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Inshore rockfish stock assessments for the west coast of Canada  
in 1997 and recommended yield options for 1998

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## Abstract

Coastwide hook and line catch of inshore rockfish is estimated at 2,041 t from all sources (commercial and recreational). Data sources for this update have changed from previous years. There remains very conservative estimates of recreational catch and no estimates of aboriginal catch coastwide. No new analyses are presented in this interim assessment for inshore rockfish. Information from logbook records in the Strait of Georgia show declines in catch per unit of effort (CPUE) indices for quillback rockfish (*Sebastes maliger*) in the three major fishing locations; lower Gulf Islands, Campbell River and Queen Charlotte Sound. Preliminary analyses of similar logbook CPUE indices for the West Coast Vancouver Island show declines for yelloweye rockfish (*Sebastes ruberrimus*) in statistical area 27. Logbook data analyses for the other management regions of the coast are pending. Given the declining trends in the logbook analyses, a precautionary approach to management is advised as well as a review of quotas on a region by region basis.

## Résumé

Les captures à la ligne et à l'hameçon de sébaste côtier, à la grandeur de la côte et de toutes les pêches (commerciale et récréative), sont estimées à 2 041 t. Les sources de données ayant servi à cette mise à jour ne sont pas les mêmes que par les années antérieures. Il s'agit d'estimations très conservatrices des prises récréatives et il n'y a pas d'estimation des captures autochtones à l'échelle de la côte. On ne présente aucune analyse nouvelle du sébaste côtier. Les renseignements des registres de bord pour le détroit de Georgia indiquent un déclin des prises par unité d'effort (PUE) pour le sébaste à dos épineux (*Sebastes maliger*) en trois importants lieux de pêche : îles du bas du Golfe, rivière Campbell et détroit de la Reine-Charlotte. Des analyses préliminaires des PUE de registres de bord semblables pour la côte ouest de l'île de Vancouver montrent un déclin du sébaste aux yeux jaunes (*Sebastes ruberrimus*) dans la zone statistique 27. Les analyses des données des registres pour les autres régions de gestion de la côte ne sont pas encore terminées. Étant donné la tendance à la baisse indiquée par les analyses des registres, il est conseillé de faire preuve de prudence en matière de gestion et de procéder à un examen des quotas de chaque région.

## INTRODUCTION

This working paper is an update of the inshore rockfish stock assessment prepared for the Pacific Stock Assessment Review Committee (PSARC) in 1996 (Yamanaka and Kronlund 1997). A summary of that assessment and PSARC recommendations is followed by brief discussions on management history and data sources for the assessment, rockfish stock status by management region and a discussion on management advice. Data sources for this update have changed from previous years. The keypunching of fish slip data for the Zn fishery ended in 1995. Fish slip data have been replaced with logbook and dockside monitoring data in 1996. The regional synopses of rockfish status refer to new logbook analyses which were presented for PSARC review (Yamanaka and Kronlund 1998, Kronlund and Yamanaka 1998.).

Managers are advised to take a "precautionary approach" when setting quotas for the 1998 fishery. Given the low productivity of inshore rockfish populations and the preliminary indications of declining catch per unit effort from the logbook analyses, reduced stock abundance over the last decade in areas of the Strait of Georgia for quillback rockfish and in areas off the West Coast of Vancouver Island for yelloweye rockfish can not be discounted. Analysis of data from other regions of the coast are pending.

### 1. OVERVIEW

Inshore rockfish are described as rockfish primarily caught on hook and line gear. In British Columbia, this group includes over twenty rockfish species in the genus *Sebastes*. The predominant rockfish species are yelloweye (*Sebastes ruberrimus*), quillback (*S. maliger*), redbanded (*S. babcocki*), rougheye (*S. aleutianus*), silvergray (*S. brevispinus*), shortraker (*S. borealis*), copper (*S. caurinus*) and china (*S. nebulosus*). Other rockfish species are caught primarily in the trawl fishery and are included in either the slope or shelf rockfish assessments conducted by Fisheries and Oceans Canada.

The most recent major review of inshore rockfish (Yamanaka and Kronlund 1997) detailed "habitat" and "catch history" assessment methods incorporating the fleet dynamics, trends in CPUE, changes in the age composition of the catch, and survey data. Where long catch history (with relatively high effort), survey data and biological data, were available, a recommended yield was determined using a habitat-based analysis (Yamanaka and Richards 1992). Where the catch history was long (effort is relatively high), but little or no other data were available, the yield recommendations were based on the 25th percentile of the catch history since 1982. Where there were no reasonable catch history and effort was relatively low, yield recommendations were not provided. Managers were advised to be "precautionary" in these areas. In this case, a "precautionary approach" meant setting very low quotas in an effort to avoid long term negative fishery effects on fish stocks.

The groundfish subcommittee of the PSARC emphasised that the current management practice of setting catch quotas (TAC's) for large regions of the coast is inconsistent with the biology of the rockfish and activities feasible for stock assessment. There were serious

concerns over the ability to sustainably management stocks under the existing TAC regime. Recommendations from PSARC included:

1. Future assessments should focus on the analysis of logbook data as these records, in theory, approach the level of spatial scale that is required for assessment. There are no further gains to be made in trying to improve estimates of stock status with the existing fish slip data.
2. Review alternative approaches to management and to identify strategies that are feasible from both an assessment and management perspective.
3. Move towards the planning of marine protected areas (MPA's) as one component in an overall plan to sustainably management inshore rockfish. Harvest refugia were considered by the committee to be a necessary basic approach to spatial management of long lived species such as inshore rockfish.

In light of these recommendations, the following working papers were prepared for PSARC review.

1. Analysis of Zn hook and line logbook data: Strait of Georgia Management Region. (Kronlund and Yamanaka 1998)
2. Preliminary analyses of the 1986-1992 Zn rockfish logbook records for the longline fishery on the W coast of Vancouver Island. (Yamanaka and Kronlund 1998)
3. A discussion paper on reconciling management and assessment in the inshore rockfishes. (Kronlund 1998).

## 2. FISHERY MANAGEMENT

Management measures for the inshore rockfish fishery are summarised in Table 1 and described in detail by Kronlund (1998). In summary, the category Zn licence, which permits rockfish species to be taken by hook and line gear, was instituted in 1986. Area licensing (inside or outside of the Strait of Georgia) and catch quotas for five management regions on the coast were introduced in 1991. The statistical areas comprising each management region are listed in the following table.

Management Region	Code	Statistical Areas
Strait of Georgia:	SG	12-20, 28 and 29
West Coast Vancouver Island	WCVI	11, 21-27, 111, 121-127
Queen Charlotte Islands	QCI	1-2, 101-102, 142, 130
North Coast	NC	3-5, 103-105
Central Coast	CG	6-10, 106-110

Limited entry was implemented for the Strait of Georgia management region in 1992 and for the remaining management regions in 1993. Limited entry reduced the number of licences to 74 in the Strait of Georgia and to 183 licences outside from over 2400 licenses coast-wide in 1986. In

1994, a user-pay logbook program was implemented, followed by a user-pay dockside monitoring program in 1995.

A major change in the management of the fishery occurred in 1995 with the introduction of quota management for yelloweye rockfish and six species aggregates. This measure was accompanied by the implementation of monthly fishing periods, fishing period limits, annual landing options, and trip limits. The six species aggregates introduced in 1995 are contained in the following table.

Aggregate	Species
1	quillback, copper
2	china, tiger
3	canary, silvergray, yellowtail, widow
4	roughey, shortraker, thornyheads
5	Pacific ocean perch, yellowmouth, redstripe
6	any combination of species other than yelloweye and other than species in aggregates 1-5

In 1996, yellowtail and widow rockfish were taken out of Aggregate 3 and formed a new Aggregate 6 with black rockfish. All other rockfish species constituted a new Aggregate 7. In both 1995 and 1996, management of the fishery was based on the attainment of the yelloweye rockfish and aggregates 1 and 2 (combined) quotas. Table 2 shows the quota and catch for the five coastal management regions between 1991 and 1994 by species, while Tables 3 and 4 show similar data for the 1995 and 1996 fishery by species aggregate.

Inshore rockfish are caught in all other (non-Zn) line fisheries. The largest of these removals in the Strait of Georgia region are from the recreational catch and for regions outside the Strait of Georgia are the incidental catch allowance in the directed halibut fishery. The recreational fishery was restricted coast-wide by a daily bag limit of eight rockfish in 1986 which was reduced in 1992 to five for the Strait of Georgia Areas 12-19, 28 and 29 and subareas 20-4 and 20-7. In 1995, an estimated 50% of the Strait of Georgia rockfish catch was taken in the recreational fishery (Yamanaka and Kronlund, 1997). The halibut fleet is permitted an incidental weight allowance of 20 percent rockfish (whole) per halibut (dressed) landing. What is notable about this incidental weight allowance is that the amount of rockfish taken from year to year is proportional to the quotas set for halibut. Incidental rockfish has fluctuated from a low of 150 t in 1991 to a high of 500 t in 1993 (AMR data bases). An unknown amount of rockfish removals are taken in aboriginal fisheries coastwide.

