Strait of Georgia Sport Fishery and Northern Vancouver Island Creel Survey Statistics For Salmon and Groundfish, 1998

D. C. Hardie, D. A. Nagtegaal, and L. Nagy

Fisheries and Oceans Canada
Science Branch, Pacific Region
Pacific Biological Station
Nanaimo, British Columbia
V9R 5K6

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STRAIT OF GEORGIA SPORT FISHERY AND NORTHERN VANCOUVER ISLAND CREEL SURVEY STATISTICS FOR SALMON AND GROUNDFISH, 1998

by

D. C. Hardie, D. A. Nagtegaal, and L. Nagy

Fisheries and Oceans Canada

Science Branch, Pacific Region

Pacific Biological Station

Nanaimo, British Columbia

V9R 5K6

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ABSTRACT

Hardie, D. C., D. A. Nagtegaal, and L. Nagy. 1999. Strait of Georgia sport fishery and Northern Vancouver Island creel survey statistics for salmon and groundfish, 1998. Can. Manuscr. Rep. Fish. Aquat. Sci. 2500: 92 p.

This report documents the 1998 catch and effort estimates for the Strait of Georgia and Northern Vancouver Island sport fishery creel surveys. Catch and effort statistics for the Strait of Georgia and Northern Vancouver Island tidal sport fishery are presented for each month, Statistical Area and by individual species. Strait of Georgia creel survey data collection began in 1980 and continues today, historical data are also presented as far back as 1960. Comparisons are made to these historical data to determine trends in catch and effort.

The 1998 Strait of Georgia statistics for statistical areas 13, 14, 15, 16, 17, 18, 19, 28 and 29, were derived from 7,456 fishing interviews and 63 aerial surveys. Anglers conducted an estimated 162,296 boat trips and kept 20,923 chinook, 1,376 coho, 3,624 chum, 6,848 pink, 4,474 sockeye salmon, as well as 2,203 halibut, 3,291 lingcod and 84,251 rockfish. The catch and effort for 1998 shows a significant downward trend. Effort has dropped 75% from a high of 664,517 boat trips in 1988 and chinook catch has dropped 94% from a high of 369,445 in 1984. Total salmon catch per boat trip has also dropped from a high of 2.30 in 1993 to 0.24 in 1998. Among salmon examined for marks, 4.6% of chinook and 13.0% of coho had adipose fin clips. The age composition of chinook catch shifted from the normally dominant age 3 to age 4. The chinook catch consisted of 5% age 2 fish, 31% age 3 fish, 55% age 4 and 9% age 5 and older fish. The length frequency distributions of the chinook and coho are also given.

The 1998 Northern Vancouver Island statistics for statistical area 12 were derived from 1,622 fishing interviews and 22 aerial surveys. Anglers conducted an estimated 16,408 boat trips and kept 2,366 chinook, 850 chum, 15,004 pink, 440 sockeye salmon, as well as 3,652 halibut, 1,521 lingcod and 12,010 rockfish. An additional 6,691 chinook and 30,857 coho were released by anglers. Catch success per boat trip averaged 1.14 for salmon and 0.73 for groundfish.

Key words: salmon, groundfish, creel survey, sport fishing, catch, effort, age composition, length distribution, Strait of Georgia, Northern Vancouver Island.

RÉSUMÉ

Hardie, D. C., D. A. Nagtegaal, and L. Nagy. 1999. Strait of Georgia sport fishery and Northern Vancouver Island creel survey statistics for salmon and groundfish, 1998. Can. Manuscr. Rep. Fish. Aquat. Sci. 2500: 92 p.

Ce rapport présente les estimations des captures et de l'effort de pêche réalisées à partir d'enquêtes auprès des pêcheurs sportifs pour le détroit de Géorgie et le nord de l'île de Vancouver. Les statistiques de capture et d'effort pour la pêche sportive en eaux à marée du détroit de Géorgie et du nord de l'île de Vancouver sont présentées pour chaque mois, pour chaque zone statistique et pour chaque espèce. Les enquêtes auprès des pêcheurs dans le détroit de Géorgie ont débuté en 1980 et se poursuivent aujourd'hui, et il existe aussi des données historiques remontant à 1960. On présente ici des comparaisons avec ces données historiques pour dégager les tendances des captures et de l'effort de pêche.

Les statistiques du détroit de Géorgie de 1998 pour les zones statistiques 13, 14, 15, 16, 17, 18, 19, 28 et 29 ont été établies à partir de 7 456 entrevues et 63 relevés aériens. On estime que les pêcheurs sportifs ont effectué 162 296 sorties en bateau et conservé 20 923 quinnats, 1 376 cohos, 3 624 kétas, 6 848 saumons roses et 4 474 saumons rouges, ainsi que 2 203 flétans, 3 291 morues-lingues et 84 251 sébastes. Les données de 1998 montrent qu'il y a une tendance à la baisse significative dans les captures et l'effort. L'effort a chuté de 75 % par rapport au sommet de 664 517 sorties en bateau enregistré en 1988, et les prises de quinnat ont chuté de 94 % par rapport au sommet de 369 445 captures enregistré en 1984. Les captures totales de saumon par sortie ont aussi chuté depuis le sommet de 2,30 de 1993, pour n'être plus que de 0,24 en 1998. Parmi les saumons qu'on a examinés pour voir s'ils portaient des marques, on a observé l'ablation de la nageoire adipeuse chez 4,6 % des quinnats et 13,0 % des cohos. Parmi les quinnats capturés, les poissons d'âge 4 étaient dominants, ce qui est nouveau, les poissons d'âge 3 étant normalement dominants. La composition par âge des captures de quinnat était la suivante : 5 % d'âge 2, 31 % d'âge 3, 55 % d'âge 4, et 9 % d'âge 5 ou plus. On présente aussi les distributions des fréquences de longueur des quinnats et des cohos.

Les statistiques du nord de l'île de Vancouver de 1998 pour la zone statistique 12 ont été établies à partir de 1 622 entrevues et 22 relevés aériens. On estime que les pêcheurs sportifs ont effectué 16 408 sorties en bateau et conservé 2 366 quinnats, 850 kétas, 15 004 saumons roses, et 440 saumons rouges, ainsi que 3 652 flétans, 1 521 morues-lingues et 12 010 sébastes. Les pêcheurs ont aussi relâché 6 691 quinnats et 30 857 cohos additionnels. Les taux de capture moyens par sortie étaient de 1,14 pour le saumon et de 0,73 pour le poisson de fond.

Mots clés : saumon, poisson de fond, enquête auprès des pêcheurs, pêche sportive, capture, effort, composition par âge, distribution par longueur, détroit de Géorgie, nord de l'île de Vancouver

PART 1

STRAIT OF GEORGIA

INTRODUCTION

Part 1 of this report documents the 1998 catch and effort statistics for the Strait of Georgia sport fishery and presents the methodology for collecting these data. Data are presented in tables and graphs with catch and effort dating back to 1960. The 1998 catch and effort are displayed in tables by month, Statistical Area and species. Graphs showing historical trends and comparisons in catch and effort for 91-95 average, 1996, 1997 and 1998. The 1998 report is one of a series of annual reports documenting the activities of the creel survey and providing official Strait of Georgia tidal sport fishery catch statistics. There have been significant changes in catch and effort since the last report was written for the year 1992. A list of previous reports in this series may be found in Appendix A. In this report all figures, tables and appendices are located at the end of text.

BACKGROUND

The Strait of Georgia fishery supports one of the most valuable recreational fisheries in British Columbia. Coded wire tag recoveries indicate these fish stocks consist of Fraser River, Puget Sound and East Coast Vancouver Island streams. These fish stocks contribute to the East and West Coast fisheries. There has been evidence of declining stocks since the 1970's (Argue et al. 1983). Various groups (Commercial, Native and Recreational) on both sides of the borders depend on these stocks and each user group is quick to blame another group for the decline. There is also evidence, from declining marine survival rates of salmon stocks (Cross et al. 1991; Beamish et al. 1994), that marine environmental factors may be involved.

The creel survey study area (Appendix B-1 and B-2) comprises over 5,900 km^2 of water surface area and has in excess of 2,400 km of shoreline. From its southern end near Victoria, the area extends about 290 km northern-west to the Campbell River area. At its greatest width this area is about 32 km wide. Two major population centres, Vancouver and Victoria, and many smaller centres such as Nanaimo and Campbell River are located within the study area. Over 500 boat launch ramps, marinas and public wharves as well as thousands of private boat launching facilities provide access to this area.

The recreational fishery is active throughout the year but over 85% of the effort occurs in the summer months of May to September (Collicutt and Shardlow 1993). The most sought after species in the Strait of Georgia recreational fishery are the chinook (*Oncorhynchus tshawytscha*) and coho (*O. kisutch*) salmon, but in recent years significant fisheries directed at pink (*O. gorbuscha*), sockeye (*O. nerka*) and halibut (*Hippoglossus stenolepis*) have developed in certain areas.

The size of vessel, methods of fishing and terminal tackle vary widely depending on location and time of year. Vessels range from 4 m car-top boats to yachts more than 17 m in length, although most boats would be in the 5 m to 8 m range. Popular fishing methods include trolling, mooching, bucktailing and stripcasting.

Over the past three decades the recreational fishery in this area has undergone dramatic changes. Prior to 1960, the numbers of chinook and coho taken by the commercial troll fleet was almost double that taken by sport fishermen. During the 1980's however, the situation has reversed with the sport fishery taking more than triple the commercial harvest of chinook and coho. The recreational fishery is still the primary harvester of chinook and coho in the Strait of Georgia. Effort in the recreational fishery has fluctuated from about 200,000 boat trips in 1960 to peaks of 769,000 in 1980 and 600,000 in 1988 to an all time low of 162,000 boat trips in 1998. The chinook catch climbed through the 1960's with a peak in the mid 1970's of over 400,000 pieces and a second peak of 370,000 pieces in 1984. A steady decline has occurred since, to a low of 20,000 pieces in 1998. Although annual coho catches have varied widely, an increase from about 200,000 pieces in 1960 to over 1 million pieces in 1988 was recorded. A gradual decline from 1988 levels to 100,000 pieces in 1997 has followed the general decline of stocks. The 1998 coho catch was an all time low of 1400 pieces, this was due, however, to a majority of areas being closed to coho retention.

There were limited commercial fishing opportunities in the Strait of Georgia in 1998, only three Statistical Areas (13, 14 and 29) had openings. In total 2 million pieces were harvested, consisting of 71% chum and 28% sockeye. Statistical Area 13 had 57% of the catch and Areas 14 and 29 had 27% and 16%, respectively. An estimated 7000 chinook made up 2% of the total catch for Area 29.

From 1956 to 1976, estimates of catch and effort in the sport fishery published by the Department of Fisheries and Oceans (DFO) were based on subjective assessments completed by Fishery Officers and on small-scale creel surveys. The general lack of statistical rigor and consistency associated with these methods of catch estimation as well as the rapid growth of the recreational fishery led to the initiation of the Strait of Georgia Creel Survey Pilot Program in 1980 (DPA 1982). The survey has been run continuously (with minor interruptions) since then. Although many details such as sampling locations and times are regularly updated to reflect changes in the fishery, the basic design of the survey remains similar to the pilot project conducted in 1980.

Creel survey data are used for a variety of management and reporting purposes. Catch and effort information is also used by local people (both inside and outside DFO) to monitor the fishery in their area. In addition, creel survey information is used to predict the effect of regulation changes and to measure the success of conservation actions imposed. The adipose mark information collected during the survey is supplied to the Mark Recovery Program (Kuhn et al. 1988) and used in combination with other data for exploitation rate and stock distribution analyses.

OBJECTIVES

The specific objectives of the 1998 Strait of Georgia creel survey were:

1. To estimate the sport angler effort and catches of chinook, coho, chum, pink, sockeye salmon, halibut, lingcod, rockfish and other finfish by month for Statistical Areas 13

through 19, 28 and 29; and to estimate the number of chinook, coho and other salmon released by anglers.

2. To estimate the catch rate for adipose-clipped chinook and coho in the sport fishery.

3. To estimate the age composition and mean length-at-age for chinook, and the length frequency for chinook and coho.

METHODS

STUDY DESIGN

The design of the Strait of Georgia Creel Survey conducted in 1998 was similar to that used by DPA Consulting Ltd. (1982) with some modifications to the data analysed, sampling intensity, flight routes and data processing. It is comprised of two independent surveys: angler interviews and aerial overflights. Angler interviews provide data on sport fishing catch per unit effort (CPUE) 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 the estimated total effort by CPUE.

The fishery was stratified according to the following criteria:

1. Month. The survey operated from April through to and including October. Interview intensity was reduced for October due to lack of fishing activity when only Statistical Area 19 was surveyed.

2. Geographic area. Catch and effort estimates were produced for Statistical Areas 13 through 19, 28 and 29. Statistical Area 19 was split into Area 19A (Saanich Inlet see Appendix B-2) and 19B+ (the rest of area 19 and that portion of Area 20 east of Sheringham Point).

3. Day type. Weekend and mid-week days were considered independently because sport fishing activity is known to differ for the two types of days.

4. Time of day. Sampling shifts (one shift is a set number of consecutive hours of interviewing anglers at one site by one creel surveyor) were conducted during set time periods. From April to October sampling was conducted during either an early shift (approximately 0700 to 1500 hours) or a late day shift (approximately 1500 to 2300 hours).

5. Guided verses unguided anglers. Certain sites are known to have primarily guided fishing effort. Unpublished data from previous surveys in this series confirm that the CPUE from guided boats differs markedly from unguided boats. Guided vs. unguided,

was documented by the interviewer, however, at this time the catch estimate program does not generate catch and effort estimates differently for the two parties.

In each region, various landing sites were chosen as locations for surveyors to conduct interviews. Site selection was based on four criteria: representativeness, traffic volume, site accessibility and adequate observation points. Discussions with local fishers, marina operators and Fisheries Officers and data from previous surveys were used to choose sites that were representative of the local sport fishing activity (i.e. sites which were used by a wide cross-section of anglers). Sites with expected traffic volumes of more than 15 boats per day in the summer were considered as possible sampling locations. Expected traffic volumes for sites were compiled from previous surveys or from discussions with marina operators or local Fisheries Officers.

Site accessibility refers to whether an interviewer can easily reach a site by car or ferry during the defined shift hours. Only sites with good accessibility were selected. As a result, landing sites on most of the islands in the Strait of Georgia were excluded from the survey. This was not expected to be a major factor, however, since most of the fishing occurs from accessible sites. The final criterion, adequate observation points, was essential for interviewers to obtain an accurate count of all boats returning to a landing site. At some large marinas, two sampling sites were identified if it was impossible to see all boats returning.

Allocation of sampling effort among months followed the same general pattern as fishing effort, that is, more effort was allocated during the summer when fishing effort is at its highest. Allocation of sampling effort among regions (groups of Statistical Areas) also followed fishing effort patterns. Within each month, each chosen site was allocated between 6 and 10 shifts. These shifts were divided equally among weekend and mid-week days and early and late daily time periods.

LGL LTD. environmental research associates conducted data collection, entry and preliminary processing. Fisheries and Oceans Canada conducted the estimation of catch and effort statistics.

DATA COLLECTION

Angler Interviews

Surveyors were stationed at access points for scheduled shifts to interview anglers as they returned from fishing. The number of boats returning to a site during a shift as well as the number of interviews attempted and completed were recorded on a tally sheet. For each boating party landing, the following information was recorded on an interview form (Fig. 1):

1. Total number of anglers in the boat.
2. Time of landing.
3. Whether the party had been sport fishing.
4. Guided vs. Non-guided.

5. Residency of anglers.
6. Time of departure and length of trip.
7. Time during which fishing lines were in the water.
8. Average number of lines in the water.
9. Catch Summary: -Total number and species of kept and released fish for each of the 3 sub-Statistical Areas.
   -Number of hours spent fishing in each sub-Statistical Area.
   -Number of marked and unmarked chinook and coho in the catch.
10. Number of hours directed at each species.
11. Loss of salmon to seals or sea lions.

Interviewers trained in fish identification inspected each boating party's 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 of nose-fork length were taken during every sampling shift. Five scales were removed from the INPFC (International Northern Pacific Fisheries Commission) preferred area of each biosampled chinook (Mosher 1968).

In 1998, interviews were conducted each month at a maximum of 35 of the 50 designated landing sites (boat ramps, marinas, or resorts, Appendix B-2) representative of the sport fishing activity in the survey area. Targets of desired precision and number of surveyors available dictated the number of sites selected in each area. 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 C.

Aerial Overflights

Aerial surveys, conducted from airplanes travelling along pre-defined routes (Fig. 2) allowed observers to count vessels actively sport fishing throughout the Strait of Georgia. Planes flew at an altitude of 150-210 m (500-700 feet) to facilitate a broad range of vision and still allow easy identification of vessel type. Each plane carried one observer; the observer counted sport fishing boats in the flight path.

The flight path and time of departure were designed to cover major concentrations of sport fishing activity at peak periods. To maximise precision, flying times during which fishing effort was rapidly changing were avoided. The number of overflights each month was governed by budget constraints, targets of desired precision and by the expected number of interviews from a given number of sampling shifts (English et al. 1986). The days for overflights during a month were randomly selected for each day type (weekday and weekend).

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, estimation of

age and length composition of chinook catch and length frequency distribution of coho. Established methods and equations were used to analyse the above data (Appendix C).

RESULTS

DISTRIBUTION OF SAMPLING EFFORT

A total of 12,736 interviews, of which 7,456 involved actively fishing anglers, and 63 overflights were conducted in 1998 (Table 1). The monthly distribution of interviews generally reflected the monthly distribution of fishing effort (number of boat trips, Fig. 3, Table 3). Interview effort was limited during October to the southern portion (Statistical Areas 19A and 19B) of the Strait of Georgia (Table 1). The total interviews represent 7.8% of the estimated total fishing effort for the entire study area (162,296 boat trips, Table 3). The interviews involving actively fishing anglers represent 4.6% of the total fishing effort and ranged in each Statistical Area from lows of 1.4% in Area 19A and 2.7% in Area 15 to a high of 27% in Area 19B (Tables 1 and 4).

SPORT FISHING EFFORT AND CATCH

The 1998 Strait of Georgia sport fishing catch and effort statistics are summarised for each species by month (Table 3) and by Statistical Area (Table 4). Fishing effort and catches statistics by species are presented for each combination of month and Statistical Area (Appendices D-1 to D-12).

Anglers made 162,296 boat trips during 1998, which is a 75% drop from the historical peak of 664,517 trips in 1988 (Fig. 4, Table 2). The fishing effort followed the same general seasonal pattern as seen in previous years where effort levels climbed steadily from April, peaked in August and declined in September and October (Table 3, Fig. 5).

The total finfish sport catch in the Strait of Georgia was estimated at 171,759 pieces (including steelhead and cutthroat trout) and consisted of 22% salmon and 78% groundfish (Table 3). Anglers released an additional 58,118 salmon of mixed species (Appendix D-8).

There were four significant regulation changes in 1998, which dramatically altered the catch and effort of the sport fishery:

1. Only barbless hooks were to be used when fishing for salmon, throughout the coast.
2. May 24, non-retention of coho in all B. C. tidal and non- tidal waters was enforced with the exceptions of a few selected terminal fisheries such as the mouth of the Capilano River (Statistical Area 28), a portion of Sechelt Inlet (Area 16) and the Big Qualicum River (Area 14). Coho daily limits were two with a possession limit of four; minimum size was 41 cm.
3. The coast was divided into Red Zones and Yellow Zones (Appendices F-1 and F-2). Fishing for salmon was allowed in the Yellow Zones, but no fishing for salmon in the Red Zones.

For the purpose of the report, only the Red Zones are displayed on the maps due to black and white graphics.

4. There were area closures on sockeye salmon.

General regulations included a minimum size limit for chinook of 62 cm, with a daily limit of two, possession of four, and an annual limit of 15 for the Strait of Georgia (Cape Sutil to Cadboro Bay). In a portion of Statistical Area 19B (Cadboro Bay to Sheringham Pt.), the minimum size limit for chinook was 45 cm, with a daily limit of two, possession of four, and an annual limit of 20. See Appendix G for a historical synopsis of regulation changes.

Salmon

Salmon sport catches for the Strait of Georgia in 1998 totalled 38,449 pieces (Tables 3 and 4) and consisted of 54% chinook, 4% coho, 9% chum, 18% pink and 12% sockeye.

In 1998, anglers kept 20,923 chinook (Tables 3 and 4), compared to 56,332 in 1997 and 89,589 in 1996 (Fig. 4, Appendix E-1). Chinook catch has dropped 94% from the historical peak of 369,445 pieces in 1984. The 1998 monthly chinook catches peaked in August and then declined steadily (Fig. 6, Table 3). Seasonal catch efficiency for chinook averaged 0.13 fish per boat trip overall and peaked in the summer months at 0.16 fish per boat trip (Fig. 7, Table 5). Catch patterns were similar to those in recent years.

The spatial distribution of chinook catch, although reduced, followed a similar pattern to previous years. The highest catches were taken in Area 19B (31% of total), Area 14 (23%), and Area 13 (17%) (Table 4, Fig. 8). The chinook catch per unit effort (CPUE) was 0.21 for Area 15, 0.18 for Area 14 and 0.15 for Areas 19B and 29. Peak catch occurred during July and August.

The 1998 coho catch was 1,376 pieces (Tables 3 and 4). Monthly coho catches peaked in August (Fig. 9 and 10). The non-retention of coho for most of the 1998 sport fishing season dramatically altered the catch estimates from previous years. Of the coho catch, 84% occurred in Area 28 (Capilano River Stock).

In 1998, Strait of Georgia anglers caught 3,624 chum (Fig. 11, Table 3), with the highest catches from Area 13 (92%), 6,848 pink (Fig. 12) of which 66% came from Area 13 and 4,474 sockeye (Fig. 13), where the highest catches were from Area 19B (56%), (Table 4).

The average number of salmon caught during each boat trip in 1998 was 0.24 (Table 5), down from a high of 2.30 in 1993. As seen below, the 1998 value was significantly lower than the range of averages seen in recent years.

Year	Catch Success
1990	1.46
1991	1.18
1992	1.59
1993	2.30
1994	0.89
1995	1.07
1996	0.81
1997	1.09
1998	0.24

In 1998, Areas 19B and 14 showed the highest effort expended with a total salmon catch per effort of 0.26 and 0.18, respectively (Table 4, Fig. 14). Area 13 recorded the highest CPUE at 0.50 fish per trip. Area 19B recorded the greatest number of salmon hooked and released followed by Area 14 (Appendix D-8).

Groundfish

While salmon accounted for the majority of the total finfish sport catch historically, the 1998 Strait of Georgia catch consisted of 133,310 groundfish, which made up 78% of the overall catch (Tables 3 and 4). The species composition of the groundfish catch, based on the Table 4 data, is as follows:

Groundfish Species	Catch	% of Total Groundfish Catch	Major Catch Area
Halibut (*Hippoglossus stenolepis*)	2,203	2%	19B
Lingcod (*Ophiodon elongatus*)	3,291	2%	19B
Rockfish (*Sebastes* spp.)	84,251	63%	13
Other finfish (Appendix H)	43,565	33%	19B
Total	133,310	100%	

The majority of the groundfish catch was taken in the summer months, reflecting the high fishing effort in the summer (Table 3, Fig. 4). Catch by Statistical Area for rockfish was highest in Area 13 (33% of total, Table 4). Lingcod were caught in greatest numbers in Area 19B (21% of total, Table 4), while the largest halibut catch came from Area 19B (97% of total, Table 4). Area 19B also produced the largest catch of other finfish (54%, Table 4). Rockfish were not identified by individual species on the interview form. For individual species commonly grouped as rockfish and fish commonly included in other finfish see Appendix H.

