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Strait of Georgia Sport Fishery Creel Survey Statistics for Salmon and Groundfish, 1984

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STRAIT OF GEORGIA SPORT FISHERY CREEL SURVEY STATISTICS FOR SALMON AND GROUNDFISH, 1984

by

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ABSTRACT

Shardlow, T. F. and L. D. Collicutt. 1989. Strait of Georgia sport fishery creel survey statistics for salmon and groundfish, 1984. Can. MS Rep. Fish. Aquat. Sci. 2032 : 61 p.

Catch and effort statistics for the Strait of Georgia tidal sport fishery are presented for each month in 1984. The statistics were derived by combining the data from over 30,000 interviews and 55 aerial surveys. Estimates were provided for the number of sport fishing boat trips and the catches of chinook, coho, and pink salmon along with rockfish, lingcod, dogfish and other finfish. Also given are numbers of marked (adipose fin-clipped) and unmarked chinook and coho examined during the creel survey, and the age composition and length distribution of chinook catches. The appendix includes all catch and effort statistics for each combination of month and Statistical Area.

Keywords: salmon, groundfish, creel survey, sport fishing, catch, effort, age composition, length distribution.

RÉSUMÉ

Shardlow, T. F. and L. D. Collicutt. 1989. Strait of Georgia sport fishery creel survey statistics for salmon and groundfish, 1984. Can. MS Rep. Fish. Aquat. Sci. 2032 : 61 p.

Les statistiques relatives aux prises et a l'effort de pêche de la pêche sportive de la zone tidale du détroit de Géorgie sont présentées pour chaque mois de 1984. Ces valeurs ont été obtenues en réunissant les données de plus de 30,000 entrevues et 55 relevés aériens. On y trouve les estimations du nombre de sorties des bateaux de pêche sportive et des prises de saumons quinnat, coho et rose en plus de celles de scorpènes, d'ophiodon, d'aiguillat et d'autres poissons. Le nombre de saumons quinnat et coho marqués (coupe de la nageoire adipeuse) et non marqués examinés au cours des relevés des prises et la composition par âges et la distribution par longueur des prises de saumon quinnat sont aussi présentés. On trouve aussi en appendice toutes les statistiques relatives aux prises et à l'effort de pêche pour chaque mois et combination de zones statistiques.

Mots clés: saumon, poisson de fond, releve des prises, pêche sportive, prises, effort de pêche, composition par âges, distribution par longueur.

1.0 INTRODUCTION

This report documents the 1984 catch and effort statistics for the Strait of Georgia sport fishery and discusses methodology for collecting these data. During the 1970s, the sport fishery grew to be the largest harvester of chinook and coho salmon in the Strait of Georgia. Figure 1 and Table 1 show historical catch statistics for the Strait of Georgia sport fishery for the period 1960-1984. Prior to 1980, fisheries managers recognized the need for accurate catch statistics. In 1980, the Strait of Georgia Creel Survey Program was initiated to meet the need for accurate and timely sport catch statistics primarily for chinook and coho. Since then, the objectives of the Creel Survey Program have been expanded to provide accurate estimates of all major sport-caught finfish, and age and length composition of chinook catches. This report is one of a series of Strait of Georgia Creel Survey Reports which document annual creel survey activities and estimation procedures, and provide official published Strait of Georgia tidal sport fishery catch statistics.

In 1984 the creel survey gathered a comprehensive set of annual sport fishing data for Strait of Georgia. The only project interruption occurred during April when no interview or overflight data were collected due to fiscal constraints.

In this report, all figures, tables and appendices are located at the end of text.

2.0 METHODS

The Strait of Georgia Creel Survey is comprised of two independent surveys: angler interviews and aerial overflights. Angler interviews provide data on sport fishing catch per unit effort (CPE) and daily activity patterns. Aerial overflights provide estimates of the total sport fishing effort in the study area at the time of the aerial survey. These data are combined to provide monthly estimates of total sport fishing effort and total catch of salmon and groundfish in the sport fishery. In its simplest form, the estimated total catch is calculated by multiplying estimated total effort by catch per unit effort.

The design of the Strait of Georgia Creel Survey conducted in 1984 was similar to the 1983 survey and similar to that used by DPA Consulting Ltd. (1982) with some modifications to the data analyzed, sampling intensity, flight routes and data processing. Sampling was conducted during each month of the year (except April) and estimates were produced for 10 time periods. January and February data were grouped together, as were November and December data because of reduced fishing activity and sampling in these winter months. Mid-week days and weekend days were considered independently because sport fishing activity is known to be quite different between the two types of days. The Strait of Georgia study area was also stratified by geographic region. Catch and effort statistics were produced for each of the 10

Statistical Areas within the Strait of Georgia (Areas 13 - 19A, 19 B+, 28 and 29, Fig. 2); Statistical Area 19 B+ includes the portion of Area 20 east of Sheringham Point (see Appendix D for a complete description of the study area). Data collection, entry and preliminary processing were conducted for most of the year by DPA Consulting Ltd., and are reported in their 1985 document. Estimation of catch and effort statistics was conducted by the Department of Fisheries and Oceans.

2.1 FIELD SURVEYS

2.11 Angler Interviews

Sport fishermen were interviewed at the end of their fishing trip to determine time spent fishing, locations fished and catch of each species on the trip. Demographic information was also collected during each interview. Figure 3 shows the interview form used in 1984.

Interviewers trained in fish identification inspected each boating party's catch. Unlike other methods of collecting sport fishery information, such as mail-in or telephone surveys, there was little memory-related recall bias, non-response bias, and fish identification concern with this approach to determining sport fishery catch. Landed chinook and coho were checked for a missing adipose fin which indicates the presence of a coded wire tag embedded in the fish nose cartilage. In addition, scale samples for age determination and measurements for nose-fork length were taken during every sampling shift in the winter and every other shift in the summer. Five scales were removed from the INPFC (International North Pacific Fisheries Commission) preferred area of each biosampled chinook (Mosher 1968).

The interviews were conducted at 31 landing sites (boat ramps, marinas, or resorts, Fig. 2) representative of sport fishing activity in each Statistical Area. The number of sites selected in each area was dictated by targets of desired precision and number of surveyors available. For each area - day type - work block stratum, sampling shifts at a site were chosen on a near random basis from the total number of shifts available. For definition of the above terms (day type, work block, shift) see Appendix A.

2.12 Aerial Overflights

Aerial surveys, conducted from float planes travelling along pre-defined routes, allowed observers to count vessels actively sport fishing throughout the Strait of Georgia. Planes flew at an altitude of 500-700 feet to facilitate a broad range of vision and still allow easy identification of vessel characteristics. Each plane carried three observers, two on the right side and one on the left, and each observer counted sport fishing boats to his/her side of the flight path. Figure 2 shows the flight paths used in 1984. The winter (October - April) flight path was slightly reduced to correspond with lower winter effort.

The flight path and time of departure were designed to cover major concentrations of sport fishing activity at peak periods. Whenever possible, the route was flown to keep most of the sport fishing boats to the right side to allow averaging of the two right side counts. To maximize precision, flying times during which fishing effort was rapidly changing were avoided. The number of overflights each month was governed by targets of desired precision and the expected number of interviews from the given number of sampling shifts (English et al. 1986). The days for overflights during a month were randomly selected for each day type.

2.2 DATA ANALYSIS

Data analysis included calculation of catch and effort statistics, calculation of variance of total fishing effort and total catch, estimation of marked chinook and coho salmon, and estimation of age composition of chinook catch. Appendix A details the methods and equations used in the above data analysis.

3.0 RESULTS

3.1 DISTRIBUTION OF SAMPLING EFFORT

Table 2 shows the number of creel survey fishing interviews conducted by month and Statistical Area in 1984, and the number of monthly overflights. A total of 32,454 interviews (27,225 fishing interviews) and 55 overflights were conducted in 1984. The monthly distribution of interviews reflected the monthly distribution of fishing effort (number of boat trips, Table 3), except in April when no interviews were conducted (Fig. 4). Interview effort was reduced during winter months, especially for Statistical Areas 13, 14 and 15 in the northern portion of Strait of Georgia (Table 2). The total fishing interviews represented 4.2% of the estimated total fishing effort for the entire study area (651,090 boat trips, Table 3) and ranged in each Statistical Area from a low of 1.9% of the estimated fishing effort in Area 18 to a high of 7.6% in Area 19B+ (Tables 2 and 4).

3.2 SPORT FISHING EFFORT AND CATCH

The 1984 Strait of Georgia sport fishing effort and catch statistics are summarized for each species by month in Table 3 and by Statistical Area in Table 4. Appendix B shows the fishing effort and catch statistics for each combination of month and Statistical Area.

Sport fishermen made 651,090 boat trips during 1984, which represents the highest level of effort recorded for this fishery to date except for 1980 (Table 1). The fishing effort followed the same general seasonal pattern as seen in previous years (Fig. 5). Effort levels climbed steadily from April, peaked in July and August, and declined rapidly in September and October. However, compared to previous years, the distribution of fishing effort in 1984 was shifted slightly toward the earlier months (Fig. 5).

The total finfish sport catch in the Strait of Georgia in 1984 was estimated at 1,213,460 pieces (including steelhead and cutthroat trout, Table 3) and consisted of 68% salmon and 32% groundfish. An additional 639,676 salmon of mixed species were released by anglers (Appendix B-7). The two main catch groups are discussed below.

3.21 Salmon

Salmon sport catches in the Strait of Georgia in 1984 totalled 828,092 pieces (Tables 3 and 4) and consisted of 54% coho, 45% chinook, 1% pink salmon and 0.6% other salmon.

Chinook sport catches showed a substantial increase in 1984, with anglers taking 369,445 fish (Tables 3 and 4) compared to 198,433 in 1983 and 163,793 in 1982 (Fig. 1, Table 1). The majority of the increased catch was taken during the months of June, July and August when catches more than doubled the previous years' average for those months (Fig. 6). The annual distribution of catch was shifted slightly earlier in the season than in previous years which corresponds to the slightly earlier timing in the effort.

Seasonal catch efficiency for chinook showed an unusual pattern in 1984. Catch per boat trip was highest in June (0.9 fish) rather than during the winter months which typically have higher catch success compared to the summer months (Fig. 7, Table 5). The earlier timing of the chinook catch and effort and the unusually high catch efficiency seen in the summer months were probably a result of greater than normal abundance of this species during the spring and summer of 1984. The greater abundance most likely resulted from a combination of a strong brood return and a shortened commercial troll season. A strong brood return was expected in 1984, based on the large catch component of age 2 chinook the previous year (57% of the 1983 chinook catch consisted of age 2 fish, Shardlow et al. 1989). In addition, the commercial troll fishery, which takes the majority of its chinook catch in the spring months (Argue et al. 1987), was delayed in 1984 from April to July.

The highest annual chinook catches in 1984 were taken in Area 13 (25% of total) and Area 14 (15%), which was similar to the 1983 catch pattern (Table 4, Fig. 8). In some months, other Statistical Areas dominated the catch (Appendix B-3). During the summer months (May - September) in 1984, 76% of the landed chinook were taken in the northern region of Strait of Georgia - Statistical Areas 13 to 17. In the winter months (January - April, October - December), 66% of the chinook catch came from the southern region - Statistical Areas 18, 19, 28 and 29. During November and December, many of the chinook came from Victoria/Sooke waters in Statistical Area 19B+.

The 1984 coho catch of 443,590 pieces (Tables 3 and 4) represents a slight increase from the 1981 to 1983 levels (Fig. 1, Table 1). This higher catch parallels the increased fishing effort observed in 1984 (Fig. 5). Coho catches in 1984 showed an average seasonal timing with the catch peaking in July; in comparison, coho catch peaked earlier than usual in 1983 (Fig. 9). Coho catch success in 1984 reached a high of 0.95 fish per boat trip in May, then declined through August (Fig. 10, Table 5). As in previous years, the highest coho catches were taken in Area 13 (34% of total) and Area 14 (24%) (Table 4, Fig. 8).

In 1984, Strait of Georgia anglers caught approximately 10,000 pink salmon (Table 3). Significant pink catches were not expected in 1984 because pink salmon returns to Strait of Georgia rivers (primarily the Fraser River) are much lower in even numbered compared to odd numbered years. Areas 13 and 14 were responsible for 94% of the pink catch (Table 4).

The landings of other salmon consisted of chum and sockeye, and were estimated at about 5,000 pieces (Table 3). The majority of this catch was taken in November and December (53% of total, Table 3). Statistical Areas 17 and 18 showed the highest catch contribution (45% of total, Table 4), much of it attributed to chum runs returning to local rivers.

In addition to the above salmon species, small numbers (<200) of steelhead, cutthroat trout and unidentified salmon were caught in the Strait of Georgia in 1984, bringing the total salmonid catch to 828,290 pieces (Appendix B-6).

The average number of total salmon caught during each boat trip in 1984 was 1.3 (Table 5). This represents a better catch success for salmon than during the 1981 to 1983 period when between 1.0 and 1.2 salmon per boat trip were reported (Shardlow et al. 1989).

In 1984, as in previous years, more salmon were landed and more effort was expended in Area 13 than in any other Statistical Area (Table 4, Fig. 11). Boaters fishing in Area 13 had an average catch of 1.8 salmon per trip. Area 14, as in 1983, recorded the greatest number of salmon hooked and released (169,492), with Area 13 next at 137,660 pieces (Appendix B-7). These two areas have major coho fisheries characterized by the release of many sub-legal coho.

3.22 Groundfish

While salmon accounted for the majority of the total finfish sport catch in the Strait of Georgia in 1984, the groundfish catch of 385,170 pieces made up 32% of the overall catch (Tables 3 and 4). The species composition of the groundfish catch, based on the Table 4 data, was as follows:

Groundfish species	Catch	% Of total groundfish catch	Major catch Area
Rockfish (*Sebastes* spp.)	158,676	41%	17, 13, 19B+
Lingcod (*Ophiodon elongatus*)	137,492	36%	13, 16
Dogfish (*Squalus acanthias*)	4,649	1%	18
Other finfish (Appendix E)	84,353	22%	16
Total	385,170	100%	

The majority of the groundfish catch was taken in the summer months, reflecting the seasonal change in fishing effort (Table 3, Fig. 4). Catch by Statistical

Area for rockfish was highest in Area 17 (22% of total), followed by Areas 13 and 19B+ each contributing approximately 14% to the total (Table 4). Lingcod were caught mainly in Area 13 (29% of total) and Area 16 (21%), while the largest dogfish catch came from Area 18 (32% of total, Table 4). Area 16 produced the largest catch of other finfish (34% of total).

Rockfish species were identified for the entire survey area for the first time in 1984 (Table 6). Applying the identification results to the 1984 rockfish catch estimates (Table 7) showed the following species dominance:

Rockfish species	Catch	% Of total rockfish catch	Major catch Area
Quillback	56,794	36%	13
Copper	31,606	20%	17, 18
Yelloweye	15,298	10%	16
Black	6,439	4%	19 B+
Other	48,539	30%	17
Total	158,676	100%	

The above "other" rockfish category consisted of tiger, yellowtail, china, canary and unidentified species.

The catch success (CPE) for both the rockfish and lingcod species was relatively constant throughout the year, each averaging 0.2 fish per boat trip (Table 5). The catch success for all non-salmon species averaged 0.6 fish per boat trip and was also relatively constant throughout the year. Catch success for total finfish during 1984 was 1.9 fish per boat trip (Table 5).

3.3 BIOLOGICAL DATA

3.31 Proportion and Catch of Marked Chinook and Coho

In 1984, 16,457 chinook and 19,443 coho were examined for adipose fin clip marks. Tables 8 and 9 show the observed numbers of marked chinook and coho respectively, by month and region. Data were presented by region since some Statistical Areas had insufficient numbers of fish examined for marks in some months, and those data were included with other Areas. Three regions were defined: the North Gulf represented by Areas 13-16; the South Gulf represented by Areas 17, 18, 28, 29 and the Saanich Inlet portion of Area 19 (Area 19A); and Victoria region represented by the remainder of Area 19 (Area 19B+) (Fig. 2).