### 3. INDUSTRY FUNDED RESEARCH

In 1997, 5% of the Zn rockfish quotas coastwide were set aside from the fishery to fund research. This was equivalent to approximately 21 t yelloweye rockfish and 24 t of

aggregates 1 and 2. Currently, this research allocation is used to conduct charter vessel surveys for the collection of biological samples and standardized catch per unit of effort indices.

In September 1997, three vessels were chartered to collect yelloweye and redbanded rockfish biological samples from the Queen Charlotte Islands region (QCI) and west coast of Vancouver Island region (WCVI). Within each of these regions, two locations were fished. One location was designated as "heavily" fished and the other location designated as "lightly" fished. The purpose of designating "heavily" and "lightly" fished locations was to determine whether a difference could be detected in the population biology of rockfish from these contrasting locations. Catch composition and catch rates from the charters will also be compared with commercial logbook data for the same locations.

#### 4. DATA SOURCES

Determining total catch for inshore rockfish coastwide is a complicated task. Over the years, the primary data source for commercial catch figures has evolved from paper fish slip records (1954 - 1981) to electronic sale slip records (1982 - 1995) and now to dockside monitoring reports (1995 - present). Additional removals to be accounted for include catch from commercial fisheries other than Zn (e.g. halibut, salmon, trawl) as well as recreational and aboriginal fisheries. Estimates of coastwide inshore rockfish landings for the commercial catch managed by onboard observer (trawl) and dockside monitoring programs (Zn, dogfish and lingcod) is considered accurate. Other commercial fishery removals continue to be reported on fish slips (halibut and salmon) and are also considered fairly accurate. Recreational catch is estimated for only a few statistical areas coastwide and therefore is considered to be extremely conservative. There is a Department of Fisheries log book program for commercially run recreational fishing lodges, however, the coastwide data are unpublished. Some aboriginal groups have also contracted consultants to estimate recreational catch within their band and council areas (Haida fisheries program, 1997), however, there are no efforts to co-ordinate the collection of aboriginal catch data coastwide. The increase of both the recreational and aboriginal catch is an ongoing concern for assessment as there are no catch data being collected or collated coastwide.

Total catch of inshore rockfish was compiled for 1996 from four data sources. The commercial catch from the hook and line fisheries was estimated from the dockside monitoring program for the Zn rockfish, dogfish and lingcod fisheries and from fish slips for the halibut and salmon fisheries. Preliminary commercial trawl catch is determined from both onboard observer and dockside monitoring data. Recreational catch is determined by creel surveys conducted at various locations coastwide. Fisheries and Oceans contracts consultants to estimate the recreational catch in some statistical areas within the five management regions coastwide (T. Gjernes pers comm). This data is gathered piece meal through regional Department offices.

Historic catch data for hook and line rockfish taken in commercial fisheries was compiled from fish slip records between 1982 and 1995. The fish slip records are no longer keypunched for the Zn fishery but continue to be keypunched for the non-Zn fisheries. Zn rockfish catch is currently compiled from Zn logbook records and dockside monitoring records, therefore, we have two estimates of Zn rockfish catch. At some point, the dockside monitoring data should be integrated electronically with logbook data and the former fish slip records would be fully replaced. Zn rockfish catch is reported here as summaries from each data source.

Estimates of total inshore rockfish catch taken on commercial hook and line gear was down in 1996 to 1947 t (1630 t DMP + 317 t fish slips) from a high of 2586 t (fish slips) in 1995. Catch reported on logbooks by species for 1995 and 1996 reflect this decrease (2396 t and 1629 t) and, in general, show slightly lower catch than the landing data from the dockside monitoring program (Tables 5 and 6). Dockside monitoring accounts for approximately 84% of the commercial rockfish landings in 1996 (Table 4). The remaining 16% is largely yelloweye rockfish landed incidentally in the halibut fishery. These landings are captured on the fish slip data base (Table 4) Zn logbooks account for 84% of the commercial rockfish catch in 1996 (Tables 4 and 6). Fish slip data for 1994 to 1996 are still preliminary.

#### 4.1. Fish Slip Data

Fish slip information is compiled and maintained by the Statistics Unit, Fisheries Branch of Fisheries and Oceans Canada. Prior to 1994, the majority of rockfish taken on hook and line gear were recorded as red snapper (code 48) and other rockfish (code 47). In 1994, the database was upgraded to allow the entry of fish slip data by species. Since 1994, the fish slip data have been summarised into the 'old' categories of red snapper and other rockfish for the catch tables. Categories for hook and line gear include longline (code 40), handline (code 36), salmon troll (code 30) and salmon freezer troll (code 31). These gear types are combined into longline and handline/troll for this document. Fields in the fish slip database do not distinguish between statistical areas inside and outside the surfline. Therefore, catches from statistical areas 101-111 and 121-127 are reported under statistical areas 1-11 and 21-27, respectively. Catch is reported as round fish weight (kg) and effort is reported as fishing days. Catch data from fish slips presented for 1995 and 1996 are preliminary and were compiled in September 1997.

Total coastwide commercial hook and line rockfish catch by region is shown in Table 7 for 1956 to 1995. Total rockfish catch by year and statistical area in the Strait of Georgia for longline gear and handline/troll gear are shown in Tables 8 and 9. Similar summaries for statistical areas outside of the Strait of Georgia appear in Tables 10 and 11. Longline and handline/troll landings and effort by year and management region are shown for red snapper in Table 12 and for other rockfish in Table 13 for 1982 to 1995. Fish slip data is summarised for yelloweye rockfish and aggregates 1 and 2 by management region and coastwide for aggregates 3 to 6 in 1995 (Table 3) and aggregates 3 to 7 in 1996 (Table 4).

#### 4.2. Zn Logbook Data

Fisheries and Oceans Canada has keypunched logbook records for periods dating back to 1986. A user-pay program was instituted in 1994 to provide data entry for Zn logbooks. Logbook records are transferred directly to the Pacific Biological Station, Science Branch, Fisheries and Oceans Canada in the form of ASCII files. Pending the completion of a standardised database, these data reside in a relational database (Haigh and Richards 1997). As of September 1997, Zn logbook records from 1986 through 1988 and 1993 through 1996 have been entered into the database. A portion of the 1989 through 1992 logbook data are also entered and the remaining records will be keypunched as funds are available.

Zn logbook catch summaries by species, gear type and management area and overall catch coastwide are shown in Tables 5 and 6 for 1995 and 1996, respectively. Overall rockfish catch declined between 1995 and 1996, from 2396 t to 1629 t. The most notable catch decline was rougheye rockfish from 596 t in 1995 to 164 t in 1996.

#### 4.3. Dockside Monitoring Program Data

Beginning in 1995, all Zn fishery landings were monitored for species composition and weight by an industry funded dockside program. The dockside monitoring program (DMP) is managed under a Fisheries and Oceans Canada contract to Archipelago Marine Research. In 1995, the DMP included only Zn rockfish landings. This changed in 1996 when commercial hook and line landings of dogfish and lingcod were added to the DMP. All other rockfish landed in hook and line fisheries, such as, halibut and salmon, continue to be reported on fish slips. Fish slips for the Zn rockfish, dogfish and lingcod fisheries were discontinued in 1996.

Catch figures from the DMP are compared with the fish slip data in 1995 in Table 3. Catch figures from the DMP and fish slips for 1996 are in Table 4. For 1995 and 1996, coastwide summaries of DMP landing data are compared to the logbook data by species in Tables 5 and 6, respectively (Archipelago Marine Research database). The DMP does not report the statistical areas of catch. Management region is reported for the landings of yelloweye rockfish and aggregates 1 and 2.

Dockside monitoring reported 2608 t of rockfish landed coastwide in 1995 and 1634 t in 1996 (Tables 3 and 4). The decline in catch between these years is also reflected in the Zn logbook summaries and estimates of overall rockfish catch.

#### 4.4. Trawl catch

Historically, trawl catches were compiled at the Pacific Biological Station (PBS Groundfish data files). Trawl catches of quillback, copper and yelloweye rockfish in areas



outside the Strait of Georgia have increased from 26 t in 1988 to a high of 94 t in 1995. Of this 94 t, approximately 42 t was yelloweye rockfish, 33 t quillback rockfish and 19 t copper rockfish.

Currently, work is progressing on a new PACHARV data system which will integrate data from onboard observers, dockside monitoring and logbook records to determine catch. For 1996, preliminary data from onboard observers and dockside monitoring are shown in Table 14. An estimate of 56 t of quillback, copper and yelloweye rockfish were taken by trawl gear in areas outside the Strait of Georgia. Significant amounts of rougheye, redbanded, silvergray and canary rockfish are taken in both the trawl and hook and line fisheries.