The CPUE for rockfish (Fig. 15 and 16) was relatively constant throughout the creel survey period and averaged 0.52 fish per boat trip, while the CPUE for halibut was 0.01 and lingcod was 0.02 fish per boat trip (Table 5). The CPUE for all non-salmon species and for total finfish during 1998 was 0.72 and 1.06 fish per boat trip, respectively (Table 5).

BIOLOGICAL DATA

Proportion and Catch of Marked Chinook and Coho

In 1998, 954 chinook and 92 coho were examined for adipose fin clip marks. Tables 6 and 8 show for chinook and coho respectively, the number of marks observed and the total fish inspected by month and region. The 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 Northern 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 the Victoria region represented by the remainder of Area 19 (Area 19B+).

Among chinook examined for marks, 4.6% had adipose fin clips. The largest observed proportion of chinook marks was in the South Gulf catch (0.079) and the lowest proportion in the Victoria catch (0.030) (Table 6). Among coho examined for marks, 14% had adipose fin clips. Monthly catch estimates of marked chinook and coho are shown by Region in Tables 7 and Table 8. Due to lower inspection rates a seasonal recovery pattern of marked chinook salmon is difficult to compare to that observed in previous years.

From the Strait of Georgia fishery, a total of 132 chinook and 25 coho with adipose-clips were returned to the head recovery program. Originating from Washington State rivers were 46 chinook, Skagit River (15), Samish River (11) and the Nooksack (7) (Table 9). Recoveries from British Columbia rivers were 132 chinook, Chilliwack River (35), Big Qualicum River (15) and the Cowichan, Nanaimo and Quinsam rivers all with 12 (Table 9). The Capilano River accounted for 21 of the 25 coho returned.

Catch-At-Age for Chinook

During 1998, 641 chinook biological samples were collected for age and length analysis. Of this total, 608 fish were aged. Table 10 shows the monthly number and percent age composition of chinook sampled for age. All ages shown in this report represent the saltwater age. The age data are summarised graphically in Figure 17. The monthly age proportions were applied to the estimated monthly chinook catches to provide a breakdown by age group (Table 11).

In 1998, the chinook sport catch in the Strait of Georgia consisted primarily of age 4 fish (54.1%), followed by age 3 fish (31.8%), age 5+ (8.6%) and age 2 fish (5.4%). Previous years showed a catch dominance of age 3 fish. Figure 17 and Table 10 show the shift in the age composite of sampled chinook, and hence of chinook catch. Age 4 fish were the dominant

component of the catch throughout the year with age 3 fish primarily making up the remainder of the catch. The age composition during 1998 is compared to previous years below:

	% Age Composition of Chinook				
Catch Year	2	3	4	5+	Reference
1983	57.1	25.5	14.2	3.1	Shardlow et al (1989a).
1984	21.6	67.3	9.4	1.7	Shardlow and Collicutt (1989a)
1985	6.6	70.8	20.6	2.0	Shardlow and Collicutt (1989b)
1986	10.9	44.9	40.4	3.8	Shardlow and Collicutt (1989c)
1987	7.8	62.1	25.0	5.2	Shardlow and Collicutt (1989d)
1988	26.4	35.3	35.4	2.8	Shardlow and Collicutt (1989e)
1989	3.1	83.3	10.5	3.1	Collicutt and Shardlow (1990)
1990	4.0	37.0	53.0	6.0	1990-1998*
1991	2.0	67.0	25.0	6.0	
1992	7.0	58.0	28.0	7.0	
1993	1.0	69.0	26.0	4.0	
1994	2.0	50.0	40.0	8.0	
1995	2.0	62.0	29.0	7.0	
1996	1.0	70.0	26.0	3.0	
1997	0.0	66.0	29.0	5.0	
1998	5.0	31.0	55.0	9.0	

*Calculated from unpublished annual age composition summaries and this report's yearly catch estimates

Mean Length-At-Age for Chinook

Table 12 shows the monthly mean nose-fork length at age for the 567 chinook for which both length and age data were available. Figure 18 shows the length frequency distribution for all the measured chinook (641 aged and unaged fish). The mean annual length for age 3 fish was 68.2 cm and age 4 fish was 76.9 cm (Table 12). The largest chinook sampled were 102 cm (both age 5) at Sunset Marina (Area 28) and at Sooke Harbour Marina (Area 19B).

As shown below, there was a slight increase in the percentage of sub-legal size chinook (45 cm in the Victoria area and 62 cm in the Strait of Georgia). This percentage has dropped since it's highest level in 1989 when the 62 cm size limit was implemented.

	Sub-legal Chinook			
	Year	Victoria	Strait of Georgia	Reference
	1989	2%	20%	Collicutt and Shardlow, 1990
	1990	0.01	10%	Collicutt and Shardlow, 1992
	1991	<1%	7%	Collicutt and Shardlow, 1995
	1992	0.02	2%	92 to 98 This report
	1993	1%	2%	
	1994	0%	2%	
	1995	0%	3%	
	1996	0%	1%	
	1997	0%	2%	
	1998	1%	6%	

Length Frequency Distribution for Coho

Figure 19 shows the length frequency distribution for the 60 coho sampled in 1998. In the 1989 report (Collicutt and Shardlow 1990) an overall decline from 1986 to 1989 in the size of landed coho was noted. This trend does not appear to have continued from 1990 to 1995. A size reduction trend appears to be occurring once again in 1996 and 1997, as shown below:

Year	Mean Length	Sample Size	
1986	53.4	5354	
1987	50.5	4997	
1988	50.0	13000	
1989	49.6	6883	
1990	51.4	8959	
1991	54.2	2281	
1992	53.2	19602	92 to 97 Unpublished reports
1993	51.0	22203	
1994	53.7	5890	
1995	56.3	1672	
1996	53.0	2257	
1997	49.7	1710	
1998	49.0	60	

SUMMARY

A sport fishery creel survey was conducted in the Strait of Georgia in 1998 in order to estimate the catches of all the important recreational finfish species and the total sport fishing boat trips. In the report data are presented by both month and Statistical Areas. Comparisons are made to previous data to determine trends in catch and effort. From the catch and effort estimates, catch successes could be calculated. These data also provides estimates of the number of chinook and coho salmon with adipose fin clips. Also the age composition of chinook and the length frequency distributions of chinook and coho are shown.

Although there were significant sport fishing regulation changes in 1998 which affected catch and effort, there is a major downward trend in fishing effort and catch of the main target species of chinook and coho. Effort has dropped 76% from a high of 664,517 boat trips in 1988 to a low of 162,296 in 1998. Chinook catch has dropped 94% from a high of 369,445 in 1984 to 20,923 in 1998. Total salmon CPUE has dropped from 2.30 in 1993 to 0.24 in 1998.

In 1998, sport fishers made an estimated 162,296 boat trips in the Strait of Georgia. A total of 12,736 boating parties, of which 7,456 were actively fishing, were interviewed at a monthly maximum of 35 landing sites in the Strait of Georgia Creel Survey area. This sampling represents approximately 8% of the total number of boat trips conducted by sport fishers in the Strait of Georgia in 1998. A total of 63 overflights were also conducted to take "snapshot" counts of fishing effort.

In 1998, sport fishers in the Strait of Georgia landed an estimated total finfish catch of 171,759 pieces of which 22% were salmon and 78% were groundfish. The 38,449 landed salmon consisted of 20,923 chinook, 1,376 coho, 3,624 chum, 6,848 pink salmon and 4,474 sockeye salmon. Anglers released an additional 58,118 salmon of mixed species. Catch success per boat trip averaged 0.24 for salmon (all species) and 0.52 for groundfish. The 133,310 landed groundfish consisted of 2,203 halibut, 3,291 lingcod, 84251 rockfish and 43,565 other finfish

Among salmon examined for marks, 4.6% of chinook and 14% of coho had adipose fin clips. The majority of chinook sport catches in 1998 consisted of age 4 fish (54.1%), followed by age 3 fish (31.8%), age 5+ (8.6%) and age 2 fish (5.4%). Of the total chinook measured in 1998, 1% were sub-legal in size (less than 45 cm) in the Victoria area and 6% were sub-legal in size (less than 62 cm) in the remaining portion of the Strait of Georgia. The mean yearly size of coho was 49 cm, which is a significant drop in size from 1996, however only 60 fish were sampled.

PART 2

NORTHERN VANCOUVER ISLAND

INTRODUCTION

Part 2 of this report documents the 1998 catch and effort statistics for the Northern Vancouver Island sport fishery. The Northern Vancouver Island access point creel survey follows the methodology of the Strait of Georgia creel survey for objectives, study design, data collection and data analysis. The following text contains only the differences between the two creel surveys. The last published report (1994) for the Northern Vancouver Island was for 1992 and creel surveys have not been conducted since. There have been significant changes in catch and effort since this last report. A list of previous reports in this series may be found in Appendix A. In this report all figures, tables and appendices are located at the end of text.

BACKGROUND

The study area is located on the north-eastern coast of Vancouver Island (Fig. 20), consisting of Queen Charlotte and Johnstone Straits. The area is approximately 80 km wide by 110 km long, the creel survey study area was divided into 5 sub areas, 12A to 12E. The major fishing areas include Gordon Channel, Hardy Bay, Broughton Strait, Blackfish Sound, Baronet Passage, Knight Inlet, Tribune Channel, Sutlej Channel, and Wells Passage.

The recreational fishery is active throughout the year but over 85% of the efforts occur in the summer months of May to September (Collicutt et al. 1993). The 1998 creel survey ran from mid June to the end of September due to budgetary restraints. The most sought after species in the Northern Vancouver Island recreational fishery were the chinook (*Oncorhynchus tshawytscha*) and coho (*O. kisutch*) salmon, but with the closure of coho (1998), pink (*O. gorbuscha*) salmon has replaced coho as a primary target species. Significant fisheries are also directed at sockeye (*O. nerka*) and halibut (*Hippoglossus stenolepis*).

The 1998 creel survey showed an estimated fishing effort of 16,408 boat trips with a catch of 2,366 chinook, 15,004 pink salmon, 3652 halibut and an additional 30,857 released coho. The 1993 access point survey estimated 17,687 boat trips, 3,454 chinook, 25,873 coho, 35,873 pink, 1,068 halibut and 4,874 released coho (Collicutt et al. 1994). The 1993 survey includes estimates from April to the end of August.

There were limited commercial fishing opportunities in the Northern Vancouver Island in 1998. In total 1.26 million pieces were harvested consisting of 0.1% chinook, 52.1% sockeye, 4.9% pink and 42.9% chum salmon.

OBJECTIVES

The objectives of the 1998 Northern Vancouver Island creel survey are contained in Part 1 Strait of Georgia objectives 1.2.

METHODS

STUDY DESIGN

The design of the 1998 Northern Vancouver Island Creel Survey was similar to that used for the 1998 Strait of Georgia Creel Survey, with some modifications to the data analysed, sampling intensity, flight routes and data processing.

The fishery was stratified according to the following criteria:

2. Month. The survey operated from late June through to and including September.

2. Geographic area. Catch and effort estimates were produced for statistical sub areas 12A to 12E.

3. Day type. Weekend and mid-week days were considered independently because sport fishing activity is known to differ for the two types of days.

4. Time of day. Sampling shifts (one shift is a set number of consecutive hours of interviewing anglers at one site by one creel surveyor) were conducted during set time periods. From June to September sampling was conducted during either an early shift (approximately 0700 to 1500 hours) or a late day shift (approximately 1500 to 2300 hours).

4. Guided verses unguided anglers. Certain sites are known to have primarily guided fishing effort. Unpublished data from previous surveys in this series confirm that the CPUE from guided boats differs markedly from unguided boats. Effort was made to document guided vs. unguided; however the catch estimate program has no allowances for guided versus non-guided.

Allocation of sampling effort among months followed the same general pattern as fishing effort (Fig. 21), that is, more effort was allocated during August when fishing effort is at its highest. Shifts were divided equally among weekend and mid-week days and early and late daily time periods.

J. O. Thomas Environmental Research Associates conducted data collection, data entry, preliminary processing and generated estimations of the catch and effort statistics.

DATA COLLECTION

Angler Interviews

Surveyors were stationed at access points for scheduled shifts to interview anglers as they returned from fishing. For each boating party landing, the following information was recorded (Fig. 22).

In 1998, interviews were conducted each month at seven sites, Sullivan Bay, Echo Bay, Telegraph Cove, Alder Bay, Broughton Strait Campsite, the Quarterdeck Marina in Port Hardy and the Port McNeil ramp. 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 C.

Two main sources of potential bias may exist for this survey: non-representative sampling and analytical method. All of the high volume access points were identified and sampled through this survey to minimise the potential of non-representative sampling bias. Some active remote resorts (Farewell Harbour Resort, Double Bay Resort) in the Blackfish Sound area were not sampled for logistical reasons, however, the fishery in this area was represented through data collected at Telegraph Cove and Alder Bay sites. Potential bias occurs through analytical methodology when access point data cannot be highly associated with a specific sub area (or sub area group). For this survey access point data and sub areas were associated using mapping analysis which indicated a very high degree of association for each site sub area used minimising the potential for bias from this source. Fishing interviews from landings to the Quarterdeck Marina in Port Hardy showed that 99.6% of the fishing activity occurred in sub area 12A. Landings at Telegraph Cove, Alder Bay and Port McNeil showed 99.5% fishing activity from sub area group 12BC, and 92.3% of fishing interviews from landings to Echo and Sullivan Bays originated from locations in sub area group 12DE.

Aerial Overflights

Aerial surveys, conducted from airplanes travelling along pre-defined 440 km route (Fig. 23), allowed observers to count vessels actively sport fishing throughout the Northern Vancouver Island. Twenty-two flights were conducted in 1998.

DATA ANALYSIS

Methods and equations are contained in Appendix C.

RESULTS

DISTRIBUTION OF SAMPLING EFFORT

A total of 2,001 interviews, of which 1,622 involved actively fishing anglers, and 22 overflights were conducted in 1998. The monthly distribution of interviews generally reflected the monthly distribution of fishing effort (Fig. 21, Table 13). The total interviews represent 12.2% of the estimated total fishing effort (16,408 boat trips) for the entire study area (Table 13). The interviews involving actively fishing anglers represent 9.9% of the total fishing effort.

SPORT FISHING EFFORT AND CATCH

The 1998 Northern Vancouver Island sport fishing catch and effort statistics are summarised for each species by month (Table 13) and by statistical area (Table 14).

Anglers made 16,408 boat trips during 1998. Effort levels climbed steadily from July, peaked in August and declined in September.

The total finfish sport catch in the Northern Vancouver Island was estimated at 36,091 pieces, including steelhead and cutthroat trout (Table 13) and consisted of 52% salmon and 48% groundfish. Anglers released an additional 37,548 chinook and coho salmon.

There were significant regulation changes in 1998, which dramatically altered the catch and effort of the sport fishery:

1. Only barbless hooks were to be used when fishing for salmon, through out the coast.
2. May 24, the non-retention of coho in all B. C. tidal and non- tidal waters with the exceptions of a few selected terminal fisheries such as the mouth of the Capilano River (Statistical Area 28) and a portion of Sechelt Inlet (Area 16). Coho daily limits were 2 with a possession limit of 4; minimum size was 41 cm.
3. There were area closures on sockeye salmon.

General regulations were minimum size limit for chinook of 62 cm, with a daily limit of 2, possession of 4, and an annual limit of 15 for the Strait of Georgia (Cape Sutil to Cadboro Bay) (Appendix G for a historical synopsis of regulation changes).

Salmon

Salmon sport catches for the Northern Vancouver Island in 1998 totalled 36,091 pieces (Tables 13 and 14) and consisted of 13% chinook, 5% chum, 80% pink, 2% sockeye salmon.

In 1998, anglers kept 2,366 chinook, 850 chum, 15,004 pink and 440 sockeye salmon (Tables 15 and 16). The average catch efficiency varied, chinook at 0.14, chum (0.05), pink (0.91) and sockeye at 0.03 (Table 15). The average boat trip caught 1.14 salmon with the peak month being July with a catch success of 1.53 (Fig. 24).

The spatial distribution of salmon catch showed a predictable pattern. The highest effort and catches were taken in sub areas 12B and 12C followed by sub areas 12A, 12D and 12E. Sub area 12B had 28% of the total effort and 12C had 29% of the total fishing effort (Table 14 and 16). Total salmon caught consisted of 12B containing 33% and 12C containing 32% of the catch.

The non-retention of coho for most of the 1998 sport fishing season dramatically altered the catch estimates. Previously a significant coho fishery occurred in the Northern Vancouver Island with 25,873 retained in 1993 (access point survey April to the end of August). In 1998,

anglers released 30,857 coho, sub areas 12A and 12C both had 26% of the released total and 12B contained 24% (Table 14 and 16). There were more released coho 30,857 than total salmon catch 18,660 (Table 13 and Fig. 25).

Groundfish

The 1998 Northern Vancouver Island catch consisted of 17,431 groundfish, which made up 48% of the overall catch (Tables 13 and 14). The total catch by anglers was 3,652 halibut, 1,521 lingcod and 12,010 rockfish.

Catch by sub area for rockfish was highest in 12A, 38% of total (Table 14 and 17). Lingcod were caught in greatest numbers in 12A. 69% of total, the largest halibut catch also came from 12A, 51% of total. Sub area 12D produced the largest catch of other finfish, 47%.

Angler catch of rockfish was recorded by individual species, however, the computer catch estimate program does not generate estimates by individual species only the rockfish group. There are various species commonly grouped as rockfish (Appendix H).

The catch success for rockfish (Table 15) was relatively constant throughout the creel survey period and averaged 0.73 fish per boat trip, while the catch success for halibut was 0.22 and lingcod was 0.09 fish per boat trip (Table 15). The catch success for all non-salmon species and for total finfish during 1998 was 2.20 per boat trip.

BIOLOGICAL DATA

The biological data was unavailable at the time of publishing.

SUMMARY

A sport fishery creel survey was conducted in the Northern Vancouver Island in 1998 in order to estimate the catches of all the important recreational finfish species and the total sport fishing boat trips. In the report data are presented by both month and statistical sub area. From the catch and effort estimates catch successes could be calculated.

Although there were significant sport fishing regulation changes in 1998, which affected catch and effort, there is a downward trend in fishing effort and catch of the main target species of chinook, coho and pink.

In 1998, sport fishers made an estimated 16,408 boat trips in the Northern Vancouver Island. A total of 2,001 boating parties, of which 1,622 were actively fishing, were interviewed at seven landing sites in the Northern Vancouver Island creel survey area. This sampling

represents approximately 9.9% of the total number of boat trips conducted by sport fishers in the Northern Vancouver Island. A total of 22 overflights were also conducted.

In 1998, sport fishers in the Northern Vancouver Island landed an estimated total finfish catch of 36,091 pieces of which 52% were salmon and 48% were groundfish. The 18,660 landed salmon consisted of 2,366 chinook, 850 chum, 15,004 pink salmon and 440 sockeye salmon. Anglers released an additional 6,691 chinook and 30,857 coho salmon. Catch successes per boat trip averaged 1.14 for salmon (all species) and 0.73 for groundfish. The 17,431 landed groundfish consisted of 3,652 halibut, 1,521 lingcod, 12,010 rockfish and 248 other finfish.

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LITERATURE CITED

Argue, A. W., R. Hilborn, R. M. Peterman, M. J. Staley, C. J. Walters and R. Yorgue. 1983. The Strait of Georgia chinook and coho fishery. Bull. Can. J. Fish. Aquat. Sci. 211: 91 p.

Beamish, R. J., C.-E. M. Neville,B. L. Thomson, P. J. Harrison, and M. St. John. 1994. A relationship between Fraser River discharge and interannual production of Pacific salmon and Pacific herring in the Strait of Georgia. Can. J. Aquat. Sci. 51: 2834-55.

Collicutt, L.D. and T.F. Shardlow. 1990. Strait of Georgia sport fishery creel survey statistics for salmon and groundfish, 1989. Can. Manuscr. Rep. Fish Aquatic Sci. 2087: 75 p.

Collicutt, L.D. and T.F. Shardlow. 1992. Strait of Georgia sport fishery creel survey statistics for salmon and groundfish, 1990. Can. Manuscr. Rep. Fish Aquatic Sci. 2109: 76 p.

Collicutt, L. D., B. G. Naito. P. Ryall and L. Lapi. 1992. Northern Vancouver Island sport fishery creel survey statistics for salmon and groundfish, 1991. Can. Tech. Rep. Fish. Aquat. Sci. 1857: 121 p.

Collicutt, L.D. and T.F. Shardlow. 1993. Strait of Georgia sport fishery creel survey statistics for salmon and groundfish, 1991. Can. Manuscr. Rep. Fish Aquatic Sci. 2137: 77 p.

Collicutt, L. D., T. F. Sharlow, G. E. Gillespie. 1994. Northern Vancouver Island sport fishery creel survey statistics for salmon and groundfish, 1993. Can. Tech. Rep. Fish. Aquat. Sci. 1974: 53 p.

Cross, C. L., L. Lapi, and E. A. Perry. 1991. Production of chinook and coho salmon from British Columbia hatcheries, 1971 through 1989. Can. Tech. Rep. Fish. Aquat. Sci. No. 1816: 48 p.

DPA Consulting Ltd. 1982. Georgia Strait sport fishing creel survey 1980-81. Final Report, prepared for Department of Fisheries and Oceans, Pacific Region by DPA Consulting Limited, Vancouver B.C. 78 p.

English, K. K., T. F. Shardlow and T. M. Webb. 1986. Assessment of Strait of Georgia sport fishing statistics, sport fishing regulations and trends in chinook catch using creel survey data. Can. Tech. Rep. Fish. Aquat. Sci. 1375: 54 p.

Gilbert, C. H. and W. H. Rich. 1927. Investigations concerning the red-salmon runs to the Karluk River, Alaska. U.S. Bur. Fish. Bull. 43(2): 1-69.

Kuhn, B. R., L. Lapi and J.M. Hamer. 1988. An Introduction to the Canadian Database on Marked Pacific Salmonids. Can. Tech. Rep. Fish. Aquat. Sci. 1649: 56 p.

Mosher, K. H. 1968. Photographic atlas of sockeye salmon scales. U.S. Fish and Wildl. Sci. Fish. Bull. 67(2): 243-280.

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. Manuscr. Rep. Fish. Aquat. Sci. 1872: 53 p.

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

Shardlow, T. F. and L.D. Collicutt. 1989 b. Strait of Georgia sport fishery creel survey statistics for salmon and groundfish, 1985. Can. Manuscr. Rep. Fish. Aquat. Sci. 2033: 60 p.

Shardlow, T. F. and L.D. Collicutt. 1989 c. Strait of Georgia sport fishery creel survey statistics for salmon and groundfish, 1986. Can. Manuscr. Rep. Fish. Aquat. Sci. 2034: 61 p.

Shardlow, T. F. and L.D. Collicutt. 1989 d. Strait of Georgia sport fishery creel survey statistics for salmon and groundfish, 1987. Can. Manuscr. Rep. Fish. Aquat. Sci. 2035: 62 p.

Shardlow, T. F. and L.D. Collicutt. 1989 e. Strait of Georgia sport fishery creel survey statistics for salmon and groundfish, 1988. Can. Manuscr. Rep. Fish. Aquat. Sci. 2036: 63 p.