Among chinook examined for marks, 2.0% had adipose fin clips. The largest observed proportion of chinook marks was in the North Gulf catch (0.023) and the lowest proportion in the Victoria catch (0.015, Table 8). Among coho examined for marks, 3.5% had adipose fin clips. The largest observed proportion of coho marks was in the South Gulf catch (0.050), and the lowest proportion in the Victoria catch (0.015, Table 9). Monthly catch estimates of marked chinook and coho are shown by region in Tables 10 and 11 respectively. The seasonal recovery pattern of marked chinook and coho salmon was generally similar to that observed in 1983 (Shardlow et al. 1989).

3.32 Catch-At-Age for Chinook

During 1984, 1,936 chinook biosamples were collected for age and length analysis. Table 12 shows the monthly number and percent age composition of chinook sampled for age. These data are summarized graphically in Figure 12. The monthly age proportions were applied to the estimated monthly chinook catches to provide breakdown by age group (Table 13). In 1984, the majority of chinook sport catch in the Strait of Georgia consisted of age 3 fish (67.3%), followed by age 2 (21.6%), age 4 (9.4%) and age 5 or older (1.7%). This catch breakdown by age group contrasts with the 1983 catch data where the majority (57.1%) of chinook caught were age 2 and only 25.5% were age 3 (Shardlow et al. 1989). As mentioned in section 3.2, the increase in age 3 catch component in 1984 was likely the result of a strong brood return combined with a delayed opening of the troll fishery.

Figure 12 and Table 12 show a shift in the age composition of sampled chinook and hence of chinook catch, between the first six months and the remainder of the year. From January to June, the catch was dominated by age 3 fish. In July, the age 2 group strengthened, and together the age 2 and 3 classes became the dominant age groups for the remainder of the year. The high proportion of age 2 chinook in July to December catches was the result of age 2 recruitment to the sport fishery. Age 2 chinook generally reach the minimum legal size limit of 45 cm in July (Argue et al. 1983).

3.33 Mean Length-At-Age for Chinook

Table 14 shows the monthly mean nose-fork length at age for the 1,932 chinook for which both length and age data were available. Figure 13 shows the length frequency distribution for all the measured chinook (2,123 aged and unaged fish). The largest portion of measured chinook (717 fish or 34% of the total sample) was in the 60-69 cm length category. This is consistent with the large catch proportion of age 3 fish (Table 13) which were found to have an annual mean length of 63.6 cm (Table 14). Of the total chinook measured in 1984, 4% were sub-legal in size (less than 45 cm) and these were landed mostly in June and July. Age 2 chinook showed a consistent growth trend from May through December when the mean length increased from 40.0 cm to 52.3 cm (Table 14). The largest chinook sampled (98 cm) was landed at Cowichan Bay in Area 18 on August 20, 1984, and was 5 years old.

4.0 SUMMARY

A sport fishery creel survey was conducted in the Strait of Georgia in 1984 in order to estimate the catches of all the important recreational finfish species and the total sport fishing boat trips. The numbers of chinook and coho salmon with adipose fin clips were also estimated. These data are presented by month and Statistical Area. Monthly age and length compositions of chinook catch are also shown.

In 1984, a total of 32,454 boating parties were interviewed at 31 landing locations in the Strait of Georgia creel survey area. The 27,225 fishing interviews conducted represents approximately 4% of the total number of boat trips conducted by sport fishermen in the Strait of Georgia in 1984. A total of 55 overflights were also conducted to take "snapshot" counts of fishing effort.

In 1984, sport fishermen made an estimated 651,090 boat trips in the Strait of Georgia and landed an estimated total finfish catch of 1,213,000 pieces of which 68% were salmon and 32% were groundfish. The 828,000 landed salmon consisted of 444,000 coho, 369,000 chinook, 10,000 pink salmon and 5,000 combined chum and sockeye. An additional 640,000 salmon of mixed species were released by anglers.

The 385,000 landed groundfish consisted of 159,000 rockfish, 137,000 lingcod, 5,000 dogfish and 84,000 other finfish. Rockfish catches were identified as quillback (36% of rockfish catch), copper (20%), yelloweye (10%), and black (4%); the remaining 30% of the rockfish catch consisted of tiger, yellowtail, china, canary and unidentified species.

Catch success per boat trip averaged 1.3 salmon (all species) and 0.6 groundfish.

Among salmon examined for marks, 2.0% of chinook and 3.5% of coho had adipose fin clips. The majority of chinook sport catch in 1984 consisted of age 3 fish (67.3%), followed by age 2 (21.6%), age 4 (9.4%) and age 5 or older (1.7%). Of the total chinook measured in 1984, 4% were sub-legal in size (less than 45 cm).

5.0 ACKNOWLEDGMENTS

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FIGURES

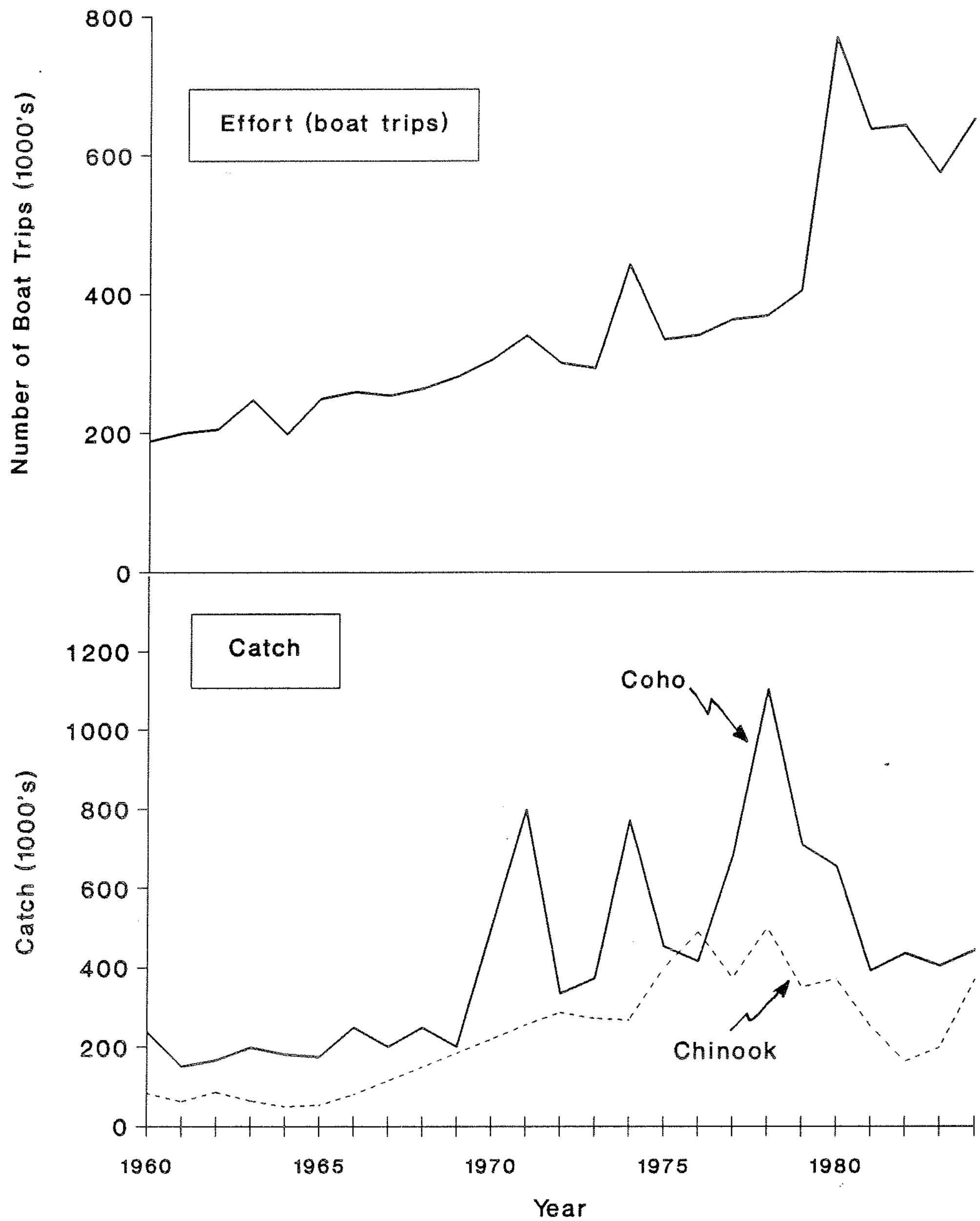
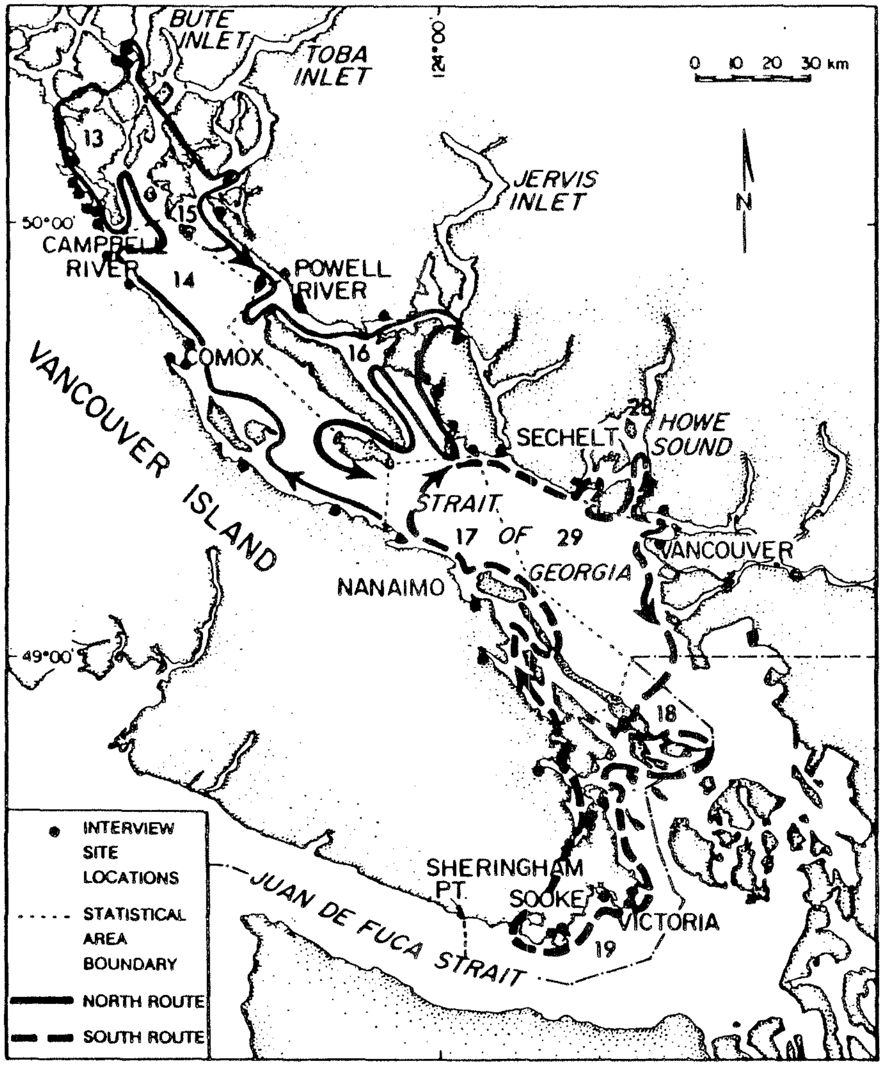


Figure 1. Tidal effort statistics and sport catches of coho and chinook salmon for the Strait of Georgia, 1960 - 1984.

SUMMER OVERFLIGHT ROUTE



WINTER OVERFLIGHT ROUTE

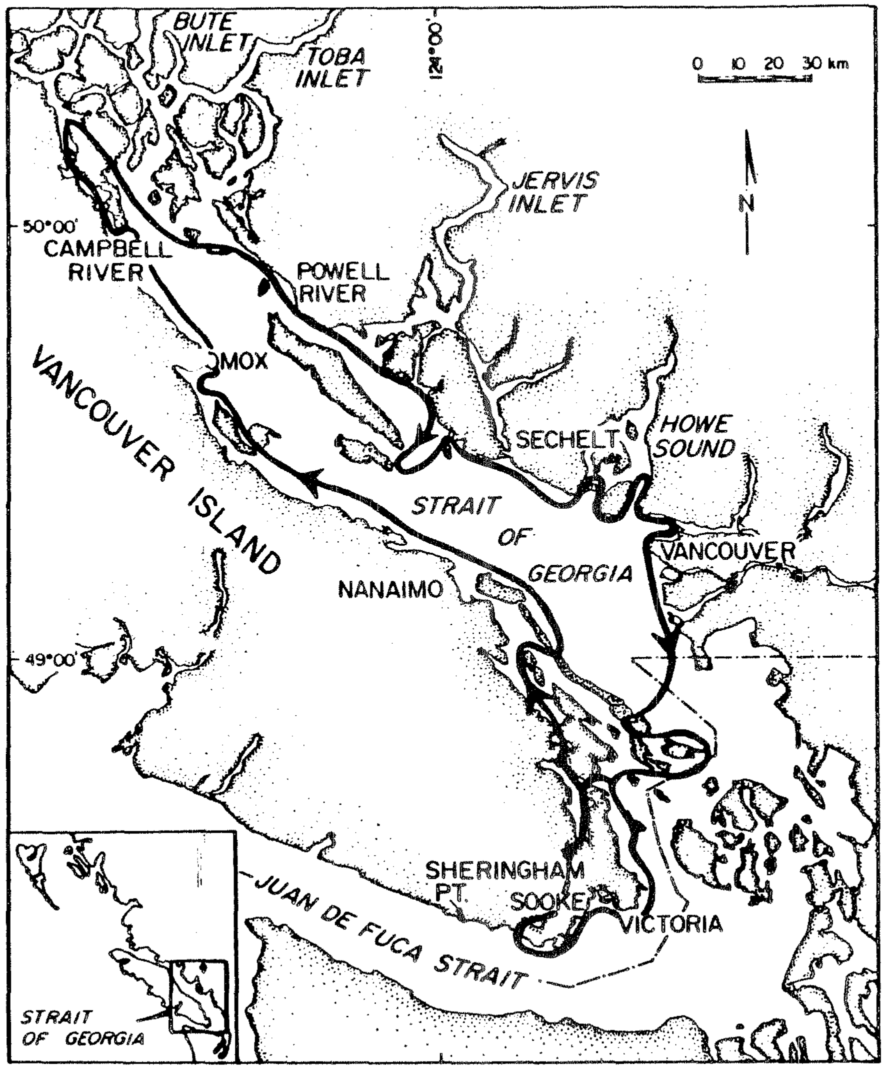


Figure 2. Interview site locations, and summer and winter overflight routes, Strait of Georgia, 1984.