#### 4.5. Recreational Catch Data

Catch statistics for the recreational fishery are available through creel surveys. Surveys are conducted in the Strait of Georgia areas 13-19 (including the portion of area 20 east of Sheringham Point), 28 and 29 (Collicutt and Shardlow 1992b)(Table 15), the West coast Vancouver Island areas 23 - 24 (W. Luedke pers com)(Table 16) and North and Central coast areas 1 -10 (T. Gjernes pers com)(Table 17). Rockfish are not summarised by species for any of the creel surveys. Catch rate indices are not comparable among the surveys as effort is not standardized.

In the Strait of Georgia for 1996, 67 t of rockfish was reported as catch from the recreational fishery (Areas 13 - 19, 28 and 29, April to September). The west coast survey reported 10 t of rockfish taken in 1996 (Areas 23 and 24, July to September), a decrease from 18 t in 1990. The north and central coast survey reported 12 t of rockfish taken in 1996, an increase from 2 t in the early 90's.

## 5. REGIONAL SYNOPSES

Discussion presented in this section is summarised from the major review completed in 1996 (Yamanaka and Kronlund 1997) with addition highlights from the logbook analyses for the Strait of Georgia (Kronlund and Yamanaka 1998) and west coast of Vancouver Island (Yamanaka and Kronlund 1998). A discussion paper on the management and assessment of inshore rockfish is detailed in Kronlund (1998) and is mentioned here as additional background information for those unfamiliar with the history of the Zn fishery.

### 5.1. Coastal Overview

The analysis of the spatial distribution of catch and effort in the hook and line rockfish fishery displayed movements consistent with a fishery that operates by progressively depleting local populations of rockfish (Yamanaka and Kronlund 1997). In the early part of the time series (mid-80's) catch and effort were concentrated near southern ports in the lower Strait

of Georgia and the lower West Coast of Vancouver Island. By 1992-93, the Strait of Georgia fleet moved gradually northward into Queen Charlotte Strait and the lower Central Coast. The West Coast Vancouver Island fleet also progressed northwards up the West Coast of Vancouver Island and into the bottom end of the Queen Charlotte Islands. Recently, the fleet is concentrated in the upper West Coast of Vancouver Island and the Queen Charlotte Islands.

In general, catch rates are lower in the southern areas and higher in the north. This result is consistent with the fleet dynamics discussed above; southern areas should be less productive in recent years if localised stock decline occurred early in the time series. A declining red snapper catch rate is coincident with an increase of other rockfish catch rates, for longline gear, in areas outside of the Strait of Georgia. The increase in other rockfish catch is due to restrictions on the yelloweye rockfish catch and has resulted in increases in both the amount of individual species landed and the diversity of species landed over time. Trends in catch rates over time by region show declines in portions of the Strait of Georgia and some areas of the West Coast Vancouver Island. The northern regions show increasing catch rates over time.

## 5.2. Strait of Georgia (areas 12-20, 28 and 29)

### 5.2.1. Commercial catch and effort data

Prior to 1986, over half of the coastwide hook and line rockfish landings were taken from the Strait of Georgia (Table 7). Catches increased in the late 1970's to a peak of 525 t in 1986 and dropped dramatically to 177 t in 1992 due to the implementation of limited entry licensing and catch quotas. The Strait of Georgia fishery is largely a handline fishery targetting quillback and copper rockfish (aggregates 1 & 2) for the live market. In recent years, the bulk of this Strait of Georgia catch is taken in areas 12, 13 and 17-19 combined, with little effort occurring elsewhere. A small longline fishery for yelloweye rockfish is centred in area 12.

Commercial catch estimates of yelloweye and aggregates 1 and 2 (quillback and copper rockfish) for 1996 from DMP and fish slips is 40 t and 156 t, respectively (Table 4). All other rockfish is estimated from fish slips and logbooks at 25 t (Tables 4 and 6). An estimated 25% of the yelloweye rockfish taken in the Strait of Georgia region is landed in the halibut fishery. The trawl catch in 1996 is very small at 0.2 t (Table 14).

### 5.2.2. Recreational fishery data

The 1996 recreational catch of rockfish in the Strait of Georgia was 67.3 t between April and September in areas 13 to 19, 28 and 29. Over 50% of this catch is taken in areas 13 (Campbell River) and 16 (Sechelt). Species of rockfish taken in this fishery are not summarised by area, however, the proportion by species is estimated at 32% quillback, 20%

copper, 4% yelloweye, 1% black and 43% other (tiger, yellowtail, china, canary and unidentified species) (Collicutt and Shardlow 1990).

In 1995, where a comparison is possible, the recreational catch is almost equivalent to the commercial catch in the Strait of Georgia. Recreational rockfish catch between March and September over the areas included in the creel survey is 92 t compared with the annual commercial catch of 110 t. In areas 14 - 16, 28 and 29 the estimated recreational catch of rockfish is greater than the commercial catch.

Direct annual comparisons of catch per unit of effort for the recreational fishery can not be made due to changes in months surveyed over time. For the three month period (June to August), catch per unit of effort indices were calculated by statistical area and are shown for 1983 to 1996 in Table 18. There is a trend in areas 13, 16 and 29 of increasing cpue since 1993 which may reflect a change in target species from salmon to rockfish or groundfish. All other areas show some decline in cpue since 1989. Figure 1 shows data from areas 13, 17 and 18.

### 5.2.3. Logbook analyses (Kronlund and Yamanaka 1998)

The predominant rockfish caught in the Strait of Georgia as recorded on logbooks is quillback rockfish. Other common species are yelloweye, copper, black, yellowtail, china and tiger rockfish. Catch rates show declines throughout the Strait of Georgia management region for quillback and copper rockfish. In addition, the proportion of quillback rockfish in the catch is decreasing coincident with an increase in the proportion of copper rockfish in the Gulf Islands. These trends may be indicative of quillback rockfish stock decline in the Strait of Georgia and particularly in the Gulf Island areas.

#### 5.2.3.1. Stock status from the major assessment review

Biological data for yelloweye rockfish in the Strait of Georgia suggest that the stock is at a point where the mean age in the fishery is at 50% maturity. Quillback rockfish biosamples show dramatic changes in the age structure of the stock in area 12 and a low mean age. In addition, research surveys show a decline in CPUE for fully recruited quillback rockfish in this area (Yamanaka and Richards 1993).

Relatively high red snapper catches in the late 1980's have not been repeated, with the exception of catches in the most northerly area 12. The catch and effort of other rockfish has been high since the beginning of the series in 1983. Declining catch trends over the series, despite high effort, are apparent in areas 13, 15, 16, 18 and 19. Because the declines occurred prior to any management action in the Strait of Georgia fishery, they are interpreted as an indicator of stock decline in the region.

### 5.3. West Coast Vancouver Island (areas 11, 21-27, 111, 121-127)

#### 5.3.1. Commercial catch and effort data

Catches fluctuated between 25 t and 100 t in the years from 1956 to 1978 (Table 7). The west coast fishery increased slightly between 1979 and 1985, coincident with the expansion of the fishery in the Strait of Georgia. In 1986, the fishery expanded rapidly with catches reaching over 800 t in 1990. The implementation of limited entry licensing in 1993 did not reduce the rockfish catch on the west coast of Vancouver Island. Landings in the first year of limited entry were the second highest on record at 797 t.

The commercial catch of yelloweye rockfish and aggregates 1 and 2 for the West Coast of Vancouver Island in 1996 are 201 t and 147 t, respectively (Table 4). All other rockfish is estimated from fish slips and logbook records at 340 t. Approximately 42% and 24% of this other rockfish is comprised of aggregate 4 (rougheye and shortraker rockfish) and redbanded rockfish, respectively. An estimated 22% of the yelloweye rockfish landed on the west coast is taken in the halibut fishery. The trawl catch of yelloweye, redbanded and rougheye rockfish is estimated at 20 t, 53 t and 212 t, respectively for the west coast.

#### 5.3.2. Recreational fishery data

The West Coast creel survey shows a general decline in catch rate between 1992-93 and 1996 in areas 23B and 24 (Table 16). The trend in Alberni Inlet area 23A increased between 1995 and 1996, however, rockfish catches are low in this area. Seventy-four percent of the total commercial and recreational catch in area 23 is taken by the recreational fishery. In area 24, only 2% of the total catch is taken by the recreational fishery.

#### 5.3.3. Biological sampling data

In September, two longline vessels were chartered to collect a biological sample of yelloweye and redbanded rockfish in each of two locations off the west coast of Vancouver Island as part of the industry funded research discussed earlier.