TABLES

Table 1. Number of fishing interviews by month and Statistical Area and number of overflights by month for the Strait of Georgia Creel Survey, 1998.

Month	Statistical Area										Total	Over Flights
	13	14	15	16	17	18	19A	19B	28	29		
Apr	87	55	0	53	78	20	5	243	18	32	591	7
May	103	136	1	42	164	14	8	199	79	56	802	10
Jun	377	290	8	74	271	34	11	438	43	74	1620	10
Jul	375	206	3	43	189	48	7	317	82	72	1342	9
Aug	493	316	7	59	234	140	20	459	54	196	1978	14
Sep	179	155	1	8	110	89	13	260	27	150	992	6
Oct	0	0	0	0	0	0	8	123	0	0	131	7
Total	1614	1158	20	279	1046	345	72	2039	303	580	7456	63

Table 2. Tidal effort estimates and sport catches for the Strait of Georgia, 1983 to 1998.
(This table uses values from April up to and including September for historical comparisons. See Appendix E-1 for total effort and catch estimates for 1980 to 1998. See Appendix E-2 for historical effort and catch estimates from 1960 to 1980).

		Salmon Catch*						Salmon Released			Groundfish Catch				
Year	Effort	Chinook	Coho	Chum	Pink	Sockeye	Total Salmon	Chinook	Coho	Other Salmon	Halibut	Lingcod	Rockfish	Dogfish	Other
1983	495756	150522	382905	0**	53129	0**	592546	0**	0**	633444	0**	68170	183493	4226	62662
1984	595998	333726	432535	0	10080	0	778403	0	0	575704	0	129550	144174	4552	69194
1985	576885	205113	715061	0	90498	0	1015445	0	0	639402	0	73957	121681	4336	46392
1986	523272	154807	550726	613	3138	873	710391	0	0	111346	0	67126	152391	5108	52333
1987	525047	100139	621749	682	89833	8491	822645	0	0	949611	0	60752	121297	3810	39100
1988	590389	90491	1042504	663	8692	16273	1160361	0	0	813689	0	61565	174709	3669	54775
1989	532968	103877	472627	3329	122859	13345	717364	181537	0	1090925	0	46225	176380	3504	30639
1990	497550	90768	602352	652	11549	30606	741051	187554	0	638406	0	31092	142797	2259	24622
1991	409376	101690	126852	888	248976	23401	502140	153687	0	545160	0	8116	150524	3324	17532
1992	422088	100343	571459	843	19077	6745	698645	143967	0	370783	0	5733	124339	1677	27109
1993	480747	113123	823694	1766	172713	23600	1163190	172690	0	507602	0	6756	98134	1893	30240
1994	423622	63456	278890	289	18453	14038	383031	136863	0	375805	0	6793	149668	1244	31888
1995	306849	59084	73080	1481	183859	5897	328628	109868	0	303500	0	4743	107379	1873	26686
1996	289423	89589	127890	3474	7887	2419	233469	180238	0	366379	0	3733	102818	1497	39786
1997	258280	55554	98553	481	111003	16819	285533	63951	0	375728	0	4009	85701	2528	51380
1998	158559	20536	1376	3556	6848	4474	37994	34294	20570	2340	2125	3283	81591	0**	43404

*Catch and effort estimates: 1983 to 1992 from prior annual reports (see Appendix A), 1993 to 1998 from unpublished creel survey data.

** A zero in a species column indicates that no catch estimates were generated for that species for that year.

Table 3. Fishing effort and catches by species and month for the Strait of Georgia, 1998.

Month		Effort (Boat Trips)	Salmon Catch						Salmon Released			Groundfish Catch				Total Finfish Catch
			Chinook	Coho	Chum	Pink	Sockeye	Total Salmon	Chinook	Coho	Other Salmon	Halibut	Lingcod	Rockfish	Other	
April	Total	11628	1622	0	0	0	0	1622	1788	0	2340	0	49	6057	3552	11280
	S.E.	2537	714	0	0	0	0	714	844	0	1057	0	40	2220	2219	5193
May	Total	15313	1182	78	0	0	0	1260	1265	224	0	126	68	12817	4256	18527
	S.E.	3496	428	63	0	0	0	462	601	142	0	74	81	4531	2340	7488
June	Total	32762	4175	32	24	0	70	4300	5205	3556	0	64	931	14838	11022	31155
	S.E.	5887	1230	31	15	0	67	1240	1598	900	0	44	453	3678	4476	9891
July	Total	32359	4143	328	49	4061	683	9254	5559	4757	0	843	917	19272	10777	41063
	S.E.	4955	1150	160	46	954	385	2103	1925	1399	0	358	410	5044	2979	10894
Aug	Total	43600	7163	665	85	2734	3672	15385	13909	8520	0	797	572	21571	12629	50954
	S.E.	7484	1721	159	39	494	949	3004	3923	2205	0	273	319	5377	3087	12060
Sep	Total	22897	2251	273	3398	53	49	6173	6568	3513	0	295	746	7036	1168	15418
	S.E.	4893	869	74	834	26	41	1717	2204	1161	0	84	354	2257	686	5098
Oct	Total	3737	387	0	68	0	0	455	492	422	0	78	8	2660	161	3362
	S.E.	432	187	0	38	0	0	192	200	269	0	41	9	909	84	1235
Total	Estimate	162296	20923	1376	3624	6848	4474	38449	34786	20992	2340	2203	3291	84251	43565	171759
	S.E.	29684	6299	487	972	1474	1442	9432	11295	6076	1057	874	1666	24016	15871	51859

See Appendices D-1 to D-12 for individual species by month and Statistical Area.
See Appendix G for historical regulation changes, which affect effort and catch.

Table 4. Fishing effort and catches by species and Statistical Area for the Strait of Georgia, 1998.

Area		Effort (Boat Trips)	Salmon Catch						Salmon Released			Groundfish Catch				Total Finfish Catch
			Chinook	Coho	Chum	Pink	Sockeye	Total Salmon	Chinook	Coho	Other Salmon	Halibut	Lingcod	Rockfish	Other	
13	Total	25727	3458	0	3348	4522	1557	12884	4123	4402	639	46	514	30107	3600	47151
	S.E.	3369	622	0	787	759	274	2105	909	996	136	27	189	5731	1022	9074
14	Total	27513	4872	1	3	8	17	4973	9802	2089	333	13	227	3668	1242	10123
	S.E.	6300	1470	1	2	10	16	1494	2990	818	147	14	149	1435	847	3939
15	Total	4362	913	26	45	169	131	1284	802	389	53	13	24	2199	347	3867
	S.E.	1674	524	25	33	82	82	634	497	218	46	19	21	1221	244	2139
16	Total	16974	902	101	0	0	0	1002	1467	266	124	0	550	17782	7657	26991
	S.E.	3695	447	88	0	0	0	484	719	140	81	0	314	5010	2751	8559
17	Total	15524	1380	0	0	0	0	1380	2527	531	223	0	602	9125	2118	13225
	S.E.	2696	412	0	0	0	0	412	908	298	77	0	259	2563	1088	4322
18	Total	9876	1170	0	0	0	0	1170	2170	199	25	0	250	3344	1484	6248
	S.E.	2004	485	0	0	0	0	485	827	140	16	0	116	1101	1089	2791
19A	Total	2284	122	0	0	0	0	122	490	12	0	0	199	2593	1879	4793
	S.E.	2040	139	0	0	0	0	139	518	10	0	0	202	1953	1706	4000
19B	Total	43972	6513	32	146	2103	2489	11352	9964	10386	179	2131	693	11923	23335	49434
	S.E.	4182	1402	31	139	581	919	2223	2457	2615	80	814	283	3301	5668	12289
28	Total	10678	807	1155	65	34	218	2794	2070	2007	267	0	182	2281	761	6018
	S.E.	1839	311	310	37	31	103	688	713	746	98	0	94	1035	397	2214
29	Total	5386	787	61	17	12	62	1488	1371	711	497	0	50	1229	1142	3909
	S.E.	1803	481	32	12	11	48	768	757	364	376	0	39	666	1059	2532
	Total	162296	20924	1376	3624	6848	4474	38449	34786	20992	2340	2203	3291	84251	43565	171759
	S.E.	29602	6293	487	1010	1474	1442	9432	11295	6345	1057	874	1666	24016	15871	51859

See Appendices D-1 to D-12 for individual species by month and Statistical Area.

Table 5. Monthly catch success (catches per boat trip) by species for the Strait of Georgia, 1998*.

Month	Salmon Catch						Salmon Release			Groundfish Catch				Total
	Chinook	Coho	Chum	Pink	Sockeye	Total Salmon	Chinook	Coho	Other Salmon	Halibut	Lingcod	Rockfish	Other	Finfish Catch
Apr	0.14	0.00	0.00	0.00	0.00	0.14	0.15	0.00	0.20	0.00	0.00	0.52	0.31	0.97
May	0.08	0.01	0.00	0.00	0.00	0.08	0.08	0.01	0.00	0.01	0.00	0.84	0.28	1.21
Jun	0.13	0.00	0.00	0.00	0.00	0.13	0.16	0.11	0.00	0.00	0.03	0.45	0.34	0.95
Jul	0.13	0.01	0.00	0.13	0.02	0.29	0.17	0.15	0.00	0.03	0.03	0.60	0.33	1.27
Aug	0.16	0.02	0.00	0.06	0.08	0.35	0.32	0.20	0.00	0.02	0.01	0.49	0.29	1.17
Sep	0.10	0.01	0.15	0.00	0.00	0.27	0.29	0.15	0.00	0.01	0.03	0.31	0.05	0.67
Oct	0.11	0.00	0.02	0.00	0.00	0.12	0.13	0.12	0.00	0.02	0.00	0.73	0.04	0.92
Yearly	0.13	0.01	0.02	0.04	0.03	0.24	0.21	0.13	0.01	0.01	0.02	0.52	0.27	1.06

* Calculated using Table 3 data.

Table 6. Monthly number of marked chinook observed by month and Region for the Strait of Georgia, 1998.

Month		Northern Gulf	South Gulf	Victoria	Total
Apr	Observed	0	6	1	7
	Inspected	15	40	3	58
			0		
May	Observed	0	4	1	5
	Inspected	27	47	19	93
			0		
Jun	Observed	5	1	0	6
	Inspected	110	45	48	203
			0		
Jul	Observed	6	4	0	10
	Inspected	103	30	42	175
			0		
Aug	Observed	5	3	3	11
	Inspected	169	56	89	314
			0		
Sep	Observed	2	1	1	4
	Inspected	58	24	18	100
			0		
Oct	Observed	0	0	1	1
	Inspected	0	0	11	11
Total	Observed	18	19	7	44
	Inspected	482	242	230	954
Proportion of marks		0.037	0.079	0.030	0.046

Table 7. Monthly estimated catches of marked chinook by Region for the Strait of Georgia, 1998*.

Month		Northern Gulf	South Gulf	Victoria	Total of Chinook
Apr	Catch	13	97	2	111
	S.E.	6	42	1	49
May	Catch	12	26	16	54
	S.E.	6	11	4	21
Jun	Catch	64	39	58	162
	S.E.	21	21	12	54
Jul	Catch	77	41	46	164
	S.E.	22	15	11	48
Aug	Catch	165	69	55	289
	S.E.	41	29	7	78
Sep	Catch	45	65	7	116
	S.E.	18	26	2	45
Oct	Catch	0	0	12	12
	S.E.	0	0	6	6
Total	Catch	375	337	195	908
	S.E.	113	144	42	300

* Calculated using data from Table 6 and Appendix D-2.

Table 8. Monthly number of marked coho observed by Region for the Strait of Georgia, 1998

Month		Northern Gulf	South Gulf	Victoria	Total
Apr	Observed	0	0	0	0
	Inspected	0	0	0	0
May	Observed	0	0	0	0
	Inspected	1	0	0	1
Jun	Observed	0	0	0	0
	Inspected	0	0	1	1
Jul	Observed	0	1	0	1
	Inspected	1	17	0	18
Aug	Observed	0	7	0	7
	Inspected	0	44	1	45
Sep	Observed	1	4	0	5
	Inspected	3	24	0	27
Oct	Observed	0	0	0	0
	Inspected	0	0	0	0
Total	Observed	1	12	0	13
	Inspected	5	85	2	92
Proportion of marks		0.200	0.141	0.000	0.141

Table 9. Origin of adipose-clipped chinook caught in the Strait of Georgia, 1998.

Species	River	Prov/State	Number	Percent
Chinook	CAPILANO R.	B.C.	1	1%
Chinook	DOME CR.	B.C.	1	1%
Chinook	LANG CR.	B.C.	1	1%
Chinook	NICOLA R.	B.C.	1	1%
Chinook	ROBERTSON CR.	B.C.	1	1%
Chinook	STUART R	B.C.	1	1%
Chinook	QUESNEL R.	B.C.	2	1%
Chinook	SKAGIT R	B.C.	2	1%
Chinook	HARRISON R.	B.C.	6	3%
Chinook	PHILLIPS R.	B.C.	6	3%
Chinook	PORTEAU COVE	B.C.	6	3%
Chinook	L. QUALICUM R.	B.C.	8	4%
Chinook	SHUSWAP R	B.C.	10	6%
Chinook	COWICHAN R.	B.C.	12	7%
Chinook	NANAIMO R.	B.C.	12	7%
Chinook	QUINSAM R.	B.C.	12	7%
Chinook	B. QUALICUM R.	B.C.	15	8%
Chinook	CHILLIWACK R.	B.C.	35	20%
Chinook	COWLITZ R	WA	1	1%
Chinook	ELWHA R	WA	1	1%
Chinook	WHATCOM CR	WA	1	1%
Chinook	BIG SOOS CR	WA	2	1%
Chinook	FINCH CR	WA	2	1%
Chinook	SNAKE R	WA	2	1%
Chinook	STILLAGUAMISH R	WA	2	1%
Chinook	WHITE R	WA	2	1%
Chinook	NOOKSACK R	WA	7	4%
Chinook	SAMISH	WA	11	6%
Chinook	SKAGIT R	WA	15	8%
			178	

Table 10. Monthly number and percent age composition of chinook sampled for age in the Strait of Georgia Creel Survey, 1998.

Month	Age 2		Age 3		Age 4		Age 5		Age 6		Total Sampled
	n	%	n	%	n	%	n	%	n	%	
April	0	0.0%	8	17.8%	36	80.0%	1	2.2%	0	0.0%	45
May	1	1.7%	17	28.8%	32	54.2%	8	13.6%	1	1.7%	59
June	1	0.7%	45	31.3%	78	54.2%	20	13.9%	0	0.0%	144
July	4	3.5%	32	27.8%	66	57.4%	13	11.3%	0	0.0%	115
August	13	6.7%	66	33.8%	102	52.3%	14	7.2%	0	0.0%	195
Sept	4	8.0%	23	46.0%	22	44.0%	1	2.0%	0	0.0%	50
Oct	5	71.4%	2	28.6%	0	0.0%	0	0.0%	0	0.0%	7
Total	23		191		336		57		1		608
Overall age composition of catch*		5.4%		31.8%		54.1%		8.6%		0.1%	

* Overall age composition of estimated catch based on data from Table 10.

Table 11. Monthly estimated catches at age of chinook for the Strait of Georgia, 1998*.

Month		Age 2	Age 3	Age 4	Age 5	Age 6	Total
Apr	Catch	0	288	1298	36	0	1622
	S.D.						714
May	Catch	20	341	641	160	20	1182
	S.D.						428
Jun	Catch	29	1305	2261	580	0	4175
	S.D.						1230
Jul	Catch	144	1153	2378	468	0	4143
	S.D.						1150
Aug	Catch	478	2424	3747	514	0	7163
	S.D.						1721
Sep	Catch	180	1035	990	45	0	2251
	S.D.						869
Oct	Catch	276	111	0	0	0	387
	S.D.						187
Total	Catch	1127	6657	11315	1804	20	20923
	S.D.						
Overall age composition		5.4%	31.8%	54.1%	8.6%	0.1%	100.0%

* Calculated by applying the total monthly chinook catch from Table 3 to the monthly age proportions from Table 10.

Table 12. Monthly mean nose-fork length (L) at age of chinook sampled in the Strait of Georgia Creel Survey, 1998.

Month	Age 2		Age 3		Age 4		Age 5		Age 6		Total
	L (cm)	n	L (cm)	n	L (cm)	n	L (cm)	n	L (cm)	n	Sampled
Apr	0.0	0	65.8	8	74.9	36	76.0	1	0.0	0	45
May	51.0	1	65.6	17	72.4	32	86.1	8	82.0	1	59
Jun	52.0	1	69.2	45	78.4	78	81.3	20	0.0	0	144
Jul	56.8	4	68.5	36	76.1	69	85.5	14	0.0	0	123
Aug	54.5	15	72.1	64	82.5	104	86.4	13	0.0	0	196
Sep	*	4	*	23	*	22	*	1	*	0	50
Oct	*	5	*	2	*	0	*	0	*	0	7
Avg.	53.6	21	68.2	170	76.9	319	83.1	56	82.0	1	567
Total		30		195		341		57		1	624

* No biological data were collected for the months of September and October.

Table 13. Fishing effort and sport catches by species and month for Northern Vancouver Island, 1998.

Month		Effort	Salmon Catch					Salmon Released		Groundfish Catch				Total Finfish Catch
			Chinook	Chum	Pink	Sockeye	Total Salmon	Chinook	Coho	Halibut	Lingcod	Rockfish	Other	
Jul	Total	5828	920	195	7745	40	8900	4385	7939	1457	389	4071	248	15065
	S.E.	1136	262	52	1742	41	1766	1221	2025	395	114	1158	231	3995
Aug	Total	8951	1304	593	7238	400	9535	1979	19308	1890	522	6407	0	18354
	S.E.	1330	260	138	1209	144	1267	560	3421	438	175	1441	0	3805
Sep	Total	1629	142	62	21	0	225	327	3610	305	610	1532	0	2672
	S.E.	756	103	43	31	0	136	188	1835	262	382	322	0	1143
	Total	16408	2366	850	15004	440	18660	6691	30857	3652	1521	12010	248	36091
	S.E.	3222	625	233	2982	185	3169	1969	7281	1095	671	2921	231	8943

Table 14. Fishing effort and sport catches by species and Statistical sub area for Northern Vancouver Island, 1998.

Sub Area		Effort	Salmon Catch					Salmon Released		Groundfish Catch				Total Finfish Catch
			Chinook	Chum	Pink	Sockeye	Total Salmon	Chinook	Coho	Halibut	Lingcod	Rockfish	Other	
A	Total	3559	627	27	3412	88	4154	3513	8020	1861	1053	4553	0	11621
	S.E.	793	189	23	813	56	874	944	1967	634	481	757	0	2953
B	Total	4662	851	379	4779	104	6113	1448	7411	740	214	2362	31	9460
	S.E.	815	207	103	905	34	966	408	1577	169	86	559	23	2086
C	Total	4744	793	408	4695	130	6026	1209	7956	793	208	2631	55	9713
	S.E.	580	147	85	512	33	566	305	1497	137	73	492	46	1525
D	Total	1774	55	16	1091	57	1219	278	3683	139	20	1232	116	2726
	S.E.	657	48	10	447	31	453	182	1348	97	14	660	121	1428
E	Total	1669	40	20	1027	61	1148	243	3787	119	26	1232	46	2571
	S.E.	377	34	12	305	31	310	130	892	58	17	453	41	951
	Total	16408	2366	850	15004	440	18660	6691	30857	3652	1521	12010	248	36091
	S.E.	3222	625	233	2982	185	3169	1969	7281	1095	671	2921	231	8943

Table 15. Monthly catch success (catches per boat trip) by species for Northern Vancouver Island, 1998.

Month	Salmon Catch					Salmon Released		Salmon Catch				
	Chinook	Chum	Pink	Sockeye	Total Salmon	Chinook	Coho	Halibut	Lingcod	Rockfish	Other	Total Finfish
Jul	0.16	0.03	1.33	0.01	1.53	0.75	1.36	0.25	0.07	0.70	0.04	2.58
Aug	0.15	0.07	0.81	0.04	1.07	0.22	2.16	0.21	0.06	0.72	0.00	2.05
Sep	0.09	0.04	0.01	0.00	0.14	0.20	2.22	0.19	0.37	0.94	0.00	1.64
Yearly	0.14	0.05	0.91	0.03	1.14	0.41	1.88	0.22	0.09	0.73	0.02	2.20

Table 16. Salmon catches by month and Statistical sub area for Northern Vancouver Island, 1998.

Month	Sub Area		Effort	Catch					Released	
				Chinook	Chum	Pink	Sockeye	Total Salmon	Chinook	Coho
7	A	Catch	1417	137	2	2380	36	2555	2434	4751
7	A	STD	249	47	2	584	35	587	643	1131
7	B	Catch	1915	434	112	2665	3	3214	969	1212
7	B	STD	352	106	32	555	4	566	253	261
7	C	Catch	1466	284	81	1951	1	2317	704	879
7	C	STD	147	50	18	256	2	261	139	125
7	D	Catch	610	41	0	444	0	485	157	649
7	D	STD	279	37	0	234	0	237	119	343
7	E	Catch	420	24	0	305	0	329	121	448
7	E	STD	109	22	0	113	0	115	67	165
8	A	Catch	1724	471	25	1032	52	1580	1060	3269
8	A	STD	336	112	21	229	21	257	271	836
8	B	Catch	2095	344	233	2109	101	2787	301	4172
8	B	STD	302	65	49	347	30	358	83	657
8	C	Catch	2820	459	299	2736	129	3623	375	5688
8	C	STD	166	60	46	249	31	262	80	487
8	D	Catch	1081	14	16	640	57	727	121	2875
8	D	STD	280	11	10	196	31	199	63	768
8	E	Catch	1231	16	20	721	61	818	122	3304
8	E	STD	246	12	12	188	31	191	63	673
9	A	Catch	418	19	0	0	0	19	19	0
9	A	STD	208	30	0	0	0	30	30	0
9	B	Catch	652	73	34	5	0	112	178	2027
9	B	STD	161	36	22	3	0	42	72	659
9	C	Catch	458	50	28	8	0	86	130	1389
9	C	STD	267	37	21	7	0	43	86	885
9	D	Catch	83	0	0	7	0	7	0	159
9	D	STD	98	0	0	17	0	17	0	237
9	E	Catch	18	0	0	1	0	1	0	35
9	E	STD	22	0	0	4	0	4	0	54
Total		Catch	16408	2366	850	15004	440	18660	6691	30857
		STD	3222	625	233	2982	185	3169	1969	7281

Table 17. Groundfish catches by month and Statistical sub area for Northern Vancouver Island, 1998.