STRAIT OF GEORGIA SPORT FISHING CREEL SURVEY N° 16080

Landing Area: ____________/________ Statistical Area: ____________

Interviewer: ____________/________ Date: ___/___/___ (YR MO DAY) TIME (INT) ____:____ AM PM

PRESENT BOAT TRIP COMPLETED

1. Total Number of Individuals in Party: [ ]

2. Time of Landing: ____:____ AM PM Time Block: [ ]

3. Was Your Party Sport Fishing on This Trip: YES NO

4. Guided: YES NO

5. Residences of Party: B.C. [ ] Rest of Canada [ ] Other [ ]

6. Length of Boat Trip: [ ] HRS.

7. Times Lines were in the Water: (EXCLUDE time not fishing)

AM		PM	
☐ (1) before 7:00	☐ (5) 10:00-10:59	☐ (9) 2:00-2:59	☐ (13) 6:00-6:59
☐ (2) 7:00-7:59	☐ (6) 11:00-11:59	☐ (10) 3:00-3:59	☐ (14) 7:00-7:59
☐ (3) 8:00-8:59	☐ (7) 12:00-12:59	☐ (11) 4:00-4:59	☐ 15) 8:00-8:59
☐ (4) 9:00-9:59	☐ (8) 1:00- 1:59	☐ (12) 5:00-5:59	☐ (16) 9:00-plus

8. Average Number of Lines in the Water for TOTAL boat Party: [ ]

9. CATCH SUMMARY

Total Catch for Trip: [ ]

Total Time Fishing: [ ] HRS.

	1ST SUB AREA	2ND SUB AREA	3RD SUB AREA
GO TO MAP:			
KEPT:			
RELEASED:			
TIME:	HRS.	HRS.	HRS.

MARKED: [ ] UNMARKED: [ ]

COHO AND CHINOOK ONLY

10. How much Fishing Time was Directed at Each of the Following?

CO [ ] CN [ ] SM [ ] LC [ ] RF [ ]

GF [ ] SF [ ] OTHER [ ]

11. Did you encounter any problems with seals, sea lions, or whales on today's fishing trip? YES NO

Figure 3. Sample of 1984 interview form.

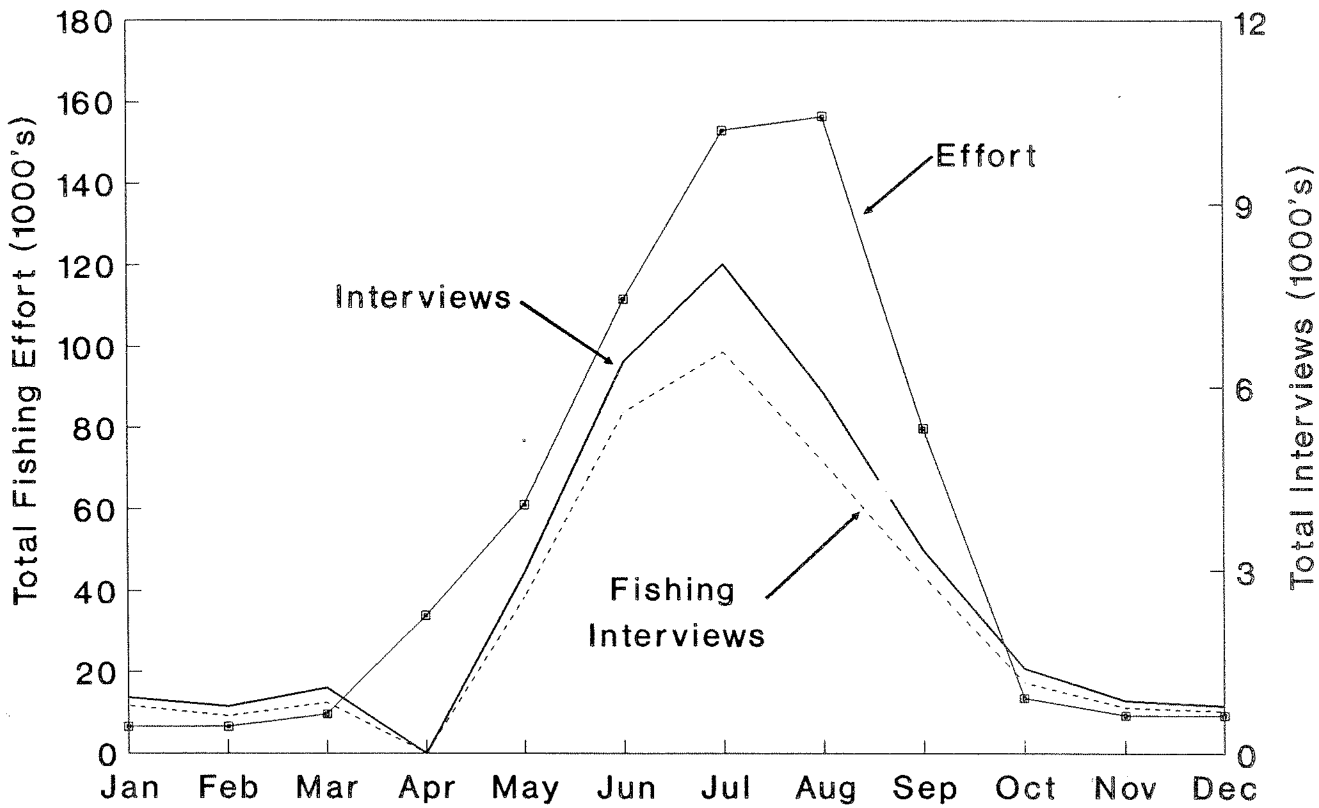


Figure 4. Comparison of monthly total fishing effort, monthly total interviews and monthly total fishing interviews, Strait of Georgia, 1984.

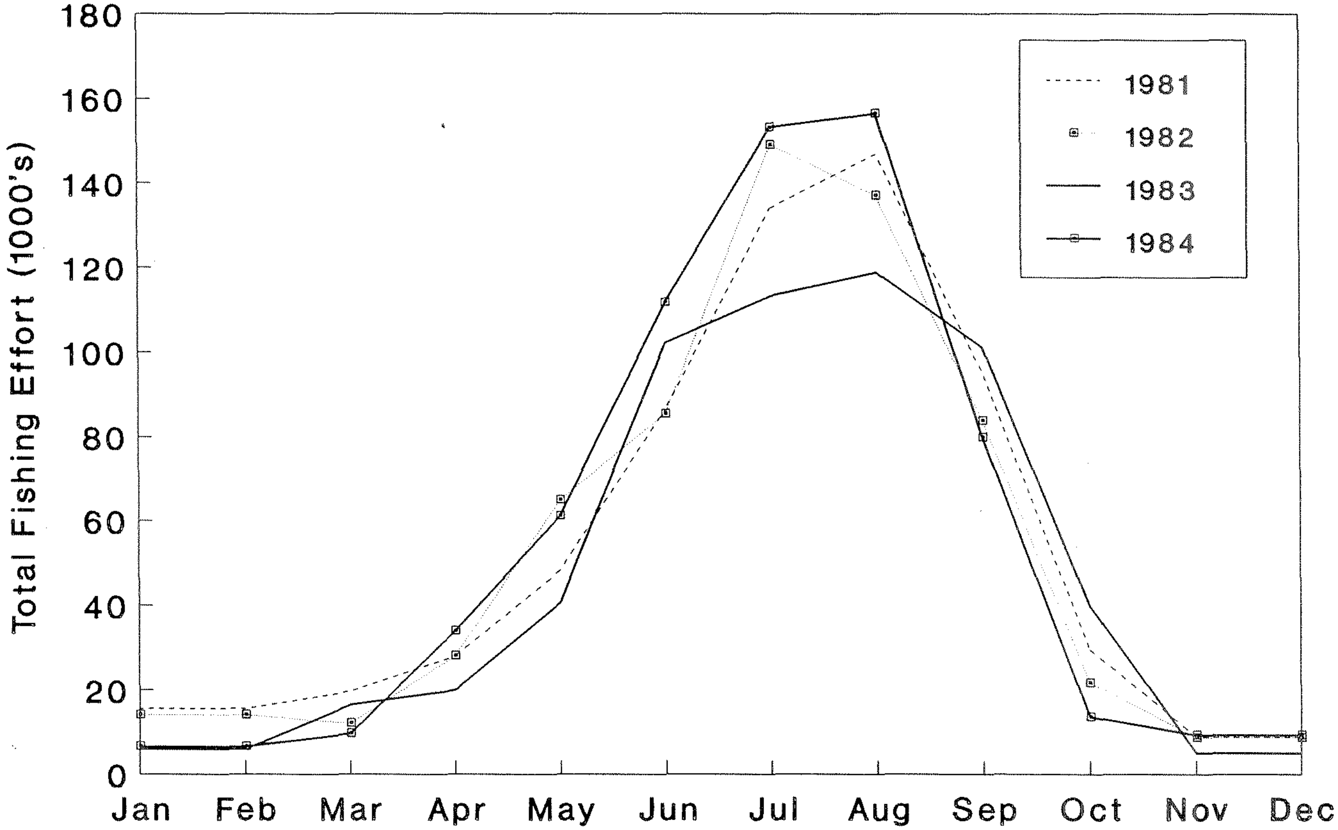


Figure 5. Monthly fishing effort estimates (number of boat trips) for the Strait of Georgia sport fishery, 1981 - 1984.

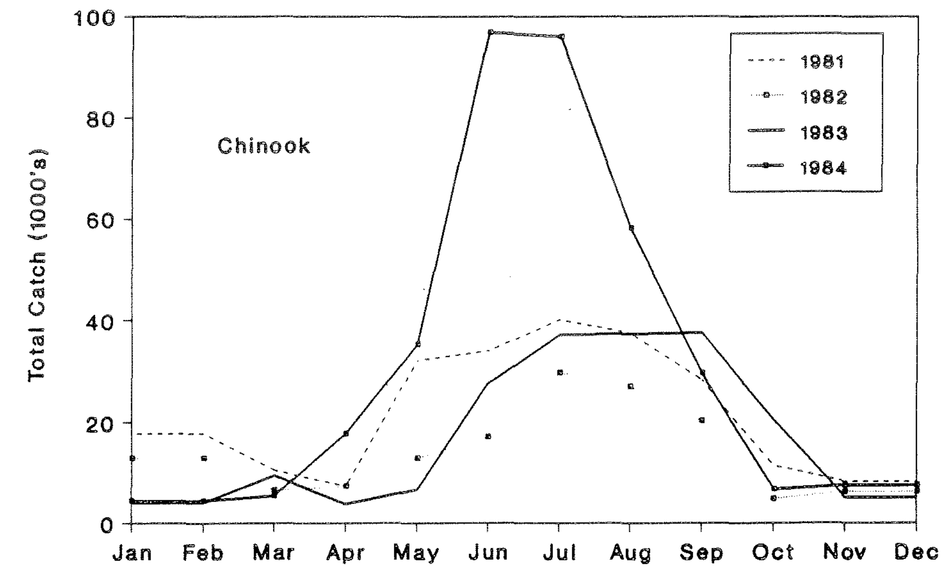


Figure 6. Monthly chinook catch for the Strait of Georgia sport fishery, 1981 - 1984.

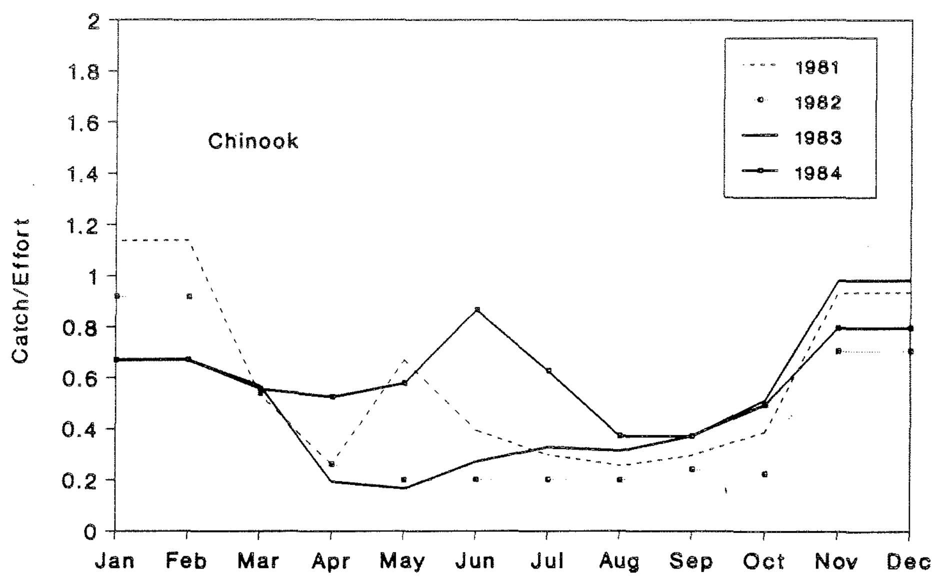


Figure 7. Monthly chinook catch per boat trip for the Strait of Georgia sport fishery, 1981 - 1984.

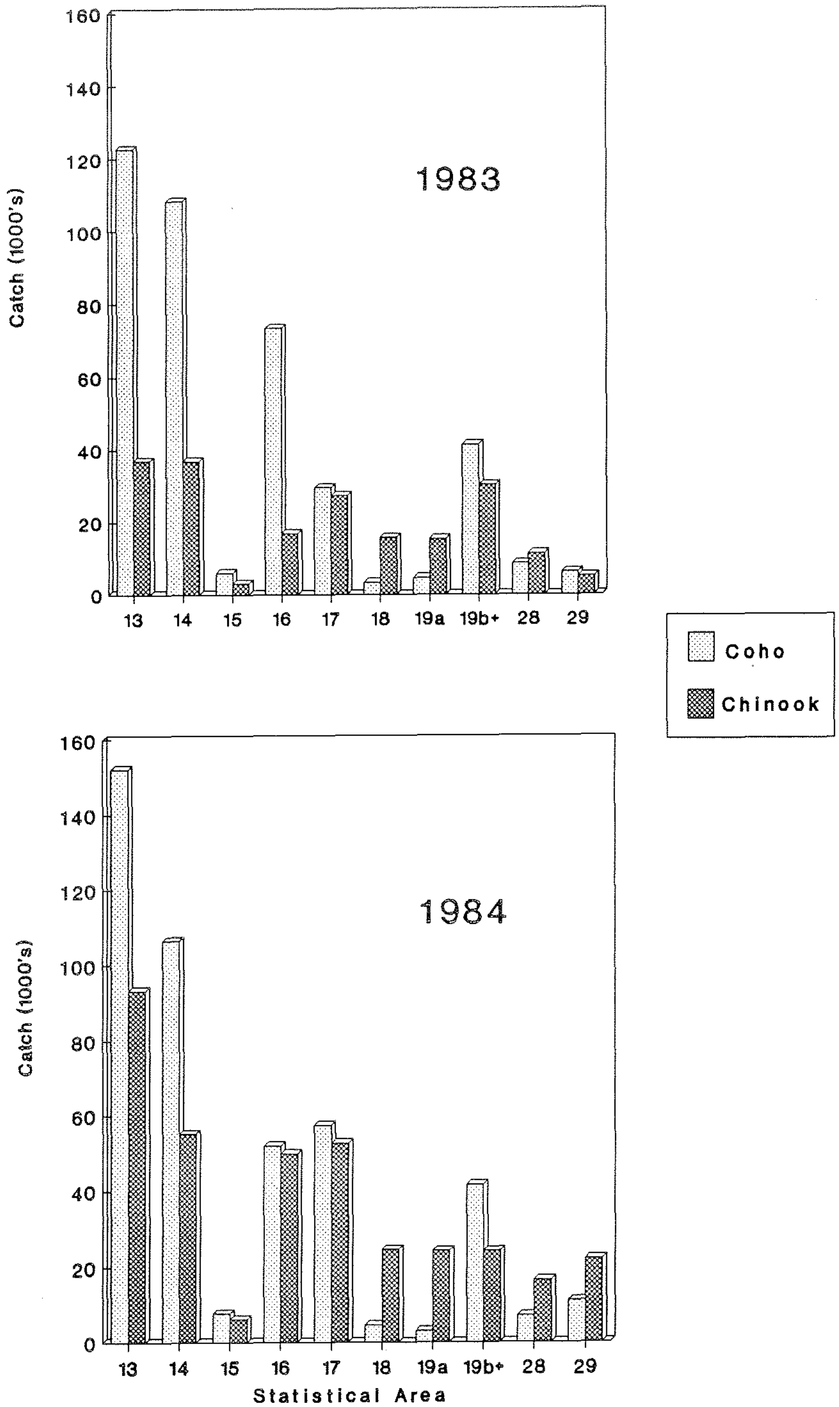


Figure 8. Annual sport catches of chinook and coho salmon by Statistical Area in the Strait of Georgia, 1983 - 1984.