The vessels each fished four standardized strings of longline gear per day for four days. Fishing was divided between 'heavily' and 'lightly' fished locations and between yelloweye and redbanded rockfish. Triangle Island '500 line' was chosen as the 'lightly' fished location and 'heavily' fished locations were Top Knot for yelloweye rockfish and Brookes Bay for redbanded rockfish. A total of 585 yelloweye rockfish otoliths and 544 redbanded rockfish otoliths were collected. Ageing of samples is now underway. Pending the results of the charter work completed in September, similar charters may be planned for May of 1998.

#### 5.3.4. Logbook analyses (Yamanaka and Kronlund 1998)

The predominant species caught in the fishery is yelloweye rockfish, closely followed by redbanded and rougheye rockfish in 1996. Fishing patterns have changed over the 1982 to 1996 period. In general, all areas are increasing the catch of rockfish species other than yelloweye. The fishery in statistical areas 11 and 23, in particular, is shifting from yelloweye rockfish to quillback rockfish. In general, catch rates have declined in the yelloweye rockfish fishery in recent years (1995 to 1996) compared with the early years (1986 to 1988). However, this decline may be attributed to changes in the management of the fishery in the later years. There appears to be a decline in yelloweye catch rates in statistical area 27 between 1989 and 1994 which may indicate a stock decline.

#### 5.4. Queen Charlotte Islands (areas 1-2, 101-102, 142, 130)

##### 5.4.1. Commercial catch and effort data

In 1984, the rockfish catch reached 100 t in the Queen Charlotte Islands (Table 7). Catches have increased steadily, more than doubling between 1994 and 1995, to an all time high of 1156 t. This increase in catch is attributed to a change in the management plan in 1995. The move to aggregate quota management shifted monitoring from red snapper and other rockfish quotas to yelloweye rockfish and quillback/copper rockfish quotas. This allowed the catch of other species of rockfish to be taken under trawl trip limits.

Estimates of the commercial catch of yelloweye rockfish and aggregates 1 and 2 landed in 1996 from the Queen Charlotte Islands are 224 t and 48 t, respectively (Table 4). About 40% of the yelloweye rockfish is taken in the halibut fishery. Other rockfish in 1996 total 335 t, of which 37% comprise aggregate 4 (rougheye and shortraker rockfish), 27% comprise redbanded rockfish and 26% comprise aggregate 3 (canary and silvergray rockfish). The trawl catch of yelloweye redbanded and rougheye rockfish is estimated at 4 t, 52 t, and 774 t, respectively (Table 14)

##### 5.4.2. Biological sampling data

In 1997, under the same industry program as the west coast of Vancouver Island, two vessels were chartered to collect yelloweye and redbanded rockfish biological samples off the Queen Charlotte Islands. The two fishing locations were north-east of Anthony Island for "heavily" fished and Tasu for "lightly" fished. These two vessels collected 757 and 528 otoliths from yelloweye and redbanded rockfish, respectively. Ageing of these samples is underway.

## 5.5. North Coast (areas 3-5, 103-105)

### 5.5.1. Commercial catch and effort data

The north coast rockfish landings began to increase in the late 1980's and by 1990 had reached 106 t (Table 7). Catches continue to increase and doubled between 1994 and 1995 to a high of 346 t. Eighty-two percent of this catch is taken on longline gear. The increase in catch between 1994 and 1995 is due to a 100 t increase in other rockfish longline catch (Table 13) and is again attributed to the change in management..

Estimates of the commercial catch of yelloweye rockfish and aggregates 1 and 2 are 114 t and 67 t, respectively (Table 4). Other rockfish species in the catch total 14 t. Seventy-five percent of the yelloweye rockfish landed from the north coast is taken in the halibut fishery. The trawl catch of inshore rockfish is low in the North Coast (Table 14).

## 5.6. Central Coast (areas 6-10, 106-110)

### 5.6.1. Commercial catch and effort data

The central coast rockfish fishery began from an northern expansion of the Strait of Georgia fishery. During the mid 1980's catches increased and peaked at 333 t in 1991 (Table 7). Since 1991 catches have declined and in 1995 were 209 t. The decline in catch is due largely to a decrease in the red snapper catch by longline gear (Table 12). The other rockfish longline catch increased between 1994 and 1995 from 119 t to 144 t (Table 13). This is again attributed to a change in management regimes.

The commercial catch of yelloweye rockfish and aggregates 1 and 2 are 108 t and 98 t, respectively (Table 4). Twenty percent of the yelloweye rockfish landed from the central coast is taken in the halibut fishery. Other rockfish species total 36 t. The trawl catch of yelloweye, redbanded and rougheye rockfish is 7 t, 207 t, and 61 t, respectively (Table 14).

## 6. **ADVICE TO MANAGERS**

The practice of recommending yields by statistical area and setting catch quotas by management region does not address the problem of local area depletion of stocks. The fishing down of local stocks is the likely mode of operation for the fishery given the longevity, sedentary nature and low productivity of these rockfish. The smallest management (and assessment) unit possible, at present, is the statistical area and therefore yields were recommended on that basis. These yields, even with perfect knowledge of the stock size, cannot be fished without the possibility of overharvest of stocks on one reef and underharvest of stocks

on another reef within the statistical area. Inherent in any decision to manage fishery quotas over large regions is the acceptance that depletion of some rockfish stocks may occur. Decisions to mitigate the effects of local rockfish stock depletion may be addressed by closing areas to all fishing (protect all stocks) or by allowing continued fishing with extremely low pre-emptive quotas (protect some portion of the stocks).

No new analyses or yield recommendations are included for this interim assessment. Yield recommendations in this assessment update remain unchanged from those of the major review in 1996 (Yamanaka and Kronlund 1997). These yield recommendations are very low. We have no method of determining whether these yields are 'sustainable' for the fishery.

Recommended yields (Yamanaka and Kronlund 1997) were based on habitat analyses, catch history and for some areas with little data, no yields were recommended. Habitat analyses were based on estimates of rockfish production from past catches scaled to estimates of corresponding habitat area. Quillback and yelloweye rockfish habitat within each statistical area was estimated by depth interval. The bottom area within the appropriate depths is totalled for a habitat estimate in square kilometres. Historic rockfish catch is divided by the habitat area to estimate historic production of rockfish in tonnes per square kilometre. These historic production estimates by statistical area were examined for the Strait of Georgia quillback rockfish (other rockfish). A level of production that did not result in production declines in subsequent years was chosen as an estimate of a "sustainable" level. The recommended yields were derived by multiplying this "sustainable" production level by the habitat estimates for all statistical areas in the Strait of Georgia. Catch caps were based on the 25th percentile of the catch history in each statistical area where the effort exceeded 100 days annually. No yields were recommended for statistical areas with less than 100 days of fishing effort annually.

## 7. RECOMMENDATIONS FOR 1998

For the 1998 rockfish fishery, managers are advised to take a precautionary approach to management in light of the logbook analyses (Kronlund and Yamanaka 1998, Yamanaka and Kronlund 1998) and assessment and management constraints described by Kronlund (1998). Based on these PSARC working papers and recommended yields for 1987 (Yamanaka and Kronlund 1997), a review of management practices coastwide and a reduction in quotas are recommended for the Strait of Georgia quillback rockfish and the West Coast of Vancouver Island yelloweye rockfish fishery. Yelloweye rockfish and aggregate 1 and 2 quotas should be reviewed on a regional basis remembering the following:

1. Inshore rockfish are long lived (eg. 45 yr for copper rockfish to 100 yr for yelloweye rockfish). There is approximately a fifty year history of exploitation of inshore rockfish from both the commercial and recreational sectors. Therefore, rockfish that existed at the start of this exploitation history are potentially still in the population today. The generation time for this population is lengthy, likely on the order of 25 years (Leaman 1991).

2. Inshore rockfish are sedentary and susceptible to spatial depletion. Declines in the rockfish catch rate over a large area may not be detected until the area is substantially over exploited. Movements of the fishing fleet from fishing grounds near to the major ports to more distant grounds is viewed as evidence of spatial depletion. This pattern of exploitation occurred prior to any management actions in the B.C. fishery.
3. Yields recommended were overrun in almost all of the years quotas were set (Tables 2, 3 and 4). This problem has a compounding effect for rockfish.
4. Removals from all sectors are affecting the same stocks of rockfish. Recreational, aboriginal and commercial catch of rockfish should be collated in a coordinated way coastwide.
5. Historically, some areas have low fishing effort. It is unclear whether this is due to naturally low productivity, or whether the fishery has not yet developed. This distinction is important when the assessing fishery performance and considering quota setting.