Month	Sub Area		Effort	Catch			
				Halibut	Lingcod	Rockfish	Other
7	A	Estimate	1417	764	253	1833	0
7	A	S.E.	249	182	74	376	0
7	B	Estimate	1915	333	78	798	31
7	B	S.E.	352	84	25	191	23
7	C	Estimate	1466	220	58	569	55
7	C	S.E.	147	47	15	113	46
7	D	Estimate	610	79	0	492	116
7	D	S.E.	279	54	0	319	121
7	E	Estimate	420	61	0	379	46
7	E	S.E.	109	28	0	159	41
8	A	Estimate	1724	810	270	1666	0
8	A	S.E.	336	221	90	381	0
8	B	Estimate	2095	403	90	1324	0
8	B	S.E.	302	82	26	254	0
8	C	Estimate	2820	567	116	1879	0
8	C	S.E.	166	83	28	258	0
8	D	Estimate	1081	53	20	695	0
8	D	S.E.	280	26	14	270	0
8	E	Estimate	1231	57	26	843	0
8	E	S.E.	246	26	17	278	0
9	A	Estimate	418	287	530	1054	0
9	A	S.E.	208	231	317	0	0
9	B	Estimate	652	4	46	240	0
9	B	S.E.	161	3	35	114	0
9	C	Estimate	458	6	34	183	0
9	C	S.E.	267	7	30	121	0
9	D	Estimate	83	7	0	45	0
9	D	S.E.	98	17	0	71	0
9	E	Estimate	18	1	0	10	0
9	E	S.E.	22	4	0	16	0
	Total	Estimate	16408	3652	1521	12010	248
		S.E.	3222	1095	671	2921	231

FIGURES

182652

GEORGIA STRAIT SPORT FISHING CREEL SURVEY

Landing site: _____ / _____ Statistical Area: _____

Interviewer: _____ / _____ Date: ___ / ___ / ___ (YR. / MO. / DAY)

PRESENT BOAT TRIP COMPLETED

Assessment Code [ ]
0 = Complete Form
1 = Marks Incomplete
3 = Not Visually Inspected
4 = Refusal

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. Time of departure: ____ : ____ AM PM Length of boat trip: [ ] HRS.
7. Times lines were in the water: (EXCLUDE time not fishing)

[ ] 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. 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
STATISTICAL SUBAREA:			
KEPT:			
RELEASED:			
TIME:	HRS.	HRS.	HRS.
SPECIFIC GEOGRAPHICAL LOCATION:			
LOCATION NAME:			

MARKS

	ADIPOSE MISSING	UNMARKED
CHINOOK	[ ]	[ ]
COHO	[ ]	[ ]

10. How much fishing time was directed at the following?

CO [ ] CN [ ] SM [ ] LC [ ] RF [ ]
GF [ ] SF [ ] OTHER [ ]

11. Did anyone in your party lose any salmon caught today to seals or sea lions? If so, how many and what species?

CN [ ] CO [ ] PK [ ] SO [ ] CM [ ] AT [ ] SM [ ]

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Figure 1. Sample of 1998 Strait of Georgia interview form.

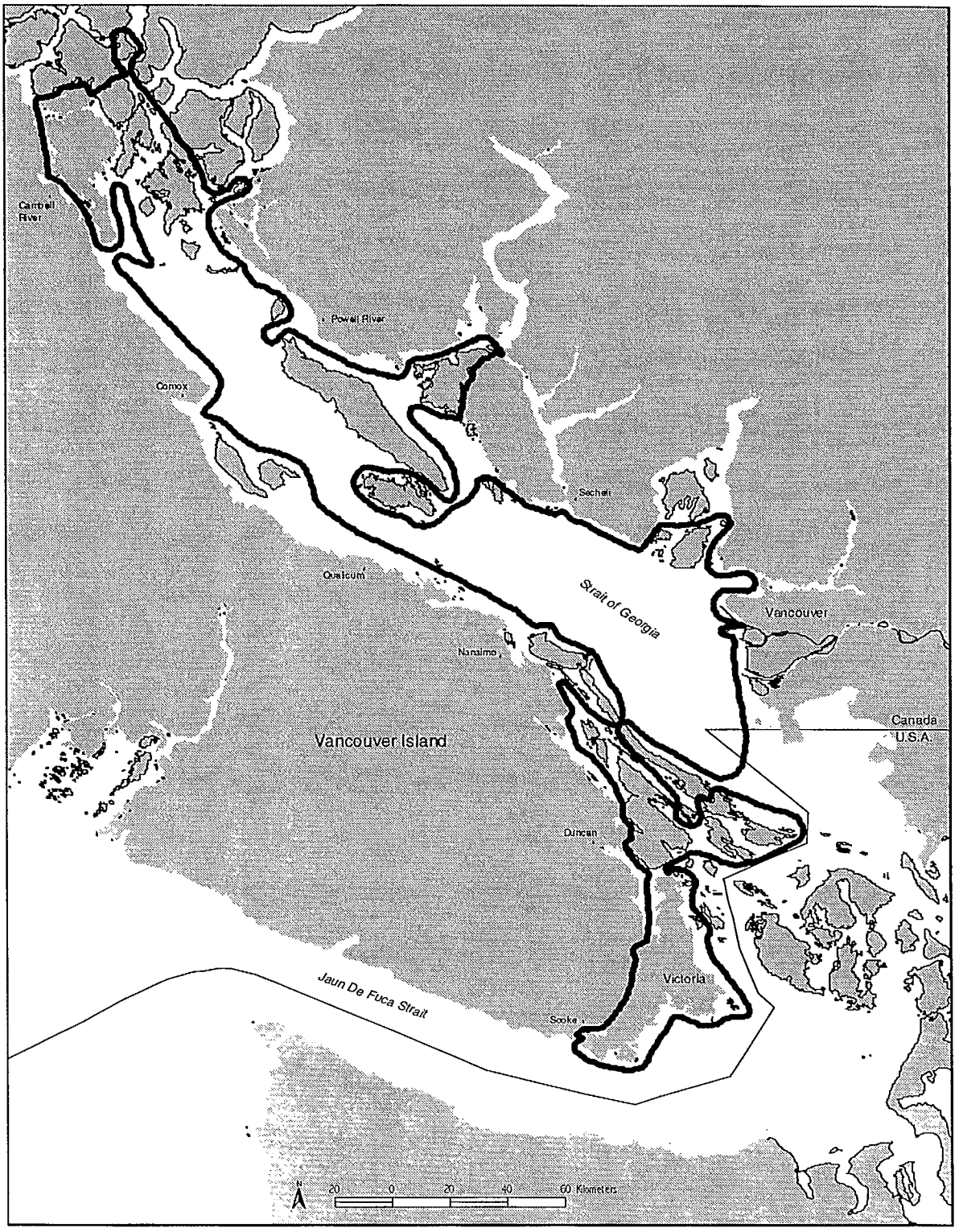


Figure 2. Overflight routes for the Strait of Georgia, 1998.

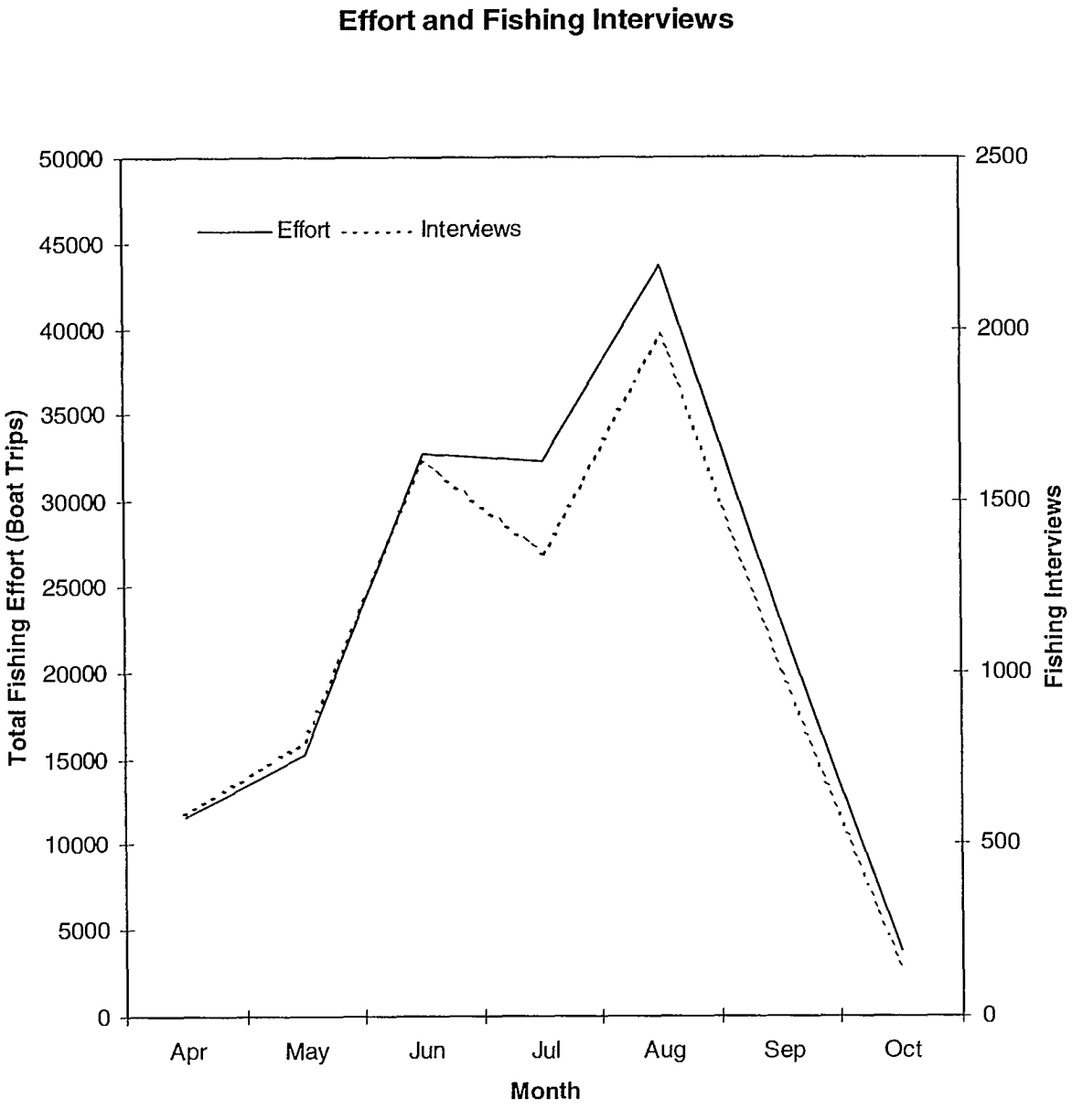


Figure 3. Comparison of monthly total fishing effort and monthly fishing interviews, Strait of Georgia, 1998.

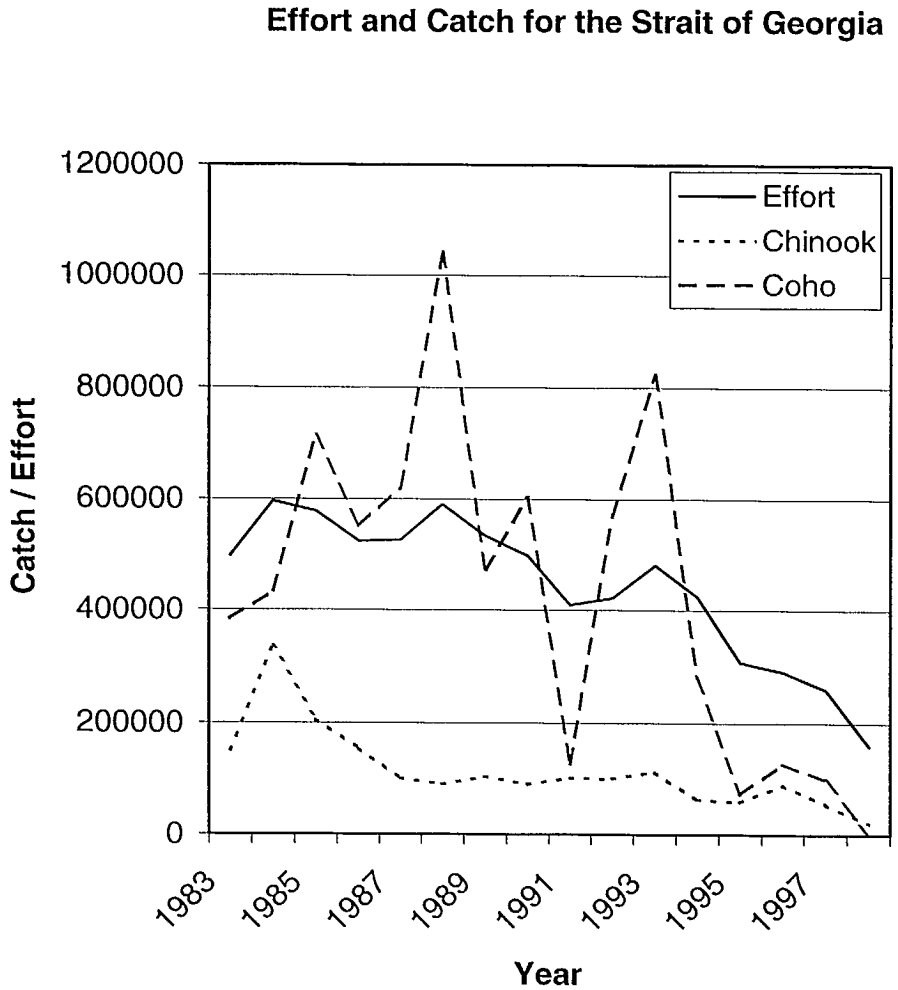


Figure 4. Tidal effort (boat trips) statistics and sport catches of chinook and coho salmon for the Strait of Georgia, 1983 – 1998*.
*For the purposes of historical comparisons only the data from April to September were used. See Appendix E-3 for historical data graph 1960 to 1982.

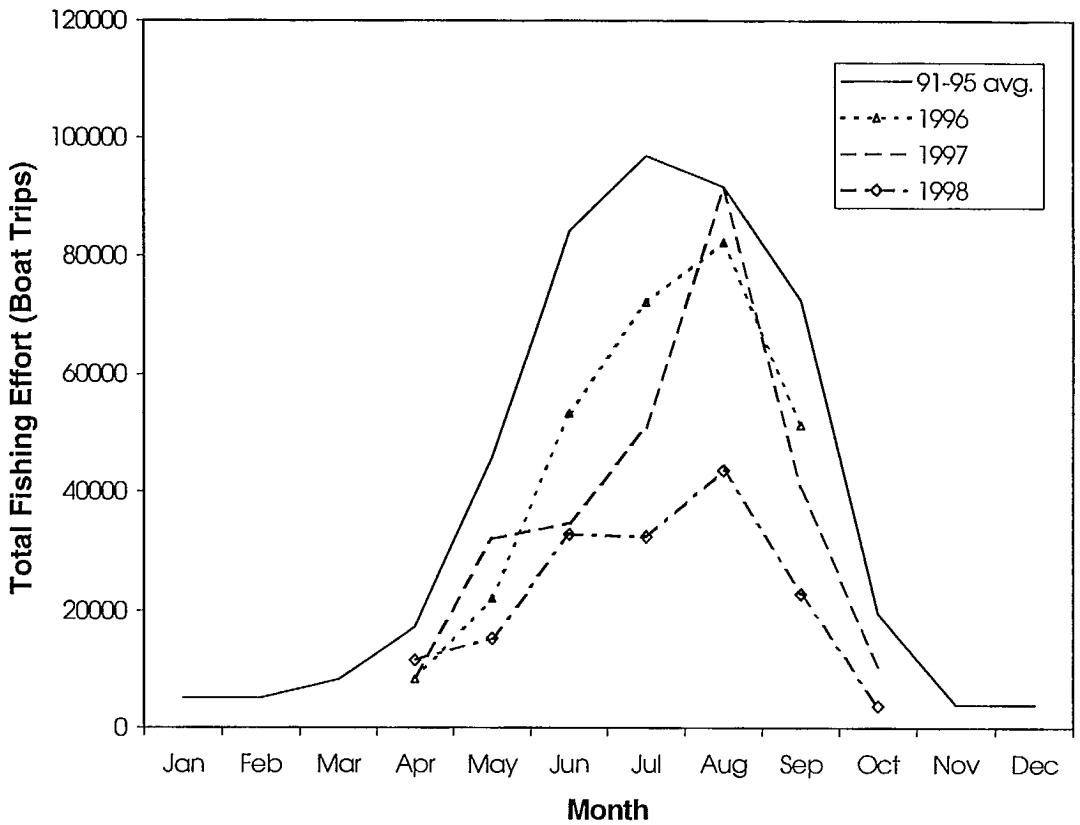


Figure 5. Monthly fishing effort estimates (boat trips) for the Strait of Georgia sport fishery for 1996, 1997, 1998 and the 5 year avg. for 1991 to 1995.

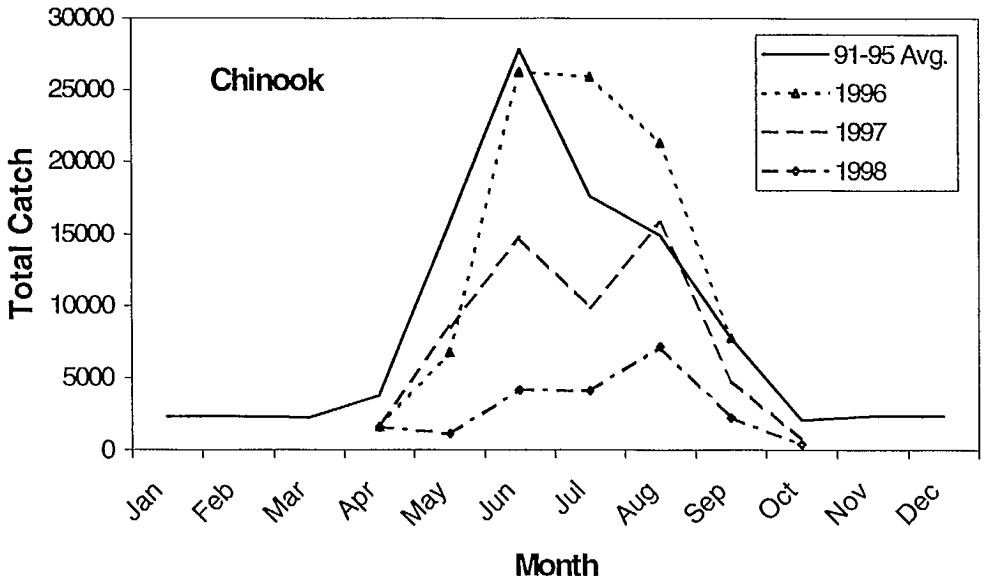


Figure 6. Monthly chinook catches for the Strait of Georgia sport fishery for 1996, 1997, 1998 and the five year avg. for 1991 to 1995.

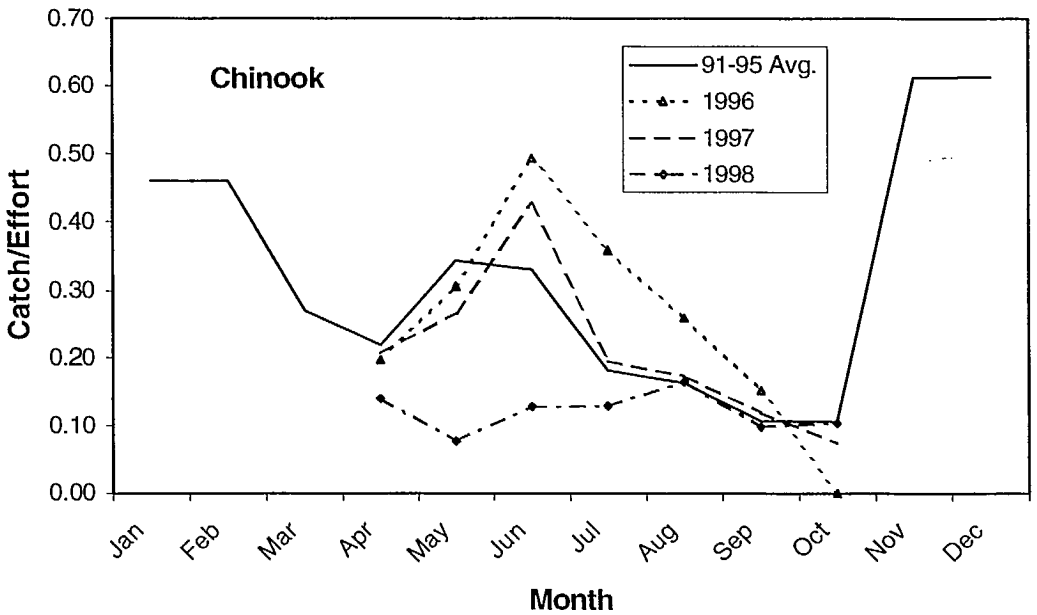


Figure 7. Monthly chinook catches per boat trip for the Strait of Georgia sport fishery for 1996, 1997, 1998 and the five year avg. for 1991 to1995.

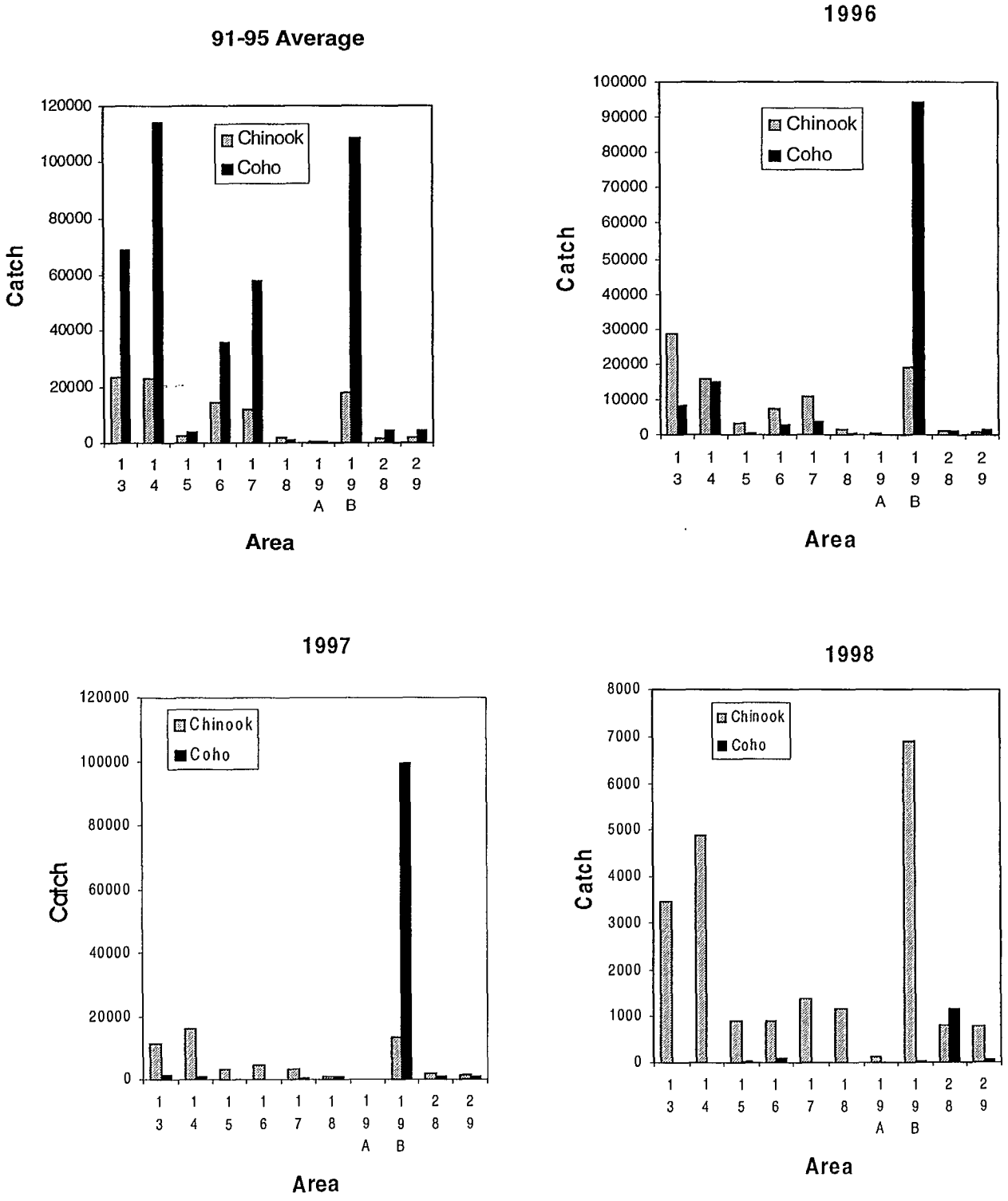


Figure 8. Annual sport catches of chinook and coho salmon by Statistical Area in the Strait of Georgia, 1991-1995 avg., 1996, 1997 and 1998.