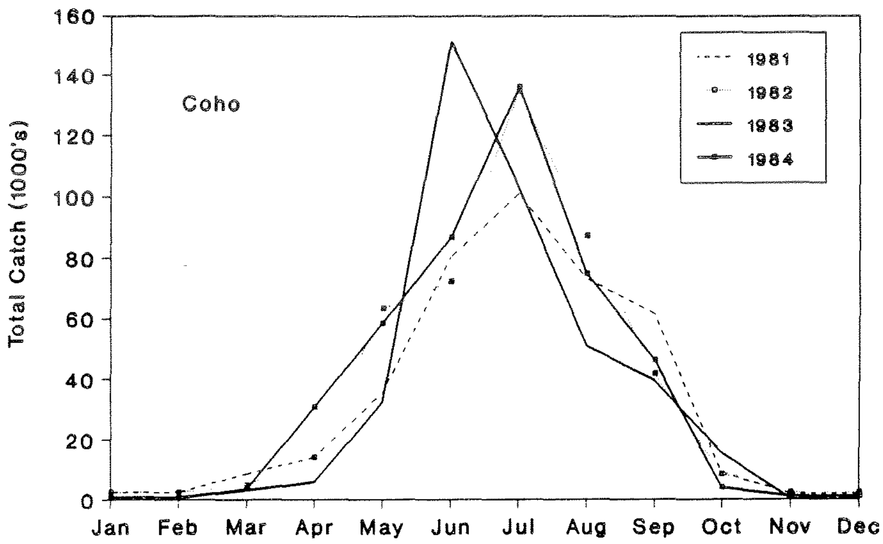


Figure 9. Monthly coho catch for the Strait of Georgia sport fishery, 1981 - 1984.

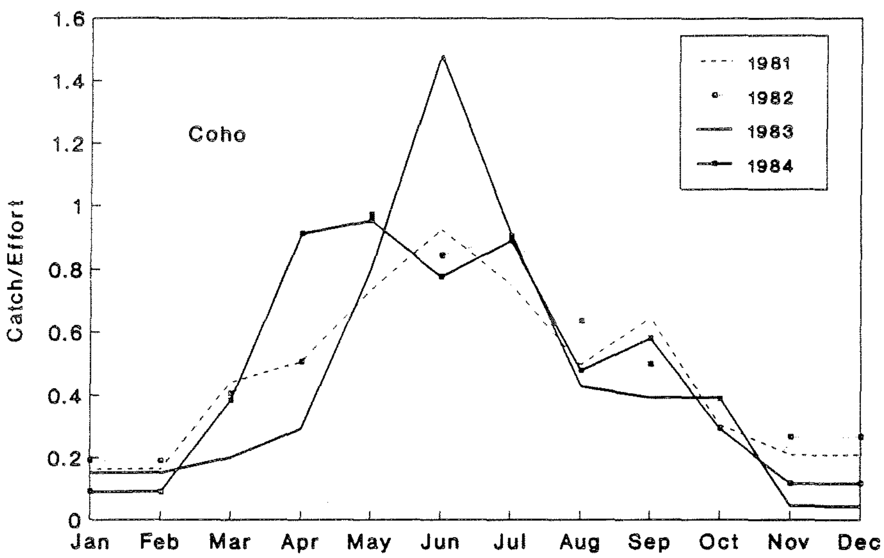


Figure 10. Monthly coho catch per boat trip for the Strait of Georgia sport fishery, 1981 - 1984.

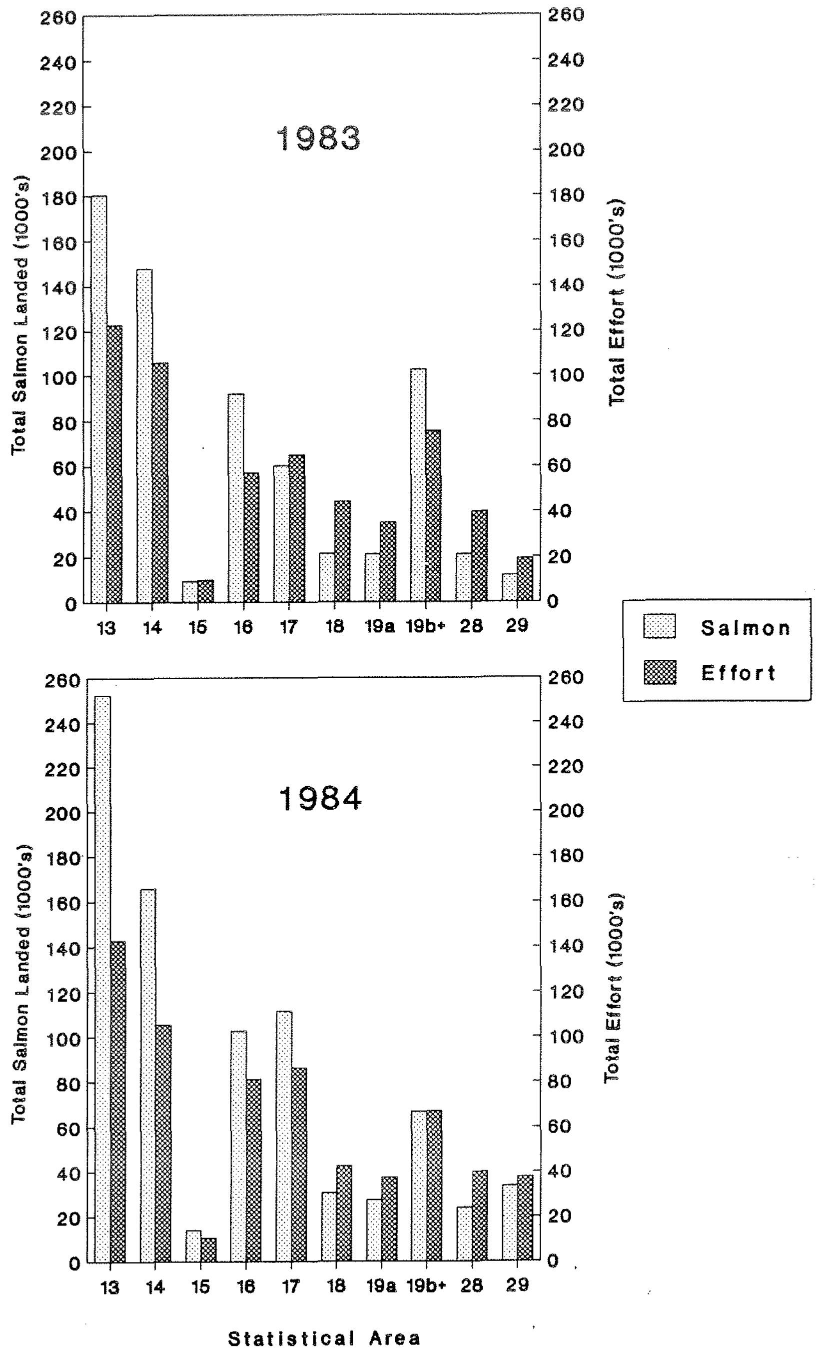


Figure 11. Total salmon landed and total fishing effort expended by Statistical Area in the Strait of Georgia sport fishery, 1983 and 1984.

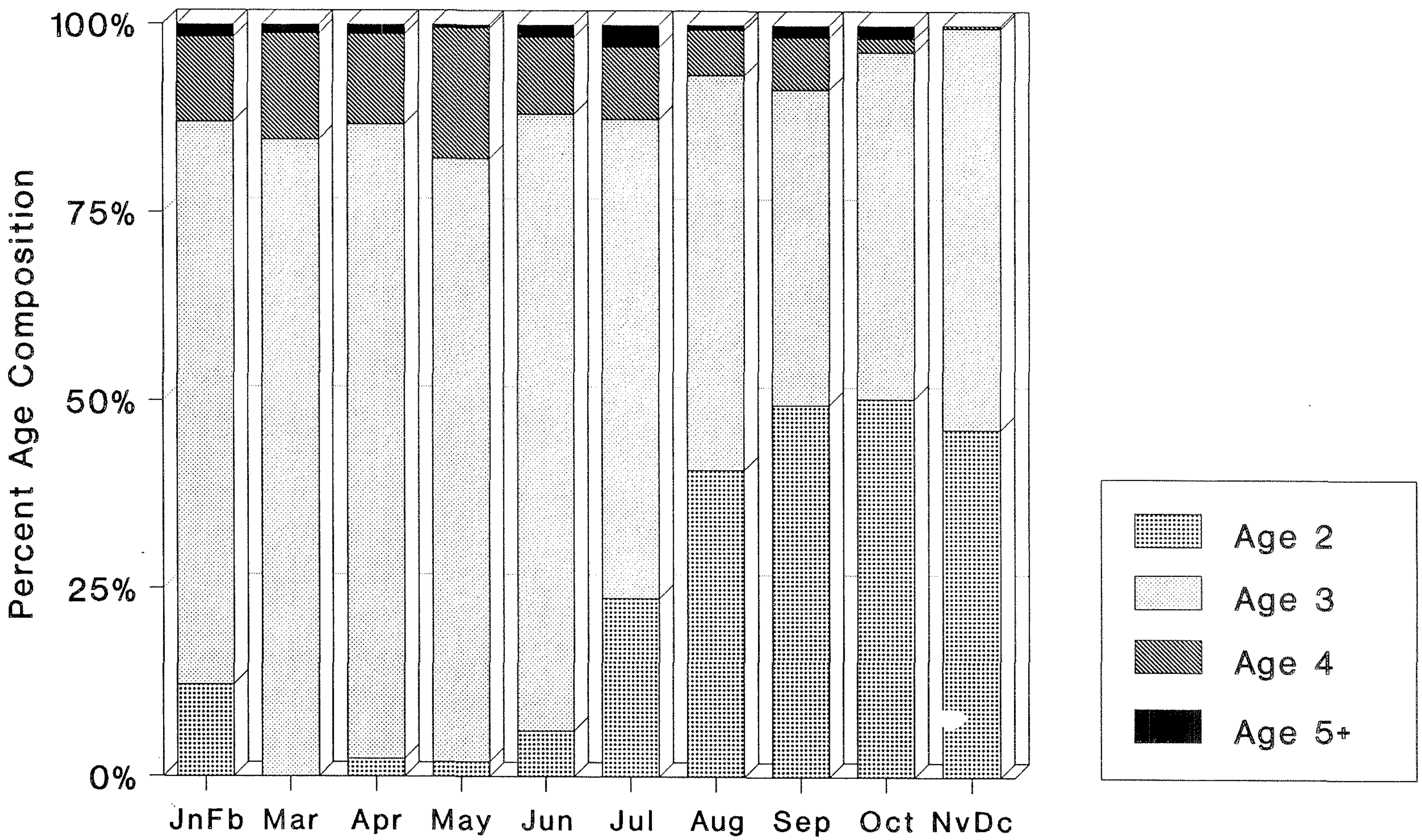


Figure 12. Monthly percent age composition of chinook salmon sampled in the Strait of Georgia Creel Survey, 1984.

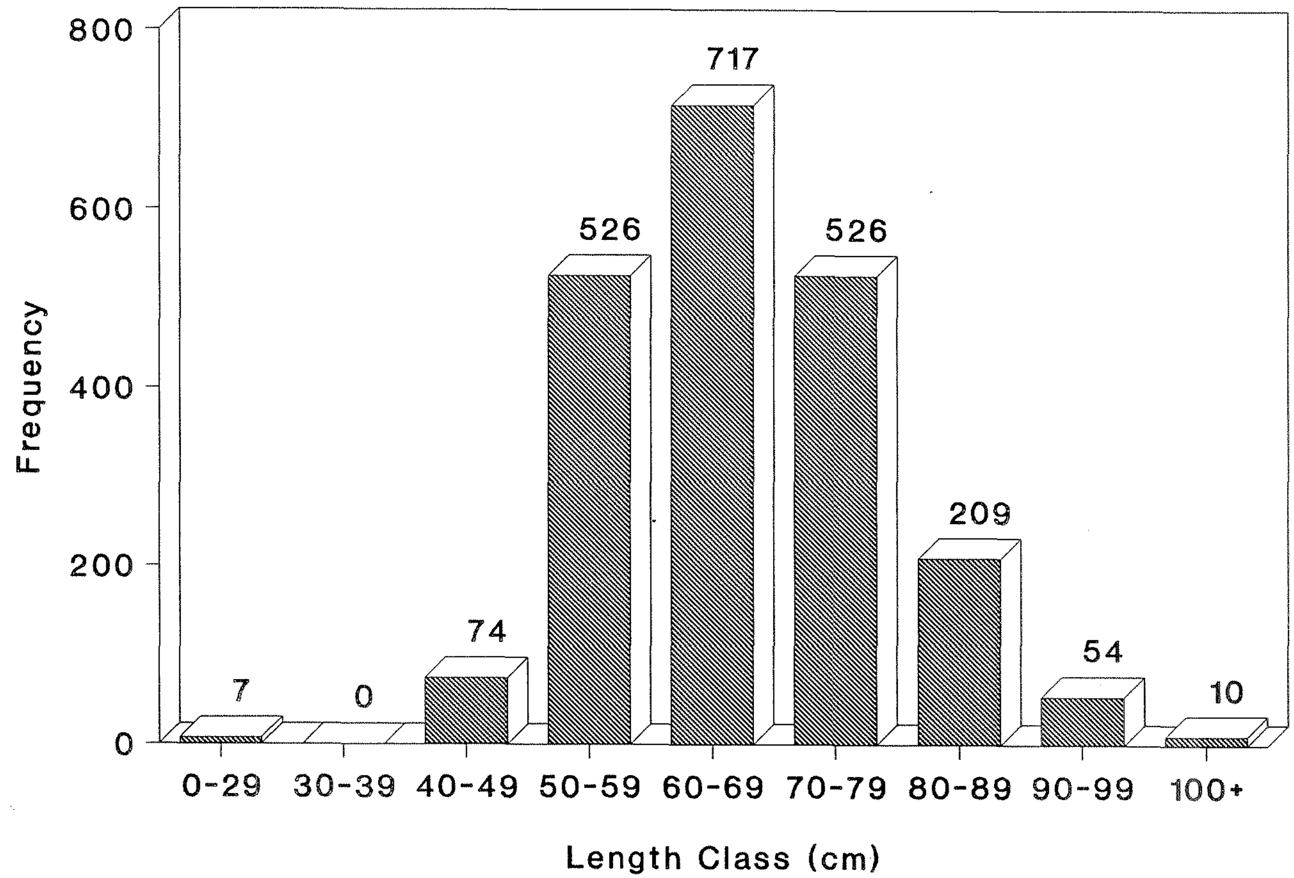


Figure 13. Length frequency distribution of chinook salmon sampled in the Strait of Georgia Creel Survey, 1984.