## SPECIFIC REGIONAL CONCERNS

### Strait of Georgia

1. Movement of the fishing fleet from the Gulf Islands to areas further north has taken place over the history of the fishery. Rockfish removals from all sectors have exceeded quotas since quotas were initiated in 1991.
2. The fishery is concentrated in statistical areas 12 and 13. Almost 75% of the Strait of Georgia quota is taken from these two areas. This is of concern, as the recommended yields were based on a habitat approach which assumes that the fishery is spread over the entire region. Quotas should be prorated according to the areas fished.
3. Fishery independent surveys in statistical area 12 show declines in survey CPUE of fully recruited quillback rockfish (>11 yr) and overall declines in mean age of quillback rockfish. Declines in mean age are also apparent in commercial fishery samples.
4. Logbook analyses of quillback rockfish CPUE show declines in the Gulf Islands, Campbell River and Johnstone Strait areas between 1986 and 1996. In the Gulf Islands area there is also an inverse relationship between the proportions of quillback and copper rockfish in the catch. Proportions of quillback rockfish in the catch are declining while copper rockfish are increasing. This may be evidence for a reduction in the quillback rockfish stocks.

### West Coast Vancouver Island

1. Movement of the fishing fleet from the lower West Coast of Vancouver Island to areas further north has taken place over the history of the fishery.



2. The fishery is concentrated in statistical areas 27 and 11. Quotas should be prorated to reflect the areas of catch.
3. Logbook analyses of yelloweye rockfish taken on longline gear show declines in CPUE for area 27.

#### Queen Charlotte Islands

1. Declines in mean age of yelloweye rockfish samples from areas 2 and 42.

#### Central Coast and North Coast

1. There is little information to assess stocks.

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Table 1. History of management actions by year and area.

Year	Area	Management Action
<1986	coast-wide	unrestricted fishery
1986	coast-wide	introduced Zn licence with a logbook requirement
	SG	Feb 15 - Apr 15 closure
1987	SG	Jan 1 - Apr 15 closure
	SG - area 12	75 t quota
1987-1990	SG	incidental yelloweye rockfish catch permitted during the winter closure
1988	SG - area 13 - Discovery Pass	year round commercial closure
	SG	Jan 1 - Apr 30 closure
1990	SG	Jan 1 - Apr 30 and Nov 1 - Dec 31 closure
	outside	650 t quota
	CC - area 7	portions closed
1990-1991	WCVI inside the surfline	Jan 1 - Apr 30 closed
1991	inside/outside	area licensing, 592 inside (SG) and 1,591 outside (all remaining regions)
	SG	trawl closure
	SG	live rockfish fishery only
	SG	Jan 1 - May 14 closure with no incidental rockfish catch allowances
	SG - area 13	2-3 day opening in Discovery Pass
	CC - area 7	rotational closure was initiated
	coast-wide	limited entry licensing program was announced
1992	SG	limited entry licensing with 74 eligible inside licences
1993	outside	limited entry licensing with 183 eligible outside licences
	coast-wide	quota management (red snapper and other rockfish) by region
	coast-wide	region/time closures
1994	coast-wide	user pay logbook program
	coast-wide	trip limits for trawl species
	coast-wide	incidental catch allowances
1995	coast-wide	user pay dockside monitoring program
	coast-wide	aggregate species quota management (yelloweye rockfish and agg. 1&2)
	coast-wide	monthly fishing periods, fishing period limits, annual landing options and trip limits
	coast-wide	relinquishment of period limit overages
1996	coast-wide	change species aggregates
1997	coast-wide	initiate 5% quota allocation for research purposes

Table 2. Red snapper and other rockfish fishery open time (days), quota (t), catch (t) and catch per day (t/day) for the five management regions between 1991-94.

Region	Year	RED SNAPPER				OTHER ROCKFISH			
		Open	Quota	Catch	C/Day	Open	Quota	Catch	C/Day
SG	1991	203	50	115	0.57	203	300	366	1.80
	1992	183	59	30	0.16	144	130	148	1.03
	1993	365	70	42	0.12	145	140	157	1.08
	1994	205	70	86	0.42	145	150	188	1.29
WCVI	1991	328	250	476	1.45	328	150	302	0.92
	1992	208	250	321	1.54	208	150	251	1.21
	1993	177	250	455	2.57	113	150	342	3.03
	1994	48	200	218	4.54	163	150	448	2.75
QCI	1991	238	200	332	1.39	238	100	142	0.60
	1992	183	200	386	2.11	365	100	176	0.48
	1993	140	200	374	2.67	365	100	199	0.55
	1994	107	200	290	2.71	365	54	369	1.01
NC	1991	365	80	57	0.16	201	20	73	0.36
	1992	365	80	87	0.24	156	20	38	0.24
	1993	275	80	98	0.36	275	60	65	0.24
	1994	205	60	47	0.23	145	60	62	0.43
CC	1991	171	100	177	1.04	171	100	156	0.91
	1992	137	100	132	0.96	128	100	130	1.02
	1993	94	100	114	1.21	106	100	110	1.03
	1994	51	100	105	2.06	119	100	127	1.07

Table 3. Overall commercial fishery quota and catches from the fish slip data base (all commercial fisheries)(slip) and the dockside monitoring data base (Zn fishery)(DMP) in tonnes for yelloweye rockfish and the aggregates 1 and 2 and 3 to 6. by region for 1995.

Sp or Agg	SG			WCVI			QCI			NC			CC			Coast-wide		
	quota	slip	DMP	quota	slip	DMP	quota	slip	DMP	quota	slip	DMP	quota	slip	DMP	quota	slip	DMP
YE	62	45	38	231	175	206	291	105	194	60	288	43	118	80	99	-	693	580
A1&2	150	159	138	144	129	155	76	26	58	63	125	67	105	82	111	-	521	529
A3	-	5	-	-	95	-	-	36	-	-	110	-	-	7	-	8925 <sup>a</sup>	253	261
A4	-	0	-	-	96	-	-	56	-	-	635	-	-	3	-	735 <sup>a</sup>	790	795
A5	-	1	-	-	3	-	-	3	-	-	7	-	-	1	-	8522 <sup>a</sup>	15	28
A6	-	6	-	-	117	-	-	50	-	-	128	-	-	13	-	none	314	415
																total=	2586	2608

YE yelloweye rockfish

A1,A2 quillback, copper, china and tiger rockfish

A3 silvergray, yellowtail, canary and widow rockfish

A4 roughey and shortraker rockfish also contains thornyhead which are not included in this table

A5 Pacific ocean perch, yellowmouth and redstripe rockfish

A6 all other rockfish species

<sup>a</sup>coast-wide quota available to trawl and hook and line gears.

Table 4. Overall commercial fishery quota and catches from the fish slip data base (non-Zn fisheries)(slip) and the dockside monitoring data base (Zn, dogfish and lingcod fisheries)(DMP) in tonnes for yelloweye rockfish and the aggregates 1 and 2 and 3 to 7. by region for 1996. For overall total inshore rockfish commercial catch in 1996, combine the slip and DMP catch.

Sp or Agg	SG			WCVI			QCI			NC			CC			Coast-wide		
	quota	slip	DMP	quota	slip	DMP	quota	slip	DMP	quota	slip	DMP	quota	slip	DMP	quota	slip	DMP
YE	31	8	32	187	36	165	242	88	136	48	85	29	139	22	86	-	239	448
A1&2	150	1	155	160	4	143	70	6	42	65	9	58	120	1	97	-	21	493
A3	-	0	-	-	1	-	-	2	-	-	2	-	-	2	-	1813 <sup>a</sup>	7	158
A4	-	0	-	-	3	-	-	14	-	-	6	-	-	1	-	1794 <sup>a</sup>	23	266
A5	-	0	-	-	0	-	-	1	-	-	0	-	-	1	-	6585 <sup>a</sup>	2	14
A6	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	6725 <sup>a</sup>	0	32
A7	-	1	-	-	4	-	-	10	-	-	9	-	-	2	-	monthly	25	224
																total=	317	1634

YE yelloweye rockfish

A1,A2 quillback, copper, china and tiger rockfish

A3 canary and silvergray rockfish

A4 roughey and shortraker rockfish also contains thornyhead which are not included in this table

A5 Pacific ocean perch, yellowmouth and redstripe rockfish

A6 yellowtail, widow and black rockfish

A7 all other rockfish species

<sup>a</sup>coast-wide quota available to trawl and hook and line gears.

Table 5. 1995 Rockfish catch (t) by species, gear type and management region from logbook records and total coastwide catch from logbook records and the dockside monitoring program.