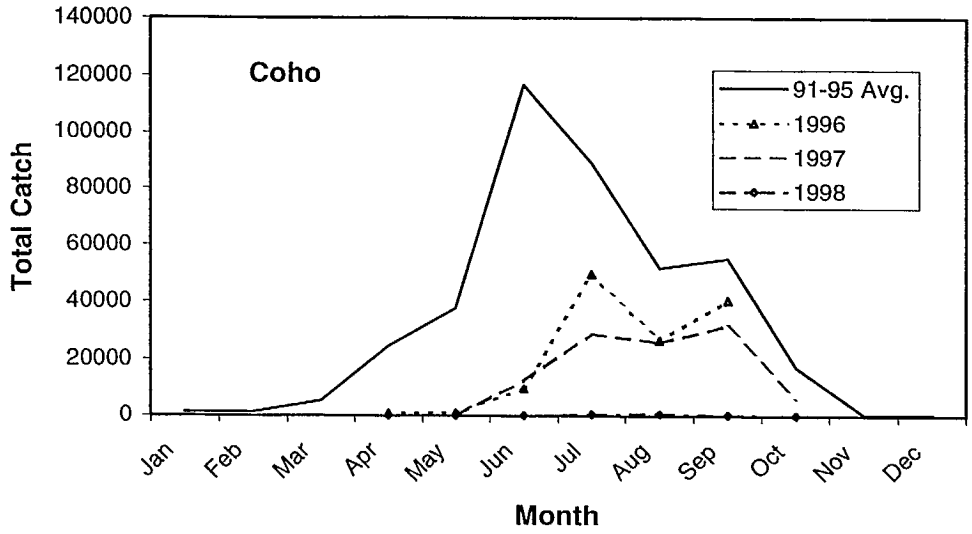


Figure 9. Monthly coho catches for the Strait of Georgia sport fishery for 1991-1995 avg., 1996, 1997 and 1998.

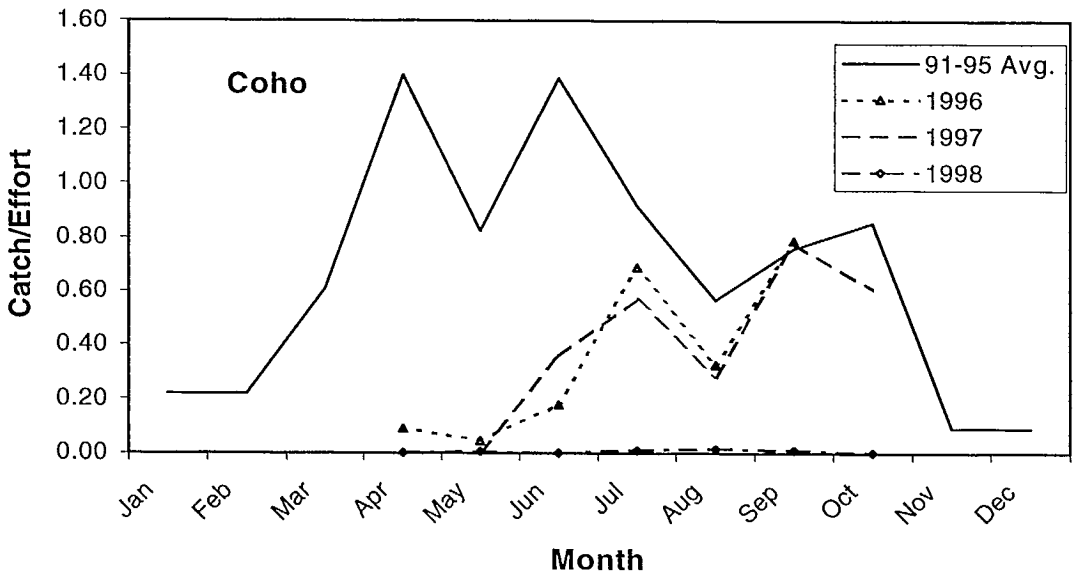


Figure 10. Monthly coho catches per boat trip for the Strait of Georgia sport fishery for 1991-1995 avg., 1996, 1997 and 1998.

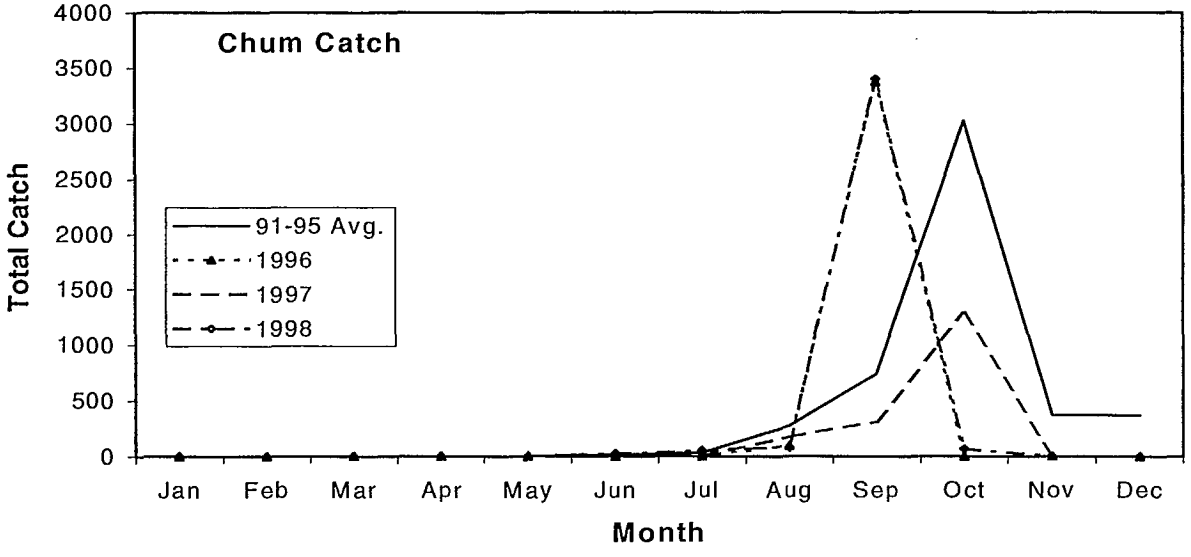


Figure 11. Monthly chum catches for the Strait of Georgia sport fishery, 1991-1995 avg., 1996, 1997 and 1998.

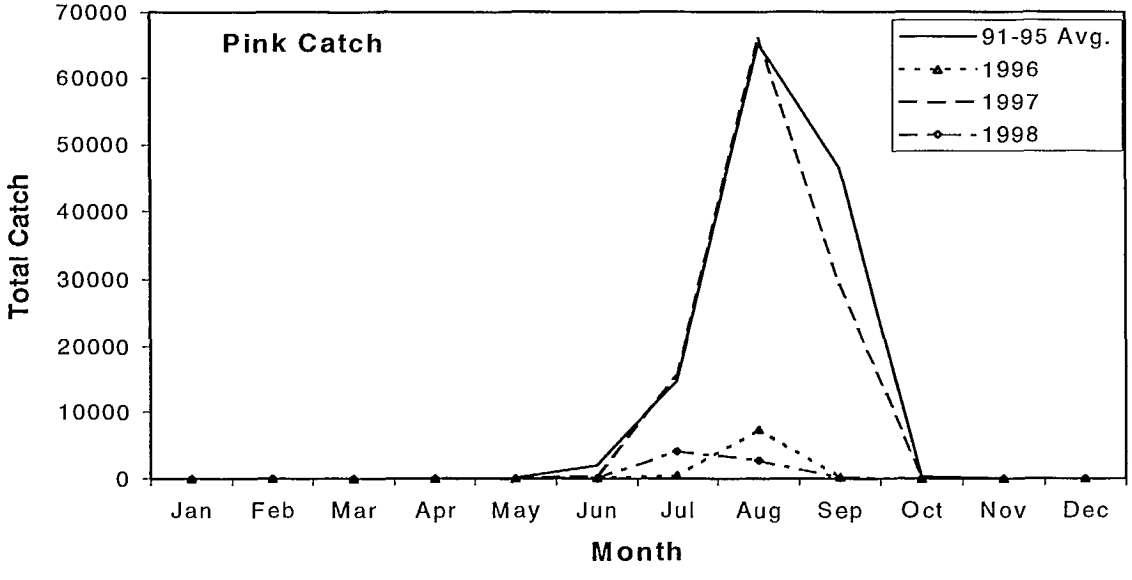


Figure 12. Monthly pink catches for the Strait of Georgia sport fishery, 1991-1995 avg., 1996, 1997 and 1998.

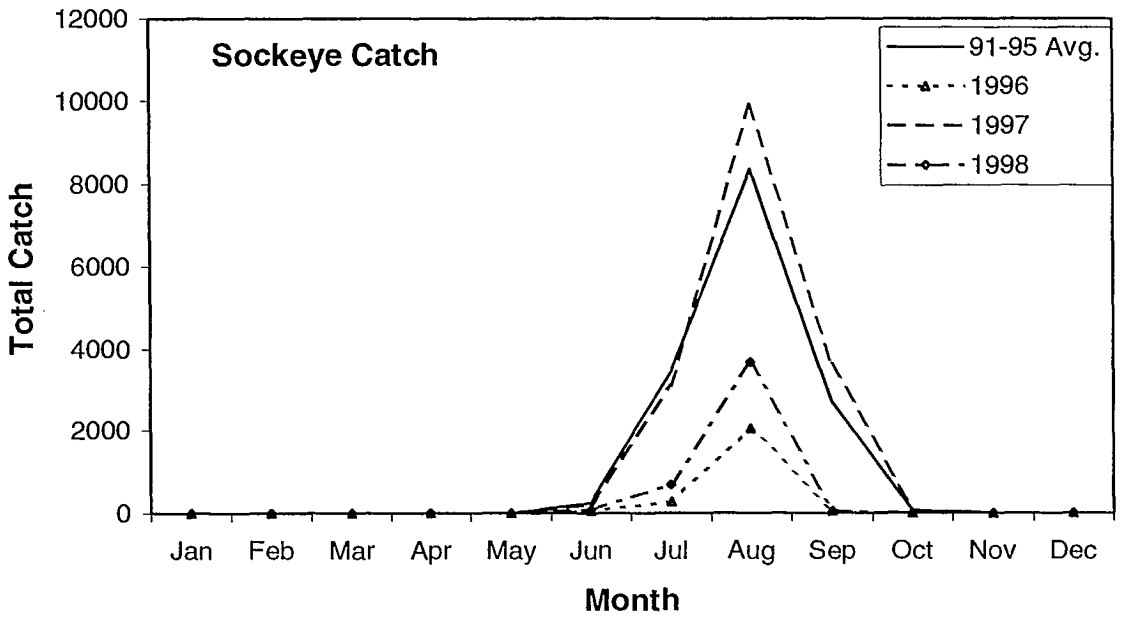


Figure 13. Monthly sockeye catches for the Strait of Georgia sport fishery for 1991-1995 avg.,1996, 1997 and 1998.

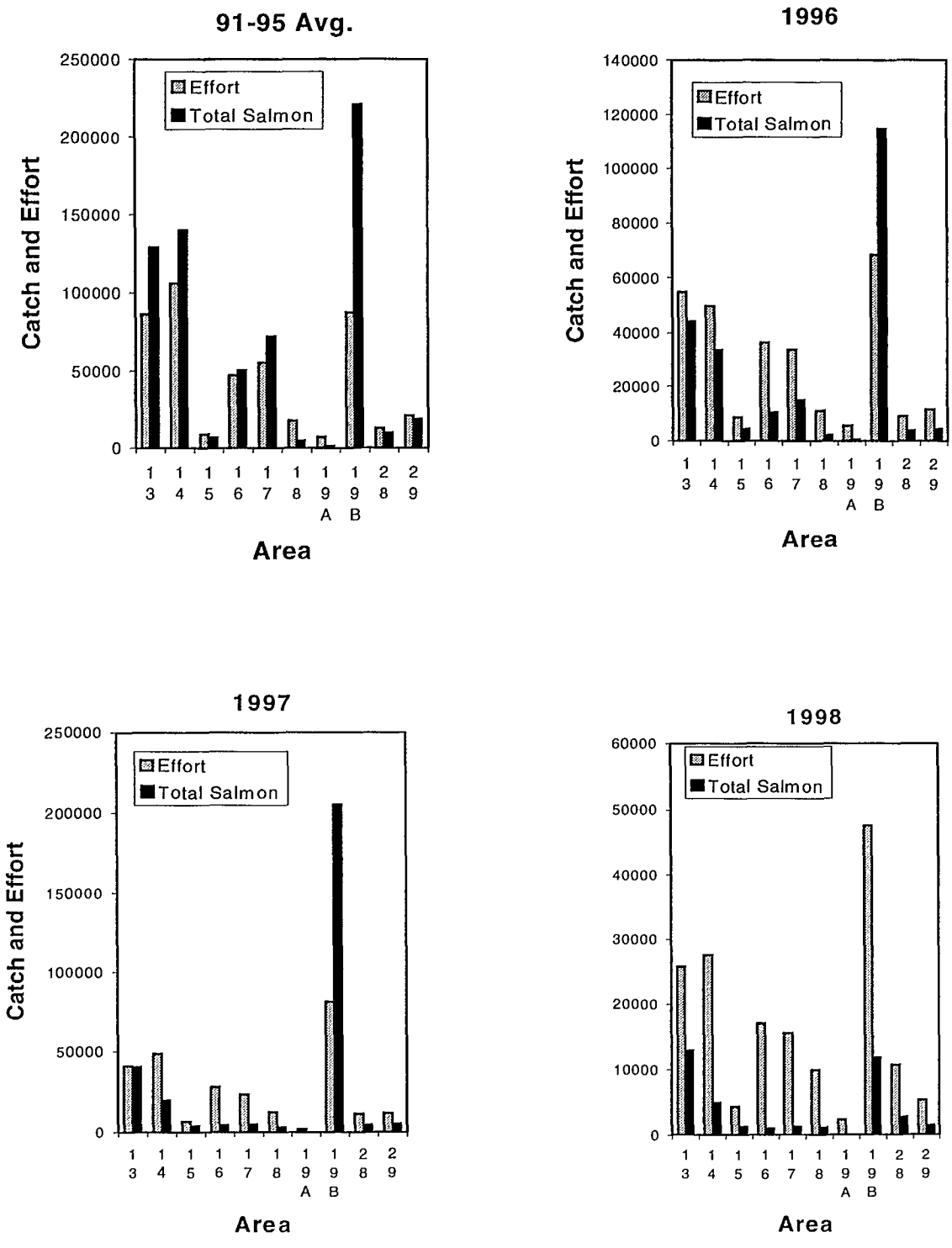


Figure 14. Total salmon landed and total fishing effort expended by Statistical Area in the Strait of Georgia sport fishery, 1991-1995 avg., 1996, 1997 and 1998.

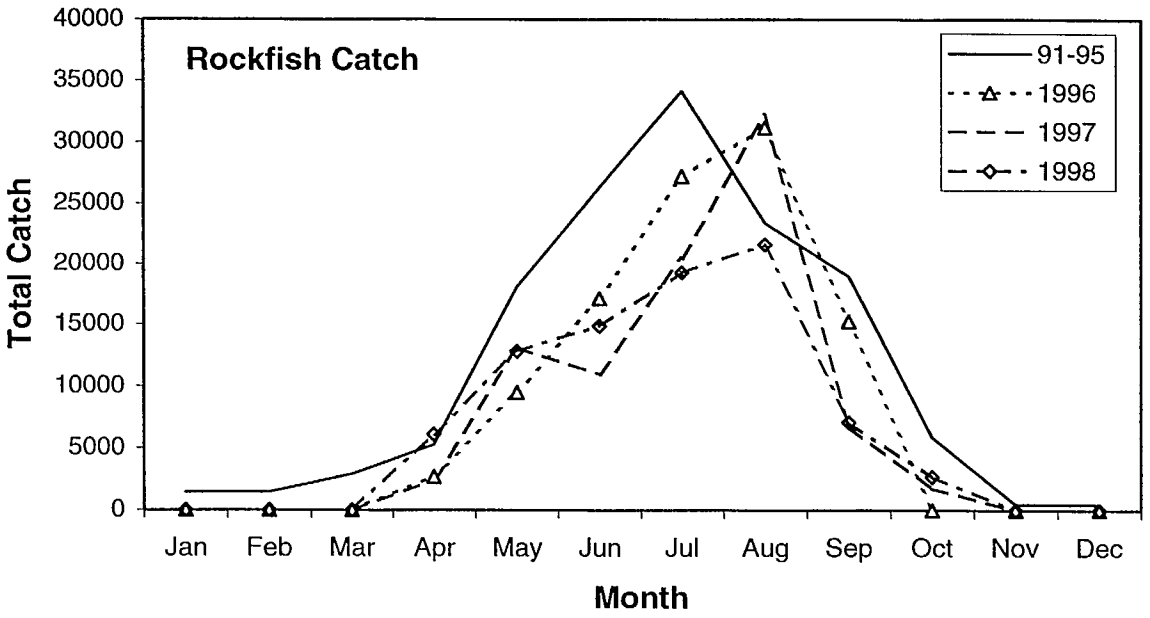


Figure 15. Monthly rockfish catches for the Strait of Georgia sport fishery, 1991-1995 avg., 1996, 1997 and 1998.

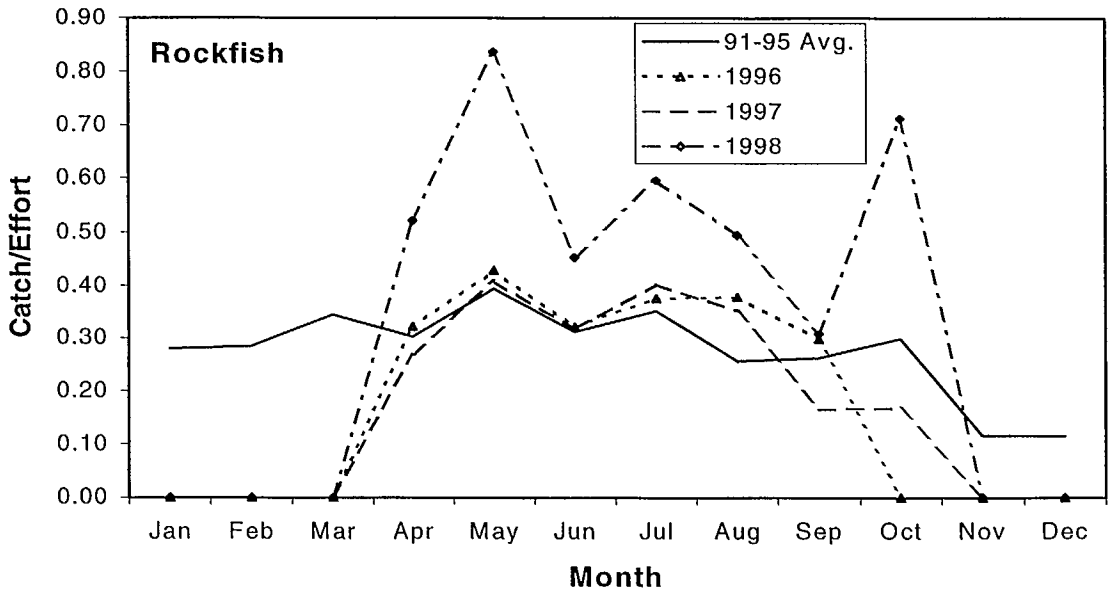


Figure 16. Monthly rockfish catches per boat trip for the Strait of Georgia, 91-95 avg., 96, 97 and 1998.

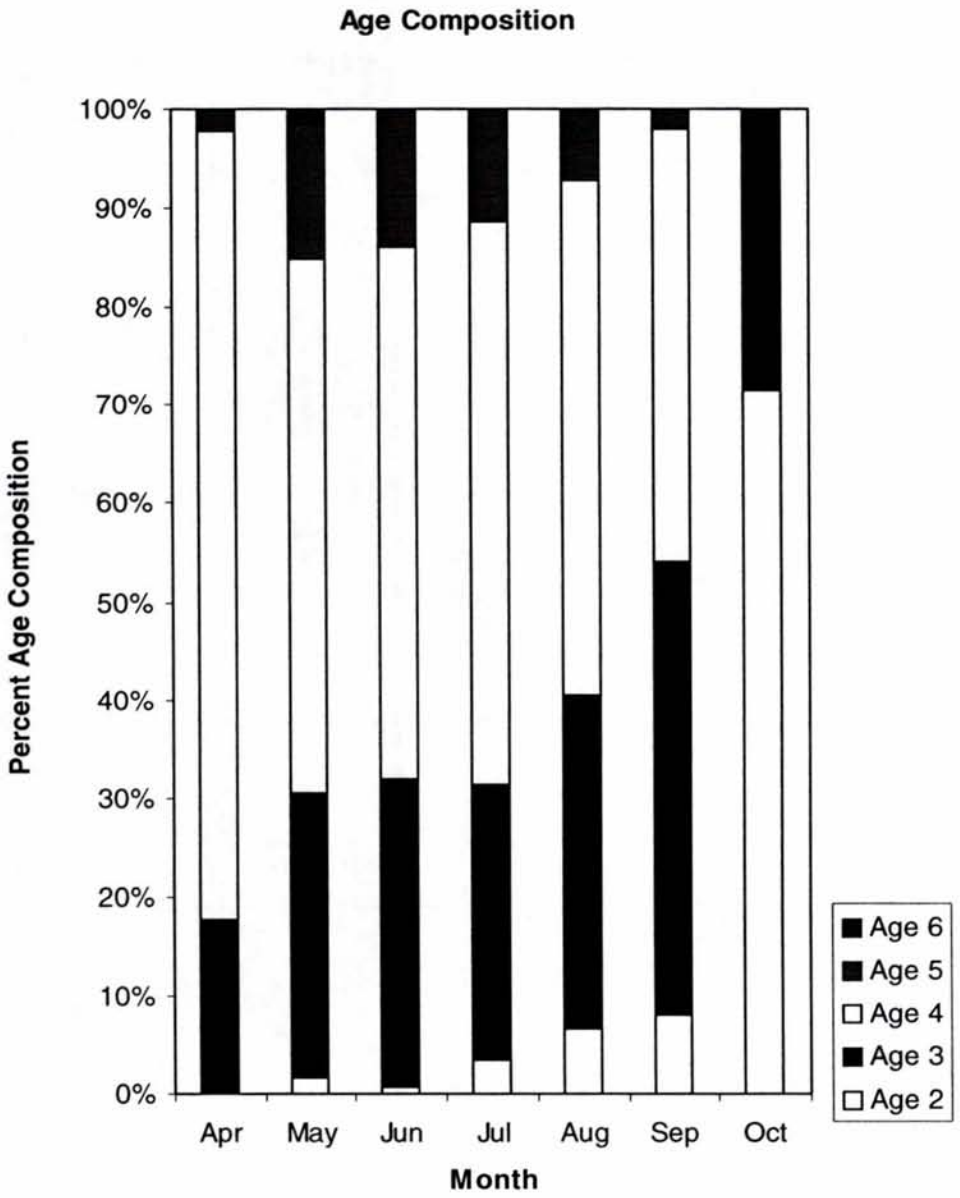


Figure 17. Monthly percent age composition of chinook salmon sampled in the Strait of Georgia Creel Survey, 1998.