TABLES

Table 1. Tidal effort statistics and sport catches of coho chinook salmon for the Strait of Georgia, 1960 - 1984.*

Year	Effort (boat trips)	Catch	
		Coho	Chinook
1960	189,150	238,000	83,000
1961	199,935	152,000	63,000
1962	205,547	167,000	86,000
1963	247,590	199,000	65,000
1964	198,120	182,000	51,000
1965	250,020	175,000	53,000
1966	259,100	249,000	80,000
1967	254,500	200,000	115,000
1968	265,030	250,000	150,000
1969	281,475	200,000	185,000
1970	306,255	500,000	220,000
1971	341,123	800,000	255,000
1972	300,349	335,000	287,000
1973	293,141	373,000	272,000
1974	443,441	772,000	269,000
1975	334,490	454,000	398,000
1976	340,729	415,000	490,000
1977	363,350	682,000	372,000
1978	369,035	1,103,000	500,000
1979	404,710	708,735	350,000
1980	769,000	655,000	371,000
1981	637,000	391,200	253,300
1982	642,200	436,090	163,793
1983	574,257	404,031	198,433
1984	651,090	443,590	369,445

* Source: Coho catch statistics: 1960-1978 from Argue et al. (1983), 1979 from R. Kadowaki (pers. comm.), 1980-1982 from Shardlow et al. (MS 1989), 1983 from Shardlow et al. (1989).
Chinook catch statistics: 1960-1977 from Argue et al. (1983), 1978 and 1979 from B. Riddell (pers. comm.) following the methods of Argue et al. (1983), 1980-1982 from Shardlow et al. (MS 1989), 1983 from Shardlow et al. (1989).
Effort statistics: 1960-1979 from annual published and unpublished Fisheries Officer statistics, 1980-1982 from Shardlow et al. (MS 1989), 1983 from Shardlow et al. (1989).

Table 2. Number of fishing interviews by month and Statistical Area, Strait of Georgia, 1984.

	Statistical Area											
Month	13	14	15	16	17	18	19A	19B+	28	29	Total	Over-flights
Jan+Feb	45	60	0	196	159	43	70	593	85	139	1,390	5
Mar	24	52	0	184	126	41	50	278	36	42	833	4
Apr *	0	0	0	0	0	0	0	0	0	0	0	0
May	241	496	44	321	410	51	355	241	319	86	2,564	5
Jun	749	1,438	84	640	659	124	286	572	820	217	5,589	6
Jul	1,175	1,063	75	773	882	143	345	1,033	803	287	6,579	10
Aug	1,005	844	34	382	624	152	349	763	387	233	4,773	9
Sep	354	567	13	221	281	88	329	556	190	302	2,901	8
Oct	31	115	0	112	95	88	235	381	45	55	1,157	4
Nov+Dec	13	29	0	218	43	57	92	669	103	215	1,439	4
Total	3,637	4,664	250	3,047	3,279	787	2,111	5,086	2,788	1,576	27,225	55

* No interviews or overflights were conducted in April.

Table 3. Fishing effort and catch by species and month, Strait of Georgia, 1984.

Month		Effort No. Boat Trips	Coho	Chinook	Pink	Other * Salmon	Rock-Fish	Lingcod	Dog-Fish	Other Finfish	Total Finfish
Jan+Feb	Estimate	13,190	1,199	8,813	48	161	3,342	120 **	8	3,006	16,697
	S.E.	876	689	973	25	139	573	39	7	715	1,511
Mar	Estimate	9,649	3,700	5,363	11	11	4,461	333 **	0	7,726	21,605
	S.E.	965	721	897	8	13	1,014	156	0	2,779	3,178
Apr +	Estimate	33,882	30,909	17,809	1,091	118	10,706	8,518	70	6,141	75,362
	S.E.	2,163	2,890	1,432	196	28	1,124	750	35	1,030	3,651
May	Estimate	61,070	58,223	35,380	1,311	154	21,447	13,437	223	4,362	134,537
	S.E.	5,077	8,393	3,349	226	74	5,524	1,460	118	1,574	10,810
Jun	Estimate	111,713	86,436	96,794	3,798	151	22,432	21,434	906	15,341	247,292
	S.E.	4,443	4,818	4,527	430	39	1,415	1,277	214	2,397	7,302
Jul	Estimate	153,083	136,076	95,904	2,515	406	32,887	30,927	1,998	15,046	315,759
	S.E.	4,443	6,155	3,921	283	83	1,875	1,678	450	2,109	8,020
Aug	Estimate	156,481	74,660	58,166	1,319	548	38,765	37,348	960	19,417	231,183
	S.E.	5,754	4,022	2,728	247	158	2,655	2,410	203	2,125	6,412
Sep	Estimate	79,769	46,231	29,673	46	535	17,937	17,886	395	8,887	121,590
	S.E.	2,954	3,031	1,538	30	132	1,990	1,411	173	1,570	4,474
Oct	Estimate	13,589	3,983	6,717	27	179	3,372	3,159	26	962	18,425
	S.E.	903	544	777	15	56	674	590	19	216	1,324
Nov+Dec	Estimate	18,664	2,173	14,826	63	2,565	3,327	4,330 **	63	3,465	30,812
	S.E.	1,110	668	1,272	49	528	981	1,660	49	896	2,621
Total	Estimate	651,090	443,590	369,445	10,229	4,828	158,676	137,492	4,649	84,353	1,213,262 ++
	S.E.	10,748	12,923	7,932	648	599	7,147	4,251	581	5,459	18,165

* Includes chum and sockeye.

** A total closure for lingcod was in effect from January 1 to April 15, and November 15 to December 31. Reported figures most likely represent illegal catches by anglers.

\+ Indirect estimate. The interview and overflight data from March and May were combined to produce the April estimates.

++ In addition, an estimated 198 steelhead, cutthroat trout and unidentified salmon were caught by sport fishermen.

Table 4. Fishing effort and catch by species and Statistical Area, Strait of Georgia, 1984.

Statistical Area		Effort No. Boat Trips	Coho	Chinook	Pink	Other * Salmon	Rock-Fish	Lingcod	Dog-Fish	Other Finfish	Total Finfish
13	Estimate	142,774	152,065	93,242	6,412	502	22,732	39,725	485	6,934	322,097
	S.E.	6,044	7,059	4,681	524	146	2,234	2,628	179	691	9,189
14	Estimate	105,409	106,498	55,178	3,207	637	14,447	11,436	600	3,890	195,893
	S.E.	4,005	5,455	2,460	371	185	1,352	967	178	507	6,248
15	Estimate	10,549	7,757	6,240	51	8	4,290	1,670	7	9	20,032
	S.E.	929	1,158	636	21	6	1,052	333	6	5	1,722
16	Estimate	81,352	51,982	49,985	90	461	16,117	28,704	65	28,700	176,104
	S.E.	2,687	2,925	3,054	31	183	1,786	2,034	68	2,878	5,791
17	Estimate	86,445	57,481	52,731	322	1,003	35,331	16,405	520	14,852	178,645
	S.E.	4,763	8,026	3,314	62	258	5,352	1,371	124	2,421	10,577
18	Estimate	42,404	4,586	24,654	40	1,182	20,277	7,148	1,501	15,304	74,692
	S.E.	2,316	984	1,878	28	423	2,323	743	462	3,066	4,499
19A	Estimate	37,480	3,081	24,319	0	74	5,131	2,478	61	2,424	37,568
	S.E.	2,563	410	2,165	0	43	815	335	31	849	2,521
19B+	Estimate	66,965	41,826	24,353	0	508	21,589	12,970	434	7,809	109,489
	S.E.	2,369	2,767	1,291	0	118	1,857	851	112	1,912	4,145
28	Estimate	39,961	7,130	16,555	50	281	10,761	8,854	431	2,002	46,064
	S.E.	1,848	522	1,063	27	73	919	731	94	275	1,695
29	Estimate	37,751	11,184	22,188	57	172	8,001	8,102	545	2,429	52,678
	S.E.	3,347	2,013	1,795	45	53	986	1,474	130	1,031	3,392
Total	Estimate	651,090	443,590	369,445	10,229	4,828	158,676	137,492	4,649	84,353	1,213,262 +
	S.E.	10,747	12,924	7,932	649	599	7,147	4,250	580	5,458	18,166

* Includes chum and sockeye.

\+ In addition, an estimated 198 steelhead, cutthroat trout and unidentified salmon were caught by sport fishermen.

Table 5. Monthly catch success (catch per boat trip) by species, Strait of Georgia, 1984. *

Month	Coho	Chinook	Total ** Salmon	Rock-Fish	Lingcod	Total Non-Salmon	All Finfish
Jan+Feb	0.09	0.67	0.77	0.25	0.01	0.49	1.27
Mar	0.38	0.56	0.94	0.46	0.03	1.30	2.24
Apr +	0.91	0.53	1.47	0.32	0.25	0.75	2.22
May	0.95	0.58	1.56	0.35	0.22	0.65	2.20
Jun	0.77	0.87	1.68	0.20	0.10	0.54	2.21
Jul	0.89	0.63	1.53	0.21	0.20	0.53	2.06
Aug	0.48	0.37	0.86	0.25	0.24	0.62	1.48
Sep	0.58	0.37	0.96	0.22	0.22	0.57	1.52
Oct	0.29	0.49	0.80	0.25	0.23	0.55	1.36
Nov+Dec	0.12	0.79	1.05	0.18	0.23	0.60	1.65
Total	0.68	0.57	1.27	0.24	0.21	0.59	1.86

* Calculated using Table 3 data.

** Includes coho, chinook, pink, chum and sockeye.

\+ Indirect estimate. The interview data from March and May were combined to produce an estimate of catch success for April.

Table 6. Identification of rockfish by species in each Statistical Area, Strait of Georgia, 1984.

Species	Statistical Area										Total
	13	14	15	16	17	18	19A	19B+	28	29	Sample
Quillback (Sebastes maliger)	377	210	47	213	203	63	95	501	93	7	1,809
Copper (S. caurinus)	2	64	0	2	288	180	24	248	135	17	960
Yelloweye (S. ruberrimus)	12	115	16	140	72	0	15	20	61	15	466
Black (S. melanops)	4	26	0	0	5	2	1	307	18	0	363
Tiger (S. nigrocinctus)	0	11	4	10	7	1	2	3	1	1	40
Yellowtail (S. flavidus)	4	5	0	0	0	0	13	8	0	0	30
China (S. nebulosus) *	0	0	0	0	0	0	0	0	0	0	0
Canary (S. pinniger) *	0	0	0	0	0	0	0	0	0	0	0
Unidentified	46	87	13	47	289	95	67	255	558	117	1,574
Total Sample	445	518	80	412	864	341	217	1,342	866	157	5,242

* China and canary species were not observed during the 1984 identification program, but were reported for the study area in other years.

Table 7. Estimated catch of rockfish by species and Statistical Area, Strait of Georgia, 1984. *

		Statistical Area										
Species		13	14	15	16	17	18	19A	19B+	28	29	Total
Quillback	Catch	19,258	5,857	2,520	8,332	8,301	3,746	2,246	3,990	1,678	866	56,794
	S.D.	1,932	631	664	1,005	1,359	607	397	413	196	227	2,866
Copper	Catch	102	1,785	0	78	11,777	10,763	567	3,990	1,678	866	31,606
	S.D.	73	268	0	56	1,873	1,351	143	413	196	227	2,386
Yelloweye	Catch	613	3,207	858	5,477	2,944	0	355	322	758	764	15,298
	S.D.	185	400	288	715	558	0	106	77	114	211	1,084
Black	Catch	204	725	0	0	204	119	24	4,939	224	0	6,439
	S.D.	104	155	0	0	97	85	24	492	56	0	545
Other +	Catch	2,555	2,873	912	2,230	12,105	5,649	1,939	8,348	6,423	5,505	48,539
	S.D.	1,099	1,082	762	1,289	4,791	1,788	689	1,690	867	907	5,973
Total	Catch	22,732	14,447	4,290	16,117	35,331	20,277	5,131	21,589	10,761	8,001	158,676
	S.D.	2,234	1,351	1,051	1,785	5,351	2,323	815	1,856	919	985	7,146

* Calculated using data from Table 6 and Appendix B-8.

+ Other includes tiger, yellowtail, china, canary and unidentified rockfish.

Table 8. Monthly number of marked chinook observed by region, Strait of Georgia, 1984.

Month		North Gulf	South Gulf	Victoria	Total Sample
Jan+Feb	Obs *	4	8	8	20
	Insp **	289	304	708	1,301
Mar	Obs	8	2	2	12
	Insp	234	149	124	507
Apr +	Obs	1	4	2	7
	Insp	30	51	19	100
May	Obs	13	18	1	32
	Insp	686	1,003	96	1,785
Jun	Obs	39	30	0	69
	Insp	2,448	1,667	165	4,280
Jul	Obs	54	21	8	83
	Insp	2,142	1,124	281	3,547
Aug	Obs	26	14	5	45
	Insp	822	665	232	1,719
Sep	Obs	11	12	2	25
	Insp	465	477	119	1,061
Oct	Obs	7	6	1	14
	Insp	218	258	132	608
Nov+Dec	Obs	12	6	10	28
	Insp	347	401	801	1,549
Total	Obs	175	121	39	335
	Insp	7,681	6,099	2,677	16,457
Proportion of marks		0.023	0.020	0.015	0.020

* Obs - marks observed.

** Insp - fish inspected.

\+ No samples taken in April. Data estimated using 1985-88 average proportions.

Table 9. Monthly number of marked coho observed by region, Strait of Georgia, 1984.

Month		North Gulf	South Gulf	Victoria	Total Sample
Jan+Feb	Obs *	1	1	1	3
	Insp **	8	24	42	74
Mar	Obs	4	5	6	15
	Insp	119	157	111	387
Apr +	Obs	19	22	3	44
	Insp	593	600	79	1,272
May	Obs	111	26	5	142
	Insp	2,592	782	198	3,572
Jun	Obs	123	20	14	157
	Insp	3,024	627	566	4,217
Jul	Obs	123	44	1	168
	Insp	4,193	475	1,175	5,843
Aug	Obs	50	19	6	75
	Insp	1,541	451	171	2,163
Sep	Obs	18	41	1	60
	Insp	956	337	135	1,428
Oct	Obs	3	1	3	7
	Insp	161	81	170	412
Nov+Dec	Obs	0	0	0	0
	Insp	9	39	27	75
Total	Obs	452	179	40	671
	Insp	13,196	3,573	2,674	19,443
Proportion of marks		0.034	0.050	0.015	0.035

* Obs - marks observed.

** Insp - fish inspected.

+ No samples taken in April. Data estimated using 1985, 1987 and 1988 average proportions.

Table 10. Monthly estimated catch of marked chinook by region, Strait of Georgia, 1984. *

Month		North Gulf	South Gulf	Victoria	Total
Jan+Feb	Catch	21	104	38	163
	S.D.	14	40	15	45
Mar	Catch	32	40	23	95
	S.D.	18	31	17	40
Apr +	Catch	224	794	101	1,119
	S.D.	224	395	70	459
May	Catch	229	401	10	640
	S.D.	69	109	10	129
Jun	Catch	1,065	502	0	1,567
	S.D.	181	98	0	206
Jul	Catch	1,636	505	113	2,254
	S.D.	236	116	41	266
Aug	Catch	1,086	430	74	1,590
	S.D.	223	117	34	254
Sep	Catch	322	371	22	715
	S.D.	99	110	16	149
Oct	Catch	49	86	11	146
	S.D.	21	38	12	45
Nov+Dec	Catch	77	109	66	252
	S.D.	25	46	24	58
Total	Catch	4,741	3,342	458	8,541
	S.D.	452	472	97	661

* Calculated using data from Table 8 and Appendix B-3.

\+ No samples taken in April. Data estimated using 1985-88 average proportions.

Table 11. Monthly estimated catch of marked coho by region, Strait of Georgia, 1984. *

Month		North Gulf	South Gulf	Victoria	Total
Jan+Feb	Catch	106	8	4	118
	S.D.	153	9	4	153
Mar	Catch	49	45	45	139
	S.D.	29	28	21	45
Apr +	Catch	687	310	39	1,036
	S.D.	173	91	24	197
May	Catch	1,172	918	82	2,172
	S.D.	175	312	57	362
Jun	Catch	2,740	294	243	3,277
	S.D.	302	79	72	320
Jul	Catch	3,110	955	17	4,082
	S.D.	324	195	17	379
Aug	Catch	1,856	600	113	2,569
	S.D.	283	156	48	327
Sep	Catch	640	1,228	16	1,884
	S.D.	159	228	16	278
Oct	Catch	36	11	21	68
	S.D.	23	11	13	29
Nov+Dec	Catch	0	0	0	0
	S.D.	0	0	0	0
Total	Catch	10,396	4,369	580	15,345
	S.D.	622	477	112	792

* Calculated using data from Table 9 and Appendix B-2.

