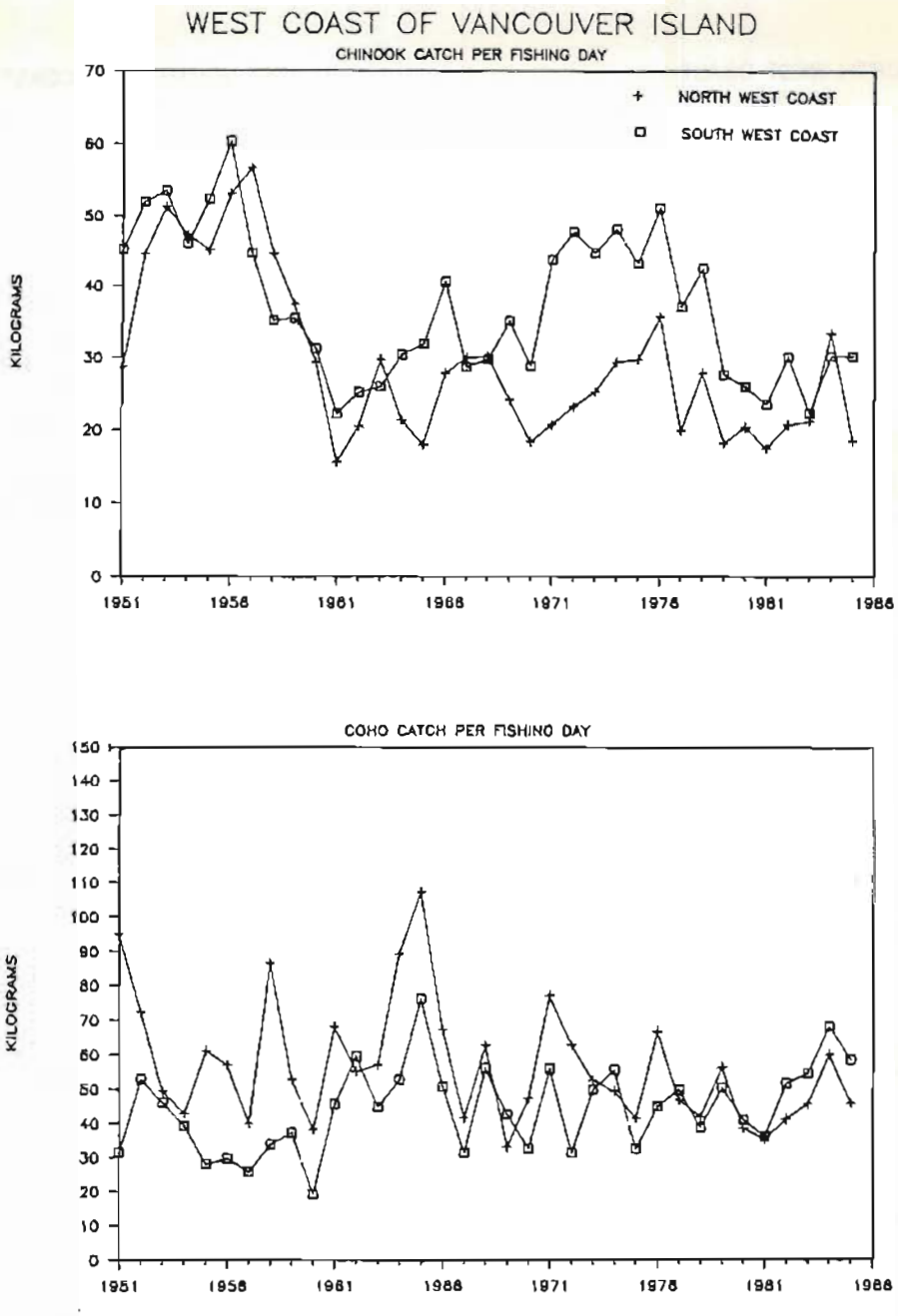


Figure 45. Annual troll catch (kg) of each salmon species per fishing day for north (areas 25-27) and south (areas 21-24) portions of the west coast of Vancouver Island, 1951-1985.

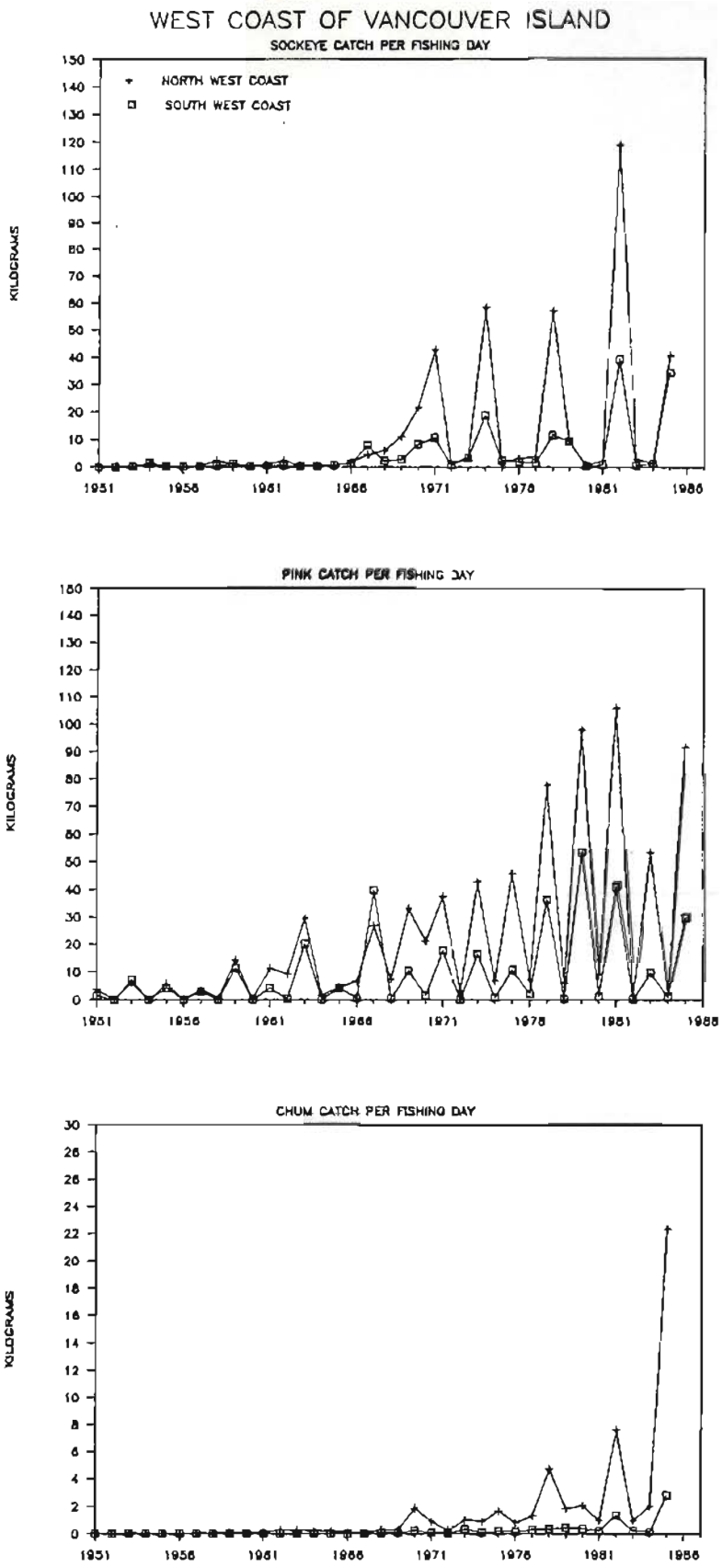


Figure 45. Continued.

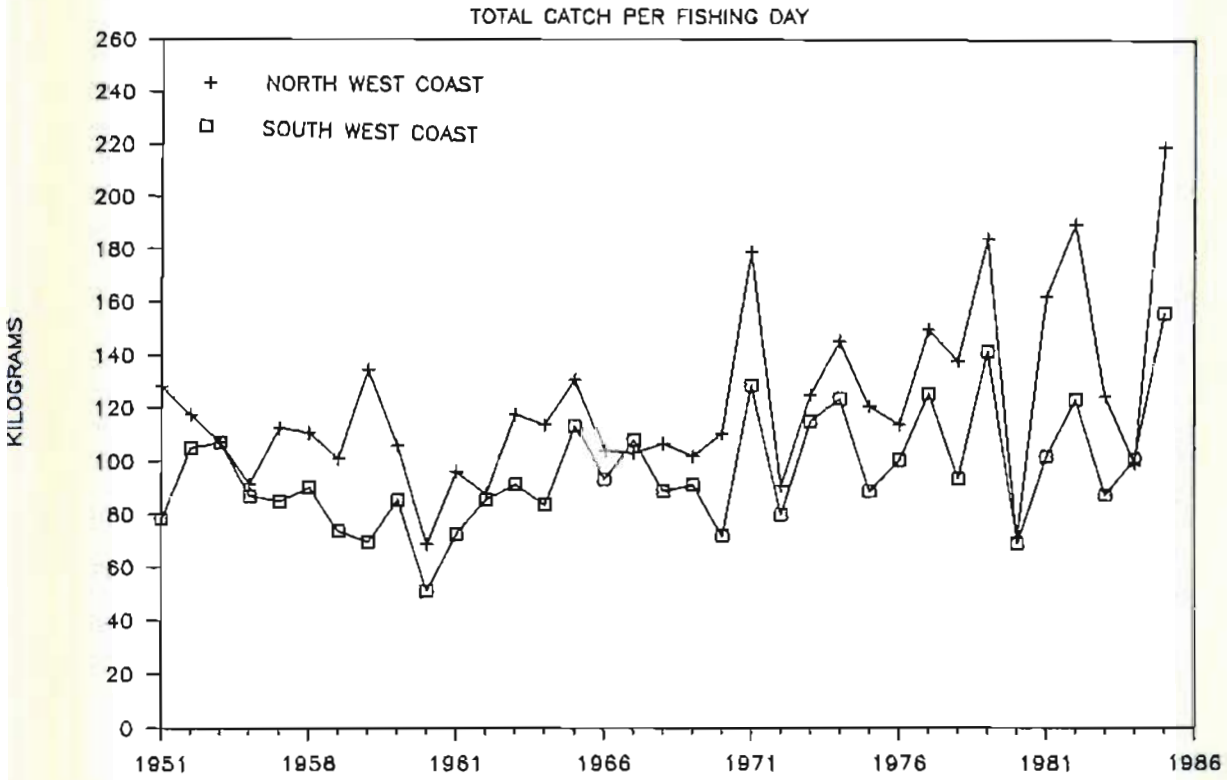


Figure 46. Comparison of total annual salmon troll catch (kg) per day fishing amongst north (areas 25-27) and south (areas 21-24) portions of the west coast of Vancouver Island, 1951-1985.

has generally been 10 to 30 percent higher in the north. In the last four years total CPUE averaged 160 kg per day in the north and 115 kg per day in the south.

4.7.3 Average weight

The average sizes of chinook, coho and pink have steadily declined in both areas since 1951, although there is a suggestion that downward trends have slowed since 1976 (Figure 47). Coho and pink are comparable in size in both areas but chinook average four to six pounds less in the south. This difference in chinook size probably reflects a younger age composition in the south (Milne 1964a, Bourque and Pitre 1972).

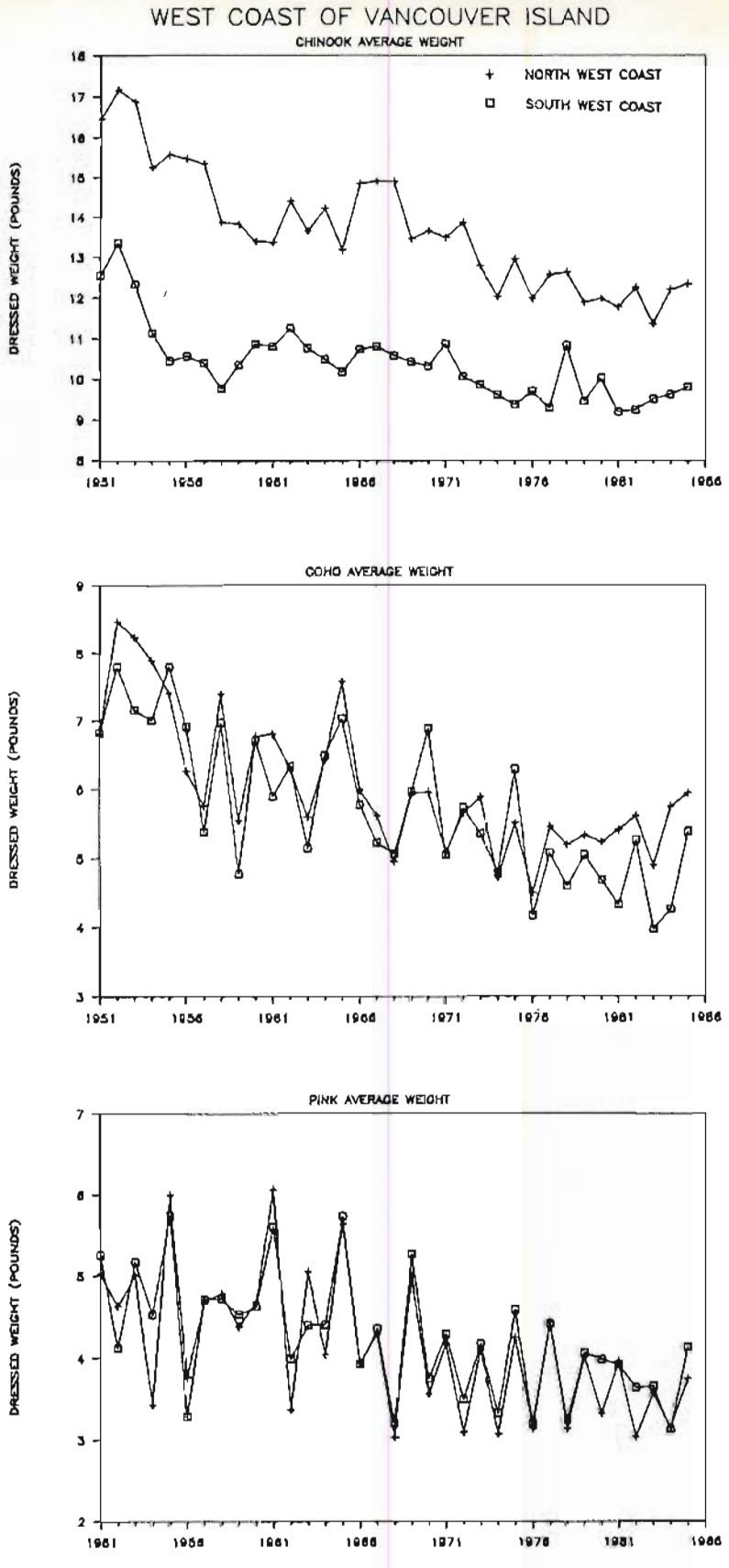


Figure 47. Trends in average weight of troll caught chinook, coho and pink salmon for north (areas 25-27) and south (areas 21-24) portions of the west coast of Vancouver Island, 1951-1985.

5.0 INTERNATIONAL ASPECTS OF MANAGEMENT OF THE B.C. TROLL FISHERY

5.1 Background

Extensive intermingling of salmon originating in the rivers of Canada and the United States gives an important international character to troll fisheries of both countries. These fisheries stretch from Washington northward through British Columbia to Alaska. In the past it was not only the mixed origins of the salmon harvested in the fisheries that provided an international perspective, but also because fishermen of both countries had access to waters off the coast of the other country, and in a number of places United States and Canadian fishermen fished competitively side by side. Due to the bilateral character of the fishery, international factors have had an important influence on the development of the regulatory regime for the Canadian troll fishery, particularly the fishery off the West Coast of Vancouver Island.