1995 Species	Longline					Handline					Troll					LOGS <sup>1</sup>	DMP <sup>2</sup>
	SG	WC	QCI	NC	CC	SG	WC	QCI	NC	CC	SG	WC	QCI	NC	CC	Coast- wide	A,B,C, I
rougeye		78.1	511.5		5.1		0.1	1.5								596.4	618.6
PO perch		0.3	0.9		11.1		0.5	0.6								1.4	1.3
redbanded	0.1	123.0	142.8	0.2	11.1		0.5	0.6							278.3	341.4	
shortraker		30.6	86.9		2.3										119.9	176.6	
silvergray	0.1	49.7	93.2	2.7	2.3	0.2	0.3	5.6	0.3	0.1		0.1			154.4	188.4	
copper	0.8	11.6	6.8	6.8	7.6	26.6	6.8	2.4	2.6		1.1	0.5			73.7	62.2	
dusky															0.1	0.1	
darkblotched		0.2													0.2	0.2	
splitnose																0.2	
greenstriped		0.6	0.8			0.5									1.9	1.6	
widow		0.2	0.7		0.1	0.3									1.3	0.5	
yellowtail		0.4	0.3	0.1	0.2	3.7	0.4	0.1	0.4						5.8	8.2	
rosethorn		1.4	1.0		0.1		1.0								3.6	6.4	
quillback	5.6	73.3	42.5	48.7	74.2	137.1	5.0	10.7	10.5	0.8	3.5	0.8		0.1	413.1	383.9	
black	0.5	3.5	1.8	0.3	1.7	3.0	1.8	0.7	0.4			0.1			13.7	14.7	
vermillion		5.8	1.0		5.0	0.1	0.4	0.1		0.1		0.4			13.0	19.2	
blue		0.2				0.2	0.2								0.6	0.7	
china	0.5	26.4	7.1	4.9	9.0	1.2	1.0	1.3	0.7	0.1		0.3			52.5	65.8	
tiger	0.2	5.6	1.6	2.9	2.6	0.6	0.2	0.2	0.2			0.1			14.2	17.0	
bocaccio	0.1	3.0	19.8	0.6	0.4	0.1		3.2	0.1	0.2					27.5	30.4	
canary	0.3	21.7	15.5	1.8	5.6	0.5	0.4	1.5	0.2	0.1	0.1	0.2			47.8	64.3	
redstripe		2.3	0.7		0.1	0.5									3.6	1.9	
yellowmouth		8.2	11.0		1.1										20.3	25.2	
yelloweye	22.9	163.7	174.7	29.7	82.7	11.1	12.8	34.9	10.1	6.7	0.7	2.5	0.2	0.4	553.0	580.6	
															total =	2396.2	2609.4

<sup>1</sup> Zn logbook data

<sup>2</sup> dockside monitoring program includes Zn fishing options A, B, C, and I.



Table 6. 1996 Rockfish catch (t) by species, gear type and management region from logbook records and total coastwide catch from logbook records and the dockside monitoring program.

1996 Species	Longline					Handline					Troll					LOGS <sup>1</sup> Coastwide	DMP <sup>2</sup> A,B,C, I,D,L
	SG	WC	QCI	NC	CC	SG	WC	QCI	NC	CC	SG	WC	QCI	NC	CC		
rougeye		79.4	84.4	0.3	0.1			0.1								164.3	174.0
PO perch		0.4	0.8													1.2	1.2
redbanded	0.1	82.7	85.7	0.1	0.1			0.2								169.0	178.6
shortraker		60.6	24.7					0.2								85.4	93.1
silvergray	0.3	16.0	70.7	1.2	1.6	0.2	0.2	0.8	0.3							91.3	99.1
copper	1.6	27.6	4.3	4.5	10.0	20.1	14.5	3.0	1.5	2.1	1.9	0.2				91.3	78.4
dusky																0.1	0.2
darkblotched		0.2	0.9													1.1	0.1
splitnose																	0.3
greenstriped		0.1	0.1		0.1	0.1										0.4	0.9
widow		0.2	0.3	0.3	0.4	0.7	0.9	0.1		0.1						2.9	0.4
yellowtail	0.1	0.8	0.2	0.2	0.2	3.6	0.5		0.5	0.3	0.1					6.6	9.7
rosethorn		1.2	0.6		0.2											2.1	5.4
quillback	10.1	57.0	29.4	28.6	57.0	112.6	9.2	3.5	9.8	3.5	2.3	0.1				323.0	334.5
black	0.1	1.5	0.4	0.2	1.2	7.0	3.9	0.6	0.7	0.3						16.0	21.6
vermillion		7.1	0.7		1.9		0.8									10.5	14.5
blue					0.1		0.1									0.3	0.2
china	0.9	21.4	3.6	5.6	13.8	2.7	3.2	0.3	1.0	0.3						52.9	65.3
tiger	1.0	3.3	0.7	2.2	4.4	1.0			0.2							12.8	15.0
bocaccio	4.7	11.3		1.1	0.1	1.0	1.7	0.1	0.2							20.3	23.2
canary		27.4	14.2	0.8	3.6	0.1	0.9	0.3	0.2	0.1						47.7	58.5
redstripe		0.3	0.1			0.1			0.1							0.5	0.5
yellowmouth		5.4	4.4													9.7	12.3
yelloweye	18.2	158.5	125.8	17.4	77.9	13.0	4.6	10.4	8.3	7.1	0.6	0.7		1.7		444.1	447.5

<sup>1</sup> Zn logbook data

<sup>2</sup> dockside monitoring program includes Zn fishing options A, B, C, and I, Dogfish and Lingcod landings.

Table 7. Total coast-wide commercial hook and line rockfish catch (t) by region and for all regions combined, from British Columbia Catch Statistics, Annual Reports, 1956-82 and fish slip records 1982-1995.

Year	SG	WCVI	QCI	NC	CC	Total
1956	58.0	26.3	1.7	0.1	5.6	91.7
1957	86.9	45.0	9.1	0.3	5.5	146.8
1958	109.2	36.9	0.6	0.1	8.0	154.8
1959	105.0	41.7	0.8	0.0	3.6	151.1
1960	83.9	49.3	8.5	2.0	7.5	151.2
1961	69.2	59.2	3.7	0.7	11.3	144.1
1962	110.4	79.2	14.0	0.0	11.9	215.5
1963	84.2	53.9	13.3	2.8	24.2	178.4
1964	50.1	33.3	2.9	0.2	4.6	91.1
1965	43.3	27.3	10.1	1.1	4.4	86.2
1966	37.0	31.8	6.4	0.5	8.4	84.1
1967	55.6	43.4	9.4	7.3	11.3	127.0
1968	56.6	35.3	2.8	0.0	18.7	113.4
1969	82.2	45.8	10.5	0.5	46.6	185.6
1970	87.2	58.3	12.8	11.4	65.7	235.4
1971	74.5	25.6	27.2	10.2	31.4	168.9
1972	94.4	88.9	19.0	17.1	30.2	249.6
1973	100.8	48.1	14.3	15.1	20.2	198.5
1974	37.5	73.7	38.6	22.3	25.2	197.3
1975	40.3	57.3	74.7	18.9	30.4	221.6
1976	48.1	58.2	23.0	13.3	39.0	181.6
1977	138.0	100.0	35.6	14.2	25.4	313.2
1978	156.0	73.5	61.0	34.0	33.5	358.0
1979	250.0	148.0	87.0	15.5	40.0	540.5
1980	180.0	130.0	90.0	19.0	24.0	443.0
1981	211.6	102.9	71.2	13.2	14.0	412.9
1982	281.2	87.4	49.0	7.5	17.4	442.5
1983	298.7	103.2	41.6	12.4	20.2	476.1
1984	347.3	140.8	100.6	23.3	27.2	639.2
1985	436.8	198.7	155.1	40.2	57.8	888.4
1986	525.4	584.1	198.8	38.1	145.8	1491.7
1987	422.7	657.2	313.7	80.2	130.9	1604.7
1988	496.5	553.9	304.8	63.5	179.4	1598.1
1989	460.2	642.7	290.6	94.2	188.9	1676.6
1990	469.9	816.9	453.6	106.7	368.8	2215.9
1991	480.6	777.6	474.0	129.9	333.0	2195.1
1992	177.7	571.4	562.1	124.1	262.2	1697.5
1993	198.9	797.0	573.0	163.3	224.0	1956.2
1994	274.4	666.5	659.7	109.3	232.5	1942.4
1995	197.5	757.8	929.3	558.5	197.3	2640.4

Table 8. Total rockfish longline catch (t) for the Strait of Georgia by statistical area and for all areas combined catch, from British Columbia Catch Statistics, Annual Reports, 1954-1995.