+ No samples taken in April. Data estimated using 1985, 1987 and 1988 average proportions.

Table 12. Monthly number and percent age composition of chinook sampled for age in the Strait of Georgia Creel Survey, 1984 (n gives sample size).

Month	Age 2		Age 3		Age 4		Age 5+		Total Sample
	n	%	n	%	n	%	n	%	
Jan+Feb	14	12.2%	86	74.8%	13	11.3%	2	1.7%	115
(Mar)	(0)	(0.0%)	(72)	(84.7%)	(12)	(14.1%)	(1)	(1.2%)	(85)
(Apr)	(2)	(2.4%)	(70)	(84.3%)	(10)	(12.0%)	(1)	(1.3%)	(83)
May	4	2.0%	157	80.1%	34	17.3%	1	0.5%	196
Jun	36	6.1%	481	81.9%	60	10.2%	10	1.7%	587
Jul	64	23.7%	172	63.7%	26	9.6%	8	3.0%	270
Aug	109	40.8%	140	52.4%	16	6.0%	2	0.7%	267
Sep	64	49.6%	54	41.9%	9	7.0%	2	1.6%	129
Oct	57	50.4%	52	46.0%	2	1.8%	2	1.8%	113
Nov+Dec	120	46.3%	138	53.3%	1	0.4%	0	0.0%	259
Total	470	-	1,422	-	183	-	29	-	2,104
Biosample *	468	-	1280	-	161	-	27	-	1,936
Overall age composition of catch **	-	21.6%	-	67.3%	-	9.4%	-	1.7%	-

( ) No data given for March and April as no samples were taken. Values given in brackets are calculated from the 1985 to 1988 average proportion by month and age (see Appendix C).

* The number of chinook actually sampled for age, ie. excluding March and April estimates.

** Overall age composition of estimated catch based on data from Table 13.

Table 13. Monthly estimated catch at age of chinook in the Strait of Georgia, 1984. *

Month		Age 2	Age 3	Age 4	Age 5+	Total **
Jan+Feb	Catch	1,073	6,591	996	153	8,813
	S.D.	295	811	284	109	915
(Mar)	Catch	(0)	(4,542)	(756)	(65)	5,363
	S.D.	-	-	-	-	897
(Apr)	Catch	(427)	(15,013)	(2,137)	(232)	17,809
	S.D.	-	-	-	-	1,431
May	Catch	722	28,340	6,137	181	35,380
	S.D.	365	2,868	1,123	182	3,107
Jun	Catch	5,936	79,315	9,894	1,649	96,794
	S.D.	999	4,016	1,297	523	4,368
Jul	Catch	22,733	61,094	9,235	2,842	95,904
	S.D.	2,652	3,759	1,764	997	5,027
Aug	Catch	23,746	30,499	3,486	436	58,166
	S.D.	2,076	2,283	861	308	3,218
Sep	Catch	14,721	12,421	2,070	460	29,673
	S.D.	1,514	1,442	675	324	2,221
Oct	Catch	3,388	3,091	119	119	6,717
	S.D.	505	478	85	85	706
Nov+Dec	Catch	6,869	7,900	57	0	14,826
	S.D.	762	837	58	0	1,133
Total ***	Catch	79,616	248,806	34,888	6,136	369,445
	S.D.	3,961	6,882	2,710	1,233	7,932 ++
Overall age composition ***		21.6%	67.3%	9.4%	1.7%	100.0%

* Calculated by applying to total monthly chinook catch the monthly age proportions from Table 12.

** Monthly total catch from Table 3.

( ) No data given for March and April as no samples were taken. Values in brackets are indirect estimates (see Table 12).

*** Total catch and overall age composition include March and April estimates.

++ S.E.

Table 14. Monthly mean nose–fork length (L) at age of chinook sampled in the Strait of Georgia Creel Survey, 1984 (n gives sample size).

	Age 2		Age 3		Age 4		Age 5		Age 6		Total
Month	L (cm)	n	L (cm)	n	L (cm)	n	L (cm)	n	L (cm)	n	Sample
Jan+Feb	52.9	14	54.5	86	68.3	13	80.5	2	52.9	0	115
Mar *	-	-	-	-	-	-	-	-	-	-	-
Apr +	-	-	-	-	-	-	-	-	-	-	-
May	40.0	4	62.6	152	72.9	34	75.0	1	-	0	191
Jun	44.3	36	64.4	481	77.1	60	82.1	10	-	0	587
Jul	46.4	64	65.4	172	74.0	26	83.9	8	92.0	1	271
Aug	49.0	109	65.4	140	86.2	16	93.0	2	-	0	267
Sep	50.6	64	64.5	54	88.6	9	95.0	2	-	0	129
Oct	50.1	57	64.4	52	78.0	2	88.5	2	-	0	113
Nov+Dec	52.3	120	62.7	138	74.0	1	-	0	-	0	259
Total	49.5	468	63.6	1275	76.5	161	84.5	27	92.0	1	1,932

* Data not available for March since records were lost.

+ No lengths given for April as no samples were taken.

APPENDICES

APPENDIX A

METHODS AND EQUATIONS USED IN ANALYSIS OF CATCH AND EFFORT STATISTICS FOR THE STRAIT OF GEORGIA SPORT FISHERY CREEL SURVEYS, 1983-1984[1].

[1]Adapted from:

Shardlow, T. F., K. K. English, T. Hoyt, G. E. Gillespie and T. A. Calvin. 1989. Strait of Georgia Creel Survey sport fishery statistics, 1983. Can. MS Rep. Fish. Aquat. Sci. 1872 : 53 p.

METHODS AND EQUATIONS USED IN ANALYSIS OF CATCH AND EFFORT STATISTICS FOR THE STRAIT OF GEORGIA SPORT FISHERY CREEL SURVEYS, 1983 - 1984.

The description of terms, variables and subscripts used in the data analysis is given in Table A-1.

Calculation of Catch and Effort Statistics

To estimate the monthly catch and effort, three components had to be calculated from that month's data:

(1) the weighted mean daily fishing pattern from interview data,
(2) the weighted mean catch per unit effort from interview data and
(3) the mean sport count from overflight data.

The equations used to estimate the means and variances for all catch and effort statistics are shown below. For April which had only overflight data, the interview data from preceding and following months were combined to estimate the mean daily fishing activity pattern and catch per unit effort. The catch and effort estimates for April are referred to as indirect estimates.

Weighting factors used to estimate the daily fishing activity pattern and mean catch per unit effort were calculated using the equations derived from DPA Consulting Ltd. (1982).

The data obtained from each shift were multiplied by the following weighting factor (W1) to expand for all possible stints at each site. The formula reads:

$$W1_{dij} = \frac{N_d}{n_{dij}} \qquad (1)$$

where N_d is the total number of days of type d in that month and n_{dij} is the number of times the jth work block at the ith site was sampled on type d days.

The interviews aggregrated by work block were multiplied by the weighting factor W2 to expand for all boats that landed in each work block. The formula reads:

$$W2_{dijk} = \frac{L_{dijk}}{I_{dijk}} \qquad (2)$$

where L_{dijk} is the number of boats landed and I_{dijk} is the number of boats interviewed on the kth stint in the jth work block at the ith site on a day type d.

Therefore, the following equations can be used to calculate an unbiased estimate of the total monthly catch ($\hat{C}_{dgr}$), fishing trips ($\hat{T}_{dg}$) and fishing activity in time block $\hat{A}_{dgt}$ for each day type (d) where g is a set of landing sites (i). These formulas read:

Table A-1. Description of terms, variables and subscripts used in this report.

DESCRIPTION OF TERMS

Shift/Stint	-	Represents a combination of a day type and landing site which was sampled on a single day. i.e. one sampling stint performed by an interviewer.
Work block	-	Represents one of four possible periods at a particular site of a given day type. Work Block 1 is before 11 AM Work Block 2 is 11 AM - 3 PM Work Block 3 is 3 PM - 7 PM Work Block 4 is after 7 PM
Day type	-	There are two possible day types: weekdays and weekends; holidays are considered to be weekend days.
Time block	-	Each day is divided into 16 time blocks which are: 1) before 7 AM 2) 7:00 - 7:59 AM 3) 8:00 - 8:59 AM . . . 15) 8:00 - 8:59 PM 16) after 9 PM

DESCRIPTION OF VARIABLES

A	-	Number of boats actively fishing
B	-	Number of boats observed on a flight
C	-	Catch
C'	-	Catch of marked salmon
CPE	-	Catch per boat trip
E	-	Effort (estimated total number of boat trips)
I	-	Number of boats interviewed and found to have been fishing
L	-	Number of boats landing
n	-	Number sampled
N	-	Population size from which n samples were observed
P	-	Proportion
T	-	Number of boat trips
V	-	Number found to be marked
W1	-	Weighting factor to expand for all possible stints at each site
W2	-	Weighting factor to expand for all boats that landed in each work block

DESCRIPTION OF SUBSCRIPTS

a	-	age
g	-	a set of landing sites
d	-	day type
i	-	site
j	-	work block
k	-	stint
l	-	landing time block
m	-	month
q	-	the next boat landing at site i and upon interviewing, found to have been fishing(q ranges from 1 to n)
r	-	species
s	-	sub-Statistical Area
t	-	time block
u	-	flight
x	-	region
y	-	annual

$$\hat{C}_{dgr} = \sum_i \sum_j \left[W1_{dij} \sum_k \sum_q \left(W2_{dijk} C_{dijklqr} \right) \right] \qquad (3)$$

$$\hat{T}_{dg} = \sum_i \sum_j \left[W1_{dij} \sum_k \sum_q \left(W2_{dijk} \right) \right] \qquad (4)$$

$$\hat{A}_{dgt} = \sum_i \sum_j \left[W1_{dij} \sum_k \sum_q \left(W2_{dijk} A_{dijkqt} \right) \right] \qquad (5)$$

where C_{dijkqr} is the catch of species r by the qth fishing party, and A_{dijkqt} can equal 0 or 1, thereby indicating whether the qth fishing party was actively fishing in time block t. Thus, the mean monthly catch per unit effort (CPE_{dgr}) measured in terms of numbers of fish kept per completed boat trip, and proportion of daily fishing effort active during the hour of the aerial survey (P_{dgt}) can be calculated with the following equations:

$$CPE_{dgr} = \frac{\hat{C}_{dgr}}{\hat{T}_{dg}} \qquad (6)$$

$$P_{dgt} = \frac{\hat{A}_{dgt}}{\hat{T}_{dg}} \qquad (7)$$

where CPE_{dgr} and P_{dgt} are calculated for each day type (d) and group of landing sites (g). The groups of landing sites reflect geographic areas with similar catch rates and/or activity patterns.

The estimated mean number of boats fishing during the hour of the sport boat count by overflight was calculated for each sub-Statistical Area using the following equation:

$$\bar{B}_{dst} = \frac{\sum_u B_{dstu}}{n_{ds}} \qquad (8)$$

where B_{dstu} is the number of boats observed fishing on flight u at time t, in sub-Statistical Area s for day type d.

The mean sport boat count at the time of the overflight ($\bar{B}_{dst}$) and proportion of daily fishing effort active during the hour of the overflight (P_{dgt}) were used in the following equation to calculate the total fishing effort for sub-Statistical Area s on day type d:

$$E_{ds} = \bar{B}_{dst} \frac{1}{P_{dgt}} N_d \qquad (9)$$

where N_d is the number of type d days in the month. Interview data for the sub-Statistical Areas fished (s) by anglers landing at each of the sites (i) within a landing group (g) were used to select the proportions (P_{dgt}) that are appropriate for each mean boat count ($\bar{B}_{dst}$).

The estimate for total effort by sub-Statistical Area and day type (E_{ds}) and the weighted catch per boat trip for a group of landing sites by day type, area and species (CPE_{dgr}) were used to calculate total catch for each species (r) and each sub-Statistical Area (s).

$$C_{sr} = \sum_d (E_{ds} \, CPE_{dgr}) \qquad (10)$$

The interview data were also used to select the catch per effort estimates (CPE_{dgr}) that should be applied to the effort estimate (E_{ds}) for a specific sub-Statistical Area (s).

Variance of Total Fishing Effort

The variance for estimates of total fishing effort has two components:

(1) the variance in aerial sport boat counts:

$$S^2_{B_{dst}} = \frac{\sum_u B^2_{dstu} - \frac{\left(\sum_u B_{dstu}\right)^2}{n_{ds}}}{n_{ds}(n_{ds}-1)} \left[\frac{N_d - n_{ds}}{N_d - 1}\right] \qquad (11)$$

where B_{dstu} is the aerial sport boat count at time t during an aerial survey u on a type d day in sub-area s; n_{ds} is the number of aerial surveys in which boats were counted on type d days, in sub-Statistical Area s; and N_d is the total number of type d days in the month.

(2) the variance in the proportion of boats fishing during the hours of the aerial boat counts:

$$S^2_{P_{dgt}} = \frac{P_{dgt}\left(1 - P_{dgt}\right)}{I_{dg}} \qquad (12)$$

where P_{dgt} is the mean proportion of boats fishing for a group of landing sites g during the hour of the aerial boat count t on type d days, and I_{dg} is the total number of sport fishing boats interviewed. The above formula assumes P_{dgt} is unbiased and normally distributed where the number of interviews is large.

The variances for boat counts ($S^2_{B_{dst}}$) and proportion of boats fishing ($S^2_{P_{dgt}}$) were combined in the following equation to calculate variance for effort:

$$S^2_{E_{ds}} = N^2_d \left(\frac{B^2_{dst}}{P^2_{dgt}}\right)\left(\frac{S^2_{B_{dst}}}{B^2_{dst}} + \frac{S^2_{P_{dgt}}}{P^2_{dgt}}\right) \qquad (13)$$

where $S^2_{E_{ds}}$ is the variance for total effort on type d days in sub-area s, and the formula is the standard formula for the variance of a ratio of two independent random variables.

Variance of Total Catch

The variance for estimates of total catch had two components: (1) the variance for total effort (presented above), and (2) the variance for catch per boat trip.

The variance for catch per boat trip($S^2_{CPE_{dgr}}$) was calculated using the following equation:

$$S^2_{CPE_{dgr}} = \frac{SS_{CPE_{dgr}} - \dfrac{\left(S_{CPE_{dgr}}\right)^2}{I_{dg}}}{I_{dg}\left(I_{dg} - 1\right)} \qquad (14)$$

where $SS_{CPE_{dgr}}$ is the weighted sum of squares for CPE_{dgr}, and $S_{CPE_{dgr}}$ is the weighted sum for CPE_{dgr}, such that the sum of the weighting factors used to estimate CPE_{dgr} was equal to the number of interviewed boat trips (I_{dg}).

The variance for total effort and the variance in the catch per boat trip for the appropriately grouped landing sites were combined in the following equation to calculate variance for total catch:

$$S^2_{C_{sr}} = \sum_d \left(E^2_{ds} S^2_{CPE_{dgr}} + CPE^2_{dgr} S^2_{E_{ds}} + S^2_{CPE_{dgr}} S^2_{E_{ds}} \right) \qquad (15)$$

which is the standard formula for the variance of the product of two independent random variables, and where $S^2_{C_{sr}}$ is the variance for total number of species r in sub-Statistical Area s.

Estimation of Marked Chinook and Coho Salmon

Incidence of marked (adipose-clipped) chinook and coho was recorded in each interview. The proportion of marks observed for each region, month and species (P_{xmr}) was calculated as:

$$P_{xmr} = \frac{V_{xmr}}{n_{xmr}} \qquad (16)$$

where V is the number of marked fish observed and n is the number of fish inspected by region(x), month(m) and species (r).