International events having important influences on the regulation of the southern British Columbia troll fishery have included:

- Strong representations from the United States through the Pacific Marine Fisheries Commission (PMFC) in the late 1940s and 1950s for adoption of unified coast-wide (California to Alaska) size limits and fishing seasons for the troll fisheries for chinook and coho salmon;

- the 1957 Conference on Coordination of Fisheries Regulations which established the "Surfline" and which provided for uniform troll chinook size limits and seasons;

- Canadian initiatives in the United Nations in 1956 and at the 1958 and 1960 United Nations Conferences on the Law of the Sea aimed at extending national fisheries jurisdiction to 12 miles (9 miles beyond the 3-mile territorial sea limit);

- the commencement, in 1960, of periodic meetings between Canadian and United States fisheries officials on "salmon problems of mutual concern" which eventually led, in 1985, to the conclusion of the Canada/United States Salmon Convention regarding the conduct of fishing by fishermen of one country on stocks bound for rivers of the other;

- the proclamation in July 1964 of the Territorial Sea and Fishing Zones Act which established Canadian fishing

zones extending 9 miles seaward of the outer limit of the 3-mile territorial sea;

- the establishment by the United States in 1966 of a 9-mile fishing zone;

- the establishment by Canada in 1969 of straight baselines off the west coast of Vancouver and Queen Charlotte Islands;

- the negotiation in 1970 of a Reciprocal Fishing Agreement between Canada and the United States permitting continued fishing by traditional fisheries within the new limits of extended jurisdiction on both sides;

- the negotiation within the United Nations Seabed Committee (1968 and 1970) and within the Third Conference on the Law of the Sea (1974-1984) of the Law of the Sea Convention including provisions for the establishment of 200-mile fishing zones;

- the 1977 extensions of Canadian and United States fisheries jurisdictions to 200-miles preceded by negotiation of a tentative agreement regarding reciprocal access of fishermen of the two countries to the newly established zone of the other country;

- breakdown of the latter arrangements and unsuccessful attempts during 1977-1979 to negotiate a bilateral fisheries agreement providing, in part, for reciprocal access;

- development of interim salmon fishing arrangements in the two countries in 1983 and 1984 in anticipation of the conclusion of a comprehensive Salmon Convention which finally came into effect in time for the 1985 fishing season.

The influence of each of these events on regulation of the southern British Columbia Troll fishery is outlined below. Before proceeding with in-depth analysis, it would seem appropriate to briefly review information on the extent of fishing by Canadian and United States fishermen in waters off each other's coasts since international negotiations between the two countries have had important effects in determining the fishing grounds available to Canadian fishermen.

5.2 Fishing by Canadian and United States trollers off the coasts of Washington and Vancouver Island

Almost from the beginning of the commercial troll fishery at the turn of the century, American and Canadian trollers fished together on the rich offshore banks at the entrance to Juan de Fuca Strait. Unfortunately, records of the catches in different areas off the coasts of Washington and Vancouver Island are not available for the earlier years of the fishery.

For Washington State, published records of catches by individual coastal areas off Vancouver Island and Washington are available from 1960 through 1977 (Table 12). The data indicate that in the early part of the 1960-1977 period, Washington trollers made substantial catches of chinooks off the British Columbia coast; during 1960-1963 more than a quarter of the Washington troll catch of chinooks came from these waters. There are indications that in years prior to 1960 an even higher proportion of the Washington troll catch came from waters off British Columbia. Prior to 1960, Washington troll catches were recorded only by area of landing (rather than by area of catch). Milne (1964) considered that the bulk of the Washington troll catch of chinook recorded as being landed in Puget Sound consisted of fish caught off Vancouver Island "...from boats which operate out of Neah Bay, Washington. The catches made at Umatilla Bank and off LaPush cannot be separated from their total catch, but they are too small to affect seriously the estimated catch off Vancouver Island ..." In Table 13, the area of catch data from Table 12 are compared with area of landing data for the post-1960 period. The comparison shows that in the early 1960s, catches of chinooks off Vancouver Island did indeed form the bulk of the Puget Sound landings. The Table also shows that prior to 1960, the proportion of the total Washington State troll catch that was landed in Puget Sound was even higher than in the post-1960 period. On the basis of landing information, Milne concluded that during 1935-1937, "... the magnitude of the United States catch [off southwest British Columbia] was of about the same magnitude as the Canadian catch." The data included in Tables 12 and 13 strongly suggest that in the mid-1960s and before, Washington troll fishermen had a strong presence off the coast of British Columbia but that that presence diminished rapidly after 1966 and was totally extinguished with termination of reciprocal fishing privileges during the 1978 fishing season (see Section 5.3.6. below)

On the other hand, in the 1950s Canadian fishermen began to fish actively off the coast of Washington (Appendix Table 9). The fishery there increased markedly during the late 1960s; with respect to chinooks, 1970 and 1971 were the peak years. Catches

Table 12. Recorded catches of chinook salmon taken by Washington State trollers off British Columbia and elsewhere, 1960-1977.*

YEAR	B.C. North of Cape Scott	West Coast Vancouver Island	Total British Columbia	Total Catch	Percent off B.C.
1960	4,235	33,928	38,163	121,805	31.3
1961	3,355	39,828	43,183	182,328	23.7
1962	2,509	46,298	48,807	159,030	30.7
1963	2,124	49,232	51,356	204,178	25.2
1964	2,775	27,498	30,273	163,618	18.5
1965	1,655	12,386	14,041	95,855	14.6
1966	3,661	24,629	28,290	167,192	16.9
1967	516	4,279	4,795	131,736	3.6
1968	809	2,514	3,323	162,787	2.0
1969	1,290	2,129	3,419	186,929	1.8
1970	470	1,521	1,991	214,298	0.9
1971	1,324	2,173	3,497	252,177	1.4
1972	3,415	7,074	10,489	202,868	5.2
1973	311	816	1,127	316,777	0.4
1974	1,707	1,668	3,375	353,052	1.0
1975	78	3,648	3,726	261,752	1.4
1976	1,334	663	1,997	347,730	0.6
1977	222	1,415	1,637	267,517	0.6

*Source: 1960-1969, Wright and Brix (1972); 1970-1978, Washington State Department of Fisheries, unpublished statistics.

Table 13. Landings of troll caught chinook salmon in Washington State, 1935-1975.*

Year	Total Catch	Catch Off B.C.+	Puget Sd. Landings	% B.C. of Puget Sd.	% Puget Sd of Total
1935	199,259	NA	140,398	NA	70.5
1936	297,353	NA	230,271	NA	77.4
1937	259,432	NA	186,458	NA	71.9
1938	175,080	NA	116,902	NA	66.8
1939	174,522	NA	122,402	NA	70.1
1940	303,402	NA	231,264	NA	76.2
1941	278,002	NA	175,174	NA	63.0
1942	255,155	NA	158,498	NA	62.1
1943	240,244	NA	154,741	NA	64.4
1944	188,337	NA	98,783	NA	52.5
1945	221,157	NA	118,394	NA	53.5
1946	348,406	NA	226,392	NA	65.0
1947	325,015	NA	231,685	NA	71.3
1948	285,908	NA	148,527	NA	51.9
1949	291,146	NA	170,365	NA	58.5
1950	256,534	NA	159,003	NA	62.0
1951	330,821	NA	102,637	NA	31.0
1952	407,445	NA	168,624	NA	41.4
1953	419,240	NA	196,885	NA	47.0
1954	383,938	NA	178,961	NA	46.6
1955	384,695	NA	137,507	NA	35.7
1956	295,276	NA	125,103	NA	42.4
1957	361,401	NA	228,964	NA	63.4
1958	269,931	NA	152,802	NA	56.6
1959	202,229	NA	134,857	NA	66.7
1960	121,805	38,163	50,918	74.95	41.8
1961	182,328	43,183	72,993	59.16	40.0
1962	159,030	48,807	68,650	71.10	43.2
1963	204,178	51,356	75,859	67.70	37.2
1964	163,318	30,273	59,282	51.07	36.3
1965	95,855	14,041	26,917	52.16	28.1
1966	167,192	28,290	52,370	54.02	31.3
1967	131,763	4,795	19,029	25.20	14.4
1968	162,787	3,323	16,009	20.76	9.8
1969	186,941	3,419	16,167	21.15	8.6
1970	214,298	1,991	22,165	8.98	10.3
1971	252,177	3,497	52,281	6.69	20.7
1972	202,870	10,489	68,811	15.24	33.9
1973	317,255	1,127	58,314	1.93	18.4
1974	353,056	3,375	75,131	4.49	21.3
1975	274,206	3,726	65,150	5.72	23.8

* Source: Annual Reports of the Washington State Department of Fisheries.
+ From Table 12

declined in the late 1970s, reflecting in large measure decreases in fishing areas available to Canadian fishermen as a consequence of negotiations of reciprocal fishing rights between Canada and the United States. Thus, during the 1960s as the United States presence off Canada diminished, the Canadian presence off Washington increased (Figure 48). As will be outlined in succeeding sections, these opposing trends had a major influence on the course of negotiations between the two countries regarding cooperation in management of salmon fisheries.

5.3 History of International Cooperation for Management of the Troll Fishery

5.3.1 The Pacific Marine Fisheries Commission (PMFC), 1948-1956

Immediately following World War II, dismal landings of chinook salmon in inshore fisheries (e.g. in the Columbia River) in Washington, Oregon and California, the post-war expansion of ocean troll fisheries and, deterioration of fresh water salmon environments (often associated with construction of dams for power and irrigation purposes), were creating great concern within United States fisheries administrations.

Before there were any formal mechanisms for states to coordinate their approaches to management, Washington and Oregon took collective action to begin to remedy the worsening situation. Following a one-year cooperative study, both states adopted common size and season regulations in 1948 for their ocean troll fisheries. By 1948, California had also adopted size and season regulations. Regulations applying in the three states in 1948 are listed below.

	Minimum Total Length (inches)		Open Season	
	Chinook	Coho	Chinook	Coho
Washington	27	18	All year	Jul 1-Nov 15
Oregon	27	None	All year	Jul 1-Nov 15
California	25	25	Apr 1-Sep 15	Apr 1-Sep 15

No size limit was applied to troll-caught coho in Washington and Oregon because it was felt that by prohibiting the landing of coho before July 1st, capture of fish below about 6 lb (approximately 26 in) would be minimized. The 18 inch limit shown in the Table for Washington state applied to coho taken in

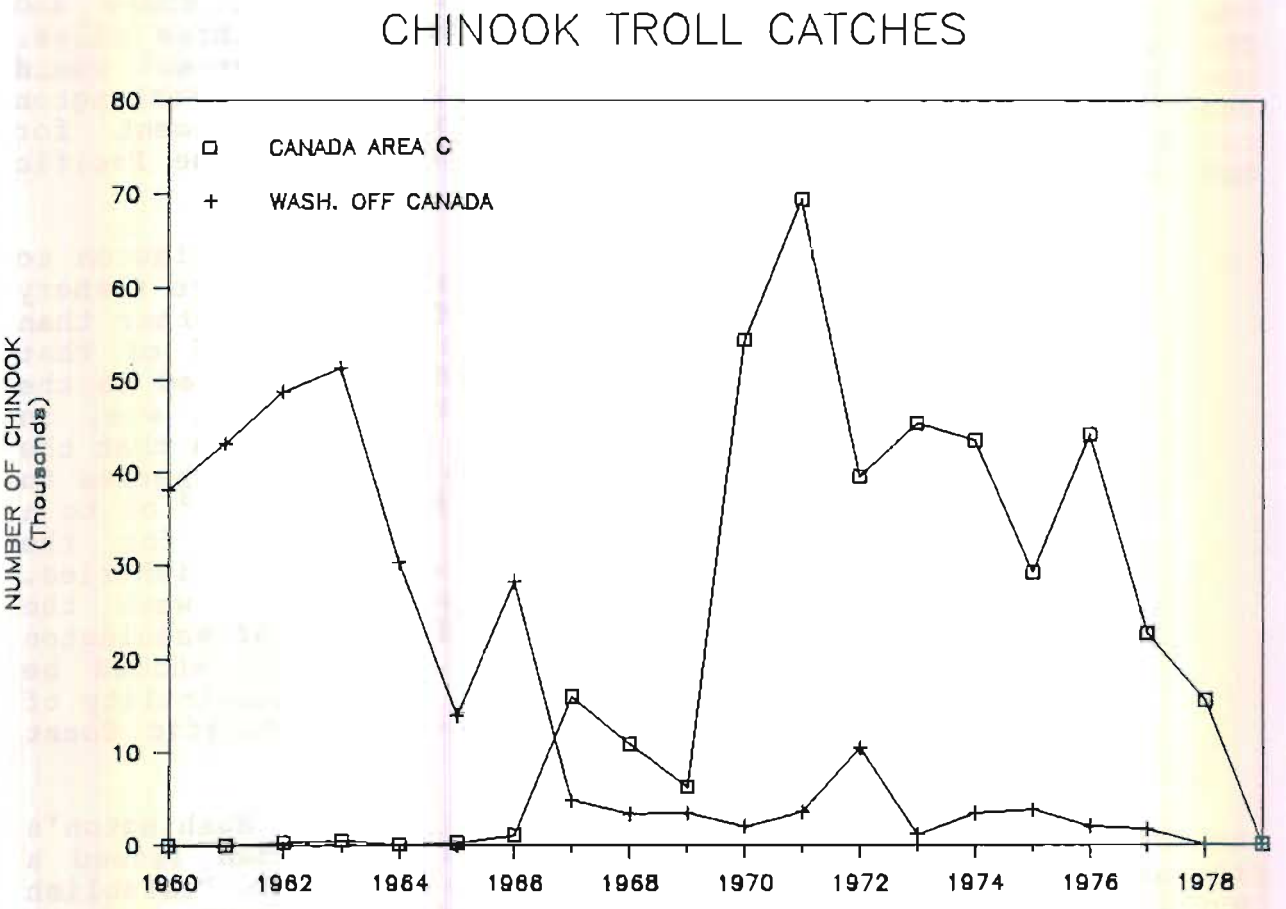


Figure 48. Troll catches of chinook (pieces) by Canadian and Washington State fishermen off the coasts of Washington, Oregon and British Columbia, 1960-1979.

seine catches (Anon 1948). By contrast, off the Canadian coast in 1948, the troll fishery was subject only to a two-month closure around the New Year and a province-wide, minimum size limit of 3 lb round (2 1/2 lb dressed).

During the late 1940s, the deteriorating situation in the salmon resource led the three western states to seek even closer cooperation in the management of chinook and coho salmon. Under the United States Constitution the individual States had jurisdiction over fisheries within three miles of shore and control over the landings of fish caught beyond three miles. Therefore, effective coordinated research and management could come only through agreement of the state governments. Washington state was the leader in pressing for an agreement for cooperation. As outlined in the first bulletin of the Pacific Marine Fisheries Commission:

> "As early as 1945 an attempt was made in Washington to provide by law some form of control for offshore fishery operations on the Pacific Coast for species other than halibut and sockeye salmon. On February 25 of that year, Senate Joint Memorial No. 8 was submitted to the Washington State Legislature. This memorial was, in effect, a resolution surrendering all interests that the State of Washington might have in offshore fisheries to the two present International Fish Commissions[3] or to a third commission which would be created for the regulation of all the Pacific Coast offshore fisheries. This resolution was opposed and defeated when the administration of fisheries for the State of Washington expressed the belief that such an agency should be composed of members who also have the responsibility of managing the fisheries within the three Pacific Coast states."

In the autumn of 1945, shortly after Washington's unsuccessful initiative (Anon 1945) President Truman issued a proclamation asserting the United States right to "establish conservation zones in those areas of the high seas contiguous to the coasts of the United States wherein fishing activities have been or in the future may be developed and maintained on a

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3. These were the International Pacific Salmon Fisheries Commission (IPSFC) and the International Pacific Halibut Commission (IPHC). The concerns that led to the formation of the Pacific Marine Fisheries Commission were not limited to salmon but included other species such as groundfish and tuna which were fished in areas beyond the three-mile limits of jurisdiction of individual States.

substantial scale." Although the United States never took explicit action to establish such zones, as reported by the PMFC's first bulletin, the proclamation sparked a tri-state meeting between Washington, Oregon and California on December 1, 1945. The meeting recommended that the three states proceed expeditiously to enact legislation to form a Pacific Marine Fisheries Commission. The bulletin noted that, "because of Canada's interest in coastwise fisheries problems, representatives were invited to attend the meeting". Unfortunately, Vancouver file records available to the authors do not contain accounts of Canadian participation in the meeting.

Beginning in February 1946, representatives of the three western states began working together to develop a compact to form the Pacific Marine Fisheries Commission. The Compact was approved by the three state legislatures in 1947 and by the United States Congress on July 24 of that year. The Compact provided for the new Commission to study the fisheries under the jurisdictions of the three states and to make recommendations to the states regarding "... the coordination of the exercise of the police powers of the several states within their respective jurisdictions and said conservation zones to promote the preservation of those fisheries and their protection against overfishing, waste, depletion or any abuse whatsoever and to assure a continuing yield from the fisheries resources..." To these ends, the Commission was given the power to draft and recommend appropriate legislation, regulations and enhancement measures.

Organizational meetings were held in November 1947 and January 1948. During the remainder of 1948, three further meetings were held to give substantive consideration to management problems. The April 5-6 meeting reviewed a staff report entitled "Coordinated Plans for Management of the fisheries of the Pacific Coast". The report did not recommend actual management measures but did propose a coordinated tagging program for the commercial troll fishery which was accepted by the Commission members. The August 17-18 meeting was attended by an "unofficial observer" from Canada (Dr. R.E. Foerster of the Nanaimo Biological Station). No recommendations were made for regulation of the fisheries but the discussion "... did bring out very forcefully the necessity of including Alaska and British Columbia in all future regulations of ocean salmon fishing" (Anon 1948a).