Year	Statistical Area											Total
	12	13	14	15	16	17	18	19	20	28	29	
1954	9.3	0.0	0.0	0.0	1.2	0.0	0.0	0.7	0.0	0.0	0.0	11.2
1955	12.3	0.0	0.0	0.8	4.2	0.0	0.0	0.0	0.0	0.0	0.0	17.3
1956	18.2	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0	0.0	0.0	20.1
1957	15.1	0.0	0.0	0.1	1.4	0.3	0.0	0.0	0.0	0.0	0.0	16.9
1958	8.1	0.0	0.0	0.6	0.8	0.0	0.0	0.0	0.0	0.0	0.0	9.5
1959	3.7	0.0	0.8	1.9	0.5	7.6	0.1	0.0	0.0	0.0	0.0	14.6
1960	3.2	0.3	0.2	1.4	1.3	3.3	0.1	0.1	0.0	0.0	0.0	9.9
1961	10.4	0.4	0.1	0.3	0.2	3.5	0.6	0.1	0.1	0.1	0.0	15.8
1962	8.7	0.9	0.0	0.0	0.2	0.8	0.0	0.0	0.0	0.0	0.0	10.6
1963	16.7	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.1	17.5
1964	9.3	0.1	0.0	0.0	7.0	0.0	0.0	0.0	0.2	0.1	0.0	16.7
1965	11.6	0.0	0.0	0.0	5.1	0.2	0.0	0.0	0.0	0.0	0.0	16.9
1966	4.5	0.1	0.0	0.0	4.3	0.6	0.0	0.0	0.0	0.0	0.0	9.5
1967	10.8	0.0	0.0	0.0	4.3	0.1	0.0	0.0	0.1	0.0	0.0	15.3
1968	11.9	0.0	0.0	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.0	13.6
1969	11.5	0.1	0.1	0.1	2.0	0.0	0.0	0.0	0.0	0.0	0.0	13.8
1970	22.8	1.7	0.1	0.2	0.1	0.6	0.2	0.0	0.8	0.0	0.0	26.5
1971	25.3	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.1	0.0	0.0	25.7
1972	34.5	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34.6
1973	40.8	4.8	0.0	4.1	14.2	2.0	0.0	0.0	0.0	0.0	0.0	65.9
1974	2.7	0.0	0.0	0.0	0.7	1.3	0.7	0.0	0.0	0.0	0.0	5.4
1975	4.1	0.6	0.0	2.7	0.6	2.3	0.0	0.0	0.0	0.0	0.0	10.3
1976	7.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.3
1977	30.4	0.0	0.5	8.6	2.7	2.3	0.0	0.0	0.0	2.1	1.0	47.6
1978	7.0	0.0	1.0	6.0	13.0	15.0	2.0	1.0	1.0	1.0	2.0	49.0
1979	23.0	6.0	4.0	7.0	18.0	22.0	8.0	1.0	0.0	1.0	4.0	94.0
1980	9.0	2.0	4.0	4.0	11.0	7.0	18.0	1.0	1.0	2.0	1.0	60.0
1981	8.7	2.6	6.0	2.2	2.7	8.8	17.1	0.1	0.0	0.4	0.4	49.0
1982	6.6	2.4	3.4	1.3	2.2	2.1	9.4	0.1	0.1	0.2	0.6	28.4
1983	3.2	1.9	0.2	3.0	1.5	6.9	11.5	0.2	0.1	0.1	0.0	28.6
1984	9.1	1.9	1.3	0.3	0.2	20.1	7.6	0.2	0.0	0.1	0.6	41.4
1985	11.6	5.9	3.1	5.6	14.3	39.2	11.5	1.3	0.3	0.0	0.0	92.8
1986	31.3	7.9	14.7	12.4	49.4	37.8	6.4	1.5	4.5	0.2	0.0	166.1
1987	27.3	3.2	5.5	13.0	12.9	12.1	9.7	4.6	1.8	12.3	9.4	111.8
1988	26.3	9.9	11.6	18.4	26.7	30.6	4.2	0.4	4.5	0.0	7.1	139.7
1989	44.9	6.3	15.2	7.2	3.1	8.0	1.2	0.5	2.1	0.0	0.1	88.6
1990	49.1	16.8	9.9	10.8	3.9	4.8	0.7	0.1	2.4	1.5	2.5	102.5
1991	12.6	17.7	1.2	3.6	1.0	7.9	0.1	0.0	0.1	0.2	0.1	44.5
1992	4.2	2.3	2.7	0.6	2.1	5.8	0.7	0.0	0.0	0.0	0.0	18.4
1993	25.1	1.0	0.8	0.0	0.5	9.0	0.0	0.1	0.9	0.0	0.8	38.2
1994	88.2	5.4	9.5	0.4	0.4	4.9	0.1	0.1	0.5	0.1	1.5	111.1
1995	25.5	4.3	0.9	0.2	0.4	7.9	0.6	0.0	1.6	0.0	2.4	43.8

Table 9. Total rockfish handline/troll catch (t) for the Strait of Georgia by statistical area and for all areas combined, from British Columbia Catch Statistics, Annual Reports, 1954-95.

Year	Statistical Areas											Total
	12	13	14	15	16	17	18	19	20	28	29	
1954	0.0	6.8	0.8	0.5	5.8	15.1	6.7	0.0	0.0	0.4	0.0	36.1
1955	0.0	3.5	0.5	1.0	2.8	16.1	4.2	0.1	0.1	0.0	0.0	28.3
1956	6.5	1.9	0.1	1.0	5.0	17.6	5.4	0.1	0.1	0.0	0.2	37.9
1957	5.6	6.1	2.4	2.5	13.4	25.5	6.9	6.4	0.0	0.1	1.1	70.0
1958	2.6	10.7	9.7	5.5	14.9	29.2	15.8	6.2	3.2	0.0	1.9	99.7
1959	5.6	16.2	8.7	9.3	10.4	31.2	3.9	3.9	0.5	0.1	0.6	90.4
1960	3.5	19.9	4.2	10.8	10.3	17.5	3.4	3.1	0.9	0.3	0.1	74.0
1961	3.4	16.6	6.3	2.5	4.6	13.8	2.8	1.3	0.6	0.1	1.4	53.4
1962	46.9	14.5	4.6	5.8	2.9	19.0	2.4	2.5	0.5	0.2	0.5	99.8
1963	27.9	7.7	3.6	1.6	5.6	16.3	2.8	0.9	0.2	0.0	0.1	66.7
1964	4.9	4.4	2.1	0.8	8.1	8.8	2.8	1.1	0.3	0.0	0.1	33.4
1965	2.4	3.5	2.1	0.1	5.3	9.0	3.2	0.4	0.1	0.0	0.3	26.4
1966	1.1	3.6	3.7	0.5	10.1	4.1	4.1	0.2	0.1	0.0	0.0	27.5
1967	2.7	7.6	5.8	3.4	13.8	6.1	0.8	0.1	0.0	0.0	0.0	40.3
1968	3.7	8.2	0.4	1.0	17.9	10.3	1.3	0.1	0.1	0.0	0.0	43.0
1969	17.5	11.9	3.8	3.5	15.2	8.8	4.1	2.7	0.9	0.0	0.0	68.4
1970	8.5	15.8	3.9	4.8	9.8	15.7	1.4	0.6	0.2	0.0	0.0	60.7
1971	11.7	9.4	2.7	5.1	6.6	12.1	1.0	0.2	0.0	0.0	0.0	48.8
1972	10.9	13.8	4.3	4.6	11.7	12.2	1.2	0.8	0.1	0.0	0.2	59.8
1973	3.6	8.2	2.7	4.5	5.4	9.1	1.4	0.0	0.0	0.0	0.0	34.9
1974	7.0	7.3	3.2	3.2	2.3	6.8	2.3	0.0	0.0	0.0	0.0	32.1
1975	3.2	5.4	2.3	4.5	1.4	7.7	4.5	0.5	0.0	0.0	0.5	30.0
1976	3.6	10.4	5.0	7.7	2.7	7.3	2.7	0.0	0.9	0.0	0.5	40.8
1977	25.4	17.7	8.6	7.3	2.7	8.6	15.0	2.7	0.5	1.4	0.5	90.4
1978	14.0	30.0	6.0	9.0	4.0	11.0	27.0	4.0	0.0	0.0	2.0	107.0
1979	17.0	57.0	8.0	9.0	4.0	15.0	38.0	4.0	1.0	2.0	1.0	156.0
1980	18.0	41.0	6.0	8.0	9.0	13.0	17.0	4.0	1.0	1.0	2.0	120.0
1981	12.1	53.1	6.8	25.7	25.6	11.4	21.2	3.2	0.8	0.7	2.0	162.6
1982	14.7	104.3	5.6	74.3	31.5	8.5	8.8	2.2	0.1	0.3	2.4	252.7
1983	8.4	197.9	9.2	8.3	28.9	8.2	4.6	1.6	0.2	1.9	0.9	270.1
1984	23.7	196.2	2.2	13.0	24.5	19.7	16.1	7.8	2.1	0.3	0.3	305.9
1985	94.7	147.2	1.9	12.1	8.6	45.7	23.2	7.8	1.1	0.1	1.6	344.0
1986	105.0	134.7	3.7	12.5	9.3	25.3	39.4	22.1	4.8	0.0	2.5	359.3
1987	85.9	116.7	4.5	5.8	4.9	20.8	20.7	30.4	10.8	0.1	1.3	301.9
1988	159.3	80.4	2.0	7.2	4.7	30.4	25.3	27.6	15.6	0.0	4.5	357.0
1989	185.2	61.8	5.2	5.6	9.4	49.0	17.8	34.0	2.9	0.1	0.6	371.6
1990	205.6	64.8	8.4	1.5	8.4	47.0	14.5	15.6	0.4	0.0	0.9	367.1
1991	165.9	174.9	3.8	4.9	5.6	38.0	25.9	15.6	0.4	0.0	1.5	436.5
1992	56.0	53.8	2.7	0.4	1.0	16.9	21.1	4.9	1.6	0.0	0.0	158.4
1993	55.2	51.2	4.1	0.5	0.3	12.6	20.0	16.0	0.8	0.0	0.0	160.7
1994	47.9	65.1	1.5	0.0	0.3	21.6	11.3	12.7	4.4	0.0	0.2	165.0
1995	56.7	60.0	2.9	0.0	0.0	15.4	6.2	7.8	3.7	0.0	1.3	154.0

Table 10. Total rockfish longline catch (t) by statistical area for areas outside the Strait of Georgia, from British Columbia Catch Statistics, Annual Reports, 1956-95.