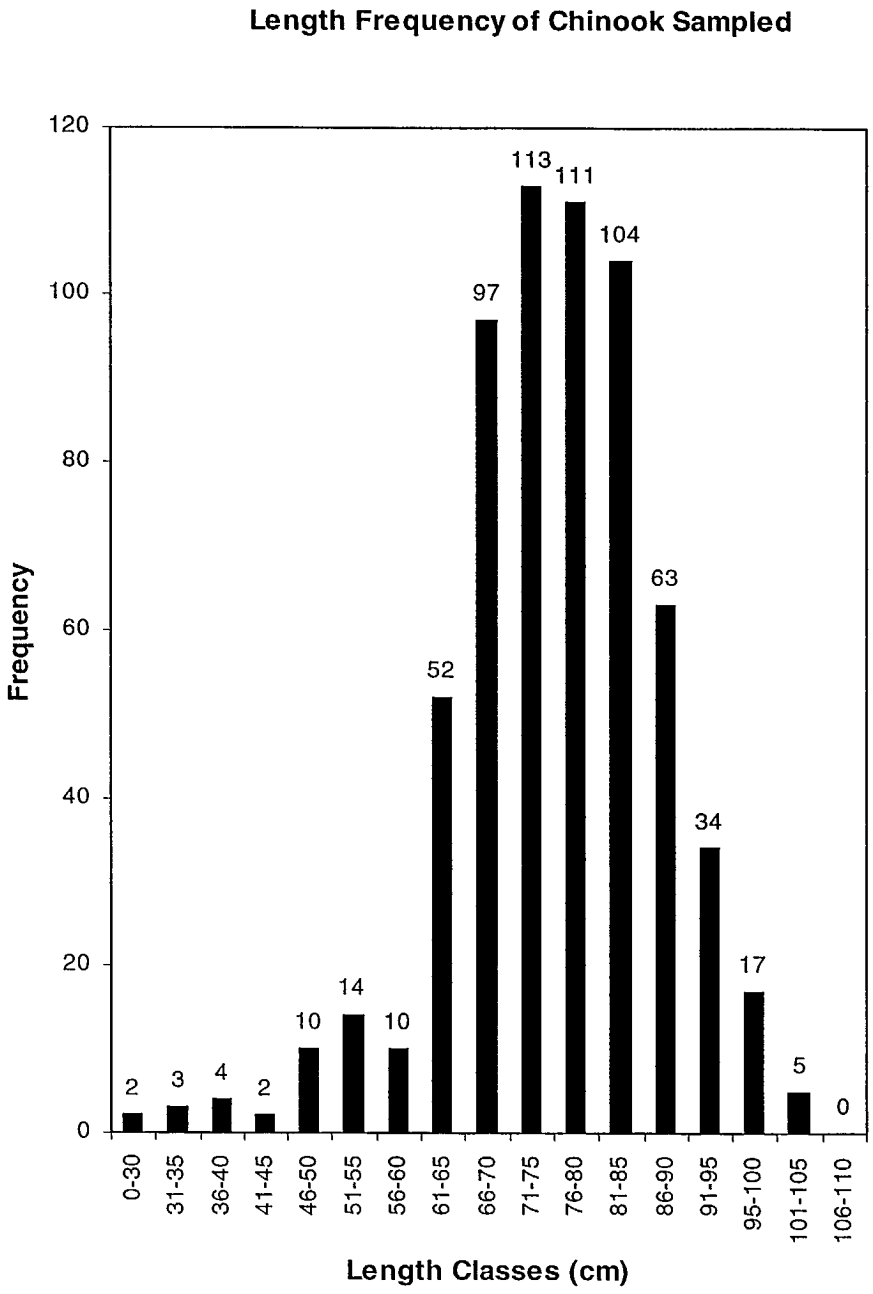


Figure 18. Length frequency distribution of chinook salmon sampled in the Strait of Georgia Creel Survey, 1998.

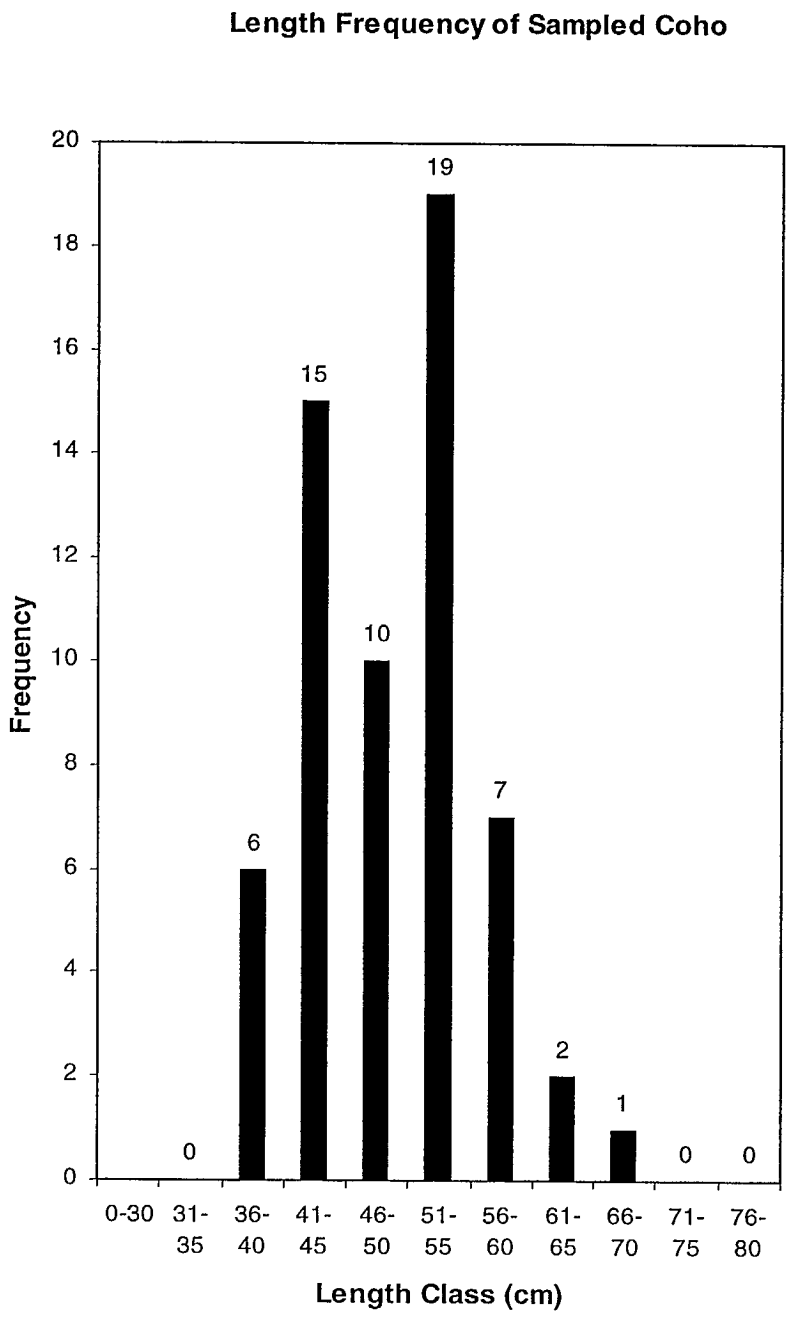


Figure 19. Length frequency distribution of coho salmon sampled in the Strait of Georgia Creel Survey, 1998.

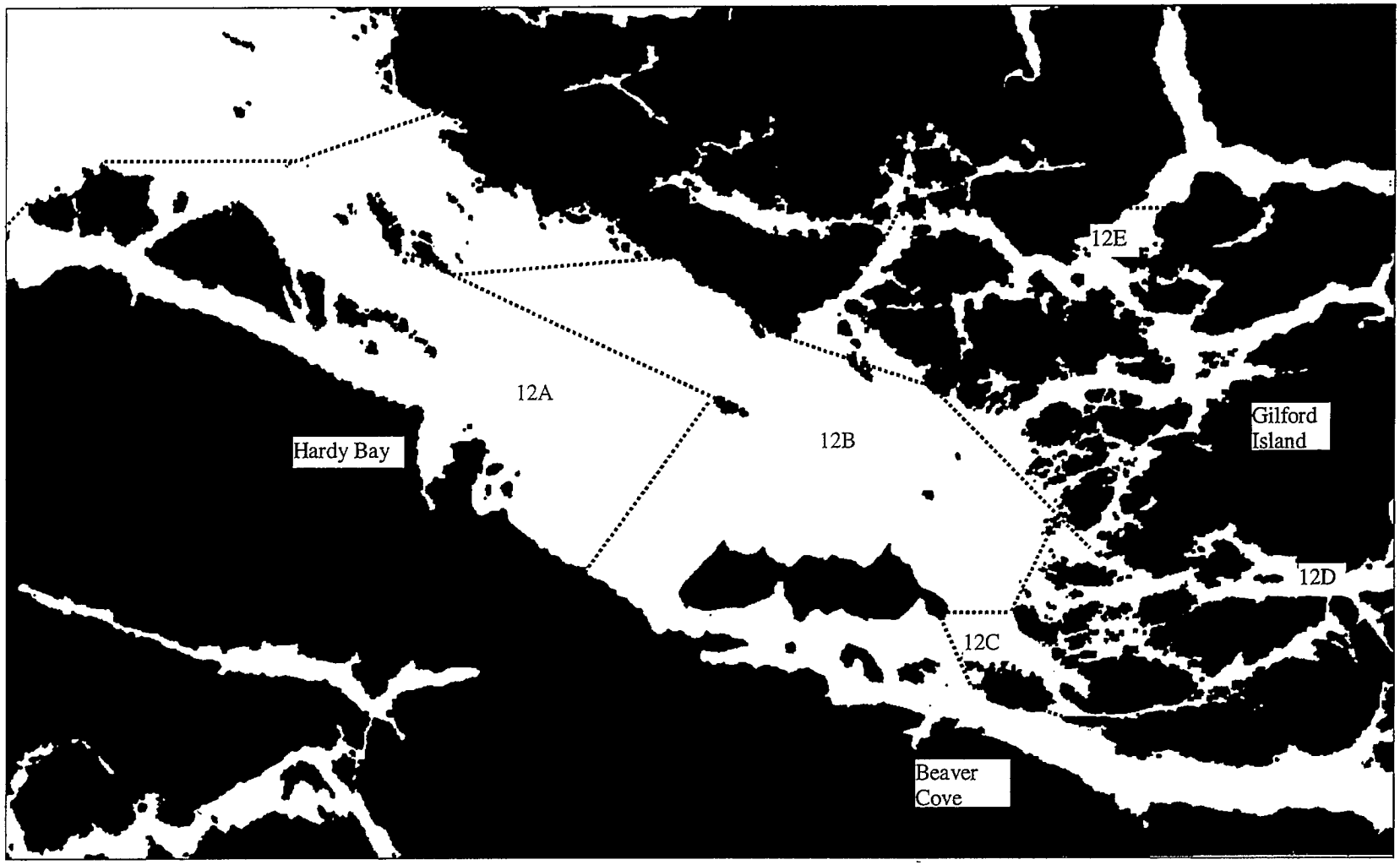


Figure 20. Statistical sub area map for the Northern Vancouver Island creel survey.

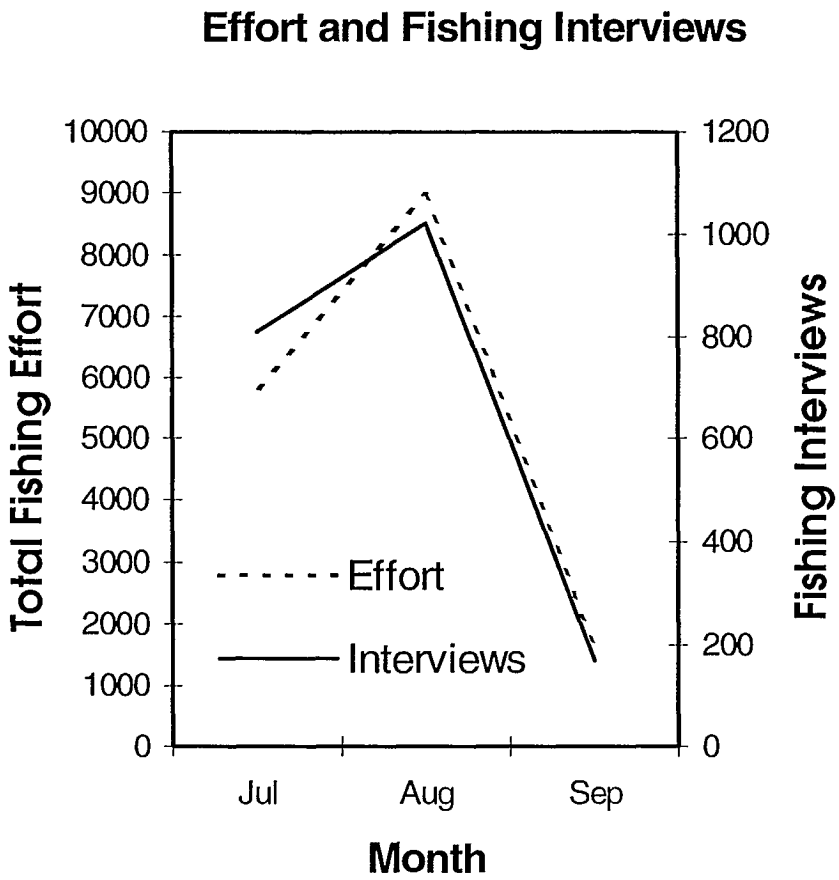


Figure 21. Comparison of monthly total fishing effort and monthly fishing interviews, Northern Vancouver Island, 1998.

Creel Survey Access Point Data Form

Page_____of_____

Survey Name: Year:

Shift Information		Species Codes:			Landing Tally				Weather Conditions	
Landing Site:		SM-Salmon	LC-Lingcod	RF-Rockfish	Time Block	Boats Landing	Time Block	Boats Landing	Time Blocks	Weather
Stat. Area		CN-Chinook	HB-Halibut	CA-Canary RF	1. Before 7:00am		10. 5:00-5:59pm		1-5	
Interviewer:		CO-Coho	DF-Dogfish	CP-Copper RF	2. 7:00-7:59am		11. 6:00-6:59pm		6-9	
Date(ymd): / /		PK-Pink	MK-Mackerel	QB-Quillback RF	3. 8:00-8:59am		12. 6:00-6:59pm		10-13	
Stat. Week:		SO-Sockeye	GR-Greenling	YE-Yelloweye RF	4. 9:00-9:59am		13. 6:00-6:59pm		14-16	
Shift Period: to		CM-Chum	CB-Cabezon	BL-Black RF	5. 10:00-10:59am		14. 7:00-7:59pm		Weather Codes:	
Shift Summary	# of Landings:		# of Interviews:		6. 11:00-11:59am		15. 8:00-8:59pm		1-Clear	6-Windy
Sub Areas	Fishing Ints.	Sockeye Catch / CPUE	Chinook Catch / CPUE	Coho Catch / CPUE	7. 12:00-1259pm		16. After 9:00pm		2-Broken	7-Rain
					8. 1:00-1:59pm				3-Overcast	
					9. 2:00-2:59pm				4-Fog	
					Total				5-Calm	

Interview Information			Trip Information											Catch Information						
Int. No.	Int. Time	Catch Obs? (100%=Y) (<100%=N)	Lndg. Time	# Anglers in Party	Lndg. Time Block	Fishing? (Y=1; N=0)	Guided? (Y=1) (N=0)	Res. (BC, Can, Other)	Trip Length (hours)	Fishing Time Blocks	# Lines Fishing	Fishing Location	Sub area	#Kept	#Released	Time Fishing (hours)	#Adipose Marked	# Adipose Unmarked	Target Species	Catch Obs? (100%=Y) (<100%=N)

J.O.Thomas and Associates 1995

Figure 22. Northern Vancouver Island interview form, 1998.

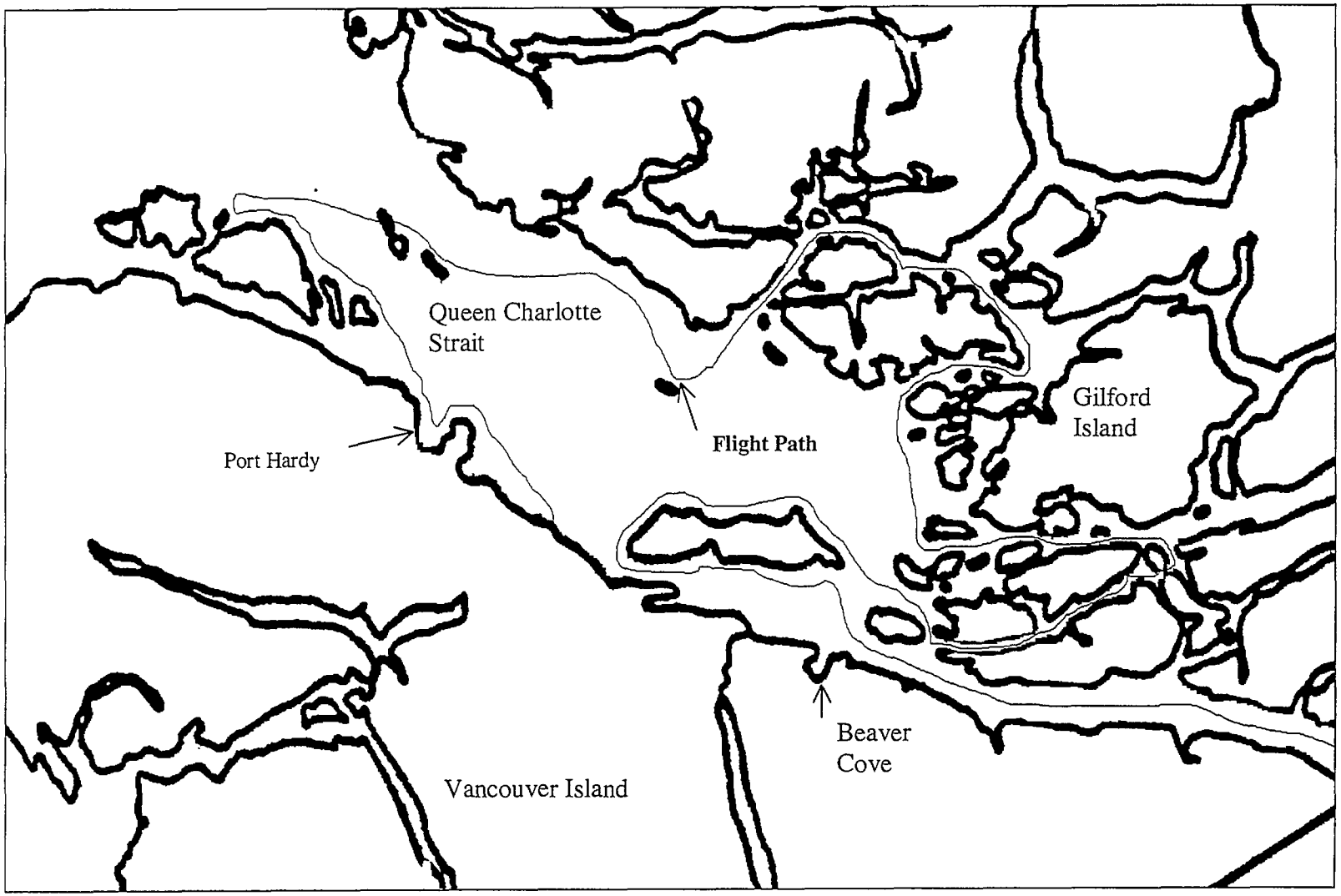


Figure 23. Northern Vancouver Island overflight routes, 1998.

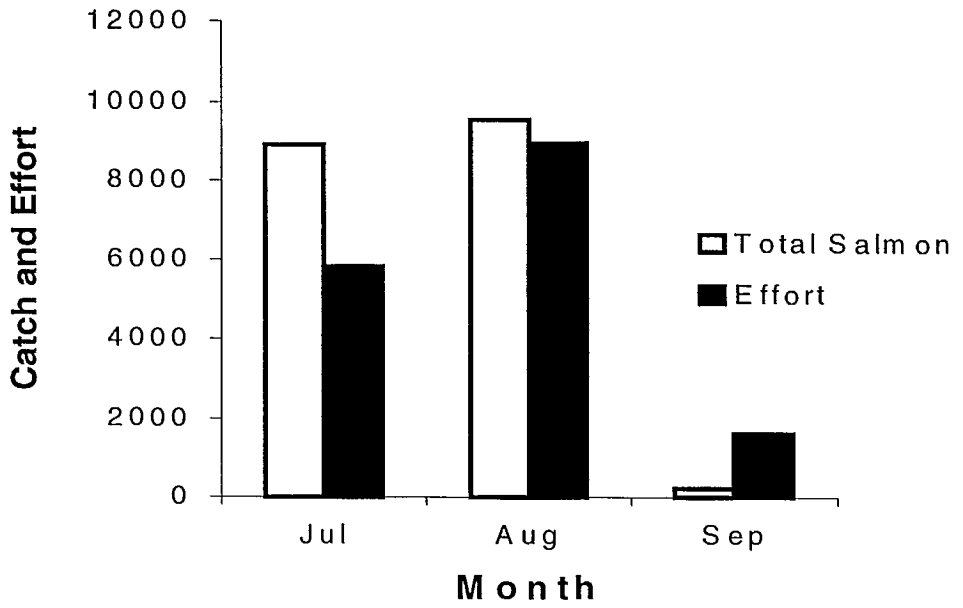


Figure 24. Total salmon catch and effort (boat trips) by month for Northern Vancouver Island, 1998.

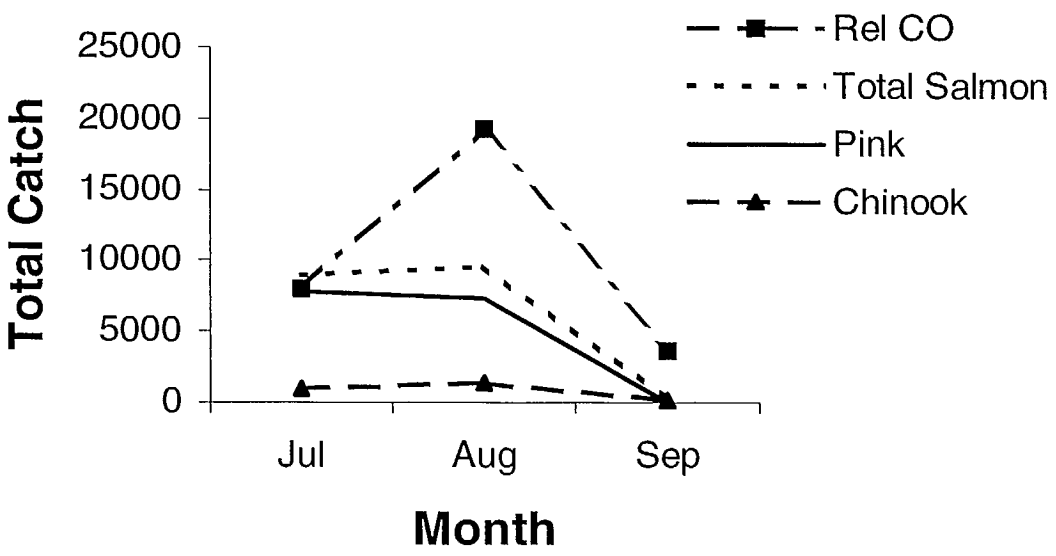


Figure 25. Comparison of monthly salmon catch between major target species in Northern Vancouver Island, 1998.