The December meeting of the Commission made the first proposals for regulation including:

- a minimum 26 inch size limit for troll caught chinook;

- a uniform March 15-October 31 season for chinook salmon; and,

- a June 15-October 31 season for cohos.[4]

The foregoing recommendations were made not only to the Commission but also to "... Canada and to the United States Fish and Wildlife Service for regulation of Alaska fishing". Thus, almost from its inception, PMFC pressed strongly for the development of uniform coastwide regulation not only of the troll fisheries of its three member states but also of Canada and Alaska (Anon 1948a).

The December meeting that proposed the regulations included observers from Canada (three from the Nanaimo Biological Station, one from the UFAWU, and one representing B.C. processors).

The regulations recommended by the Commission were adopted by Washington and Oregon for the 1949 season. California adopted "alternate" recommendations proposed by its participants at the December 1948 meeting (Anon 1949).

Although not a member of the Commission, Alaska (through the Federal Government) adopted the same regulations in 1950 (Anon 1950). Canada did not respond to PMFC's representation. This resulted in expression of strong concern by the United States. At the Commission's July 1950 meeting, a United States participant noted that, "... inequities between the American and Canadian troll regulations were working a hardship on American fishermen" (Anon 1950). The minutes of the meeting indicated that the Commission subsequently decided to make a formal request to Canada to adopt troll fishing regulations in line with those previously recommended by the Commission. The authors have been unable to find such a recommendation either in the Commission's published record or in DFO Pacific Region files. Nevertheless, it is evident that Canadian officials had been informed. The

4. The recommendation noted that, "The California industry has recommended a 25" size limit (tip to tip) and a season of May 1 to September 30 for silver salmon". The text went on to say that the foregoing recommended measures accomplish "... about the same thing as a June 15 opening and that, therefore, the apparent conflict is of no consequence and should not interfere with the passage of a June 15 opening by other States". It was evident that California was not expected to accept the Commission's recommendations.

minutes of the October 1951 meeting of the Commission contained a statement by the Canadian observer, D.J. Milne, that Canada would adopt the Commission's recommendations of a June 15 opening for coho and that the 26 inch chinook size limit was under consideration (Anon 1951). Thus, Canada's adoption in 1952 of a June 15 opening date for coho followed closely on representations by the United States through PMFC.

The 1951 PMFC meeting attempted to go further by agreeing that there was a "consensus that July 1 would be the proper opening date for the troll fishery for silver salmon and that date be put in effect as soon as all parties are able to do so ..." The Commission also heeded the biologists' suggestion for adoption of a 28 inch size limit for chinooks (Anon 1951).

The 1952 meeting reaffirmed the recommendation for a coastwide opening date of July 1 for coho, with the provision of an alternative that California could adopt a 26 inch minimum size regulation (Anon 1952-1956). This recommendation remained "on the books" with no action being taken by member states or observers through 1956 (Anon 1952-1956).

In 1955, the Commission recommended a shortening of the chinook season for 1956 from April 15 to September 30 from the earlier recommended opening of March 15 to October 31 in order to protect declining runs of Columbia River fall chinooks(Anon 1952-1956). Washington and Oregon accepted the recommendation and adopted the shortened season in 1956.

Canadians continued to attend the PMFC meetings as observers. The Canadian position at these meetings was well characterized by Dr. John L. Hart of Canada at the July 1950 meeting of the Commission when he said that, "... when it is apparent to those in Canada that the American troll regulations are in the best interests of conservation, the regulations will very likely be adopted by Canada." (Anon 1950). Apparently, Canadian specialists remained unconvinced of the value of the regulatory package and during 1955 and 1956 the Canadian government took no further regulatory action on the troll fishery.

From its formation in 1948, through 1956, PMFC served a useful purpose in providing a focus for planning and sharing of results or research on migratory salmon stocks. The organization had some limited success in coordinating regulatory regimes for the troll fisheries of the three participating states. Not being a member of the Commission, Canada was naturally reserved in its participation in the Commission's work and United States participants were naturally disappointed that Canada had not been more forthcoming.

In 1956, circumstances totally unrelated to the troll fisheries changed the focus of international discussion from PMFC to direct intergovernmental negotiations between the federal governments of the United States and Canada. The event that triggered the change was the seaward spread of net fisheries of both countries, a development vigorously opposed by fisheries administrations on both sides of the border.

5.3.2 The negotiation of the International North Pacific Treaty and the 1957 Canada/United States Conference on Coordination of Fisheries Regulations

In 1954, Canada and the United States were successful in concluding the North Pacific Fisheries Treaty with Japan (Anon 1954). The Treaty banned Japanese fisheries for salmon from operating in the eastern North Pacific (generally eastward from 175°W); prior to World War II, Japanese fisheries had been moving ever closer to the North American coast and there was no question that without the restraint imposed by the INPFC treaty, the eastward spread of Japanese high seas fishing would have resumed after the war. In negotiating the Treaty, the North Americans had argued strongly against the capture of salmon on the high seas.

In 1955 and 1956, increasing competition between net fisheries in southern British Columbia and Washington State (including the development of mobile gillnet fisheries capable of fishing offshore) was leading to a rapid expansion of net fishing at the entrance to Juan de Fuca Strait. Canada was gravely concerned about this development. In October 1956, the subject had become an issue in negotiations with the United States regarding the inclusion of pink salmon under the terms of the Fraser River Treaty (the Protocol adding pink salmon was successfully concluded in the autumn of 1956). Not only was the seaward spread of net fishing complicating domestic management, it was also clearly inconsistent with the Canadian and United States positions viz a viz high seas fishing by Japan. In late 1956, Canada proposed a ban on offshore net fishing. The proposal was the focus of discussion at the November 1956 meeting of PMFC and led to a supporting resolution from the Commission favoring establishment of a coast-wide ban on high seas fishing with nets.

With obvious United States interest, the two countries agreed to hold an informal conference on the coordination of fisheries regulations. The meeting was held in Seattle on February 27-28, 1957. It was not restricted to consideration of the net fishing problem, but embraced all regulatory problems of

mutual concern, including troll regulations. The parties agreed to a ban on salmon net fishing outside "surf lines" established along the coasts of both countries (Anon 1957).

The meeting had important ramifications for the Canadian troll fishery. In the context of broader international negotiations, Canada agreed to adopt a 26 inch (66 cm) total length (or equivalent weight) minimum size limit and also to accept a chinook season of April 15 to October 31 (shortened from the 10-month February to October season that previously existed). The closure date applied to coho fishing as well. Alaska also agreed to adopt an April 15 opening. The Conference indicated the desirability of determining areas where juvenile fish concentrated and were vulnerable to commercial harvest ("nursery areas") so that, as a conservation measure, such areas could be closed to avoid capture of undersized fish.

Although Canadian officials agreed with the Conference's decision, they were obviously lukewarm regarding the 26 inch size limit being pushed by the United States. The Committee report dealing with the size limit problem noted that, "... the Committee recognizes that biological and practical considerations are both involved and that biological evidence to date from all areas does not indicate that this proposal is essential as a conservation measure." (emphasis added).

Regardless of the background, it is evident that the establishment of the 26 inch chinook minimum size limit, and the April 15-October 31 chinook season for the troll fishery, had been adopted by Canada in the context of the negotiations with the United States for a mutually beneficial package of fishery arrangements. The dynamics of the negotiations were such (the United States had agreed to Canadian proposals to ban high seas fishing, and to Canadian proposals to place pink salmon under the Fraser River Treaty) that Canada felt it was appropriate to accept the United States proposals regarding trolling.

5.3.3 The 1958 Conference on the Law of the Sea

The 1958 United Nations Conference on the Law of the Sea introduced an entirely new dimension into Canada/United States fisheries relations on the Pacific Coast.

By the late 1950s, Canada was becoming concerned with lack of jurisdiction over waters in which its fishing vessels operated, sometimes in competition with foreign vessels. As indicated by the Truman Proclamation of 1945 (see Section 5.3.1), the United States too was expressing interest in extending its jurisdiction beyond the 3-mile limit of the territorial sea for

resource exploration purposes.

At the 1958 Conference on the Law of the Sea, Canada proposed that coastal States should have exclusive rights over fishing within 12 miles of its shores.[5] The United States proposed establishment of a 6-mile territorial sea plus an additional 6 mile zone in which the coastal State would have exclusive fishing rights subject to concessions regarding historical fishing rights of the other nations. The latter proviso was undoubtedly influenced by the desire of United States fishermen to continue fishing off the Canadian coast. For example, a mimeographed note issued by the State of Washington Department of Fisheries in July 1958, stated that:

> "If the 12-mile limit were ratified, it would not only deny our [troll salmon] fishermen the right to [the] historical fishing areas off Vancouver Island but the right to harvest and participate in conservation measures of stocks of salmon from United States rivers. In other words, we would be responsible for maintaining the runs of salmon in our rivers and streams, but have no means of regulating the fishing pressure placed on them once they leave the ocean waters adjacent to our coast."(Anon 1958).

The statement not only indicated the interest of Washington State fishermen in continuing to fish in waters off the Canadian coast, but also clearly identified Washington's desire to participate in the management of fisheries on Washington State stocks on a coast-wide international basis. This position underlay PMFC's consistent attempts to seek Canadian concurrence with United States regulatory regimes and was to remain a constant element in Canada/United States fisheries negotiations over the following two decades.

In any event, neither the Canadian nor the United States proposals received the necessary two-thirds majority vote in the Conference required for adoption. A joint Canada/United States proposal at the second Law of the Sea Conference in 1960, calling for a 6-mile territorial sea plus a 6-mile contiguous fishing zone (with 10-year phase-out for foreign fishing vessels) also failed, but by only a single vote (Johnson and Zacher 1977). Nevertheless, the actions of the two countries began the inexorable movement toward extensions of fisheries jurisdiction

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5. A concise account of the 1958 negotiations is provided in a May 19, 1958 Bulletin of the Fisheries Council of Canada. See also Johnson and Zacher (1977).

that were to have an important impact on the future of the Canadian troll fishery in later years.

After the Canadian and United States initiatives at the 1958 and 1960 Law of the Sea Conferences, the jurisdictional issue lay dormant until the mid-1960s. On the Pacific coast, however, Canadian and United States dialogue continued on other fronts.

5.3.4 The 1959 Conference on Coordination of Fishing Regulations and the emergence of the "salmon interception" problem

In April 1959, a second Conference on Coordination of Fisheries Regulations was convened to review progress that had been made since the 1957 meeting (see Section 5.3.2 above) (Anon 1959). In the 1959 meeting, the salmon troll fishery received little attention. The Conference's Sub-committee on troll salmon reviewed and listed troll regulations applying in individual states and in Canada, pointed out that there were contrasting opinions regarding the "biological soundness of minimum size limits", and re-iterated support expressed at the 1957 Conference regarding the desirability of establishing salmon nursery areas. With respect to the latter observation, the Committee's report indicated that data were lacking to define such areas at that time; the Sub-Committee urged that legal steps be taken to prevent fishing from occurring before season opening dates (Washington laws prescribed dates of landing rather than dates of fishing).

With respect to salmon, the most significant development of the Conference stemmed from concerns expressed by Canada regarding tagging studies in Southeast Alaska in 1957 and 1958 which showed that Alaskan net fisheries operating off Noyes Island were taking large quantities of sockeye and pink salmon bound for northern British Columbia Rivers. This concern led to the Conference's recommendation that, "... a committee be established as soon as possible to consider [the] problems and subsequently recommend appropriate action to ensure continued effective conservation of these stocks."

The work of the latter Committee, recorded in a technical report in 1965 (Anon 1965a), provided estimates by United States and Canadian scientists of the numbers of sockeye and pink salmon intercepted by each country in the Alaskan/Northern British Columbia boundary area. The Committee's work focused attention on the question of the extent to which fishermen of one country were intercepting salmon bound for rivers of the other country, a subject that continued to be

debated for the next two decades, culminating in the comprehensive Pacific Salmon Treaty which came into force in 1985.

5.3.5 Extensions of fisheries jurisdiction and reciprocal fishing rights, 1964-1976

After its initiatives at the 1960 Law of the Sea Conference failed, Canada continued to lobby for a partial multilateral treaty providing for a six-mile territorial sea plus a six-mile contiguous zone (Johnson and Zacher 1977). The United States administration rejected the partial treaty approach in 1963 and, in 1964, following the example of a number of other States (eg. Iceland in 1959 and Norway in 1960), Canada unilaterally extended its jurisdiction by establishing a nine-mile fishing zone beyond the three-mile territorial sea (An Act Respecting the Territorial Seas and Fishing Zones of Canada, assented to on July 16, 1964). According to the Act, the territorial sea limit would be drawn from straight baselines drawn from headland to headland. These baselines in fact were not set out in the Act. Canada permitted United States fishermen to fish in the newly established fishing zone, including major sections of the trolling grounds off the west coast of Vancouver Island. The United States initially was angered by Canada's unilateral move, but in 1966 joined Canada in establishing a nine-mile contiguous zone. By mutual consent, fisheries of both countries were allowed to continue in each other's newly established zones. In 1968, the two governments met to formalize reciprocal fishing arrangements. Discussions continued through 1969. The United States proposed that only traditional fisheries of each country be permitted to continue in the contiguous zone of the other country. This was rejected by Canada which was developing a number of new fisheries off the United States coast (eg. troll fisheries off Washington and Alaska) whereas United States fisheries off the Canadian coast were either static or declining.[6]

An agreement was reached in April 1970, providing for continuation of troll fishing by both countries in each other's contiguous zones but only off the coasts of Vancouver Island and Washington State; i.e., Canadians could no longer fish within 12 miles of the Alaska or Oregon coasts and United States fishermen could not fish off the north coast of British Columbia (Agreement between the Government of Canada and the Government of the United States of America on Reciprocal Fishing Privileges in Certain Areas off their Coasts. 1970). The agreement represented the

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6. Author's (MPS) interpretation from notes made at the time.

first step in a series of successive limitations in areas off the United States coast available to Canadian trollers. At the time, the Canadian troll fishery was aggressively expanding both its fishing power and fishing areas. As shown in Appendix Table 9, the fishery was becoming especially active off the coast of Washington. The agreement also stopped a growing Canadian freezer troller fishery that had developed off the coast of Southeast Alaska. At the same time, the United States troll fishery off Vancouver Island was declining (Table 12).

Over the next eight years there were successive negotiations of reciprocal agreements and finally, negotiations during 1977 and 1978 associated with the establishment of 200-mile fishing zones by both countries, which led to continuous limitations, and finally to the exclusion of areas off the United States coast available to Canadian fishermen. This trend reflected the strong desire on the part of the United States to reduce Canadian troll fisheries interception of substantial quantities of Washington-bound chinook and coho salmon. With its own troll fishery declining (partially as the result of restrictive policies favoring the development of sport and Indian fisheries) and depending less and less on waters off the coast of British Columbia, Washington had little to lose by pushing continuously for limitations in reciprocal fishing privileges.

After 1976, the pattern of the negotiations regarding reciprocal access within fishing zones developed as follows:

- by an exchange of notes on April 21, 1972, the 1970 Agreement was extended for one year to April 24, 1973;

- the Agreement was revised in April 1973 (for a one-year term) to limit the area available to Canadian trollers to between Carroll Island and Cape Flattery and to restrict United States trolling to banks off the Southwest corner of Vancouver Island (Agreement between the Government of Canada and the Government of the United States of America on Reciprocal Fishing Privileges in Certain Areas off their Coasts. 1973);

- by exchanges of notes in 1974, the 1973 Agreement was extended for one year to April 24, 1975 and in 1975, for an additional year to April 1976.

5.3.6 Reciprocal fishing rights viz a viz the establishment of 200-mile fishing zones

Following the 1960 Conference on the Law of the Sea, international debate on maritime problems switched to the Seabed

Committee of the United Nations. Beginning in Committee meetings in 1968, Canada pressed consistently to gain improvements in the legal regime of the sea which would improve the situation of coastal states. Those efforts were substantially rewarded during the Third United Nations Conference on the Law of the Sea that began in 1974. By 1975, coastal states were successful in achieving a consensus for extension of coastal state jurisdiction for exploitation and management of resources to an outer limit of 200 miles from the inner baselines of the territorial sea.

By 1976, both Canada and the United States had decided to extend their fisheries jurisdictions to 200-miles during 1977. The United States, however, had made the decision very late and there was little time for Canada and the United States to conduct bilateral discussions regarding access arrangements to permit fishermen of one country to continue fishing in the 200-mile zone of the other.