The variance of each proportion was calculated as:

$$S^2_{P_{xmr}} = \frac{P_{xmr}(1 - P_{xmr})}{n_{xmr}} \qquad (17)$$

Monthly catch estimates of marked salmon were calculated as:

$$C'_{xmr} = P_{xmr} C_{xmr} \qquad (18)$$

where C_{xmr} is the estimated catch of species r in region x and month m.

The variance of the marked catch estimates was calculated as:

$$S^2_{C'_{xmr}} = P^2_{xmr} S^2_{C_{xmr}} + C^2_{xmr} S^2_{P_{xmr}} + S^2_{C_{xmr}} S^2_{P_{xmr}} \qquad (19)$$

where $S^2_{C_{xmr}}$ is the variance of the catch estimate of species r in region x and month m.

The estimated annual proportions of marked salmon caught in each region (weighted by the corresponding regional annual catch estimates) were calculated as:

$$P_{xry} = \frac{C'_{xry}}{C_{xry}} \qquad (20)$$

where

$$C'_{xry} = \sum_{m} C'_{xmr} \quad \text{and} \quad C_{xry} = \sum_{m} C_{xmr} \qquad (21)$$

The variance of the annual proportions was calculated as:

$$S^2_{P_{xry}} = \left(\frac{C'_{xry}}{C_{xry}}\right)^2 \left[\frac{S^2_{C'_{xry}}}{(C'_{xry})^2} + \frac{S^2_{C_{xry}}}{(C_{xry})^2}\right] \qquad (22)$$

where $S^2 C_{xry}$ is the variance of the annual estimated catch of species r in region x.

Estimation of Age Composition of Chinook Catch

Scale samples and length measurements were taken in a subsampling program during the interview process. Ages used in this report represent total age of the fish (including both freshwater and oceanic life) according to the Gilbert-Rich (1927) recording convention.

The proportion of chinook at each age and month (P_{am}) was calculated as:

$$P_{am} = \frac{a_m}{n_m} \qquad (23)$$

where a_m represents the number of fish observed at age a during month m, and n_m is the total number of fish biosampled in that month.

The variance of each proportion was calculated as:

$$S^2_{am} = \frac{P_{am}(1 - P_{am})}{n_m} \qquad (24)$$

The catch at age of chinook in each month was calculated as:

$$C_{am} = P_{am} C_m \qquad (25)$$

where C_m is the estimated catch of chinook salmon in a given month m.
The variance of the catch at age estimate was calculated as:

$$S^2_{C_{am}} = P^2_{am} S^2_{C_m} + C^2_m S^2_{P_{am}} + S^2_{C_m} S^2_{P_{am}} \qquad (26)$$

where $S^2{}_{C_m}$ is the variance of the monthly catch estimate C_m.
The annual catch at age was calculated as:

$$C_{ay} = \sum_m C_{am} \qquad (27)$$

with a variance

$$S^2_{C_{ay}} = \sum_m S^2_{C_{am}} \qquad (28)$$

The annual proportion at age (weighted by monthly catch) was calculated as:

$$P_{ay} = \frac{C_{ay}}{C_y} \qquad (29)$$

with a variance

$$S^2_{P_{ay}} = \left(\frac{C_{ay}}{C_y}\right)^2 \left[\frac{S^2_{C_{ay}}}{(C_{ay})^2} + \frac{S^2_{C_y}}{(C_y)^2}\right] \qquad (30)$$

APPENDIX B

CATCH AND EFFORT STATISTICS BY MONTH AND STATISTICAL AREA FOR STRAIT OF GEORGIA, 1984.

APPENDIX B-1. STRAIT OF GEORGIA FISHING EFFORT (NO. BOAT TRIPS), 1984.

		Statistical Area										
Month		13	14	15	16	17	18	19A	19B+	28	29	Total
Jan+Feb	Estimate	1,519	646	113	780	1,757	879	863	3,109	2,627	897	13,190
	S.E.	361	180	88	206	308	259	221	403	350	242	876
March	Estimate	652	474	159	971	1,894	790	371	2,569	929	840	9,649
	S.E.	279	108	129	303	582	233	29	452	209	303	965
April *	Estimate	6,064	4,213	368	5,608	5,411	2,328	3,765	2,644	1,854	1,627	33,882 *
	S.E.	769	729	82	875	890	507	1,183	314	287	390	2,163
May	Estimate	6,626	6,462	468	7,634	16,793	6,303	8,018	4,247	2,520	1,999	61,070
	S.E.	798	1,234	42	869	3,784	1,715	2,035	1,028	430	464	5,077
June	Estimate	28,627	25,048	1,881	13,197	12,791	5,007	4,510	8,290	5,131	7,231	111,713
	S.E.	3,276	1,688	217	1,028	1,378	485	518	676	770	1,266	4,443
July	Estimate	37,915	23,810	3,439	22,928	17,579	10,932	5,392	16,793	7,457	6,838	153,083
	S.E.	2,463	1,815	812	1,379	1,765	967	432	1,338	1,055	823	4,443
August	Estimate	41,296	29,906	2,334	17,536	18,199	9,316	6,053	12,461	10,606	8,774	156,481
	S.E.	3,835	2,621	239	1,091	1,155	619	471	845	927	2,602	5,754
September	Estimate	17,000	12,447	1,491	8,932	9,240	4,474	5,748	8,200	6,154	6,083	79,769
	S.E.	1,815	916	236	1,148	787	577	481	659	542	1,143	2,954
October	Estimate	1,577	1,086	109	1,203	1,172	1,060	1,631	3,588	1,091	1,072	13,589
	S.E.	469	208	47	232	327	259	105	401	183	341	903
Nov+Dec	Estimate	1,498	1,317	187	2,563	1,609	1,315	1,129	5,064	1,592	2,390	18,664
	S.E.	281	214	96	211	264	304	240	731	298	458	1,110
Total	Estimate	142,774	105,409	10,549	81,352	86,445	42,404	37,480	66,965	39,961	37,751	651,090
	S.E.	6,044	4,005	929	2,687	4,763	2,316	2,563	2,369	1,848	3,347	10,747

* Indirect estimate.

APPENDIX B-2. STRAIT OF GEORGIA COHO CATCH SUMMARY, 1984.

Month		Statistical Area 13	14	15	16	17	18	19A	19B+	28	29	Total
Jan+Feb	Catch	0	849	0	0	196	0	0	154	0	0	1,199
	S.E.	0	683	0	0	76	0	0	42	0	0	688
March	Catch	104	1,348	0	0	1,409	0	0	839	0	0	3,700
	S.E.	96	410	0	0	553	0	0	192	0	0	721
April *	Catch	7,073	10,132	269	3,969	7,615	327	60	1,015	130	319	30,909 *
	S.E.	987	1,824	83	1,031	1,702	178	38	202	36	102	2,890
May	Catch	7,668	13,095	407	6,190	25,761	1,135	206	3,258	178	325	58,223
	S.E.	1,153	2,696	94	1,267	7,538	882	133	1,609	55	173	8,393
June	Catch	28,772	30,696	1,132	6,775	8,069	166	81	9,840	219	686	86,436
	S.E.	3,495	2,623	153	690	1,385	49	37	1,298	48	117	4,818
July	Catch	56,802	24,833	3,940	20,449	6,385	573	461	19,740	1,018	1,875	136,076
	S.E.	4,391	2,962	1,112	1,851	1,440	137	120	1,724	164	243	6,155
August	Catch	29,866	14,370	1,538	11,415	5,152	1,086	1,099	3,230	2,759	4,145	74,660
	S.E.	3,090	1,340	231	1,126	524	157	176	375	370	1,704	4,022
September	Catch	20,764	9,631	451	3,145	2,542	522	553	2,147	2,769	3,707	46,231
	S.E.	2,510	875	104	845	320	92	207	329	318	1,016	3,031
October	Catch	1,016	875	20	39	341	239	153	1,163	43	94	3,983
	S.E.	408	199	7	38	137	84	53	238	20	53	544
Nov+Dec	Catch	0	669	0	0	11	538	468	440	14	33	2,173
	S.E.	0	518	0	0	11	313	238	151	11	25	668
Total	Catch	152,065	106,498	7,757	51,982	57,481	4,586	3,081	41,826	7,130	11,184	443,590
	S.E.	7,059	5,455	1,158	2,925	8,026	984	410	2,767	522	2,013	12,923

* Indirect estimate.

APPENDIX B-3. STRAIT OF GEORGIA CHINOOK CATCH SUMMARY, 1984.

		Statistical Area										
Month		13	14	15	16	17	18	19A	19B+	28	29	Total
Jan+Feb	Catch	345	214	148	786	559	289	310	3,354	1,838	970	8,813
	S.E.	156	160	119	557	139	132	130	496	455	255	973
March	Catch	264	142	235	308	1,304	234	118	1,440	282	1,036	5,363
	S.E.	227	54	205	209	608	86	46	286	120	435	897
April *	Catch	1,907	2,431	139	2,250	2,659	1,290	2,839	964	1,591	1,739	17,809 *
	S.E.	293	511	51	521	471	255	934	150	262	422	1,432
May	Catch	4,343	4,432	148	3,142	7,514	4,743	5,993	945	2,110	2,010	35,380
	S.E.	665	957	63	805	2,073	1,260	1,674	217	368	578	3,349
June	Catch	30,101	19,299	2,268	15,154	12,256	3,230	2,376	2,097	3,922	6,091	96,794
	S.E.	3,441	1,390	355	1,557	1,507	445	401	266	633	1,036	4,527
July	Catch	29,630	13,657	1,572	20,036	12,494	6,476	3,362	3,969	1,835	2,873	95,904
	S.E.	2,095	1,302	379	2,250	1,624	948	409	421	270	356	3,921
August	Catch	19,925	9,746	508	4,158	8,183	5,134	3,884	3,425	1,422	1,781	58,166
	S.E.	2,090	996	108	516	665	642	502	387	244	697	2,728
September	Catch	6,255	4,319	829	2,202	6,813	2,069	4,067	1,334	834	951	29,673
	S.E.	812	421	187	457	800	374	612	191	141	270	1,538
October	Catch	286	919	105	213	613	178	938	1,499	834	1,132	6,717
	S.E.	152	224	53	152	257	41	137	336	231	502	777
Nov+Dec	Catch	186	19	288	1,736	336	1,011	432	5,326	1,887	3,605	14,826
	S.E.	170	13	150	262	132	445	134	850	312	668	1,273
Total	Catch	93,242	55,178	6,240	49,985	52,731	24,654	24,319	24,353	16,555	22,188	369,445
	S.E.	4,681	2,460	636	3,054	3,314	1,878	2,164	1,291	1,063	1,795	7,932

* Indirect estimate.

APPENDIX B-4. STRAIT OF GEORGIA PINK CATCH SUMMARY, 1984.

		Statistical Area										
Month		13	14	15	16	17	18	19A	19B+	28	29	Total
Jan+Feb	Catch	0	0	0	0	48	0	0	0	0	0	48
	S.E.	0	0	0	0	25	0	0	0	0	0	25
March	Catch	0	0	0	0	11	0	0	0	0	0	11
	S.E.	0	0	0	0	8	0	0	0	0	0	8
April *	Catch	469	601	0	0	21	0	0	0	0	0	1,091 *
	S.E.	86	176	0	0	9	0	0	0	0	0	196
May	Catch	551	714	0	0	46	0	0	0	0	0	1,311
	S.E.	110	195	0	0	32	0	0	0	0	0	226
June	Catch	2,345	1,295	0	0	158	0	0	0	0	0	3,798
	S.E.	370	216	0	0	42	0	0	0	0	0	430
July	Catch	1,966	464	22	25	38	0	0	0	0	0	2,515
	S.E.	247	137	10	14	15	0	0	0	0	0	283
August	Catch	1,035	133	29	65	0	40	0	0	12	5	1,319
	S.E.	237	54	18	28	0	28	0	0	10	5	247
September	Catch	46	0	0	0	0	0	0	0	0	0	46
	S.E.	30	0	0	0	0	0	0	0	0	0	30
October	Catch	0	0	0	0	0	0	0	0	19	8	27
	S.E.	0	0	0	0	0	0	0	0	13	7	15
Nov+Dec	Catch	0	0	0	0	0	0	0	0	19	44	63
	S.E.	0	0	0	0	0	0	0	0	21	44	49
Total	Catch	6,412	3,207	51	90	322	40	0	0	50	57	10,229
	S.E.	524	371	21	31	62	28	0	0	27	45	648

* Indirect estimate.

APPENDIX B-5. STRAIT OF GEORGIA CATCH SUMMARY FOR OTHER SALMON, 1984. *

		Statistical Area										
Month		13	14	15	16	17	18	19A	19B+	28	29	Total
Jan+Feb	Catch	0	0	0	161	0	0	0	0	0	0	161
	S.E.	0	0	0	139	0	0	0	0	0	0	139
March	Catch	0	11	0	0	0	0	0	0	0	0	11
	S.E.	0	13	0	0	0	0	0	0	0	0	13
April **	Catch	82	13	0	0	4	0	0	19	0	0	118 **
	S.E.	23	12	0	0	3	0	0	10	0	0	28
May	Catch	67	0	0	0	9	0	0	78	0	0	154
	S.E.	26	0	0	0	7	0	0	69	0	0	74
June	Catch	28	53	0	0	24	0	16	30	0	0	151
	S.E.	21	18	0	0	13	0	19	16	0	0	39
July	Catch	75	39	4	19	52	0	0	204	13	0	406
	S.E.	30	21	4	16	26	0	0	67	6	0	83
August	Catch	144	7	0	76	40	45	0	121	80	35	548
	S.E.	122	5	0	56	19	20	0	62	46	18	158
September	Catch	0	15	4	182	3	43	41	13	147	87	535
	S.E.	0	9	5	102	3	43	33	14	51	34	132
October	Catch	0	13	0	23	45	1	0	21	37	39	179
	S.E.	0	7	0	20	28	1	0	12	24	35	56
Nov+Dec	Catch	106	486	0	0	826	1,093	17	22	4	11	2,565
	S.E.	62	182	0	0	254	420	20	13	5	11	528
Total	Catch	502	637	8	461	1,003	1,182	74	508	281	172	4,828
	S.E.	146	185	6	183	258	423	43	118	73	53	599

* Includes chum and sockeye.

** Indirect estimate.

APPENDIX B-6. STRAIT OF GEORGIA CATCH SUMMARY FOR TOTAL SALMONIDS, 1984. *

Month		Statistical Area 13	14	15	16	17	18	19A	19B+	28	29	Total	
Jan+Feb	Catch	345	1,063	148	946	802	289	310	3,508	1,838	970	10,219	
	S.E.	156	680	119	559	199	132	130	508	455	255	1,191	
March	Catch	368	1,500	235	308	2,724	234	118	2,279	282	1,036	9,084	
	S.E.	249	447	205	209	1,080	86	46	397	120	435	1,373	
April **	Catch	9,532	13,178	408	6,220	10,298	1,617	2,899	1,998	1,720	2,058	49,928	**
	S.E.	1,299	2,339	120	1,314	2,127	360	955	283	283	481	3,854	
May	Catch	12,629	18,241	555	9,333	33,331	5,877	6,200	4,280	2,288	2,335	95,069	
	S.E.	1,594	3,559	113	1,535	9,127	1,762	1,740	1,733	398	686	10,519	
June	Catch	61,247	51,344	3,400	21,929	20,507	3,396	2,472	11,968	4,142	6,777	187,182	
	S.E.	6,917	3,887	467	2,012	2,809	462	411	1,412	658	1,101	8,896	
July	Catch	88,485	39,004	5,540	40,538	18,978	7,051	3,823	23,916	2,870	4,751	234,956	
	S.E.	6,242	4,042	1,462	3,739	2,947	984	453	2,013	417	548	9,263	
August	Catch	50,978	24,261	2,078	15,719	13,382	6,309	4,983	6,779	4,279	5,970	134,738	
	S.E.	5,034	2,202	302	1,382	1,026	690	585	645	524	2,325	6,337	
September	Catch	27,074	13,972	1,286	5,536	9,362	2,637	4,662	3,499	3,754	4,748	76,530	
	S.E.	3,195	1,182	266	1,085	1,010	408	566	429	403	1,256	4,051	
October	Catch	1,303	1,813	128	276	1,007	421	1,092	2,685	938	1,279	10,942	
	S.E.	505	392	55	177	382	107	149	445	255	544	1,087	
Nov+Dec	Catch	293	1,176	289	1,736	1,174	2,644	918	5,793	1,926	3,693	19,642	
	S.E.	187	550	150	262	304	747	315	901	454	673	1,628	
Total	Catch	252,254	165,552	14,067	102,541	111,565	30,475	27,477	66,705	24,037	33,617	828,290	
	S.E.	11,268	7,546	1,621	5,065	10,388	2,378	2,289	3,340	1,332	3,194	18,818	

* Includes coho, chinook, pink, chum, sockeye, steelhead and cutthroat trout.