APPENDICES

APPENDIX A. PREVIOUS STRAIT OF GEORGIA AND NORTHERN VANCOUVER ISLAND CREEL SURVEY REPORTS.

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. Manuscr. Rep. Fish. Aquat. Sci. 1872: 53 p.

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

Shardlow, T. F. and L. D. Collicutt. 1989 b. Strait of Georgia sport fishery creel survey statistics for salmon and groundfish, 1985. Can. Manuscr. Rep. Fish. Aquat. Sci. 2033: 60 p.

Shardlow, T. F. and L. D. Collicutt. 1989 c. Strait of Georgia sport fishery creel survey statistics for salmon and groundfish, 1986. Can. Manuscr. Rep. Fish. Aquat. Sci. 2034: 61 p.

S rdlow, T. F. and L. D. Collicutt. 1989 d. Strait of Georgia sport fishery creel survey statistics for salmon and groundfish, 1987. Can. Manuscr. Rep. Fish. Aquat. Sci. 2035: 62 p.

Shardlow, T. F. and L. D. Collicutt. 1989 e. Strait of Georgia sport fishery creel survey statistics for salmon and groundfish, 1988. Can. Manuscr. Rep. Fish. Aquat. Sci. 2036: 63 p.

Collicutt, L. D. and T. F. Shardlow. 1990. Strait of Georgia sport fishery creel survey statistics for salmon and groundfish, 1989. Can. Manuscr. Rep. Fish. Aquat. Sci. 2087: 75 p.

Collicutt, L. D., B. G. Naito. P. Ryall and L. Lapi. 1992. Northern Vancouver Island sport fishery creel survey statistics for salmon and groundfish, 1991. Can. Tech. Rep. Fish. Aquat. Sci. 1857: 121 p.

Collicutt, L. D. and T. F. Shardlow. 1992. Strait of Georgia sport fishery creel survey statistics for salmon and groundfish, 1990. Can. Manuscr. Rep. Fish. Aquat. Sci. 2109: 76 p.

Collicutt, L. D. and T. F. Shardlow. 1995. Strait of Georgia sport fishery creel survey statistics for salmon and groundfish, 1991. Can. Manuscr. Rep. Fish. Aquat. Sci. 2137: 75 p.

Collicutt, L. D. and T. F. Shardlow. 1994. Strait of Georgia sport fishery creel survey statistics for salmon and groundfish, 1992. Can. Manuscr. Rep. Fish. Aquat. Sci. 2221: 75 p.

Collicutt, L. D., T. F. Shardlow. B. D. Smith and G. E. Gillespie. 1994. Northern Vancouver Island sport fishery creel survey statistics for salmon and groundfish, 1992. Can. Tech. Rep. Fish. Aquat. Sci. 1973: 53 p.

Collicutt, L. D., T. F. Shardlow. B. D. Smith and G. E. Gillespie. 1994. Northern Vancouver Island sport fishery creel survey statistics for salmon and groundfish, 1993. Can. Manuscr. Rep. Fish. Aquat. Sci. 1974: 53 p.

APPENDIX B-1. STRAIT OF GEORGIA CREEL SURVEY STUDY AREA.

The Strait of Georgia Creel Survey study area and landing site locations used in 1998 are shown in Appendix B-2. The 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 northern by the following 3 boundary lines:

1) Discovery Passage from Granite Pt. on Quadra Island to the stream mouth west of Moriarty Pt. on Vancouver Island.

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

3) 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.

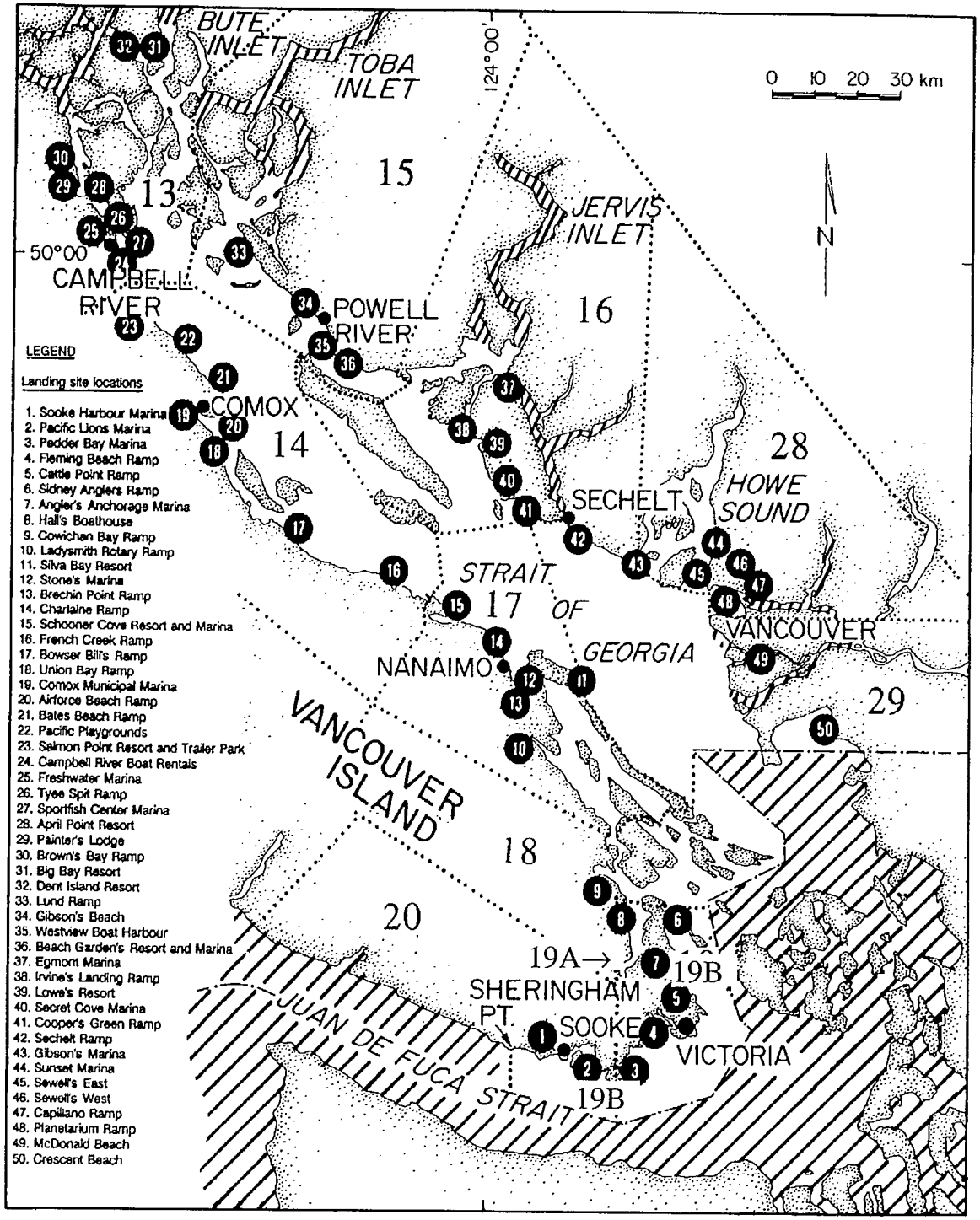
2) Waters of Pryce Channel, Waddington Channel, Pendrell Sound, Homfray Channel and Toba Inlet bounded by a line drawn from Horace Head on East Redonda Island at the south end of Waddington Channel to the northern point of Roscoe Bay on West Redonda Island and a line drawn within Homfray Channel from 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 Pt. 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 south-east of the Egmont Pt. 224° across the Narrows to Sechelt Peninsula.

APPENDIX B-2. STRAIT OF GEORGIA CREEL SURVEY STUDY AREA AND LANDING SITE LOCATIONS, 1998.



APPENDIX C. METHODS AND EQUATIONS USED IN ANALYSIS OF CATCH AND EFFORT STATISTICS FOR THE STRAIT OF GEORGIA SPORT FISHERY CREEL SURVEY.

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

Calculation of Catch and Effort Statistics

To estimate the monthly catch and effort, three components had to be calculated from a 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.

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

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

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

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

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:

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

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

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

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:

$$CPE_{dgr} = \frac{\hat{C}_{dgr}}{\hat{T}_{dg}} \tag{6}$$

$$P_{dgt} = \frac{\hat{A}_{dgt}}{\hat{T}_{dg}} \tag{7}$$

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:

$$\overline{B}_{dst} = \frac{\sum_{u} B_{sdtu}}{n_{ds}} \tag{8}$$

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 ($\overline{B}_{dst}$) 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:

$$E_{ds} = \overline{B}_{dst} \frac{1}{P_{dgt}} N_d \tag{9}$$

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 ($\overline{B}_{dst}$).

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):

$$C_{sr} = \sum_{d} (E_{ds} CPE_{dgr}) \tag{10}$$

The interview data were also used to select the catch per effort estimates (CPE_{dgr}) that should be applied to the effort estimates (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 months.

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

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

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_{Bdst}) and proportion of boats fishing (S^2_{Pdgt}) 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_{Eds} 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_{CPEdgr}) was calculated using the following equation:

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

where SS_{CPEdgr} is the weighted sum of squares for CPE_{dgr}, and S_{CPEdgr} 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_{Csr} is the variance for total number of species r in sub-Statistical Area s.

Estimation of Marked Chinook and Coho Salmon

The 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:

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

Monthly catch estimates of marked salmon were calculated as:

$$C'_{xmr} = P_{xmr}C_{xmr} \tag{18}$$

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:

$$S^2_{C'\,xmr} = P^2_{xmr}S^2_{C\,xmr} + C^2_{xmr}S^2_{P\,xmr} + S^2_{C\,xmr}S^2_{P\,xmr} \tag{19}$$

where S^2_{Cxmr} is the variance of the catch estimates of species r in region x and month m.

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

$$P_{xry} = \frac{C'_{xry}}{C_{xry}} \tag{20}$$

where

$$C'_{xry} = \sum_m C'_{xmr} \quad and \quad C_{xry} = \sum_m C_{xmr} \tag{21}$$

The variance of the annual proportions was calculated as:

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

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 sub-sampling 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:

$$P_{am} = \frac{a_m}{n_m} \tag{23}$$

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

The variance of each proportion was calculated as:

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

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

$$_{am} = P_{am} C_m \tag{25}$$

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:

$$S^2_{Cam} = P^2_{am} S^2_{Cm} + C^2_m S^2_{Pam} + S^2_{Cm} S^2_{Pam} \quad (26)$$

where S^2_{Cm} is the variance of the month catch estimate C_m.

The annual catch at age was calculated as:

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

with a variance:

$$S^2_{Cay} = \sum_m S^2_{Cam} \quad (28)$$

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

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

with a variance:

$$S^2_{Pay} = \left(\frac{C_{ay}}{C_y}\right)^2 \left[\frac{S^2_{Cay}}{(C_{ay})^2} + \frac{S^2_{Cy}}{(C_y)^2}\right] \quad (30)$$

APPENDIX D-1. STRAIT OF GEORGIA FISHING EFFORT (NUMBER OF BOAT TRIPS) SUMMARY, 1998.

		Statistical Area										
Month		13	14	15	16	17	18	19A	19B	28	29	Total
Apr	Estimate	1214	1069	384	2885	1993	314	184	2189	590	806	11628
	S.E.	166	341	185	532	298	84	65	314	125	427	2537
May	Estimate	1680	2204	261	1488	1686	649	539	5323	873	610	15313
	S.E.	343	531	106	317	340	176	625	737	133	188	3496
Jun	Estimate	4557	5449	890	3091	3746	1424	0	10690	1333	1582	32762
	S.E.	656	1648	269	551	739	389	26	837	357	415	5887
Jul	Estimate	7140	5128	992	3405	2702	1343	182	9149	2018	300	32359
	S.E.	882	1028	261	596	339	165	222	1039	359	64	4955
Aug	Estimate	8181	8152	1578	5215	2915	1781	1295	9116	3876	1491	43600
	S.E.	780	1430	638	1168	373	410	1044	496	597	548	7484
Sep	Estimate	2955	5511	257	890	2482	4365	0	3852	1988	597	22897
	S.E.	542	1322	215	531	607	780	58	409	268	161	4893
Oct	Estimate	0	0	0	0	0	0	84	3653	0	0	3737
	S.E.	0	0	0	0	0	0	80	350	0	0	430
Total	Catch	25727	27513	4362	16974	15524	9876	2284	43972	10678	5386	162296
	S.E.	3369	6300	1674	3695	2696	2004	2120	4182	1839	1803	29682

APPENDIX D-2. STRAIT OF GEORGIA CHINOOK CATCH SUMMARY, 1998.

Month		Statistical Area										Total of Chinook
		13	14	15	16	17	18	19A	19B	28	29	
Apr	Estimate	15	116	10	204	502	2	0	51	219	503	1622
	S.E.	10	58	8	79	118	2	0	26	74	339	714
May	Estimate	88	150	34	51	70	6	8	525	140	110	1182
	S.E.	36	57	25	31	33	7	10	143	40	46	428
Jun	Estimate	663	627	273	178	242	102	9	1940	66	75	4175
	S.E.	124	240	117	96	77	88	7	386	51	44	1230
Jul	Estimate	1167	360	211	340	182	54	26	1545	216	42	4143
	S.E.	201	124	104	168	53	22	29	360	70	19	1150
Aug	Estimate	1143	2918	266	128	365	270	71	1836	121	45	7163
	S.E.	159	756	119	72	114	96	84	242	52	27	1721
Sep	Estimate	382	701	119	1	19	736	8	228	45	12	2251
	S.E.	92	235	151	1	17	270	9	64	24	6	869
Oct	Estimate	0	0	0	0	0	0	0	387	0	0	0
	S.E.	0	0	0	0	0	0	0	187	0	0	
Total	Catch	3458	4872	913	902	1380	1170	122	6512	807	787	20536
	S.E.	622	1470	524	447	412	485	139	1408	311	481	6112

APPENDIX D-3. STRAIT OF GEORGIA COHO CATCH SUMMARY, 1998.

Month		Statistical Area										Total of Coho
		13	14	15	16	17	18	19A	19B	28	29	
Apr	Estimate	0	0	0	0	0	0	0	0	0	0	0
	S.E.	0	0	0	0	0	0	0	0	0	0	0
May	Estimate	0	1	0	75	0	0	0	0	0	2	78
	S.E.	0	1	0	58	0	0	0	0	0	4	63
Jun	Estimate	0	0	0	0	0	0	0	32	0	0	32
	S.E.	0	0	0	0	0	0	0	31	0	0	31
Jul	Estimate	0	0	26	26	0	0	0	0	217	59	328
	S.E.	0	0	25	30	0	0	0	0	77	28	160
Aug	Estimate	0	0	0	0	0	0	0	0	665	0	665
	S.E.	0	0	0	0	0	0	0	0	159	0	159
Sep	Estimate	0	0	0	0	0	0	0	0	273	0	273
	S.E.	0	0	0	0	0	0	0	0	74	0	74
Oct	Estimate	0	0	0	0	0	0	0	0	0	0	0
	S.E.	0	0	0	0	0	0	0	0	0	0	0
Total	Catch	0	1	26	101	0	0	0	32	1155	61	1376
	S.E.	0	1	25	88	0	0	0	31	310	32	487

APPENDIX D-4. STRAIT OF GEORGIA CHUM CATCH SUMMARY, 1998.

Month		Statistical Area										Total of Chum
		13	14	15	16	17	18	19A	19B	28	29	
Apr	Estimate	0	0	0	0	0	0	0	0	0	0	0
	S.E.	0	0	0	0	0	0	0	0	0	0	0
May	Estimate	0	0	0	0	0	0	0	0	0	0	0
	S.E.	0	0	0	0	0	0	0	0	0	0	0
Jun	Estimate	23	0	1	0	0	0	0	0	0	0	24
	S.E.	14	0	1	0	0	0	0	0	0	0	15
Jul	Estimate	0	0	0	0	0	0	0	49	0	0	49
	S.E.	0	0	0	0	0	0	0	46	0	0	46
Aug	Estimate	69	0	1	0	0	0	0	0	11	4	85
	S.E.	21	0	1	0	0	0	0	0	12	5	39
Sep	Estimate	3256	3	43	0	0	0	0	29	54	13	3398
	S.E.	752	2	31	0	0	0	0	17	25	7	834
Oct	Estimate	0	0	0	0	0	0	0	68	0	0	68
	S.E.	0	0	0	0	0	0	0	38	0	0	38
Total	Catch	3348	3	45	0	0	0	0	146	65	17	3624
	S.E.	787	2	33	0	0	0	0	101	37	12	972

APPENDIX D-5. STRAIT OF GEORGIA PINK CATCH SUMMARY, 1998.

Month		Statistical Area										Total of Pink
		13	14	15	16	17	18	19A	19B	28	29	
Apr	Estimate	0	0	0	0	0	0	0	0	0	0	0
	S.E.	0	0	0	0	0	0	0	0	0	0	0
May	Estimate	0	0	0	0	0	0	0	0	0	0	0
	S.E.	0	0	0	0	0	0	0	0	0	0	0
Jun	Estimate	0	0	0	0	0	0	0	0	0	0	0
	S.E.	0	0	0	0	0	0	0	0	0	0	0
Jul	Estimate	2679	4	60	0	0	0	0	1287	23	8	4061
	S.E.	497	4	23	0	0	0	0	405	19	6	954
Aug	Estimate	1791	4	108	0	0	0	0	816	11	4	2734
	S.E.	237	6	58	0	0	0	0	176	12	5	494
Sep	Estimate	52	0	1	0	0	0	0	0	0	0	53
	S.E.	25	0	1	0	0	0	0	0	0	0	26
Oct	Estimate	0	0	0	0	0	0	0	0	0	0	0
	S.E.	0	0	0	0	0	0	0	0	0	0	0
Total	Catch	4522	8	169	0	0	0	0	2103	34	12	6848
	S.E.	759	10	82	0	0	0	0	581	31	11	1474

APPENDIX D-6. STRAIT OF GEORGIA SOCKEYE CATCH SUMMARY, 1998.

Month		Statistical Area 13	14	15	16	17	18	19A	19B	28	29	Total of Sockeye
Apr	Estimate	0	0	0	0	0	0	0	0	0	0	0
	S.E.	0	0	0	0	0	0	0	0	0	0	0
May	Estimate	0	0	0	0	0	0	0	0	0	0	0
	S.E.	0	0	0	0	0	0	0	0	0	0	0
Jun	Estimate	0	0	0	0	0	0	0	70	0	0	70
	S.E.	0	0	0	0	0	0	0	67	0	0	67
Jul	Estimate	38	0	0	0	0	0	0	645	0	0	683
	S.E.	24	0	0	0	0	0	0	361	0	0	385
Aug	Estimate	1487	0	131	0	0	0	0	1774	218	62	3672
	S.E.	225	0	82	0	0	0	0	491	103	48	949
Sep	Estimate	32	17	0	0	0	0	0	0	0	0	49
	S.E.	25	16	0	0	0	0	0	0	0	0	41
Oct	Estimate	0	0	0	0	0	0	0	0	0	0	0
	S.E.	0	0	0	0	0	0	0	0	0	0	0
Total	Catch	1557	17	131	0	0	0	0	2489	218	62	4474
	S.E.	274	16	82	0	0	0	0	919	103	48	1442

APPENDIX D-7. STRAIT OF GEORGIA CATCH SUMMARY FOR TOTAL SALMONIDS, 1998.

Month		Statistical Area 13	14	15	16	17	18	19A	19B	28	29	Total
Apr	Estimate	15	116	10	204	502	2	0	51	219	503	1622
	S.E.	10	58	8	79	118	2	0	26	74	339	714
May	Estimate	88	151	34	126	70	6	8	525	140	112	1260
	S.E.	36	57	25	65	33	7	10	143	40	46	462
Jun	Estimate	687	627	273	178	242	102	9	2041	66	75	4300
	S.E.	127	240	117	96	77	88	7	393	51	44	1240
Jul	Estimate	3878	363	297	365	182	54	26	3525	457	107	9254
	S.E.	621	124	112	171	53	22	29	796	129	46	2103
Aug	Estimate	4492	2922	507	128	365	270	71	4498	1539	593	15385
	S.E.	491	757	217	72	114	96	84	607	305	261	3004
Sep	Estimate	3724	794	163	1	19	736	8	257	373	98	6173
	S.E.	820	258	155	1	17	270	9	66	89	32	1717
Oct	Estimate	0	0	0	0	0	0	0	455	0	0	455
	S.E.	0	0	0	0	0	0	0	192	0	0	192
Total	Catch	12884	4973	1284	1002	1380	1170	122	11352	2794	1488	38449
	S.E.	2105	1494	634	484	412	485	139	2223	688	768	9432

APPENDIX D-8. STRAIT OF GEORGIA SUMMARY FOR TOTAL RELEASED SALMONIDS, 1998*.

Month		Statistical Area 13	14	15	16	17	18	19A	19B	28	29	Total
Apr	Estimate	1015	640	69	143	446	39	0	248	534	994	4128
	S.E.	218	288	59	99	154	26	0	109	196	752	1901
May	Estimate	369	214	40	152	116	0	0	21	320	257	1489
	S.E.	165	172	33	99	40	0	0	20	105	109	743
Jun	Estimate	1029	543	110	96	401	118	12	6006	205	241	8761
	S.E.	261	176	63	51	146	94	10	1480	114	103	2498
Jul	Estimate	1383	1797	151	396	281	240	18	4959	901	190	10316
	S.E.	329	534	82	208	102	153	20	1425	370	101	3324
Aug	Estimate	2501	5304	836	1065	1464	822	386	7340	1933	778	22429
	S.E.	394	1493	497	478	399	277	452	1123	630	385	6128
Sep	Estimate	2867	3726	38	5	573	1175	86	1041	451	119	10081
	S.E.	674	1292	27	5	442	433	46	257	142	47	3365
Oct	Estimate	0	0	0	0	0	0	0	914	0	0	914
	S.E.	0	0	0	0	0	0	0	469	0	0	469
Total	Catch	9164	12224	1244	1857	3281	2394	502	20529	4344	2579	58118
	S.E.	2041	3955	761	940	1283	983	528	4883	1557	1497	18428

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

APPENDIX D-9. STRAIT OF GEORGIA HALIBUT CATCH SUMMARY, 1998.

Month		Statistical Area 13	14	15	16	17	18	19A	19B	28	29	Total of Halibut
Apr	Estimate	0	0	0	0	0	0	0	0	0	0	0
	S.E.	0	0	0	0	0	0	0	0	0	0	0
May	Estimate	20	0	1	0	0	0	0	105	0	0	126
	S.E.	14	0	1	0	0	0	0	59	0	0	74
Jun	Estimate	26	0	0	0	0	0	0	38	0	0	64
	S.E.	13	0	0	0	0	0	0	31	0	0	44
Jul	Estimate	0	0	0	0	0	0	0	843	0	0	843
	S.E.	0	0	0	0	0	0	0	358	0	0	358
Aug	Estimate	0	13	12	0	0	0	0	772	0	0	797
	S.E.	0	14	18	0	0	0	0	241	0	0	273
Sep	Estimate	0	0	0	0	0	0	0	295	0	0	295
	S.E.	0	0	0	0	0	0	0	84	0	0	84
Oct	Estimate	0	0	0	0	0	0	0	78	0	0	78
	S.E.	0	0	0	0	0	0	0	41	0	0	41
Total	Catch	46	13	13	0	0	0	0	2131	0	0	2203
	S.E.	27	14	19	0	0	0	0	814	0	0	874

APPENDIX D-10. STRAIT OF GEORGIA LINGCOD CATCH SUMMARY, 1998.