During 1976 serious problems arose in the implementation of the existing Reciprocal Fishing Agreement. Prior to the scheduled commencement of the fishery (June 15), Washington State authorities decided to delay the opening in United States waters off the coast of Washington and to implement a number of other measures later in the season. Canada objected to these actions, claiming that, as required by the Agreement, 60 days notice had not been given thus preventing any assessment of the proposed regulations by Canada. The problems were eventually finessed when the Canadian troll fleet voluntarily abided by the United States regulations, when the United States made a formal request to the Canadian Government to waive the 60-day notice requirement, and finally, when the United States court action prevented full application of the Washington State measures. Nevertheless, the awkward situation that had developed presaged even greater difficulties that were to arise in 1977. It was becoming increasingly obvious that United States and Canadian interests and procedures were clearly at odds and that the maintenance of reciprocal salmon fishing privileges within the 200-mile regimes of the two countries would be extremely difficult.

Following the 1976 season, Canadian and United States officials embarked upon a marathon series of negotiations aimed at developing long-term arrangements for cooperative management and reciprocal fishing privileges in the newly formed 200-mile zones. Canada had far greater interests in maintaining access to United States waters than the United States had in Canadian waters. In a number of instances (eg. the halibut fishery off the Alaskan coast) United States fishing interests were adamantly opposed to continued Canadian access. Under these difficult circumstances, in early 1977, with only a few weeks to go before the United States 200-mile limit came into force, the officials

abandoned the attempt to reach a long-term agreement and switched their attention to development of an agreement covering only the 1977 season. Even with such limited objectives, it took a meeting between Prime Minister Trudeau and President Carter to create the momentum for the short-term accord. The agreement was signed only days before the United States' limits came into force. The overall purpose of the 1977 Agreement was to preserve existing fishing patterns. For the Canadian troll fishery, therefore, the Agreement provided essentially the same conditions as had been provided in the 1973 Agreement, namely that Canadians could fish throughout the United States zone seaward of 12 miles, but only between 3 and 12 north of Carroll Island off the Washington coast.

With great difficulties and forbearance, the 1977 season passed without serious incident, but it was becoming obvious that the United States and Canadian systems and objectives were incompatible.

In the summer of 1977, the Governments renewed their attempts to resolve their fisheries differences. Two special negotiators were appointed, Ambassadors Marcel Cadieux of Canada and Lloyd Cutler of the United States. Their mandate extended beyond fisheries to include settlement of boundaries, mineral rights, etc.. The new negotiators developed an interim agreement for reciprocal fishing arrangements for the 1978 season. In the end, the fundamental differences between the two sides were too great to bridge and the arrangements collapsed. As outlined by Wang (1981):

> "The ink was hardly dry on the 1978 interim agreement before serious problems of implementation arose on both coasts. On the Pacific coast, the differences were over conservation measures for salmon in the boundary area. The United States claimed that there was a conservation need to close Swiftsure Bank, an area under Canadian jurisdiction, to salmon trolling from 15 April to 14 June on the grounds that fishing in this area (primarily by Canadian fishermen) would result in a high catch of immature salmon originating from United States spawning grounds. Canada indicated it was prepared to do so, to the detriment of Canadian fishermen, only on the basis of sound scientific evidence that a conservation problem really existed. Consequently, Canadian fisheries experts carried out tests closely monitoring Canadian fishing activities on Swiftsure Bank through April to determine whether a significant number of immature salmon were in fact being caught. They shared the findings and consulted with United States experts. Canada concluded that except in one quarter of Swiftsure Bank, which was

duly closed to salmon fishing, there was no conservation problem. The United States government, responding to pressure from fishing interests in the state of Washington, reiterated its request that Canada close all of Swiftsure Bank. In continuing consultations Canadian experts sought clarification of the grounds on which the United States based its conclusion that the situation gave rise to a conservation problem. If a problem existed, which stocks were involved and to what extent? The Canadian experts reported that they received no satisfactory response to their questions. In the meantime however feelings amongst the fishing communities on each side were running high about perceived discriminatory treatment under regulations on the other side. What began as a difference between scientists over the complex intermingling on Swiftsure Bank of various salmon stocks originating from Canadian and United States rivers quickly became a matter for pressure tactics and retaliatory measures.

In response to the Canadian failure to close Swiftsure Bank, the United States decided unilaterally in late April to revoke [the] privileges granted to Canadian fishermen under the 1978 interim agreement to troll for salmon in waters off Washington State.

Under the weight of these differences the 1978 interim agreement collapsed. On June 1 1978 Canada notified the United States that in consequence of difficulties encountered in respect of the implementation by the United States of the interim agreement, Canada was discontinuing provisional implementation of the agreement. As of noon on 4 June United States fishing vessels would no longer be permitted to continue fishing operations in Canadian fisheries waters."

5.3.7 The Pacific Salmon Treaty

As outlined above, the 1959 Conference on Coordination of Fisheries Regulations launched a debate on the implications of interceptions by fishermen of each country of salmon bound for the rivers of the other country. Over the next 25 years, frequent formal and informal meetings were held. Detailed discussion of the issues is beyond the purview of the present report. In short, however, Canadian concerns focussed on two problems:

- The provisions of the Fraser River Salmon Treaty which gave United States fishermen a 50:50 share of

sockeye and pink catches in the Fraser Convention Area. The concern arose mainly because production from major potential salmon enhancement projects on the Fraser (a river totally contained within Canada's borders) would have to be shared in perpetuity on a basis of virtual equality with the United States;

- Southeastern Alaska fisheries which took substantial quantities of salmon bound for British Columbia coastal rivers (particularly in northern British Columbia) and for Canadian sections of transboundary rivers draining to the sea through Southeast Alaska waters.

United States concerns (aside from not wanting to give up their advantageous position on the Fraser) focussed on Canadian interceptions of chinook and coho salmon bound for the rivers of Washington and Oregon. The majority of these interceptions occurred in the troll fisheries, particularly those operating off the west coast of Vancouver Island. Scientific information produced by both sides indicated that 80% or more of the chinook taken off southwest Vancouver Island were bound for the United States. As shown by Figures 18 and 19 (and Appendix Table 4), Canadian catches of chinook and coho in the west coast of Vancouver Island fishery increased markedly in the 1970s, representing an increasing threat to competing United States fishing further to the south around Washington.

By the early 1970s, the discussions had been elevated to the status of full treaty negotiations aimed at establishing principles for the control of interceptions. Around this time, both countries were becoming increasingly successful with their salmon enhancement programs, making it important to negotiate an interception agreement to ensure that each country would not lose the benefits of its enhancement programs to fishing by the other country. Involving a great deal of intricate technical discussion and major policy adjustments with respect to fishing opportunities afforded to different fleet segments in both countries, it was not until the early 1980s that an agreement was in sight. In 1981, agreements were reached on interim management plans for key fisheries during the 1982 season. Similar arrangements were made for 1983. By 1983, a framework for an overall agreement had been developed along with more interim arrangements for 1984. Finally, a full-fledged agreement was signed and ratified in early 1985 providing for both long-term arrangements and specific measures for the 1985 season. Concern over persistent declines in chinook salmon was a key factor in forcing the two sides to go the last mile to reach an agreement.

Very generally, the principles of the Treaty are to:

- prevent overfishing and provide for optimum production;
- provide for each Party to receive benefits equivalent to production of salmon originating in its waters;
- cooperate in management, research and enhancement.

In practical terms, the agreement and the interim arrangements that proceeded provided for the establishment of mutually agreed limits on levels of harvest in key intercepting fisheries.

The interim arrangements developed for the 1981-1983 seasons did not involve the troll fisheries of southern British Columbia, the subject of the present report. The longer term arrangements associated with the final treaty, however, provide for important limitations on the latter. The draft final treaty, first initialed in late 1983, included provisions for a chinook rebuilding plan involving cutbacks on fisheries in both countries in order to rehabilitate depressed stocks of that species originating in rivers of British Columbia and Washington/Oregon.

The United States government did not sign the agreement that had been initialed by the negotiators and the measures proposed for 1984 were not fully implemented. Nevertheless, Canada did place some restrictions on the southern British Columbia troll fisheries (eg. see Section 3.1.1). The final Treaty, ratified in early 1985, provided for catch ceilings of 360,000 chinook and 1.75 million coho in Canada's west coast of Vancouver Island troll fishery, and of 275,000 chinook for the Strait of Georgia sport and troll fishery. Some of the measures taken in 1985 to implement the agreement are mentioned in Section 3.1.1 and are described in detail by Shardlow et al. (1986).

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6.0 SUMMARY

Between 1957 and 1983 there were few changes to chinook and coho trolling seasons in Georgia Strait, Johnstone Strait, and on the west coast of Vancouver Island. Trolling for chinook was open seven days per week for approximately seven and one-half months per year (6.5 months on the west coast of Vancouver Island). Trolling for coho was open seven days per week, five and one-half months per year (4.5 months on the west coast of Vancouver Island). Prior to 1957, chinook fisheries were open ten to twelve months per year and coho fisheries were open six months per year. The practice of extending the chinook season during winter months was continued through the 1960s inside the surfline on the west coast, and in Georgia and Johnstone Straits. The only other regulation of consequence was the 26 in minimum size limit on chinook that was applied first in 1957 to troll catches seaward of the surfline.

Starting in the late 1970's, Canada began modifying the basic troll seasons to conserve chinook and to curtail troll harvest of sockeye, pink and chum. Modifications included periods when sockeye, pink and chum had to be released, placing most trolling in Johnstone Strait on the same times and areas as net fishing, and reductions to the "seven-day-per-week" chinook season in all areas.

The comprehensive Canada/United States Salmon Treaty came into force in 1985 and resulted in the most significant curtailment of B.C. troll fisheries to date. Because the treaty placed southern B.C. chinook and coho fisheries under catch limits (Georgia Strait chinook 275,000, west coast chinook 360,000, and west coast coho 1.75 million), 1985 trolling seasons were reduced to less than four months. Many changes to fishing areas were adopted to ensure catch limits were not exceeded or fisheries prematurely closed.

In spite of major regulatory changes in recent years, total troll catches in Georgia Strait, Johnstone Strait and on the west coast of Vancouver Island did not decline. Catch trends have not been the same for each species, however. Chinook catches dropped in all areas, coho catches declined in Georgia and Johnstone Straits, but increased on the west coast, and pink, sockeye, and chum catches increased dramatically in all areas. Clearly trollers are in the process of switching effort to sockeye, pink and chum as regulations stiffen on the traditional troll species, chinook and coho.

The troll fishery is changing in other respects. Troll catch per day fishing and catch per vessel have been increasing, and the proportion of the troll catch taken by freezer trollers

account for over one quarter of troll landings. In brief, trollers have greatly increased in flexibility and efficiency over the last ten years.

The troll fishery has long been a focus of bilateral fisheries relations between the United States and Canada on the Pacific coast. Prior to 1960, B.C. troll regulations resulted mainly from this interrelationship and the coastwide troll fisheries' growing exploitation of a mixture of chinook and coho stocks from both countries. Major regulations were the 26 inch size limit on chinook and trolling seasons outside the surfline. These were coordinated between the two countries.

During the late 1960s and 1970s Canada developed a significant troll fishery for chinook and coho off the United States coast; in contrast, the U.S. troll fishery off the B.C. coast was on the wane and was virtually non-existent by 1968. Extensions of fisheries jurisdictions by both countries between 1974 and 1978 gradually reduced fishing opportunities for B.C. trollers. In 1978, only one year after both countries declared 200-mile limits, all reciprocal salmon fishing privileges ended.

Overlaying the politics of Canada/U.S. salmon relations was mounting concern through the 1980s over the status of chinook and coho stocks. These species had long been pawns in an often acrimonious debate over which country was intercepting more of the other's salmon. With adoption of the Comprehensive Salmon Treaty in 1985, both countries accepted treaty obligations to limit chinook and coho fisheries. This has finally set the stage for effective management of troll fisheries. By the response of trollers to the 1985 season, it would appear they are facing up to this challenge.

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APPENDIX TABLES

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Appendix Table 1. Standardization of areas used to present troll vessel distributions in Georgia Strait in 1970, 1984 and 1985.

Area Name	Management Subareas (1985)	Flight Areas (1984)	Flight Areas (1970)
Stuart Island	13-18, 13-20, 13-23	13-G, 13-H	39
Cape Mudge to Discovery Passage	13-1 - 13-5, 13-7, 13-13 - 13-15	13-A - 13-E	37, 38
Lund to Cortez Island Strait	15-2 - 15-5	15-A, 15-C, 15-D	40-44
Cape Lazo to Black Creek	14-13	14-J - 14-L	33-36
North end Texada Island	16-22	16-I	45
Hornby and Denman Islands	14-7 - 14-11, 14-5, 14-14	14-C, 14-D, 14-F	27-32
mid-Gulf north	14-6, 14-12, 16-20, 16-21	14-H, 16-D	
Malaspina Strait- Jervis Inlet	16-2 - 16-18, 15-1	16-B, 16-C, 16-F, 16-G, 16-J	46-51
Thormamby Is. to Lasqueti Island	14-3, 16-1, 16-19	14-G, 16-A	52-53
Qualicum	14-1, 14-2 14-4	14-A, 14-B	24-26
Nanoose-Nanaimo	17-12, 17-13 17-18 - 17-21	17-E, 17-F	22-23
Sunshine coast, lower mid-Gulf	17-11, 29-1, 29-2	17-G, 29-F	54-57
Fraser "dropoff"	28-7, 29-3, 29-4, 29-6	28-A, 29-A	61-63
Stuart Channel, Porlier and Gabriola Passes	17-1 - 17-10, 17-7, 29-5	17-A - 17-D	17-21
Sansum Narrows	18-7, 18-8	18-A	15, 16
Sidney	19-5, 19-6		9, 10
Southern Gulf Islands and Active Pass	18-1 - 18-6, 18-9 - 18-11	18-B - 18-D	11-14
Juan de Fuca Strait	19-1 - 19-4, 20-5 - 20-7	19-F	

Appendix Table 2. Calendar dates corresponding to statistical weeks for years in Tables 4-8 and for "example" years, Continued.*