** Indirect estimate.

APPENDIX B-7. STRAIT OF GEORGIA CATCH SUMMARY FOR RELEASED SALMON, 1984.

		Statistical Area										
Month		13	14	15	16	17	18	19A	19B+	28	29	Total
Jan+Feb	Catch	491	2,910	13	919	594	78	107	3,645	1,286	806	10,849
	S.E.	228	1,478	10	349	167	28	54	512	335	250	1,681
March	Catch	197	617	18	918	1,034	113	16	3,717	408	595	7,633
	S.E.	166	201	17	508	453	55	11	565	152	286	979
April *	Catch	866	2,021	55	832	2,090	542	1,790	2,194	531	701	11,622 *
	S.E.	158	405	24	319	402	167	644	284	100	191	1,011
May	Catch	2,067	2,655	70	736	8,130	1,862	4,508	1,237	675	821	22,761
	S.E.	343	598	25	249	3,344	817	1,387	806	141	353	3,887
June	Catch	6,271	17,339	869	3,918	10,324	1,292	1,300	1,368	1,677	2,766	47,124
	S.E.	880	1,303	174	581	1,595	251	296	266	345	588	2,464
July	Catch	20,253	30,525	3,347	14,066	16,744	2,980	1,683	3,947	2,176	2,128	97,849
	S.E.	1,718	2,676	959	1,550	1,919	519	322	532	345	320	4,242
August	Catch	68,270	60,531	4,504	11,510	29,681	8,014	10,574	17,544	5,632	2,754	219,014
	S.E.	8,509	6,112	733	1,242	2,751	847	1,233	2,411	684	451	11,319
September	Catch	38,076	49,494	2,776	12,834	28,548	6,304	9,366	20,564	4,433	4,939	177,334
	S.E.	4,866	6,739	573	3,482	2,910	1,095	1,449	2,565	689	1,369	10,111
October	Catch	1,063	2,649	323	759	4,632	1,902	3,123	11,382	1,677	2,204	29,714
	S.E.	409	567	164	352	1,567	397	381	1,795	425	939	2,772
Nov+Dec	Catch	106	751	108	292	968	1,510	2,013	7,015	989	2,024	15,776
	S.E.	71	356	57	57	246	494	573	1,119	318	403	1,512
Total	Catch	137,660	169,492	12,083	46,784	102,745	24,597	34,480	72,613	19,484	19,738	639,676
	S.E.	10,010	9,738	1,359	4,133	6,030	1,830	2,574	4,305	1,276	1,969	16,862

* Indirect estimate.

APPENDIX B-8. STRAIT OF GEORGIA ROCKFISH CATCH SUMMARY, 1984.

Month		Statistical Area 13	14	15	16	17	18	19A	19B+	28	29	Total
Jan+Feb	Catch	461	46	30	393	448	747	358	624	211	24	3,342
	S.E.	209	55	31	334	146	321	123	154	76	18	573
March	Catch	260	26	130	660	1,149	1,152	151	669	264	0	4,461
	S.E.	218	21	145	527	303	684	100	262	209	0	1,014
April *	Catch	1,262	256	119	1,720	2,173	1,884	489	1,391	887	525	10,706 *
	S.E.	235	113	38	603	466	656	215	232	193	211	1,124
May	Catch	787	424	121	2,109	9,335	3,357	948	2,351	1,250	765	21,447
	S.E.	162	195	38	853	5,131	1,596	453	707	299	226	5,524
June	Catch	3,232	2,868	335	1,770	4,842	2,781	594	2,680	1,482	1,848	22,432
	S.E.	623	407	121	371	689	564	234	441	278	422	1,415
July	Catch	5,278	3,197	837	3,388	7,301	4,009	1,371	3,158	2,339	2,009	32,887
	S.E.	683	460	238	646	871	870	479	520	400	435	1,875
August	Catch	7,263	5,834	1,379	3,255	7,437	4,786	753	3,008	2,984	2,066	38,765
	S.E.	1,748	960	306	772	790	828	300	405	588	688	2,655
September	Catch	2,003	1,027	1,277	2,642	1,857	1,152	261	5,874	1,185	659	17,937
	S.E.	390	219	957	740	277	256	102	1,427	278	177	1,990
October	Catch	1,092	126	19	53	218	190	107	1,382	126	59	3,372
	S.E.	545	83	9	47	98	79	43	346	91	50	674
Nov+Dec	Catch	1,094	643	43	127	571	219	99	452	33	46	3,327
	S.E.	677	648	28	83	202	129	44	127	16	34	981
Total	Catch	22,732	14,447	4,290	16,117	35,331	20,277	5,131	21,589	10,761	8,001	158,676
	S.E.	2,234	1,352	1,052	1,786	5,352	2,323	815	1,857	919	986	7,147

* Indirect estimate.

APPENDIX B-9. STRAIT OF GEORGIA LINGCOD CATCH SUMMARY, 1984.

		Statistical Area											
Month		13	14	15	16	17	18	19A	19B+	28	29	Total	
Jan+Feb	Catch	26	0	0	0	19	4	49	3	19	0	120	**
	S.E.	20	0	0	0	11	4	27	0	17	0	39	
March	Catch	104	0	0	0	38	34	0	75	82	0	333	**
	S.E.	82	0	0	0	28	60	0	41	108	0	156	
April *	Catch	2,873	324	36	1,832	829	388	242	1,308	440	246	8,518	*
	S.E.	427	118	15	507	153	116	104	211	83	97	750	
May	Catch	2,788	523	41	2,401	2,933	892	368	2,353	707	431	13,437	
	S.E.	464	253	13	595	997	392	145	546	140	109	1,460	
June	Catch	6,569	2,843	137	2,571	3,326	1,135	446	2,116	988	1,303	21,434	
	S.E.	915	341	30	345	488	248	153	342	167	297	1,277	
July	Catch	6,522	2,418	535	9,846	3,907	1,450	502	1,781	1,948	2,018	30,927	
	S.E.	609	328	143	1,221	649	281	169	267	328	342	1,678	
August	Catch	11,551	3,570	269	7,771	3,584	1,880	160	2,318	2,971	3,274	37,348	
	S.E.	1,402	563	87	987	390	356	57	290	507	1,385	2,410	
September	Catch	5,243	1,735	644	3,299	1,335	783	551	2,057	1,488	751	17,886	
	S.E.	756	562	286	862	189	155	146	278	304	163	1,411	
October	Catch	705	23	6	792	241	216	143	750	204	79	3,159	
	S.E.	324	12	6	438	88	74	55	149	107	40	590	
Nov+Dec	Catch	3,344	0	2	192	193	366	17	209	7	0	4,330	**
	S.E.	1,628	0	1	74	88	291	13	91	11	0	1,660	
Total	Catch	39,725	11,436	1,670	28,704	16,405	7,148	2,478	12,970	8,854	8,102	137,492	
	S.E.	2,628	967	333	2,034	1,371	743	335	851	731	1,474	4,250	

* Indirect estimate.

** A total closure for lingcod was in effect from January 1 to April 15, and November 15 to December 31, 1984; see Table 3 footnote.

APPENDIX B-10. STRAIT OF GEORGIA DOGFISH CATCH SUMMARY, 1984.

		Statistical Area										
Month		13	14	15	16	17	18	19A	19B+	28	29	Total
Jan+Feb	Catch	0	0	0	0	0	0	0	0	4	4	8
	S.E.	0	0	0	0	0	0	0	0	6	4	7
March	Catch	0	0	0	0	0	0	0	0	0	0	0
	S.E.	0	0	0	0	0	0	0	0	0	0	0
April *	Catch	0	0	0	0	0	11	0	0	20	39	70 *
	S.E.	0	0	0	0	0	11	0	0	12	31	35
May	Catch	0	109	0	0	0	28	0	0	33	53	223
	S.E.	0	110	0	0	0	23	0	0	18	30	118
June	Catch	49	259	0	57	150	174	32	72	38	75	906
	S.E.	31	119	0	68	96	110	23	30	20	52	214
July	Catch	151	70	0	0	127	1,027	15	228	179	201	1,998
	S.E.	85	41	0	0	47	417	13	97	51	74	450
August	Catch	224	158	0	0	116	75	14	120	131	122	960
	S.E.	148	62	0	0	49	31	16	45	70	70	203
September	Catch	61	4	7	8	101	186	0	14	7	7	395
	S.E.	46	3	6	6	36	162	0	10	8	6	173
October	Catch	0	0	0	0	26	0	0	0	0	0	26
	S.E.	0	1	0	0	19	0	0	0	0	0	19
Nov+Dec	Catch	0	0	0	0	0	0	0	0	19	44	63
	S.E.	0	0	0	0	0	0	0	0	21	44	49
Total	Catch	485	600	7	65	520	1,501	61	434	431	545	4,649
	S.E.	179	178	6	68	124	462	31	112	94	130	581

* Indirect estimate.

APPENDIX B-11. STRAIT OF GEORGIA CATCH SUMMARY FOR OTHER FINFISH, 1984.

		Statistical Area										
Month		13	14	15	16	17	18	19A	19B+	28	29	Total
Jan+Feb	Catch	27	207	0	30	360	1,052	645	500	178	7	3,006
	S.E.	21	222	0	33	141	402	385	344	113	6	715
March	Catch	0	3	0	0	972	3,979	1,169	1,551	8	44	7,726
	S.E.	0	3	0	0	460	1,973	669	1,780	8	39	2,779
April *	Catch	22	38	1	1,667	1,243	2,298	63	708	65	36	6,141 *
	S.E.	12	23	1	433	400	784	74	304	18	18	1,030
May	Catch	21	56	1	1,480	452	1,607	0	561	122	62	4,362
	S.E.	15	33	1	439	177	1,490	0	171	41	24	1,574
June	Catch	1,442	507	7	4,424	4,688	2,529	0	1,079	274	391	15,341
	S.E.	264	96	5	696	1,808	1,329	0	356	74	116	2,397
July	Catch	1,518	881	0	8,483	1,376	1,313	294	809	149	223	15,046
	S.E.	218	261	0	1,971	373	402	332	172	31	67	2,109
August	Catch	2,650	1,568	0	8,894	2,215	1,155	13	885	658	1,379	19,417
	S.E.	519	314	0	1,621	556	339	16	154	187	1,018	2,125
September	Catch	393	600	0	2,941	2,579	437	184	1,142	367	244	8,887
	S.E.	106	172	0	929	1,201	217	75	229	95	71	1,570
October	Catch	0	24	0	332	9	12	48	417	88	32	962
	S.E.	0	12	0	169	11	8	60	102	58	21	216
Nov+Dec	Catch	861	6	0	449	958	922	8	157	93	11	3,465
	S.E.	281	6	0	107	528	651	8	62	83	11	897
Total	Catch	6,934	3,890	9	28,700	14,852	15,304	2,424	7,809	2,002	2,429	84,353
	S.E.	691	507	5	2,878	2,421	3,066	849	1,912	275	1,031	5,458

* Indirect estimate.

APPENDIX C. ANNUAL PROPORTION OF CHINOOK CATCH AT AGE BY PERIOD, 1983 TO 1988.

	Period	1983	1984	1985	1986	1987	1988	85-88 Mean
	March	(0.001)	(0.001)	0.000	0.005	0.000	0.000	0.001
Age 2	April	(0.003)	(0.003)	0.000	0.000	0.010	0.003	0.003
	Jan-Feb May-Dec	(0.996)	(0.996)	1.000	0.995	0.990	0.997	0.996
	March	(0.052)	(0.052)	0.056	0.022	0.086	0.044	0.052
Age 3	April	(0.049)	(0.049)	0.052	0.017	0.079	0.046	0.049
	Jan-Feb May-Dec	(0.900)	(0.900)	0.892	0.961	0.835	0.910	0.900
	March	(0.064)	(0.064)	0.041	0.022	0.109	0.082	0.064
Age 4	April	(0.057)	(0.057)	0.065	0.021	0.095	0.046	0.057
	Jan-Feb May-Dec	(0.880)	(0.880)	0.894	0.957	0.796	0.872	0.880
	March	(0.043)	(0.043)	0.000	0.063	0.109	0.000	0.043
Age 5	April	(0.029)	(0.029)	0.037	0.046	0.031	0.000	0.029
	Jan-Feb May-Dec	(0.929)	(0.929)	0.963	0.891	0.860	1.000	0.929

NOTE: Values in brackets represent the 85-88 mean proportion.

APPENDIX D. STRAIT OF GEORGIA CREEL SURVEY STUDY AREA.

The Strait of Georgia Creel Survey study area includes those waters of Juan de Fuca Strait and the Strait of Georgia bounded in the south by a line from Sheringham Pt. on Vancouver Island due south to an intersection with the International Boundary and along the International Boundary to the B.C. Mainland coast at Blaine (Boundary Bay) and in the north by the following 3 boundary lines:

1) in discovery passage from Granite Pt. on Quadra Island to the stream mouth west of Moriarity Pt. on Vancouver Island.

2) in Okisollo Channel from Granite Pt. on Quadra Island due north to Sonora Island.

3) in Cordero Channel from Burnt Bluff on the mainland 214° passing west of Dent Island to Sonora Island.

The area for which the Strait of Georgia Creel Survey statistics apply includes the above listed administrative area with the exception of the following areas:

1) Bute Inlet above a line from Lawrence Pt. running across the inlet. This area coincides with management units 13-21 and 13-22.

2) Waters of Pryce Channel, Waddington Channel, Pendrell Sound, Homfray Channel and Toba Inlet bounded by a line drawn from Horace Head on East Redonda Island at the south end of Waddington Channel to the northern point of Roscoe Bay on West Redonda Island and a line drawn within Homfray Channel from Price Pt. on the eastern shore of the channel by a line drawn from George Head at the easterly entrance of Ramsay Arm to Sutil Pt. on Cortes Island.

3) Hotham Sound above a line drawn from Elephant Point on the western shore of the Sound to the southern point of Granville Bay on the eastern shore of the Sound.

4) Jervis Inlet above a line drawn within Prince of Whales Reach from the mouth of Treat Creek on the east shore across the Reach to the summit (1625') at the head of Goliath Bay.

5) Sechelt Inlet including Narrows Inlet and Salmon Inlet above a line drawn within Skookumchuck Narrows from the "dog-leg" point southeast of the Egmont Pt. 224° across the Narrows to Sechelt Peninsula.

APPENDIX E. SPECIES COMMONLY INCLUDED WITH OTHER FINFISH.

Pacific Herring
Pacific Cod
Pacific Tomcod
Walleye Pollock
Pacific Hake
Perches - any perch, seaperch or surfperch
Greenlings
Flounders - Pacific Halibut, any flounder or sole