Month		Statistical Area 13	14	15	16	17	18	19A	19B	28	29	Total of Lingcod
Apr	Estimate	0	1	0	0	30	10	0	8	0	0	49
	S.E.	0	1	0	0	21	9	0	9	0	0	40
May	Estimate	0	0	0	0	0	18	32	18	0	0	68
	S.E.	0	0	0	0	0	12	54	15	0	0	81
Jun	Estimate	153	15	4	357	346	26	3	3	8	16	931
	S.E.	46	8	3	205	147	15	3	3	7	16	453
Jul	Estimate	95	161	5	0	164	79	62	351	0	0	917
	S.E.	33	93	3	0	58	34	59	130	0	0	410
Aug	Estimate	141	10	14	50	48	22	48	130	87	22	572
	S.E.	51	7	13	32	17	10	65	58	49	17	319
Sep	Estimate	125	40	1	143	14	95	54	175	87	12	746
	S.E.	59	40	2	77	16	36	21	59	38	6	354
Oct	Estimate	0	0	0	0	0	0	0	8	0	0	8
	S.E.	0	0	0	0	0	0	0	9	0	0	9
Total	Catch	514	227	24	550	602	250	199	693	182	50	3291
	S.E.	189	149	21	314	259	116	202	283	94	39	1666

APPENDIX D-11. STRAIT OF GEORGIA ROCKFISH CATCH SUMMARY, 1998.

Month		Statistical Area 13	14	15	16	17	18	19A	19B	28	29	Total of Rockfish
Apr	Estimate	1276	384	325	1400	760	120	0	1250	292	250	6057
	S.E.	279	240	271	493	188	63	0	352	155	179	2220
May	Estimate	4941	153	383	2928	2105	194	614	1131	166	202	12817
	S.E.	1294	85	276	889	683	107	708	308	79	102	4531
Jun	Estimate	5259	529	179	2708	2899	757	256	1429	408	414	14838
	S.E.	911	166	66	461	822	300	68	474	162	248	3678
Jul	Estimate	7419	1630	386	3524	1983	1212	355	2245	447	71	19272
	S.E.	1393	544	118	1183	403	277	262	627	206	31	5044
Aug	Estimate	8179	853	882	6298	1104	470	857	1943	766	219	21571
	S.E.	1112	330	457	1525	292	118	737	407	328	71	5377
Sep	Estimate	3033	119	44	924	274	591	205	1571	202	73	7036
	S.E.	742	70	33	459	175	236	69	333	105	35	2257
Oct	Estimate	0	0	0	0	0	0	306	2354	0	0	2660
	S.E.	0	0	0	0	0	0	286	800	0	0	1086
Total	Catch	30107	3668	2199	17782	9125	3344	2593	11923	2281	1229	84251
	S.E.	5731	1435	1221	5010	2563	1101	2130	3301	1035	666	24193

APPENDIX D-12. STRAIT OF GEORGIA CATCH SUMMARY FOR OTHER FINFISH, 1998.

Month		Statistical Area 13	14	15	16	17	18	19A	19B	28	29	Total
Apr	Estimate	326	209	95	675	673	33	0	564	265	712	3552
	S.E.	114	132	73	456	316	27	0	151	153	797	2219
May	Estimate	867	97	80	1251	454	256	556	419	128	148	4256
	S.E.	331	51	64	457	196	161	731	215	61	73	2340
Jun	Estimate	517	62	19	855	378	1002	1222	6809	26	132	11022
	S.E.	122	24	8	196	339	811	906	1923	27	120	4476
Jul	Estimate	657	226	50	1450	139	55	27	8080	73	20	10777
	S.E.	171	175	27	523	81	20	31	1899	40	12	2979
Aug	Estimate	1020	245	100	3426	469	29	0	7101	145	94	12629
	S.E.	212	102	69	1119	152	15	0	1316	61	41	3087
Sep	Estimate	213	403	3	0	5	109	74	201	124	36	1168
	S.E.	72	363	3	0	4	55	38	80	55	16	686
Oct	Estimate	0	0	0	0	0	0	0	161	0	0	161
	S.E.	0	0	0	0	0	0	0	84	0	0	84
Total	Catch	3600	1242	347	7657	2118	1484	1879	23335	761	1142	43565
	S.E.	1022	847	244	2751	1088	1089	1706	5668	397	1059	15871

APPENDIX E-1. TOTAL ESTIMATED EFFORT AND SPORT CATCHES FOR THE STRAIT OF GEORGIA, 1998*.
Totals include data for all months surveyed.

		Salmon Catch						Salmon Released			Groundfish Catch				
Year	Effort	Chinook	Coho	Chum	Pink	Sockeye	All Salmon	Chinook	Coho	All Salmon	Halibut	Lingcod	Rockfish	Dogfish	Other
1980	510400	204100	393500	0	0	0	609200	0	0	0	0	0	0	0	0
1981	494604	197239	317091	0	0	0	572964	0	0	215556	0	51319	77889	2280	8633
1982	559395	124390	411686	0	2846	0	547196	0	0	578169	0	77035	176302	7214	43126
1983	574257	198433	404031	0	54852	0	668142	0	0	775502	0	73800	209099	4518	94100
1984	651090	369445	443590	0	10229	0	828290	0	0	639676	0	137492	158676	4649	84353
1985	628513	234838	728197	0	91246	0	1062939	0	0	703264	0	77103	134112	4680	58531
1986	582946	181896	571980	919	3145	918	760361	0	0	166862	0	70817	167783	5212	65081
1987	589731	121081	641572	3544	90004	8867	867029	0	0	1068027	0	65789	136270	4110	61497
1988	664517	119117	1084790	4802	8843	16376	1235680	0	0	935330	0	65929	194735	4114	71045
1989	603331	132846	497223	7819	123046	13356	775616	190186	0	1201306	0	52329	199898	3672	57165
1990	543368	111914	630033	2978	11549	30669	792440	221081	0	704554	0	31716	154858	2679	30016
1991	466749	115523	157111	5273	249662	23521	551521	178921	0	622445	0	8214	173383	4972	23469
1992	467559	116581	595554	5927	19085	6745	744564	165710	0	417401	0	5968	135763	1802	32146
1993	528508	127576	861323	3096	173143	23766	1217381	182111	0	526817	0	7239	104009	1907	35218
1994	461129	70839	294767	4279	18476	14054	410352	147571	0	418387	0	6885	162431	1244	35840
1995	323642	62173	86145	4023	183938	5897	347401	112324	0	317735	0	4829	112299	1884	32365
1996	289423	89589	127890	3474	7887	2419	233469	180238	0	366379	0	3733	102818	1497	39786
1997	268797	56332	104953	1761	111124	16887	293605	65421	0	404166	0	4086	87453	2528	52088
1998	162296	20923	1376	3624	6848	4474	38449	34786	20992	2340	2203	3291	84251	0	43565

*SOURCE: Catch statistics 1980-1998 from unpublished creel survey data.

APPENDIX E-2. TIDAL EFFORT STATISTICS AND SPORT CATCH ESTIMATES OF CHINOOK AND COHO FOR THE STRAIT OF GEORGIA, 1960 TO 1980*.

Year	Effort** (boat trips)	Catch	
		Chinook	Coho
1960	189,150	83,000	238,000
1961	199,935	63,000	152,000
1962	205,547	86,000	167,000
1963	247,590	65,000	199,000
1964	198,120	51,000	182,000
1965	250,020	53,000	175,000
1966	259,100	80,000	249,000
1967	254,500	115,000	200,000
1968	265,030	150,000	250,000
1969	281,475	185,000	200,000
1970	306,255	220,000	500,000
1971	341,123	255,000	800,000
1972	300,349	287,000	335,000
1973	293,141	272,000	373,000
1974	443,441	269,000	772,000
1975	334,490	398,000	454,000
1976	340,729	490,000	415,000
1977	363,350	372,000	682,000
1978	369,035	500,000	1,103,000
1979	404,710	350,000	708,735
1980	510,400	204,100	393,500
1981	494,604	197,239	317,091
1982	559,395	124,390	411,686

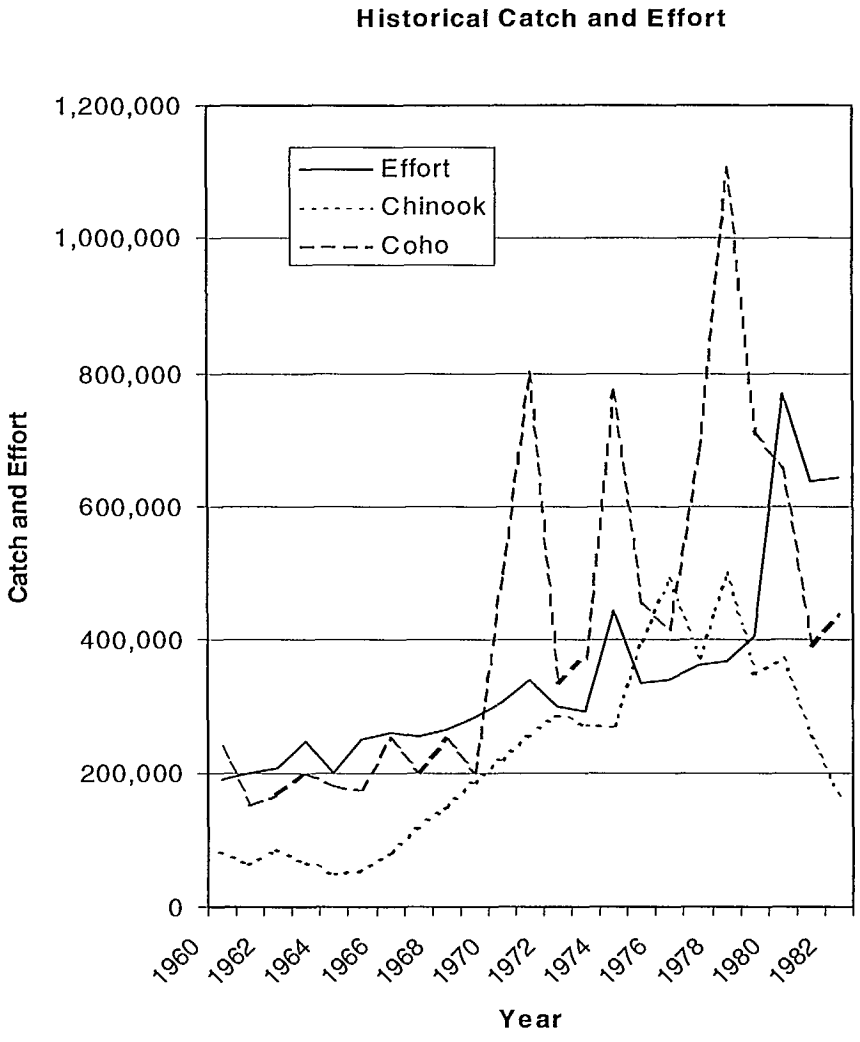
*SOURCE: Coho catch statistics: 1960-1978 from Argue et al. (1983); 1979 from R. Kadowaki (Fisheries and Oceans Canada, Pacific Bio. Stn. Nanaimo, B.C. pers. comm.); 1980-1982 from unpublished creel survey data.

Chinook catch statistics: 1960-1977 from Argue et al. (1983); 1978 and 1979 from B. Riddell (Fisheries and Oceans Canada, Pacific Bio. Stn. Nanaimo, B.C. pers. comm.) following the methods of Argue et al . (1983); 1980-1982 from unpublished creel survey data.

Effort statistics: 1960-1979 from published and unpublished Fisheries Officer statistics; 1980-1982 from unpublished creel survey data.

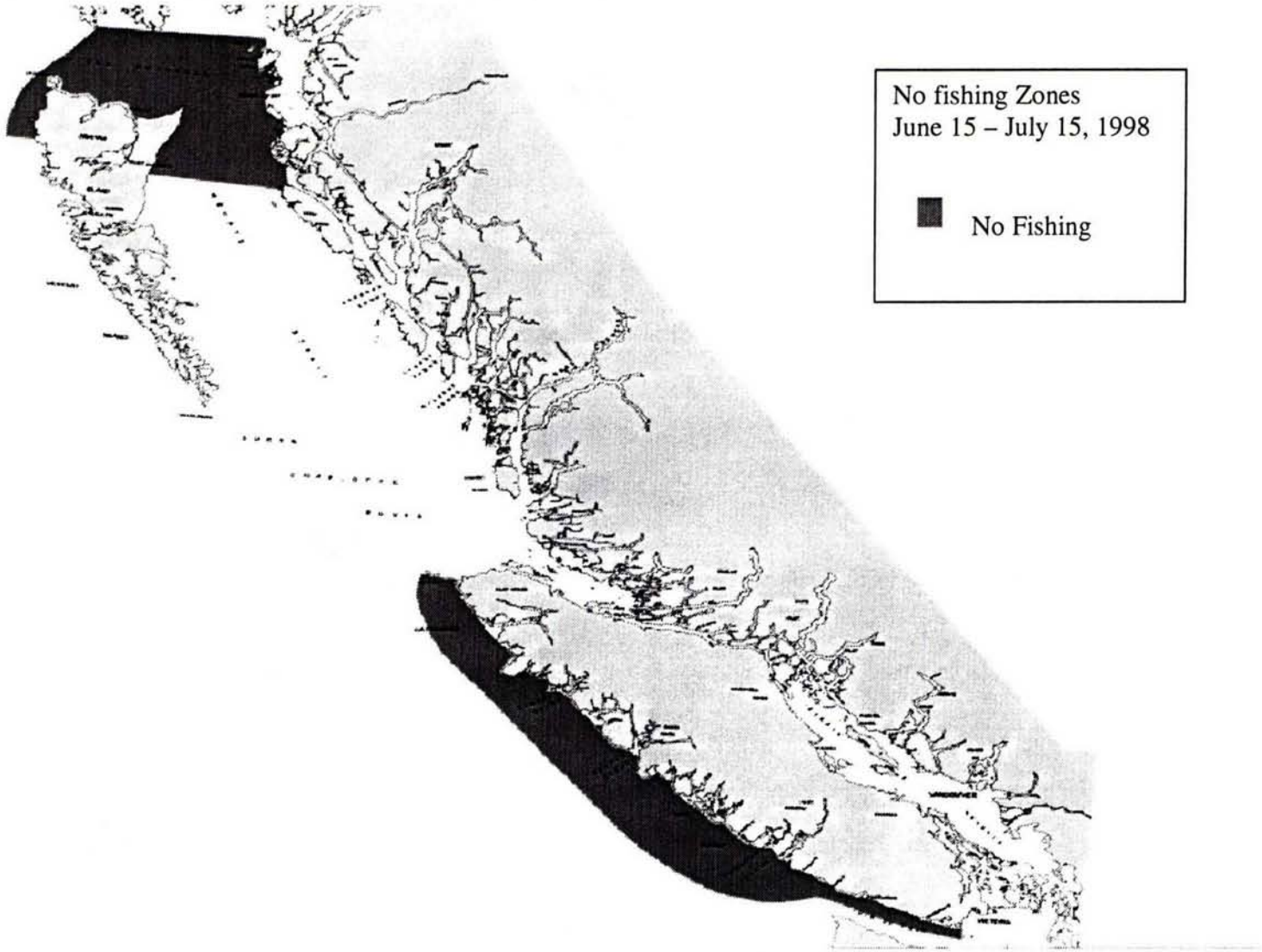
**Effort prior to 1980 (the start of the creel survey) may not represent boat trips.

APPENDIX E-3. HISTORICAL CATCH* AND EFFORT** GRAPH, 1960 TO 1982.

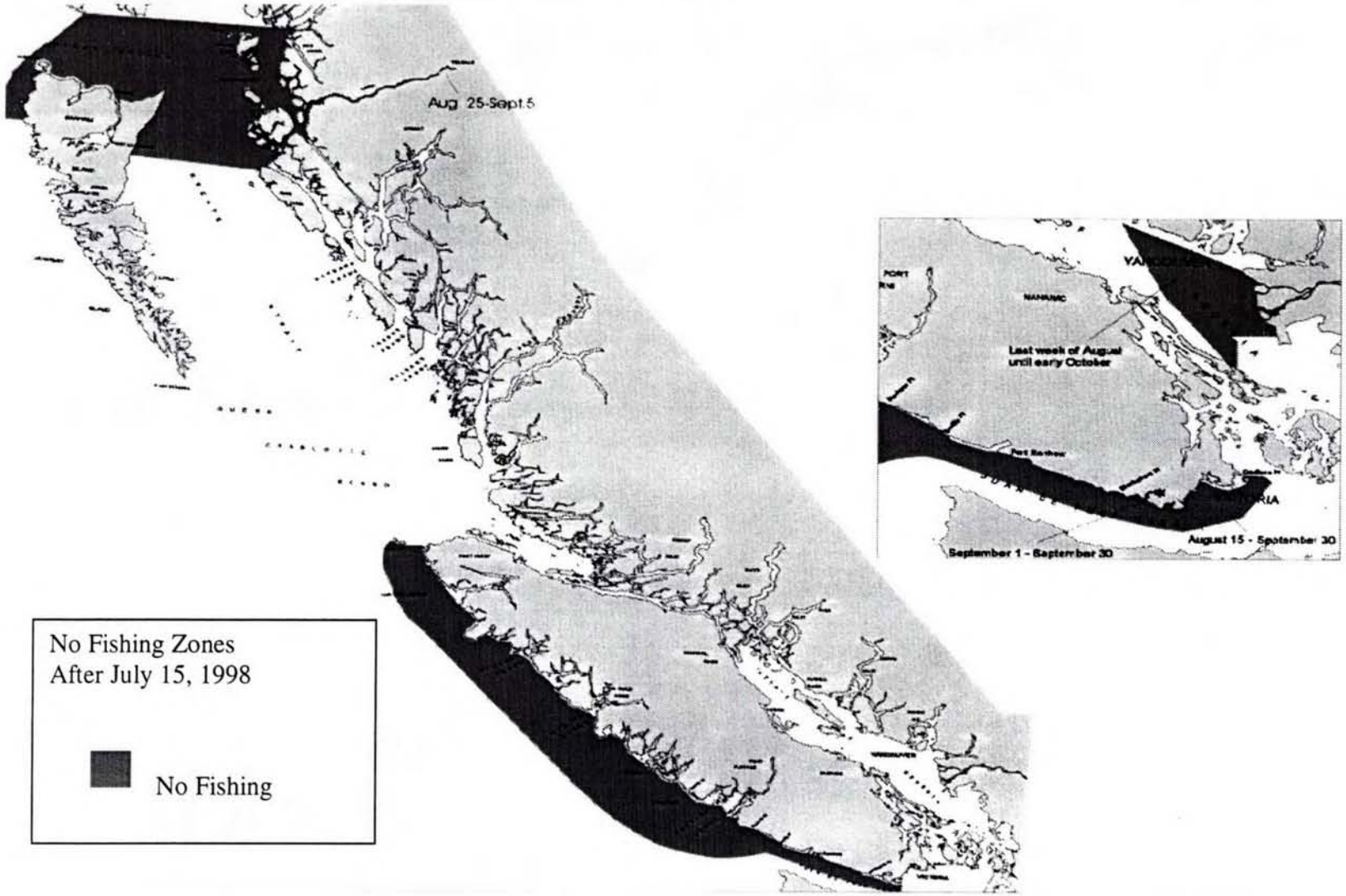


*SOURCE: Coho catch statistics: 1960-1978 from Argue et al. (1983); 1979 from R. Kadowaki (Fisheries and Oceans Canada, Pacific Bio. Stn. Nanaimo, B.C. pers. comm.); 1980-1982 from unpublished creel survey data.
Chinook catch statistics: 1960-1977 from Argue et al. (1983); 1978 and 1979 from B. Riddell (Fisheries and Oceans Canada, Pacific Bio. Stn. Nanaimo, B.C. pers. comm.) following the methods of Argue et al . (1983); 1980-1982 from unpublished creel survey data.
Effort statistics: 1960-1979 from published and unpublished Fisheries Officer statistics; 1980-1982 from unpublished creel survey data.
**Effort prior to 1980 (the start of the creel survey) may not represent boat trips.

APPENDIX F-1. NO FISHING ZONES JUNE 15 –JULY 15, 1998.



APPENDIX F-2. NO FISHING ZONES AFTER JULY 15, 1998.



APPENDIX G. HISTORICAL REGULATION CHANGES AFFECTING THE STRAIT OF GEORGIA SPORT FISHERY*.

1981	July 1, chinook minimum size limit changed from 30 cm to 45 cm. Minor spot closures, E.g. River mouths only.
1982	Annual bag limit established at 30 chinook.
1985	May 15, daily limit reduced from 4 to 2 chinook. June 5, annual limit reduced from 30 to 20 chinook. Spot closure plan implemented (32 closures), similar program continues to present day.
1988	April 1, annual bag limit reduced to 8 chinook. A proposed chinook minimum size limit of 62 cm (not enforced).

The Strait of Georgia has been divided into 2 areas: 1. Victoria area, Cadboro Bay to Sheringham Point. 2. The rest of the Strait of Georgia.

1989	Feb 1, 62 cm minimum size limit for chinook. Aug 16, Victoria area, minimum size limit for chinook reduced to 45 cm and the annual limit increased to 20 fish. Strait of Georgia, chinook size limit of 62 cm and an increase in annual limit to 15 fish.
1992	Feb 6, daily limit for lingcod reduced to 1 and minimum size limit of 65 cm established.
1994	Daily possession limit for coho reduced from 4 to 2, minimum size limit increased from 30 cm to 41cm. Annual limit of 10 lingcod.
1998	July 1, barbless hooks in tidal waters. May 4, non-retention of coho in all tidal and non-tidal waters (some exceptions). Creation of Red zones (no fishing) and Yellow zones (fishing allowed), see Appendices F-1 and F-2. Spot closures for sockeye.

*__SOURCE__: regulation changes 1981 and 1982, English et al. (1986); 1985 T. F. Shardlow, et al. (1989); 1988 T. F. Shardlow, et al. (1989); 1989 L. D. Collicutt et al. (1990); 1992, 1994 Wendy Grider (Fisheries and Oceans Canada, Vancouver, B.C. pers. comm).

APPENDIX H. SPECIES BREAKDOWN OF ROCKFISH.

Common Name	Latin Name
Quillback	*Sebastes maliger*
Copper	*S. caurinus*
Yelloweye	*S. ruberrimus*
Black	*S. melanops*
Tiger	*S. nigrocinctus*
Yellowtail	*S. flavidus*
China	*S. nebulosus*
Canary	*S. pinniger*

SPECIES COMMONLY INCLUDED WITH OTHER FINFISH.

Common Names	
Pacific Herring	*Clupea pallasi*
Pacific Cod	*gadus macrocephalus*
Pacific Tomcod	*Microgadus proximus*
Walleye Pollock	*Theragra chalcogramma*
Pacific Hake	*Merluccius productus*
Perch (all species)	Family *Scorpaenidae*
Greenlings (all species)	Family *Hexagrammidae*
Flounder (all species)	Family *Pleuronectidae*
Sole (all species)	Family *Pleuronectidae*
Pacific (jack) mackeral	*Trachurus symmetricus*