Statistical Month-Week	1951	1952 #	1956 #	1957	1960 #	1963	1965	1966	1967
1-1	D 31-J 6	D 30-J 5	J 1-7	D 30-J 5	D 27-J 2	D 30-J 5	D 27-J 2	D 26-J 1	J 1-7
1-2	J 7-13	J 6-12	J 8-14	J 6-12	J 3-9	J 6-12	J 3-9	J 2-8	J 8-14
1-3	J 14-20	J 13-19	J 15-21	J 13-19	J 10-16	J 13-19	J 10-16	J 9-15	J 15-21
1-4	J 21-27	J 20-26	J 22-28	J 20-26	J 17-23	J 20-26	J 17-23	J 16-22	J 22-28
1-5	J 28-F 3	J 27-F 2	J 29-F 4	J 27-F 2	J 24-30	J 27-F 2	J 24-30	J 23-29	J 29-F 4
2-1	F 4-10	F 3-9	F 5-11	F 3-9	J 31-F 6	F 3-9	J 31-F 6	J 30-F 5	F 5-11
2-2	F 11-17	F 10-16	F 12-18	F 10-16	F 7-13	F 10-16	F 7-13	F 6-12	F 12-18
2-3	F 18-24	F 17-23	F 19-25	F 17-23	F 14-20	F 17-23	F 14-20	F 13-19	F 19-25
2-4	F 25-M 3	F 24-M 1	F 26-M 3	F 24-M 2	F 21-27	F 24-M 2	F 21-27	F 20-26	F 26-M 4
3-1	M 4-10	M 2-8	M 4-10	M 3-9	F 28-M 5	M 3-9	F 28-M 6	F 27-M 5	M 5-11
3-2	M 11-17	M 9-15	M 11-17	M 10-16	M 6-12	M 10-16	M 7-13	M 6-12	M 12-18
3-3	M 18-24	M 16-22	M 18-24	M 17-23	M 13-19	M 17-23	M 14-20	M 13-19	M 19-25
3-4	M 25-31	M 23-29	M 25-31	M 24-30	M 20-26	M 24-30	M 21-27	M 20-26	M 26-A 1
4-1	A 1-7	M 30-A 5	A 1-7	M 31-A 6	M 27-A 2	M 31-A 6	M 28-A 3	M 27-A 2	A 2-8
4-2	A 8-14	A 6-12	A 8-14	A 7-13	A 3-9	A 7-13	A 4-10	A 3-9	A 9-15
4-3	A 15-21	A 13-19	A 15-21	A 14-20	A 10-16	A 14-20	A 11-17	A 10-16	A 16-22
4-4	A 22-28	A 20-26	A 22-28	A 21-27	A 17-23	A 21-27	A 18-24	A 17-23	A 23-29
4-5	A 29-M 5	A 27-M 3	A 29-M 5	A 28-M 4	A 24-30	A 28-M 4	A 25-M 1	A 24-30	A 30-M 6
5-1	M 6-12	M 4-10	M 6-12	M 5-11	M 1-7	M 5-11	M 2-8	M 1-7	M 7-13
5-2	M 13-19	M 11-17	M 13-19	M 12-18	M 8-14	M 12-18	M 9-15	M 8-14	M 14-20
5-3	M 20-26	M 18-24	M 20-26	M 19-25	M 15-21	M 19-25	M 16-22	M 15-21	M 21-27
5-4	M 27-J 2	M 25-M 31	M 27-J 2	M 26-J 1	M 22-28	M 26-J 1	M 23-29	M 22-28	M 28-J 3
6-1	J 3-9	J 1-7	J 3-9	J 2-8	M 29-J 4	J 2-8	M 30-J 5	M 29-J 4	J 4-10
6-2	J 10-16	J 8-14	J 10-16	J 9-15	J 5-11	J 9-15	J 6-12	J 5-11	J 11-17
6-3	J 17-23	J 15-21	J 17-23	J 16-22	J 12-18	J 16-22	J 13-19	J 12-18	J 18-24
6-4	J 24-30	J 22-28	J 24-30	J 23-29	J 19-25	J 23-29	J 20-26	J 19-25	J 25-Jy 1
7-1	Jy 1-7	J 29-Jy 5	Jy 1-7	J 30-Jy 6	J 26-Jy 2	J 30-Jy 6	J 27-Jy 3	J 26-Jy 2	Jy 2-8
7-2	Jy 8-14	Jy 6-12	Jy 8-14	Jy 7-13	Jy 3-9	Jy 7-13	Jy 4-10	Jy 3-9	Jy 9-15
7-3	Jy 15-21	Jy 13-19	Jy 15-21	Jy 14-20	Jy 10-16	Jy 14-20	Jy 11-17	Jy 10-16	Jy 16-22
7-4	Jy 22-28	Jy 20-26	Jy 22-28	Jy 21-27	Jy 17-23	Jy 21-27	Jy 18-24	Jy 17-23	Jy 23-29
7-5	Jy 29-A 4	Jy 27-A 2	Jy 29-A 4	Jy 28-A 3	Jy 24-30	Jy 28-A 3	Jy 25-31	Jy 24-30	Jy 30-A 5
8-1	A 5-11	A 3-9	A 5-11	A 4-10	Jy 31-A 6	A 4-10	A 1-7	Jy 31-A 6	A 6-12
8-2	A 12-18	A 10-16	A 12-18	A 11-17	A 7-13	A 11-17	A 8-14	A 7-13	A 13-19
8-3	A 19-25	A 17-23	A 19-25	A 18-24	A 14-20	A 18-24	A 15-21	A 14-20	A 20-26
8-4	A 26-S 1	A 24-30	A 26-S 1	A 25-31	A 21-27	A 25-31	A 22-28	A 21-27	A 27-S 2
9-1	S 2-8	A 31-S 6	S 2-8	S 1-7	A 28-S 3	S 1-7	A 29-S 4	A 28-S 3	S 3-9
9-2	S 9-15	S 7-13	S 9-15	S 8-14	S 4-10	S 8-14	S 5-11	S 4-10	S 10-16
9-3	S 16-22	S 14-20	S 16-22	S 15-21	S 11-17	S 15-21	S 12-18	S 11-17	S 17-23
9-4	S 23-29	S 21-27	S 23-29	S 22-28	S 18-24	S 22-28	S 19-25	S 18-24	S 24-30
10-1	S 30-O 6	S 28-O 4	S 30-O 6	S 29-O 5	S 25-O 1	S 29-O 5	S 26-O 2	S 25-O 1	O 1-7
10-2	O 7-13	O 5-11	O 7-13	O 6-12	O 2-8	O 6-12	O 3-9	O 2-8	O 8-14
10-3	O 14-20	O 12-18	O 14-20	O 13-19	O 9-15	O 13-19	O 10-16	O 9-15	O 15-21
10-4	O 21-27	O 19-25	O 21-27	O 20-26	O 16-22	O 20-26	O 17-23	O 16-22	O 22-28
10-5	O 28-N 3	O 26-N 1	O 28-N 3	O 27-N 2	O 23-29	O 27-N 2	O 24-30	O 23-29	O 29-N 4
11-1	N 4-10	N 2-8	N 4-10	N 3-9	O 30-N 5	N 3-9	O 31-N 6	O 30-N 5	N 5-11
11-2	N 11-17	N 9-15	N 11-17	N 10-16	N 6-12	N 10-16	N 7-13	N 6-12	N 12-18
11-3	N 18-24	N 16-22	N 18-24	N 17-23	N 13-19	N 17-23	N 14-20	N 13-19	N 19-25
11-4	N 25-D 1	N 23-29	N 25-D 1	N 24-30	N 20-26	N 24-30	N 21-27	N 20-26	N 26-D 2
12-1	D 2-8	N 30-D 6	D 2-8	D 1-7	N 27-D 3	D 1-7	N 28-D 4	N 27-D 3	D 3-9
12-2	D 9-15	D 7-13	D 9-15	D 8-14	D 4-10	D 8-14	D 5-11	D 4-10	D 10-16
12-3	D 16-22	D 14-20	D 16-22	D 15-21	D 11-17	D 15-21	D 12-18	D 11-17	D 17-23
12-4	D 23-29	D 21-27	D 23-29	D 22-28	D 18-24	D 22-28	D 19-25	D 18-24	D 24-30
12-5								D 25-31	

* Source: Anon (1951-1985) # Leap year.

Appendix Table 2. Continued.

Statistical Month-Week	1968	1969	1970	1971	1972	1973	1974	1975	1976
1-1	D 31-J 6	D 29-J 4	D 28-J 3	D 27-J 2	D 26-J 1	D 24-30	D 30-J 5	D 29-J 4	D 28-J 3
1-2	J 7-13	J 5-11	J 4-10	J 3-9	J 2-8	D 31-J 6	J 6-12	J 5-11	J 4-10
1-3	J 14-20	J 12-18	J 11-17	J 10-16	J 9-15	J 7-13	J 13-19	J 12-18	J 11-17
1-4	J 21-27	J 19-25	J 18-24	J 17-23	J 16-22	J 14-20	J 20-26	J 19-25	J 18-24
1-5	J 28-F 3	J 26-F 1	J 25-31	J 24-30	J 23-29	J 21-27	J 27-F 2	J 26-F 1	J 25-31
2-1	F 4-10	F 2-8	F 1-7	J 31-F 6	J 30-F 5	J 28-F 3	F 3-9	F 2-8	F 1-7
2-2	F 11-17	F 9-15	F 8-14	F 7-13	F 6-12	F 4-10	F 10-16	F 9-15	F 8-14
2-3	F 18-24	F 16-22	F 15-21	F 14-20	F 13-19	F 11-17	F 17-23	F 16-22	F 15-21
2-4	F 25-M 2	F 23-M 1	F 22-28	F 21-27	F 20-26	F 18-24	F 24-M 2	F 23-M 1	F 22-28
3-1	M 3-9	M 2-8	M 1-7	F 28-M 6	F 27-M 4	F 25-M 3	M 3-9	M 2-8	F 29-M 6
3-2	M 10-16	M 9-15	M 8-14	M 7-13	M 5-11	M 4-10	M 10-16	M 9-15	M 7-13
3-3	M 17-23	M 16-22	M 15-21	M 14-20	M 12-18	M 11-17	M 17-23	M 16-22	M 14-20
3-4	M 24-30	M 23-29	M 22-28	M 21-27	M 19-25	M 18-24	M 24-30	M 23-29	M 21-27
4-1	M 31-A 6	M 30-A 5	M 29-A 4	M 28-A 3	M 26-A 1	M 25-31	M 31-A 6	M 30-A 5	M 28-A 3
4-2	A 7-13	A 6-12	A 5-11	A 4-10	A 2-8	A 1-7	A 7-13	A 6-12	A 4-10
4-3	A 14-20	A 13-19	A 12-18	A 11-17	A 9-15	A 8-14	A 14-20	A 13-19	A 11-17
4-4	A 21-27	A 20-26	A 19-25	A 18-24	A 16-22	A 15-21	A 21-27	A 20-26	A 18-24
4-5	A 28-M 4	A 27-M 3	A 26-M 2	A 25-M 1	A 23-29	A 22-28	A 28-M 4	A 27-M 3	A 25-M 1
5-1	M 5-11	M 4-10	M 3-9	M 2-8	A 30-M 6	A 29-M 5	M 5-11	M 4-10	M 2-8
5-2	M 12-18	M 11-17	M 10-16	M 9-15	M 7-13	M 6-12	M 12-18	M 11-17	M 9-15
5-3	M 19-25	M 18-24	M 17-23	M 16-22	M 14-20	M 13-19	M 19-25	M 18-24	M 16-22
5-4	M 26-J 1	M 25-M 31	M 24-30	M 23-29	M 21-27	M 20-26	M 26-J 1	M 25-M 31	M 23-29
6-1	J 2-8	J 1-7	M 31-J 6	M 30-J 5	M 28-J 3	M 27-J 2	J 2-8	J 1-7	M 30-J 5
6-2	J 9-15	J 8-14	J 7-13	J 6-12	J 4-10	J 3-9	J 9-15	J 8-14	J 6-12
6-3	J 16-22	J 15-21	J 14-20	J 13-19	J 11-17	J 10-16	J 16-22	J 15-21	J 13-19
6-4	J 23-29	J 22-28	J 21-27	J 20-26	J 18-24	J 17-23	J 23-29	J 22-28	J 20-26
7-1	J 30-Jy 6	J 29-Jy 5	J 28-Jy 4	J 27-Jy 3	J 25-Jy 1	J 24-30	J 30-Jy 6	J 29-Jy 5	J 27-Jy 3
7-2	Jy 7-13	Jy 6-12	Jy 5-11	Jy 4-10	Jy 2-8	Jy 1-7	Jy 7-13	Jy 6-12	Jy 4-10
7-3	Jy 14-20	Jy 13-19	Jy 12-18	Jy 11-17	Jy 9-15	Jy 8-14	Jy 14-20	Jy 13-19	Jy 11-17
7-4	Jy 21-27	Jy 20-26	Jy 19-25	Jy 18-24	Jy 16-22	Jy 15-21	Jy 21-27	Jy 20-26	Jy 18-24
7-5	Jy 28-A 3	Jy 27-A 2	Jy 26-A 1	Jy 25-31	Jy 23-29	Jy 22-28	Jy 28-A 3	Jy 27-A 2	Jy 25-31
8-1	A 4-10	A 3-9	A 2-8	A 1-7	Jy 30-A 5	Jy 29-A 4	A 4-10	A 3-9	A 1-7
8-2	A 11-17	A 10-16	A 9-15	A 8-14	A 6-12	A 5-11	A 11-17	A 10-16	A 8-14
8-3	A 18-24	A 17-23	A 16-22	A 15-21	A 13-19	A 12-18	A 18-24	A 17-23	A 15-21
8-4	A 25-31	A 24-30	A 23-29	A 22-28	A 20-26	A 19-25	A 25-31	A 24-30	A 22-28
9-1	S 1-7	A 31-S 6	A 30-S 5	A 29-S 4	A 27-S 2	A 26-S 1	S 1-7	A 31-S 6	A 29-S 4
9-2	S 8-14	S 7-13	S 6-12	S 5-11	S 3-9	S 2-8	S 8-14	S 7-13	S 5-11
9-3	S 15-21	S 14-20	S 13-19	S 12-18	S 10-16	S 9-15	S 15-21	S 14-20	S 12-18
9-4	S 22-28	S 21-27	S 20-26	S 19-25	S 17-23	S 16-22	S 22-28	S 21-27	S 19-25
10-1	S 29-O 5	S 28-O 4	S 27- O 3	S 26-O 2	S 24-S 30	S 23-29	S 29-O 5	S 28-O 4	S 26-O 2
10-2	O 6-12	O 5-11	O 4-10	O 3-9	O 1-7	S 30-O 6	O 6-12	O 5-11	O 3-9
10-3	O 13-19	O 12-18	O 11-17	O 10-16	O 8-14	O 7-13	O 13-19	O 12-18	O 10-16
10-4	O 20-26	O 19-25	O 18-24	O 17-23	O 15-21	O 14-20	O 20-26	O 19-25	O 17-23
10-5	O 27-N 2	O 26-N 1	O 25-31	O 24-30	O 22-28	O 21-27	O 27-N 2	O 26-N 1	O 24-30
11-1	N 3-9	N 2-8	N 1-7	O 31-N 6	O 29-N 4	O 28-N 3	N 3-9	N 2-8	O 31-N 6
11-2	N 10-16	N 9-15	N 8-14	N 7-13	N 5-11	N 4-10	N 10-16	N 9-15	N 7-13
11-3	N 17-23	N 16-22	N 15-21	N 14-20	N 12-18	N 11-17	N 17-23	N 16-22	N 14-20
11-4	N 24-30	N 23-29	N 22-28	N 21-27	N 19-25	N 18-24	N 24-30	N 23-29	N 21-27
12-1	D 1-7	N 30-D 6	N 29-D 5	N 28-D 4	N 26-D 2	N 25-D 1	D 1-7	N 30-D 6	N 28-D 4
12-2	D 8-14	D 7-13	D 6-12	D 5-11	D 3-9	D 2-8	D 8-14	D 7-13	D 5-11
12-3	D 15-21	D 14-20	D 13-19	D 12-18	D 10-16	D 9-15	D 15-21	D 14-20	D 12-18
12-4	D 22-28	D 21-27	D 20-26	D 19-25	D 17-23	D 16-22	D 22-28	O 21-27	D 19-25
12-5						D 23-29			

Appendix Table 2. Continued.

Statistical Month-Week	1977	1978	1979	1980	1981	1982	1983	1984	1985
1-1	D 26-J 1	J 1-7	D 31-J 6	D 30-J 5	D 28-J 3	D 27-J 2	D 26-J 1	J 1-7	D 30-J 5
1-2	J 2-8	J 8-14	J 7-13	J 6-12	J 4-10	J 3-9	J 2-8	J 8-14	J 6-12
1-3	J 9-15	J 15-21	J 14-20	J 13-19	J 11-17	J 10-16	J 9-15	J 15-21	J 13-19
1-4	J 16-22	J 22-28	J 21-27	J 20-26	J 18-24	J 17-23	J 16-22	J 22-28	J 20-26
1-5	J 23-29	J 29-F 4	J 28-F 3	J 27-F 2	J 25-31	J 24-30	J 23-29	J 29-F 4	J 27-F 2
2-1	J 30-F 5	F 5-11	F 4-10	F 3-9	F 1-7	J 31-F 6	J 30-F 5	F 5-11	F 3-9
2-2	F 6-12	F 12-18	F 11-17	F 10-16	F 8-14	F 7-13	F 6-12	F 12-18	F 10-16
2-3	F 13-19	F 19-25	F 18-24	F 17-23	F 15-21	F 14-20	F 13-19	F 19-25	F 17-23
2-4	F 20-26	F 26-M 4	F 25-M 3	F 24-M 1	F 22-28	F 21-27	F 20-26	F 26-M 3	F 24-M 2
3-1	F 27-M 5	M 5-11	M 4-10	M 2-8	M 1-7	F 28-M 6	F 27-M 5	M 4-10	M 3-9
3-2	M 6-12	M 12-18	M 11-17	M 9-15	M 8-14	M 7-13	M 6-12	M 11-17	M 10-16
3-3	M 13-19	M 19-25	M 18-24	M 16-22	M 15-21	M 14-20	M 13-19	M 18-24	M 17-23
3-4	M 20-26	M 26-A 1	M 25-31	M 23-29	M 22-28	M 21-27	M 20-26	M 25-31	M 24-30
4-1	M 27-A 2	A 2-8	A 1-7	M 30-A 5	M 29-A 4	M 28-A 3	M 27-A 2	A 1-7	M 31-A 6
4-2	A 3-9	A 9-15	A 8-14	A 6-12	A 5-11	A 4-10	A 3-9	A 8-14	A 7-13
4-3	A 10-16	A 16-22	A 15-21	A 13-19	A 12-18	A 11-17	A 10-16	A 15-21	A 14-20
4-4	A 17-23	A 23-29	A 22-28	A 20-26	A 19-25	A 18-24	A 17-23	A 22-28	A 21-27
4-5	A 24-30	A 30-M 6	A 29-M 5	A 27-M 3	A 26-M 2	A 25-M 1	A 24-30	A 29-M 5	A 28-M 4
5-1	M 1-7	M 7-13	M 6-12	M 4-10	M 3-9	M 2-8	M 1-7	M 6-12	M 5-11
5-2	M 8-14	M 14-20	M 13-19	M 11-17	M 10-16	M 9-15	M 8-14	M 13-19	M 12-18
5-3	M 15-21	M 21-27	M 20-26	M 18-24	M 17-23	M 16-22	M 15-21	M 20-26	M 19-25
5-4	M 22-28	M 28-J 3	M 27-J 2	M 25-M 31	M 24-30	M 23-29	M 22-28	M 27-J 2	M 26-J 1
6-1	M 29-J 4	J 4-10	J 3-9	J 1-7	M 31-J 6	M 30-J 5	M 29-J 4	J 3-9	J 2-8
6-2	J 5-11	J 11-17	J 10-16	J 8-14	J 7-13	J 6-12	J 5-11	J 10-16	J 9-15
6-3	J 12-18	J 18-24	J 17-23	J 15-21	J 14-20	J 13-19	J 12-18	J 17-23	J 16-22
6-4	J 19-25	J 25-Jy 1	J 24-30	J 22-28	J 21-27	J 20-26	J 19-25	J 24-30	J 23-29
7-1	J 26-Jy 2	Jy 2-8	Jy 1-7	J 29-Jy 5	J 28-Jy 4	J 27-Jy 3	J 26-Jy 2	Jy 1-7	J 30-Jy 6
7-2	Jy 3-9	Jy 9-15	Jy 8-14	Jy 6-12	Jy 5-11	Jy 4-10	Jy 3-9	Jy 8-14	Jy 7-13
7-3	Jy 10-16	Jy 16-22	Jy 15-21	Jy 13-19	Jy 12-18	Jy 11-17	Jy 10-16	Jy 15-21	Jy 14-20
7-4	Jy 17-23	Jy 23-29	Jy 22-28	Jy 20-26	Jy 19-25	Jy 18-24	Jy 17-23	Jy 22-28	Jy 21-27
7-5	Jy 24-30	Jy 30-A 5	Jy 29-A 4	Jy 27-A 2	Jy 26-A 1	Jy 25-31	Jy 24-30	Jy 29-A 4	Jy 28-A 3
8-1	Jy 31-A 6	A 6-12	A 5-11	A 3-9	A 2-8	A 1-7	Jy 31-A 6	A 5-11	A 4-10
8-2	A 7-13	A 13-19	A 12-18	A 10-16	A 9-15	A 8-14	A 7-13	A 12-18	A 11-17
8-3	A 14-20	A 20-26	A 19-25	A 17-23	A 16-22	A 15-21	A 14-20	A 19-25	A 18-24
8-4	A 21-27	A 27-S 2	A 26-S 1	A 24-30	A 23-29	A 22-28	A 21-27	A 26-S 1	A 25-31
9-1	A 28-S 3	S 3-9	S 2-8	A 31-S 6	A 30-S 5	A 29-S 4	A 28-S 3	S 2-8	S 1-7
9-2	S 4-10	S 10-16	S 9-15	S 7-13	S 6-12	S 5-11	S 4-10	S 9-15	S 8-14
9-3	S 11-17	S 17-23	S 16-22	S 14-20	S 13-19	S 12-18	S 11-17	S 16-22	S 15-21
9-4	S 18-24	S 24-30	S 23-29	S 21-27	S 20-26	S 19-25	S 18-24	S 23-29	S 22-28
10-1	S 25-O 1	O 1-7	S 30-O 6	S 28-O 4	S 27- O 3	S 26-O 2	S 25-O 1	S 30-O 6	S 29-O 5
10-2	O 2-8	O 8-14	O 7-13	O 5-11	O 4-10	O 3-9	O 2-8	O 7-13	O 6-12
10-3	O 9-15	O 15-21	O 14-20	O 12-18	O 11-17	O 10-16	O 9-15	O 14-20	O 13-19
10-4	O 16-22	O 22-28	O 21-27	O 19-25	O 18-24	O 17-23	O 16-22	O 21-27	O 20-26
10-5	O 23-29	O 29-N 4	O 28-N 3	O 26-N 1	O 25-31	O 24-30	O 23-29	O 28-N 3	O 27-N 2
11-1	O 30-N 5	N 5-11	N 4-10	N 2-8	N 1-7	O 31-N 6	O 30-N 5	N 4-10	N 3-9
11-2	N 6-12	N 12-18	N 11-17	N 9-15	N 8-14	N 7-13	N 6-12	N 11-17	N 10-16
11-3	N 13-19	N 19-25	N 18-24	N 16-22	N 15-21	N 14-20	N 13-19	N 18-24	N 17-23
11-4	N 20-26	N 26-D 2	N 25-D 1	N 23-29	N 22-28	N 21-27	N 20-26	N 25-D 1	N 24-30
12-1	N 27-D 3	D 3-9	D 2-8	N 30-D 6	N 29-D 5	N 28-D 4	N 27-D 3	D 2-8	D 1-7
12-2	D 4-10	D 10-16	D 9-15	D 7-13	D 6-12	D 5-11	D 4-10	D 9-15	D 8-14
12-3	D 11-17	D 17-23	D 16-22	D 14-20	D 13-19	D 12-18	D 11-17	D 16-22	D 15-21
12-4	D 18-24	D 24-30	D 23-29	D 21-27	D 20-26	D 19-25	D 18-24	D 23-29	D 22-28
12-5	D 25-31						D 25-31		

Appendix Table 3. Dates for open troll seasons for coho and chinook, for closures to all trolling during coho/chinook seasons, and for troll non-retention periods for sockeye, pink and chum, 1951-1984. Closed periods for chinook also include other salmon species.

Species	Season/ Non-Retention	Areas	Effective Years
GEORGIA STRAIT			
Coho	Jun 1 - Nov 30	13-20, 29	<1951- 1955
Coho	Jun 15- Nov 30	13-20, 29	1956 - 1964
Coho	Jul 1 - Sep 30	13-20, 29	1965 - 1983
Coho	Jul 1 - Aug 31	13-20, 29	1984 - 1984
Chinook	Feb 1 - Nov 30	13-20, 29	<1951- 1964
Chinook	Feb 1 - Sep 30	13-20, 29	1965 - 1965
Chinook	Apr 15- Sep 30	13-20, 29	1966 - 1983
Chinook	Jul 1 - Aug 31	13-20, 29	1984 - 1984
Closure	Jun 24- Jun 30	13 south, 14	1979 - 1979*
Closure	Aug 20- Aug 26	13	1979 - 1979*
Pink	Apr 15-Jun 15, Jul 15-Aug 15	13	1971 - 1971*
Sockeye/Pink	Aug 15 - Aug 26	13-20, 29	1978 - 1978
Pink	Aug 27 - Sep 17	13	1979 - 1979*
Chum	Sep 17 - Sep 30	13	1979 - 1979*
Chum	Sep 22 - Sep 30	14-18, 29	1979 - 1979
Pink	Jul 31 - Aug 26	13-16	1979 - 1979
Chum	Sep 8 - Sep 30	13	1980 - 1980*
Soc/Pink/Chum	Jun 16 - Sep 7	13-20, 29	1980 - 1980
JOHNSTONE STRAIT (inside surfline)			
Coho	Jun 1 - Nov 30	11-12	<1951- 1951
Coho	Jun 15- Nov 30	11-12	1952 - 1980
Coho	Jul 1 - Sep 30	11-12	1981 - 1983
Coho	Jul 1 - Sep 19	11-12	1984 - 1984
Chinook	Feb 1 - Nov 30	11-12	<1951- 1978
Chinook	Apr 15- Nov 30	11-12	1979 - 1980
Chinook	Apr 15- Sep 30	11-12	1981 - 1983
Chinook	Jul 1 - Sep 19	11-12	1984 - 1984
Closure	Jun 24- Jul 15	11	1973 - 1973
Closure	Jun 30- Jul 21	11	1974 - 1974
Closure	Jun 29- Jul 20	11	1975 - 1975
Closure	Jul 3 - Jul 24	11	1977 - 1977
Closure	Jun 25- Jul 23	11	1978 - 1978
Closure	Jun 24-Jul 27, Aug 2-Aug 21	11	1979 - 1979
Closure	Jun 23- Jul 21	11	1980 - 1980
Closure	Jun 17- Jun 30	11	1983 - 1983
Sockeye	Jun 22- Jul 10	11	1971 - 1971
Sockeye/Pink	Jul 11- Jul 18	11	1971 - 1971
Pink	Jul 19- Aug 21	11	1971 - 1971
Sockeye/Pink	Aug 12- Aug 26	11	1978 - 1978
Sockeye	Jul 22- Jul 29	11	1979 - 1979
Chum	Sep 15- Nov 30	11	1979 - 1979
Sockeye	Jul 28- Sep 8	11	1980 - 1980
Chum	Sep 8 - Nov 30	11	1980 - 1980
JOHNSTONE STRAIT (inside surfline)			
Soc/Pink/Chum	Jun 28- Sep 8	11	1981 - 1981
Sockeye	Aug 27- Sep 30	11	1982 - 1982
Soc/Pink/Chum	Jul 1 - Jul 27	11	1983 - 1983
Pink	Jul 11- Aug 15	12	1971 - 1971
Sockeye/Pink	Aug 12- Aug 26	12	1978 - 1978
Pink	Sep 10- Sep 17	12	1978 - 1978
Sockeye	Jul 8 - Jul 29	12 north	1979 - 1979*
Pink	Aug 3 - Sep 17	12	1979 - 1979
Chum	Sep 15- Nov 30	12	1979 - 1979
Soc/Pink/Chum	Apr 15- Sep 30	12	1980 - 1980
Soc/Pink/Chum	Jul 1 - Sep 30	12	1984 - 1984
WEST COAST VANCOUVER ISLAND (outside surfline)			
Coho	Jun 1 - Nov 30	121-127	<1951- 1951
Coho	Jun 15- Nov 30	121-127	1952 - 1956
Coho	Jun 15- Oct 31	121-127	1957 - 1980
Coho	Jul 1 - Sep 30	121-127	1981 - 1983
Coho	Jul 1 - Sep 19	121-127	1984 - 1984
Chinook	Feb 1 - Nov 30	121-127	<1951- 1956
Chinook	Apr 15- Oct 31	121-127	1957 - 1980
Chinook	Apr 15- Sep 30	121-127	1981 - 1983
Chinook	Apr 15-Jun 15, Jul 1-Sep 19	121-127	1984 - 1984
Closure	Aug 14- Aug 19	121-123,127	1982 - 1982*
Closure	Aug 20- Aug 23	121	1982 - 1982*
Sockeye	Aug 12- Aug 26	121-127	1978 - 1978
Sockeye	Aug 20- Aug 23	123	1982 - 1982*
Sockeye/Pink	Jun 14- Jul 24	124-127	1983 - 1983
Sockeye/Pink	Jun 14 - ?	121-123	1983 - 1983
WEST COAST VANCOUVER ISLAND (inside surfline)			
Coho	Jun 1 - Nov 30	21-27	<1951- 1951
Coho	Jun 15- Nov 30	21-27	1952 - 1980
Coho	Jul 1 - Sep 30	21-27	1981 - 1983
Coho	Jul 1 - Sep 19	21-27	1984 - 1984
Chinook	Feb 1 - Nov 30	21-27	<1951- 1976
Chinook	Feb 1 - Nov 30	21-25, 27	1977 - 1977
Chinook	Apr 15- Nov 30	26	1977 - 1977
Chinook	Feb 1 - Nov 30	21-24, 27	1978 - 1978
Chinook	Apr 15- Nov 30	25-26	1978 - 1978
Chinook	Feb 1 - Nov 30	21-23	1979 - 1980
Chinook	Apr 15- Nov 30	24-27	1979 - 1980
Chinook	Feb 1 - Sep 30	21-23	1981 - 1981
Chinook	Apr 15- Sep 30	24-27	1981 - 1981
Chinook	Apr 15- Sep 30	21-27	1982 - 1983
Chinook	Apr 15-Jun 15, Jul 1-Sep 19	21-27	1984 - 1984

* Not included on symbol part of Tables 4 to 8.

Appendix Table 4. Troll fishery catch in pieces and tonnes (dressed weight) and average fish weight (dressed) for Georgia Strait (areas 13 - 20, 28, 29), 1951-1985.*

Year	Chinook			Coho			Sockeye			Pink			Chum			Total		Days Fishing
	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	
1951	67560	261	8.5	201698	414	4.5	206	0.5	5.3	5551	13	5.0	432	2	10.0	275447	690	36411
1952	78326	320	9.0	425617	770	4.0	149	0.4	5.4	2520	5	4.0	297	1	9.8	506909	1096	42126
1953	119591	446	8.2	443628	731	3.6	54	0.1	5.6	9820	22	4.9	104	0.5	9.6	573197	1199	39629
1954	90965	344	8.3	324846	490	3.3	168	0.4	5.4	318	1	3.8	115	0.5	8.7	416412	835	35053
1955	71942	255	7.8	457454	737	3.6	148	0.4	5.4	3858	9	5.1	131	1	9.2	533533	1002	36620
1956	101024	320	7.0	193813	388	4.4	130	0.3	5.4	426	1	3.8	97	0.2	5.2	295490	709	32284
1957	139558	400	6.3	311694	543	3.8	241	1	5.4	20693	46	4.9	69	0.2	5.8	472255	990	37754
1958	198261	590	6.6	371336	590	3.5	6619	16	5.3	2393	4	4.1	93	0.3	7.5	578702	1200	45953
1959	141257	482	7.5	274194	419	3.4	2337	6	5.3	72875	140	4.2	516	2	9.1	491179	1049	43061
1960	98867	312	7.0	492561	843	3.8	299	1	5.4	525	1	3.6	109	0.4	8.3	592361	1157	47810
1961	116906	332	6.3	312538	497	3.5	6642	12	4.1	45530	128	6.2	366	1	8.2	481982	970	45737
1962	123129	358	6.4	290629	566	4.3	2093	5	5.1	1868	3	3.9	160	1	10.6	417879	933	42105
1963	132071	411	6.9	137862	266	4.3	8178	21	5.6	139321	289	4.6	496	2	8.9	417928	989	38714
1964	98650	307	6.9	297931	575	4.3	257	1	4.7	4788	9	4.0	104	0.5	9.6	401730	892	38180
1965	94742	276	6.4	220864	436	4.4	1149	3	4.9	14096	33	5.1	136	0.4	6.6	330987	748	28135
1966	105838	332	6.9	324172	606	4.1	2129	6	6.2	7293	12	3.7	50	0.2	10.0	439482	956	28622
1967	130015	396	6.7	145577	251	3.8	29116	69	5.2	79832	167	4.6	272	1	6.0	384812	884	23333
1968	85782	270	6.9	120038	204	3.7	1560	3	4.8	15174	18	2.7	86	0.4	10.5	222640	495	18125
1969	99983	311	6.9	50246	108	4.7	10347	22	4.7	45563	109	5.3	161	1	9.7	206300	551	16184
1970	134166	384	6.3	178892	359	4.4	24959	64	5.6	2266	4	3.8	768	3	9.0	341051	814	22156
1971	286465	745	5.7	246115	407	3.6	36422	92	5.5	34712	65	4.1	163	1	6.8	603877	1310	27768
1972	225754	618	6.0	70315	125	3.9	7822	18	5.2	1885	3	3.7	255	1	9.7	306031	765	19281
1973	147050	412	6.2	94005	170	4.0	19272	48	5.5	35006	75	4.7	646	3	10.1	295979	708	17266
1974	169976	465	6.0	153738	270	3.9	86892	234	5.9	2819	4	2.9	3474	13	8.0	416899	986	17731
1975	178238	448	5.5	116703	223	4.2	39406	99	5.5	43117	95	4.8	2063	9	9.4	379527	874	17183
1976	199486	545	6.0	84007	145	3.8	25700	63	5.4	2093	3	3.4	4794	24	10.9	316080	780	18642
1977	250256	608	5.4	150562	293	4.3	25116	61	5.3	61803	136	4.8	1599	6	8.6	489336	1104	26914
1978	216355	594	6.1	328203	590	4.0	130524	352	5.9	6709	10	3.2	6331	28	9.6	688122	1574	27638
1979	257673	628	5.4	225735	398	3.9	66571	170	5.6	73029	139	4.2	766	3	7.9	623774	1338	27409
1980	273591	672	5.4	153021	266	3.8	6552	15	4.9	3317	5	3.0	1985	9	9.6	438466	967	27237
1981	239493	588	5.4	69137	111	3.5	36166	80	4.9	180259	328	4.0	848	4	9.3	525903	1111	18179
1982	178706	432	5.3	117286	172	3.2	212818	554	5.7	1904	3	2.9	761	3	10.0	511475	1164	18602
1983	105265	300	6.3	57938	94	3.6	138284	331	5.3	155331	243	3.5	905	3	8.2	457723	971	13943
1984	88433	277	6.9	84058	128	3.3	123238	294	5.3	2372	3	3.0	97	0.3	7.9	298198	702	6916
1985	52413	165	6.9	184502	296	3.5	131481	279	4.7	368731	694	4.1	2130	7	7.0	739257	1441	8182

* Source: all weights, chinook pieces 1963-1984, coho and pink pieces 1956-1984, and sockeye and chum pieces all years (except 1985) from PBS data base; chinook pieces for areas 13-18, 28, 29 for 1951-1962 from Marshall (1970); chinook pieces for areas 19-20 for 1951-1957 from Hourston and Campbell (1962) (chinook < 5 lb "jacks" excluded) and for 1958-1962 from Argue (1970); coho and pink pieces 1951-1955 from Hourston and Campbell (1962); days fishing for areas 13-18, 28 and 29 for 1951-1962 from Marshall (1970) and for remaining years (except 1985) from PBS data base, and effort for areas 19-20 for 1951-1957 from Hourston and Campbell (1962) and for 1958-1962 from Argue (1971) and for remaining years (except 1985) from PBS data base. 1985 catch in pieces and effort from sales slips processed as of March 12, 1986; 1985 catch in tonnes equals average weight from PBS data base times catch in pieces (this table).

Appendix Table 5. Troll fishery catch in pieces and tonnes (dressed weight) and average fish weight (dressed) for Johnstone Strait (areas 11-12), 1951-1985.*

Year	Chinook			Coho			Sockeye			Pink			Chum			Total		Days Fishing
	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	
1951	14219	75	11.7	382088	1225	7.1	1207	3	5.3	77178	149	4.2	3388	17	11.3	478080	1469	9416
1952	22771	142	13.7	195233	516	5.8	301	1	5.3	13679	32	5.2	56	0.3	12.5	232040	691	6417
1953	18823	118	13.8	204237	569	6.1	962	2	5.3	86869	188	4.8	274	1	11.3	311165	878	6670
1954	17623	109	13.7	173664	542	6.9	490	1	5.3	9070	19	4.7	190	1	13.2	201037	672	6172
1955	17963	99	12.1	175883	507	6.4	1584	4	5.3	98929	228	5.1	266	1	10.5	294625	839	6073
1956	21966	112	11.3	239255	730	6.7	433	1	5.3	13161	24	4.0	91	1	13.2	274906	868	5266
1957	21420	124	12.8	306971	915	6.6	4659	11	5.3	237327	493	4.6	338	2	10.9	570715	1545	8374
1958	24493	139	12.6	211847	705	7.3	78320	188	5.3	109268	210	4.2	278	1	11.2	424206	1243	8930
1959	36560	209	12.6	216103	575	5.9	16942	41	5.3	347641	726	4.6	674	3	10.8	617920	1554	11314
1960	19598	106	11.9	112316	296	5.8	3357	8	5.3	48965	92	4.2	215	1	11.2	184451	503	7625
1961	14931	73	10.8	181209	491	6.0	6648	17	5.8	196865	584	6.5	734	4	11.2	400387	1169	11371
1962	16567	75	10.0	189708	467	5.4	3059	8	5.7	57955	95	3.6	328	2	10.7	267617	647	7405
1963	24303	107	9.7	231148	640	6.1	3362	8	5.5	168666	337	4.4	1049	5	11.1	428528	1097	7947
1964	23989	100	9.2	279930	708	5.6	1763	5	5.7	68727	108	3.5	1621	7	9.6	376030	928	7642
1965	22257	103	10.2	298484	821	6.1	737	2	4.7	42673	89	4.6	809	3	9.1	364960	1018	6807
1966	51762	202	8.6	724022	1527	4.7	8743	25	6.3	206165	346	3.7	898	4	10.4	991590	2104	11852
1967	39492	194	10.8	293296	601	4.5	26557	62	5.1	625667	1288	4.5	633	3	10.0	985645	2148	12025
1968	48674	257	11.6	441085	896	4.5	19537	48	5.4	423744	494	2.6	998	5	10.4	934038	1700	12385
1969	39558	187	10.4	164308	428	5.7	12069	27	5.0	92088	202	4.8	1100	4	8.9	309123	848	10066
1970	35765	167	10.3	241778	496	4.5	60181	160	5.8	201275	295	3.2	4028	15	8.3	543027	1133	10872
1971	28836	144	11.0	128402	339	5.8	5171	13	5.7	181319	327	4.0	1350	4	7.1	345078	827	5719
1972	53421	258	10.6	182299	417	5.0	2757	6	4.7	77744	96	2.7	542	2	9.3	316763	779	8020
1973	35469	192	11.9	162166	432	5.9	14362	35	5.4	264719	458	3.8	1828	8	9.6	478544	1125	9064
1974	42153	205	10.7	173962	367	4.6	38649	103	5.9	90039	114	2.8	487	2	9.2	345290	791	7066
1975	43227	241	12.3	109204	266	5.4	2115	4	4.6	92344	179	4.3	1747	7	9.0	248637	697	7215
1976	61630	268	9.6	324473	717	4.9	13272	31	5.1	464363	616	2.9	2032	10	10.5	865770	1642	12658
1977	62693	329	11.6	154121	391	5.6	22021	56	5.6	636929	1360	4.7	3597	18	10.8	879361	2154	16848
1978	40056	228	12.5	190965	402	4.6	205380	563	6.0	107223	137	2.8	12061	53	9.6	555685	1383	12356
1979	39546	205	11.4	174917	413	5.2	15355	36	5.2	644738	1067	3.6	8804	33	8.4	883360	1754	12557
1980	38811	197	11.2	205857	404	4.3	14136	31	4.8	124499	175	3.1	20025	81	8.9	403328	888	12854
1981	38692	196	11.2	184573	429	5.1	28732	66	5.0	936873	1662	3.9	6848	29	9.3	1195718	2382	15769
1982	28908	140	10.7	131847	275	4.6	42052	109	5.7	12676	17	3.0	5484	23	9.3	220967	564	8531
1983	54787	263	10.6	286811	632	4.9	105349	255	5.3	1256920	1886	3.3	15152	56	8.1	1719019	3092	18334
1984	44163	201	10.0	208202	497	5.3	6195	14	5.0	14001	19	3.0	6285	25	8.7	278846	756	8155
1985	14004	75	11.7	82688	229	6.1	56104	121	4.8	647483	1026	3.5	58898	175	6.6	859177	1626	6474

* Source: all weights, chinook pieces for 1963-1984, coho and pink pieces for 1956-1984, and sockeye and chum pieces all years (except 1985) from PBS data base; chinook pieces for area 11 for 1951-1960 (chinook < 5 lb "jacks" excluded) and coho and pink pieces for area 11 for 1951-1955 from Hourston and Campbell (1962), and chinook pieces for area 12 for 1951-1962 from Anon (1969); chinook pieces for area 11 for 1961-1962 assumed to be average of 1959 and 1960; days fishing for 1951-1960 from Hourston and Campbell (1962), days fishing for 1961-1962 from Anon (1951-1985), and for remaining years (except 1985) from PBS data base. 1985 catch in pieces and effort from sales slips processed as of March 12, 1986; 1985 catch in tonnes equals average weight from PBS data base times catch in pieces (this table).

Appendix Table 6. Troll fishery catch in pieces and tonnes (dressed weight) and average fish weight (dressed) for West Coast of Vancouver Island (areas 21 - 27), 1951-1985.*

Year	Chinook			Coho			Sockeye			Pink			Chum			Total		Days Fishing
	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	
1951	345477	2094	13.4	924531	2858	6.8	6298	15	5.3	52064	121	5.1	429	2	8.9	1328799	5090	53025
1952	389703	2528	14.3	828735	3026	8.0	1053	3	5.3	2383	5	4.5	97	0.4	8.2	1221971	5561	50922
1953	412072	2511	13.4	661600	2243	7.5	3733	9	5.3	139510	324	5.1	183	1	10.4	1217098	5089	47440
1954	377365	2090	12.2	552913	1826	7.3	26375	63	5.3	1688	3	3.9	301	1	9.3	958642	3984	44966
1955	424280	2257	11.7	530026	1820	7.6	5394	13	5.3	81203	215	5.8	211	1	8.5	1041114	4306	45303
1956	523117	2794	11.8	639420	1904	6.6	1318	3	5.3	2977	5	3.7	144	1	8.3	1166976	4707	48313
1957	482176	2631	12.0	661702	1666	5.6	6903	17	5.3	79821	171	4.7	396	2	9.6	1230998	4486	53627
1958	397173	1994	11.1	823755	2692	7.2	23563	57	5.3	7749	17	4.8	293	1	9.2	1252533	4760	51844
1959	355278	1808	11.2	919430	2099	5.0	24790	60	5.3	302031	614	4.5	477	2	9.6	1602006	4583	50031
1960	266117	1388	11.5	369590	1130	6.7	6110	15	5.3	4616	10	4.7	187	1	9.6	646620	2543	45091
1961	232018	1192	11.3	1095847	3098	6.2	15077	36	5.3	142297	377	5.8	677	3	10.8	1485916	4706	58901
1962	232932	1257	11.9	1069208	3069	6.3	20947	56	5.9	99114	154	3.4	1276	5	8.7	1423477	4542	52590
1963	277342	1452	11.5	1079249	2591	5.3	8479	20	5.3	584782	1227	4.6	1062	5	9.7	1950914	5295	53551
1964	343545	1701	10.9	1209606	3551	6.5	8792	21	5.2	14986	28	4.1	863	4	9.5	1577792	5305	59214
1965	404893	1932	10.5	1699930	5537	7.2	16081	39	5.3	113611	294	5.7	894	4	9.7	2235409	7806	66703
1966	522998	2653	11.2	1420426	3754	5.8	34405	98	6.3	69891	125	3.9	413	2	10.4	2048133	6632	69527
1967	395318	2083	11.6	1002218	2427	5.3	215995	500	5.1	1328705	2621	4.3	570	3	10.5	2942806	7634	71541
1968	419554	2181	11.5	1838960	4201	5.0	95019	228	5.3	119734	166	3.1	1805	8	9.8	2475072	6783	72630
1969	459866	2270	10.9	1040342	2815	6.0	151562	336	4.9	479950	1115	5.1	2282	11	10.2	2134002	6546	69822
1970	353789	1723	10.7	779433	2328	6.6	277479	732	5.8	236842	387	3.6	9637	39	8.9	1657180	5208	64756
1971	615847	3119	11.2	2175719	4996	5.1	585073	1518	5.7	959174	1846	4.2	5697	22	8.6	4341510	11503	81666
1972	578404	2745	10.5	988425	2558	5.7	26216	62	5.2	39318	56	3.1	1282	6	9.8	1633645	5426	65621
1973	610424	2815	10.2	1406301	3485	5.5	98253	229	5.1	802575	1510	4.1	7415	32	9.4	2924968	8070	68971
1974	628311	2847	10.0	1644003	3567	4.8	749607	1957	5.8	115484	164	3.1	5071	20	8.9	3142476	8555	66109
1975	547402	2457	9.9	781248	2140	6.0	54534	131	5.3	606231	1206	4.4	8249	34	9.0	1997664	5967	61523
1976	656161	2993	10.1	1640259	3179	4.3	64782	144	4.9	150442	217	3.2	4720	19	8.8	2516364	6552	63121
1977	566571	2479	9.6	1567879	3669	5.2	65306	154	5.2	1701141	3418	4.4	9967	39	8.6	3910864	9759	74467
1978	555259	2820	11.2	1360274	2946	4.8	710788	1899	5.9	105143	150	3.1	30554	125	9.0	2762018	7940	74015
1979	480373	2150	9.9	1912878	4453	5.1	330956	813	5.4	3064409	5615	4.0	18992	69	8.0	5807608	13100	85442
1980	488240	2307	10.4	1738934	3798	4.8	23286	51	4.8	201907	319	3.5	21877	77	7.7	2474244	6551	93928
1981	397518	1754	9.7	1385323	2895	4.6	44433	100	5.0	2753954	4914	3.9	9373	35	8.3	4590601	9698	80506
1982	543783	2427	9.8	1777436	4316	5.4	2190455	5760	5.8	36680	52	3.1	73426	297	8.9	4621780	12852	89010
1983	385355	1742	10.0	2167149	4102	4.2	36601	94	5.6	1091027	1779	3.6	8975	34	8.3	3689107	7751	78770
1984	460317	2165	10.4	2172171	4531	4.6	41797	94	5.0	65971	94	3.1	12930	50	8.6	2753186	6935	69048
1985	357799	1679	10.3	1403561	3526	5.5	1057911	2353	4.9	1830560	3218	3.9	215916	618	6.3	4865747	11393	62297

* Source: all weights, chinook pieces for 1963-1984, coho and pink pieces for 1956-1984, and sockeye and chum pieces all years (except 1985) from PBS data base; chinook pieces for 1951-1962 from Anon (1969) less area 20 chinook catch from Argue (1970) (chinook < 5 lb "jacks" included); coho and pink pieces for 1951-1955 from Hourston and Campbell (1962); days fishing for 1951-1960 from Hourston and Campbell (1962), for 1961-1962 from Anon (1951-1985), and for remaining years (except 1985) from PBS data base. 1985 catch and effort from sales slips processed as of March 12, 1986; 1985 catch in tonnes equals average weight from PBS data base times catch in pieces (this table).

Appendix Table 7. Troll fishery catch in pieces and tonnes (dressed weight) and average weight (dressed) for northern west coast of Vancouver Island (areas 25-27), 1951-1985.*

Year	Chinook			Coho			Sockeye			Pink			Chum			Total		Days Fishing
	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	
1951	71312	532	16.5	571066	1764	6.8	4772	11	5.3	29838	68	5.0	347	1	8.9	677335	2377	18524
1952	95587	744	17.2	314910	1209	8.5	602	1	5.3	1897	4	4.6	22	0.1	9.0	413018	1959	16684
1953	99311	760	16.9	196370	734	8.2	1131	3	5.3	39687	90	5.0	134	1	8.9	336633	1587	14791
1954	98543	681	15.2	173444	621	7.9	6225	15	5.3	1048	2	3.4	100	0.4	9.0	279360	1319	14399
1955	105643	746	15.6	300739	1009	7.4	2320	6	5.3	34446	94	6.0	111	0.5	9.0	443259	1855	16503
1956	128851	904	15.5	341572	970	6.3	734	2	5.3	2702	5	3.8	43	0.1	6.9	473902	1881	16995
1957	158891	1105	15.3	299410	782	5.8	3999	10	5.3	33275	71	4.7	263	1	9.5	495838	1969	19495
1958	125400	789	13.9	457239	1533	7.4	17602	42	5.3	7050	15	4.8	234	1	9.4	607525	2381	17698
1959	87603	550	13.8	308926	777	5.5	6131	15	5.3	104937	209	4.4	284	1	10.5	507881	1551	14645
1960	65968	401	13.4	170105	523	6.8	2282	5	5.3	3967	8	4.7	126	1	10.3	242448	938	13633
1961	46800	284	13.4	399220	1234	6.8	6482	16	5.4	73993	203	6.1	489	2	11.2	526984	1739	18109
1962	47400	310	14.4	290972	833	6.3	13955	37	5.9	91946	141	3.4	1130	4	8.4	445403	1325	15071
1963	73302	454	13.7	342848	870	5.6	3623	9	5.2	197244	452	5.0	783	3	9.8	617800	1789	15229
1964	38561	249	14.2	355842	1038	6.4	4411	11	5.3	11405	21	4.0	628	3	9.5	410847	1321	11618
1965	44412	266	13.2	458166	1574	7.6	3414	8	5.2	26802	69	5.6	670	3	9.8	533464	1920	14679
1966	56531	381	14.8	337804	918	6.0	8247	24	6.3	51365	92	3.9	303	1	10.9	454250	1415	13657
1967	77054	521	14.9	283166	722	5.6	32556	78	5.3	238907	466	4.3	279	1	10.9	631962	1788	17337
1968	84647	572	14.9	525805	1182	5.0	45282	112	5.5	101577	140	3.0	1343	6	9.4	758654	2012	18862
1969	68157	416	13.5	212392	572	5.9	87232	190	4.8	252321	571	5.0	1313	5	8.4	621415	1755	17231
1970	42862	266	13.7	252839	683	6.0	116643	310	5.9	187918	304	3.6	6759	27	8.8	607021	1589	14386
1971	67830	416	13.5	666334	1538	5.1	329077	856	5.7	395113	748	4.2	4492	18	8.7	1462846	3576	19974
1972	58523	368	13.9	387038	994	5.7	9630	22	5.1	35732	50	3.1	816	4	10.2	491739	1438	15823
1973	61768	359	12.8	278553	744	5.9	19661	46	5.2	325558	606	4.1	3222	14	9.7	688762	1769	14143
1974	96736	528	12.0	413520	886	4.7	407029	1049	5.7	89265	124	3.1	3956	16	9.1	1010506	2603	17914
1975	78676	463	13.0	256741	642	5.5	11624	28	5.3	368785	711	4.3	6218	25	9.0	722044	1870	15486
1976	101528	553	12.0	503476	1028	4.5	22588	50	4.9	79161	113	3.1	3154	12	8.7	709907	1756	15424
1977	59837	342	12.6	323383	801	5.5	26911	64	5.3	662282	1335	4.4	5236	22	9.3	1077649	2564	17101
1978	111076	637	12.6	404946	955	5.2	485036	1304	5.9	95787	136	3.1	26249	108	9.1	1123094	3140	22772
1979	79650	430	11.9	547801	1326	5.3	90613	223	5.4	1266056	2304	4.0	11258	43	8.4	1995378	4327	23466
1980	95636	521	12.0	412868	981	5.2	10480	23	4.8	152941	230	3.3	14575	52	7.9	686500	1807	25421
1981	81753	437	11.8	358408	880	5.4	24525	56	5.0	1470137	2636	4.0	5942	24	9.0	1940765	4033	24872
1982	106325	592	12.3	461621	1175	5.6	1275795	3367	5.8	31702	44	3.0	52823	217	9.0	1928266	5394	28412
1983	95771	494	11.4	478188	1061	4.9	25653	67	5.8	764763	1239	3.6	5734	22	8.5	1370109	2883	23155
1984	132204	733	12.2	503757	1313	5.7	13143	30	5.0	37320	53	3.1	11581	44	8.4	698005	2173	21843
1985	75517	423	12.4	369281	995	5.9	421956	923	4.8	1208849	2052	3.7	178249	501	6.2	2253852	4893	22135

* Source: all weights, chinook pieces for 1963-1984, coho and pink pieces for 1956-1984, and sockeye and chum pieces all years (except 1985) from PBS data base; chinook pieces (chinook < 5 lb "jacks" excluded) for 1951-1960 and coho and pink pieces for 1951-1955 from Hourston and Campbell (1962); chinook catch for 1961 and 1962 from Anon (1951-1985) (includes catch by net gear equal to <1% of total troll catch); days fishing for 1951-1960 from Hourston and Campbell (1962), days fishing for 1961-1962 from Anon (1951-1985), and for remaining years (except 1985) from PBS data base. 1985 catch in pieces and effort from sales slips processed as of March 12, 1986; 1985 catch in tonnes equals average weight from PBS data base times catch in pieces (this table).

Appendix Table 8. Troll fishery catch in pieces and tonnes (dressed weight) and average fish weight (dressed) for southern west coast of Vancouver Island (area 21-24), 1951-1985.*

Year	Chinook			Coho			Sockeye			Pink			Chum			Total		Days Fishing
	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	
1951	274165	1562	12.6	353465	1095	6.8	1526	4	5.3	22226	53	5.3	82	0.3	8.6	651464	2713	34501
1952	294116	1783	13.4	513825	1816	7.8	451	1	5.3	486	1	4.1	75	0.3	8.0	808953	3602	34238
1953	312761	1751	12.3	465230	1510	7.2	2602	6	5.3	99823	234	5.2	49	0.3	14.3	880465	3502	32649
1954	278822	1409	11.1	379469	1206	7.0	20150	48	5.3	640	1	4.5	201	1	9.5	679282	2665	30567
1955	318637	1511	10.5	229287	810	7.8	3074	7	5.3	46757	122	5.7	100	0.4	8.0	597855	2451	28800
1956	394266	1890	10.6	297848	934	6.9	584	1	5.3	275	0.4	3.3	101	0.4	8.9	693074	2826	31318
1957	323285	1526	10.4	362292	884	5.4	2904	7	5.3	46546	99	4.7	133	1	9.8	735160	2517	34132
1958	271773	1204	9.8	366516	1159	7.0	5961	14	5.3	699	1	4.7	59	0.2	8.5	645008	2380	34146
1959	267675	1258	10.4	610504	1322	4.8	18659	45	5.3	197094	405	4.5	193	1	8.3	1094125	3031	35386
1960	200149	986	10.9	199485	608	6.7	3828	9	5.3	649	1	4.6	61	0.2	8.2	404172	1605	31458
1961	185218	908	10.8	696627	1864	5.9	8595	20	5.2	68304	173	5.6	188	1	9.6	958932	2967	40792
1962	185532	947	11.3	778236	2236	6.3	6992	19	6.0	7168	13	4.0	146	1	11.0	978074	3216	37519
1963	204040	998	10.8	736401	1720	5.1	4856	12	5.3	387538	775	4.4	279	1	9.3	1333114	3506	38322
1964	304984	1452	10.5	853764	2514	6.5	4381	10	5.2	3581	7	4.4	235	1	9.4	1166945	3984	47596
1965	360481	1666	10.2	1241764	3963	7.0	12667	31	5.4	86809	226	5.7	224	1	9.4	1701945	5886	52024
1966	466467	2272	10.7	1082622	2836	5.8	26158	75	6.3	18526	33	3.9	110	0.5	9.1	1593883	5217	55870
1967	318264	1561	10.8	719052	1705	5.2	183439	423	5.1	1089798	2155	4.4	291	1	10.0	2310844	5845	54204
1968	334907	1609	10.6	1313155	3019	5.1	49737	116	5.1	18157	26	3.2	462	2	11.0	1716418	4772	53768
1969	391709	1853	10.4	827950	2242	6.0	64330	146	5.0	227629	544	5.3	969	6	12.8	1512587	4791	52591
1970	310927	1457	10.3	526594	1645	6.9	160836	422	5.8	48924	83	3.7	2878	12	9.1	1050159	3619	50370
1971	548017	2704	10.9	1509385	3459	5.1	255996	662	5.7	564061	1098	4.3	1205	5	8.4	2878664	7927	61692
1972	519881	2377	10.1	601387	1564	5.7	16586	40	5.3	3586	6	3.5	466	2	9.2	1141906	3988	49798
1973	548656	2456	9.9	1127748	2741	5.4	78592	183	5.1	477017	904	4.2	4193	17	9.1	2236206	6301	54828
1974	531575	2319	9.6	1230483	2681	4.8	342578	908	5.8	26219	40	3.3	1115	4	8.3	2131970	5951	48195
1975	468726	1994	9.4	524507	1498	6.3	42910	103	5.3	237446	495	4.6	2031	8	8.9	1275620	4097	46037
1976	554633	2440	9.7	1136783	2151	4.2	42194	94	4.9	71281	104	3.2	1566	6	9.0	1806457	4796	47697
1977	506734	2137	9.3	1244496	2868	5.1	38395	90	5.2	1038859	2083	4.4	4731	17	7.8	2833215	7195	57366
1978	444183	2183	10.8	955328	1991	4.6	225752	595	5.8	9356	14	3.2	4305	17	8.7	1638924	4799	51243
1979	400723	1720	9.5	1365077	3127	5.0	240343	590	5.4	1798353	3311	4.1	7734	26	7.5	3812230	8774	61976
1980	392604	1786	10.0	1326066	2817	4.7	12806	28	4.8	48966	88	4.0	7302	25	7.4	1787744	4744	68507
1981	315765	1316	9.2	1026915	2015	4.3	19908	45	4.9	1283817	2278	3.9	3431	11	7.1	2649836	5665	55634
1982	437458	1835	9.2	1315815	3141	5.3	914660	2393	5.8	4978	8	3.6	20603	80	8.6	2693514	7458	60598
1983	289584	1249	9.5	1688961	3040	4.0	10948	26	5.3	326264	541	3.7	3241	12	8.1	2318998	4868	55615
1984	328113	1433	9.6	1668414	3218	4.3	28654	64	5.0	28651	41	3.1	1349	6	9.9	2055181	4762	47205
1985	282642	1257	9.8	1033680	2523	5.4	635955	1430	5.0	621711	1164	4.1	37677	117	6.8	2611665	6491	40162

* Source: catch and days fishing in Appendix Table 6 less catch and days fishing in Appendix Table 7.

Appendix Table 9. Troll fishery catch in pieces and tonnes (dressed weight) and average fish weight (dressed) for United States waters south of Cape Flattery (area C), 1951-1985.*

Year	Chinook			Coho			Sockeye			Pink			Chum			Total		Days Fishing
	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	
1951	13	0.1	12.2	392	1.4	8.0	-	-	-	22	0.05	5.0	-	-	-	427	2	56
1952	2878	19	12.2	32857	141	8.0	-	-	-	10	0.02	5.0	-	-	-	35745	160	692
1953	4246	32	14.1	22372	73	6.1	-	-	-	7140	19	5.0	-	-	-	33758	124	199
1954	3904	26	12.6	2660	9	6.2	-	-	-	-	-	-	-	-	-	6564	35	389
1955	163	1	11.6	332	2	9.9	-	-	-	-	-	-	-	-	-	495	3	13
1956	666	4	12.3	8300	24	5.4	-	-	-	-	-	-	-	-	-	8966	28	129
1957	23	0.2	13.0	116	0.4	6.0	-	-	-	-	-	-	-	-	-	139	1	56
1958	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1959	-	-	-	16	0.1	6.2	-	-	-	-	-	-	-	-	-	16	0.1	21
1960	-	-	-	16	0.1	6.2	-	-	-	-	-	-	-	-	-	16	0.1	NA
1961	13	0.1	7.6	67	0.2	6.0	-	-	-	-	-	-	-	-	-	80	0.3	17
1962	474	3	10.5	3137	10	6.2	-	-	-	15	0.1	6.6	-	-	-	3626	13	56
1963	506	3	9.5	2295	8	6.1	-	-	-	1135	3	4.4	-	-	-	3936	13	60
1964	89	1	11.2	949	3	6.3	-	-	-	-	-	-	-	-	-	1038	4	30
1965	263	1	10.6	5401	19	6.6	-	-	-	947	3	6.3	-	-	-	6611	24	90
1966	1081	5	9.4	9530	35	6.9	-	-	-	44	0.1	4.5	-	-	-	10655	40	150
1967	15980	90	10.6	166348	577	6.5	1449	4	5.0	134127	336	4.7	32	0.2	10.0	317936	1008	3440
1968	10897	62	10.6	113170	393	6.5	239	1	5.0	1178	3	4.7	17	0.1	10.0	125501	458	1750
1969	6217	34	10.1	59820	151	4.7	938	3	5.1	5075	12	4.6	-	-	-	72050	199	970
1970	54313	307	10.6	585383	2031	6.5	11544	31	5.0	18858	47	4.7	705	4	10.0	670803	2420	14380
1971	69386	384	10.4	177542	446	4.7	2158	6	5.2	10353	21	3.9	50	0.2	6.6	259489	858	3900
1972	39545	210	10.0	145297	463	6.0	1609	4	4.9	508	1	3.8	15	0.05	5.7	186974	678	3810
1973	45294	234	9.7	192113	524	5.1	2581	8	6.0	28792	64	4.1	250	1	7.5	269030	830	3250
1974	43478	232	10.0	182908	457	4.7	3151	10	5.9	1610	3	3.9	82	0.4	9.6	231229	703	2830
1975	29239	154	9.8	105240	324	5.8	1386	4	5.2	12841	29	4.2	71	0.3	7.6	148777	510	2540
1976	44054	216	9.2	213062	480	4.2	597	1	4.6	4548	9	3.9	37	0.1	6.0	262298	707	2960
1977	22696	126	10.4	52022	157	5.7	417	1	5.8	49237	114	4.3	94	0.4	7.7	124466	399	1490
1978	15520	96	11.6	-	-	-	-	-	-	-	-	-	-	-	-	15520	96	520
1979	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1985	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* Source: all weights, chinook pieces for 1963-1978, coho and pink pieces for 1956-1978, and sockeye and chum pieces all years from PBS data base; chinook pieces for 1951-1960 (chinook < 5 lb "jacks" excluded) and coho and pink pieces for 1951-1955 from Hourston and Campbell (1962); chinook pieces for 1961-1962 from Anon (1969); days fishing for 1951-1960 from Hourston and Campbell (1962), for 1961-1962 from Anon (1951-1985), and for remaining years from PBS data base.

Appendix Table 10. Troll fishery catch in pieces and tonnes (dressed weight) and average fish weight (dressed) for area 20, 1951-1985.*

Year	Chinook			Coho			Sockeye			Pink			Chum			Total		Days Fishing
	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	Avg. lb	Pieces	Tonnes	
1951	449	2	9.8	2919	11	8.4	-	-	-	1102	3	5.1	11	0	9.1	4481	16	609
1952	477	3	13.4	990	3	7.8	-	-	-	-	-	-	-	-	-	1467	6	383
1953	308	2	13.6	1916	6	7.3	-	-	-	907	2	5.0	-	-	-	3131	10	491
1954	177	1	10.2	380	1	7.9	-	-	-	-	-	-	-	-	-	557	2	131
1955	65	1	26.2	541	1	4.8	-	-	-	651	2	5.2	-	-	-	1257	3	100
1956	150	1	11.3	861	3	7.7	-	-	-	-	-	-	-	-	-	1011	4	156
1957	549	3	12.2	9829	25	5.7	56	0.1	5.4	13651	31	5.0	18	0.1	11.1	24103	59	1222
1958	1871	9	10.1	8383	25	6.7	113	0.3	5.3	104	0.2	3.8	-	-	-	10471	34	1251
1959	1366	6	9.2	16424	40	5.4	1603	4	5.3	52997	106	4.4	246	1	9.3	72636	157	4605
1960	1540	7	10.5	693	2	6.5	75	0.2	5.3	-	-	-	27	0.1	11.1	2335	10	559
1961	2960	13	10.0	7085	25	7.7	418	1	5.3	8274	24	6.5	75	0.3	9.3	18812	63	2615
1962	5492	20	8.0	18400	52	6.3	96	0.3	6.2	174	0.4	4.6	-	-	-	24162	73	1056
1963	10845	39	7.9	10810	26	5.3	528	1	4.9	70098	143	4.5	204	1	8.3	92485	210	3960
1964	9549	36	8.4	12396	32	5.7	66	0.1	4.5	44	0.0	2.3	21	0.1	14.3	22076	68	1860
1965	3038	13	9.1	6362	21	7.2	172	0.4	4.7	4426	12	5.8	-	-	-	13998	45	1240
1966	3904	17	9.7	7873	20	5.5	51	0.1	5.9	216	0.5	4.6	14	0.1	14.3	12058	37	1110
1967	1384	6	9.8	2659	6	5.2	3685	9	5.3	44898	93	4.6	43	0.1	6.5	52669	114	980
1968	518	2	9.5	1825	5	5.7	7	0.0	4.6	2	0.0	4.0	2	0.0	8.5	2354	7	160
1969	1978	7	7.6	8792	27	6.7	2580	6	5.1	30201	75	5.5	30	0.1	10.8	43581	115	780
1970	6257	25	8.7	16789	61	8.0	16904	44	5.7	792	1	4.1	308	1	9.3	41050	132	1300
1971	2395	10	9.1	7130	17	5.2	4299	11	5.7	5118	11	4.7	33	0.1	7.2	18975	49	430
1972	3371	15	9.9	7434	21	6.1	1501	3	5.1	729	2	4.7	142	1	9.2	13177	42	350
1973	561	3	10.8	1508	5	6.9	1967	5	5.7	11148	23	4.5	70	0.3	9.6	15254	36	260
1974	1501	6	8.9	5664	13	5.2	4702	14	6.4	86	0.1	3.4	72	0.3	10.1	12025	33	220
1975	920	4	9.3	4094	13	7.0	291	1	5.3	2645	5	4.5	230	1	9.1	8180	24	180
1976	1613	6	8.7	3365	8	5.4	2559	5	4.3	8	0.0	4.1	490	2	8.7	8035	21	170
1977	1283	5	8.9	7314	19	5.8	2794	7	5.4	24659	55	4.9	251	1	8.1	36301	87	440
1978	824	4	10.3	1831	5	5.8	3966	10	5.7	22	0.0	3.9	89	0.3	8.0	6732	19	200
1979	395	2	8.5	1496	4	5.9	1269	3	5.4	21077	39	4.1	16	0.1	10.5	24253	48	190
1980	469	2	11.1	2202	5	4.7	106	0.2	5.2	2	0.0	3.0	861	4	9.4	3640	11	140
1981	617	3	10.1	5270	11	4.7	230	0.5	5.0	8800	16	4.1	162	1	10.0	15079	32	180
1982	208	1	11.1	1593	4	5.5	4913	13	5.9	16	0.0	3.4	50	0.2	9.9	6780	18	90
1983	204	1	8.3	-	-	-	-	-	-	-	-	-	-	-	-	204	1	30
1984	275	1	9.0	3642	6	3.8	2262	5.2	5.1	-	-	-	1	0.0	6.0	6180	13	130
1985	200	1	13.0	574	1	5.3	1064	3	6.4	957	2	3.9	3	0.0	6.8	2798	7	26

* Source: all weights, chinook pieces 1963-1984, coho and pink pieces 1956-1984, and sockeye and chum pieces all years (except 1985) from PBS data base; chinook pieces for 1951-1957 from Hourston and Campbell (1962) (chinook < 5 lb "jacks" excluded) and for 1958-1962 from Argue (1970); coho and pink pieces 1951-1955 from Hourston and Campbell (1962); days fishing for 1951-1957 from Hourston and Campbell (1962) and for 1958-1962 from Argue (1971) and for remaining years (except 1985) from PBS data base. 1985 catch in pieces and effort from sales slips processed as of March 12, 1986; 1985 catch in tonnes equals average weight from PBS data base times catch in pieces (this table).