Year	1	2	3	4	5	6	7	8	9	10	11	21	23	24	25	26	27	30	42
1956	0.2	1.5	0.0	0.1	0.0	0.6	3.1	0.2	0.3	1.0	0.7	0.1	0.6	1.5	0.0	2.2	18.8		
1957	1.2	7.9	0.3	0.0	0.0	0.2	3.9	1.4	0.0	0.0	0.0	0.0	2.9	6.8	3.1	3.9	23.4		
1958	0.1	0.5	0.1	0.0	0.0	0.3	0.6	1.5	0.0	0.0	0.0	0.8	1.0	0.0	6.0	6.8	17.7		
1959	0.1	0.7	0.0	0.0	0.0	0.1	1.0	1.6	0.2	0.7	0.0	0.0	0.3	2.1	3.0	5.0	25.2		
1960	1.6	6.9	0.3	1.5	0.1	0.8	0.0	1.5	2.0	0.1	3.0	0.0	0.6	1.2	5.9	5.2	25.7		
1961	0.8	2.9	0.0	0.0	0.7	1.0	0.3	0.0	0.0	0.6	1.0	0.1	2.2	1.3	5.9	24.4	16.9		
1962	0.0	13.8	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0	1.8	0.4	3.2	2.5	5.6	23.5	21.0		
1963	0.0	13.2	0.0	1.9	0.4	2.2	3.9	1.2	0.0	0.1	0.1	0.0	2.8	1.4	0.9	13.6	11.2		
1964	0.0	2.5	0.0	0.2	0.0	0.2	0.0	0.3	0.0	0.8	0.7	1.5	1.1	1.0	0.8	8.6	14.9		
1965	0.0	10.1	0.1	0.7	0.2	1.4	0.1	0.0	1.0	0.0	0.1	0.6	1.2	0.0	1.6	8.9	9.5		
1966	2.7	3.7	0.0	0.2	0.0	1.1	3.4	0.3	0.4	0.8	0.0	0.1	1.4	0.0	1.7	14.3	8.4		
1967	0.9	8.4	0.0	0.8	6.4	0.0	1.1	0.8	0.0	0.0	0.0	0.6	1.0	1.5	4.6	18.9	9.1		
1968	1.5	1.3	0.0	0.0	0.0	0.0	1.2	2.0	0.0	0.0	0.0	0.1	2.7	0.0	1.4	6.7	17.1		
1969	0.0	10.5	0.0	0.5	0.0	2.9	15.9	1.0	0.2	3.4	1.8	1.3	1.2	0.5	2.7	19.9	0.8		
1970	0.0	12.7	0.0	0.2	3.8	24.4	9.3	6.8	0.0	0.4	1.2	0.5	4.2	3.6	0.9	8.2	8.4		
1971	2.0	25.1	0.0	1.1	5.6	4.3	2.7	9.0	3.1	2.0	1.8	0.0	1.2	0.8	0.0	1.9	2.1		
1972	0.0	19.0	0.0	2.6	4.9	0.3	7.5	6.4	0.5	0.0	6.0	0.3	1.1	0.0	0.5	8.6	7.2		
1973	0.0	11.5	2.7	2.7	8.8	8.2	0.2	6.1	0.0	3.4	6.1	0.7	0.7	0.7	0.7	3.4	7.5		
1974	0.7	36.3	0.7	8.8	11.6	15.0	0.2	4.1	0.0	1.6	3.4	0.0	0.7	0.7	0.0	1.4	4.1		
1975	3.4	69.4	0.7	8.2	7.5	6.1	8.2	2.0	2.0	4.1	2.7	1.4	1.4	0.0	0.7	0.0	8.8		
1976	4.1	17.3	0.9	1.8	9.1	5.4	19.5	4.5	0.0	1.4	2.7	2.7	1.8	0.2	0.2	0.2	12.2		
1977	2.3	29.5	0.5	3.6	7.3	4.5	8.2	5.0	0.2	0.2	23.1	0.2	0.5	0.9	0.5	0.9	15.0		
1978	3.0	51.0	8.0	14.0	5.0	4.0	11.0	8.0	1.0	0.5	9.0	0.0	1.0	2.0	0.5	1.0	13.0		
1979	15.0	66.0	2.0	3.0	8.0	6.0	7.0	5.0	1.0	3.0	27.0	1.0	1.0	3.0	3.0	5.0	30.0		
1980	22.0	61.0	1.0	3.0	4.0	5.0	4.0	3.0	1.0	0.5	20.0	0.5	6.0	0.5	4.0	7.0	22.0		
1981	17.1	46.4	2.5	3.7	4.7	1.5	1.5	6.2	0.0	0.6	18.1	0.8	1.0	0.5	2.7	4.3	11.1		
1982	8.2	11.5	2.1	3.7	1.7	5.2	2.6	1.1	0.9	0.3	11.3	0.4	1.1	2.9	0.0	2.0	10.5	0.0	6.0
1983	10.1	22.3	0.6	6.2	1.0	4.2	1.4	1.0	0.0	0.0	9.2	0.5	2.5	0.1	1.4	0.5	23.5	2.2	4.0
1984	8.3	21.7	2.6	12.0	1.0	1.7	2.3	0.6	0.5	2.9	13.8	0.8	6.5	1.3	0.0	0.9	63.3	0.0	60.0
1985	29.5	96.6	6.5	15.2	4.9	9.3	4.9	7.6	0.0	1.6	32.8	3.9	0.0	4.5	5.5	8.7	16.9	18.5	23.5
1986	24.9	78.0	3.7	9.4	14.5	18.2	5.1	19.7	0.1	0.3	55.9	2.0	36.3	56.9	75.6	76.8	116.3	79.0	82.0
1987	55.1	195.7	5.8	12.9	39.9	31.7	19.3	21.6	1.5	17.4	90.8	22.2	30.3	37.8	40.4	37.7	104.0	1.2	38.8
1988	100.0	110.5	9.6	13.4	8.5	37.6	14.6	25.3	0.6	16.9	146.1	6.3	26.3	77.6	36.3	30.5	108.4	3.7	83.0
1989	76.9	91.4	6.1	37.8	22.7	39.3	33.6	35.2	0.1	25.8	169.2	14.0	37.0	66.3	47.5	30.0	169.3	14.8	90.9
1990	176.9	98.6	11.5	29.1	42.1	60.3	137.0	16.5	8.6	48.6	219.1	4.2	31.3	110.4	74.2	36.5	108.0	16.1	124.5
1991	163.5	48.6	8.0	29.4	32.3	100.9	83.3	24.0	3.6	28.5	219.2	3.2	34.8	56.5	98.0	75.9	124.7	130.5	92.5
1992	95.5	65.1	10.1	13.3	60.8	85.6	68.2	24.6	1.1	13.3	185.7	2.5	15.1	38.7	31.1	17.2	88.2	53.4	292.6
1993	97.1	72.7	15.4	26.8	94.9	82.3	63.8	21.9	2.6	14.6	137.2	3.5	13.8	28.0	44.5	60.7	349.9	35.7	288.7
1994	120.0	98.0	12.1	37.0	28.8	58.8	82.3	40.5	17.6	22.1	151.9	1.3	15.0	25.3	21.6	59.9	311.6	72.8	337.8
1995	308.9	211.0	62.6	169.7	77.0	65.6	36.5	26.6	0.2	32.5	224.2	2.0	4.7	81.3	39.1	44.2	307.8	61.4	519.3

Table 11. Total rockfish handline/troll catch (t) by statistical area for areas outside the Strait of Georgia, from British Columbia Catch Statistics, Annual Reports, 1956-95.

Year	1	2	3	4	5	6	7	8	9	10	11	21	23	24	25	26	27	30	42
1956	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.1	1.6	0.2	0.0	0.5		
1957	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.5	0.4	0.7	2.1		
1958	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.7	0.8	0.6	1.3		
1959	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	2.8	1.0	0.9	0.7		
1960	0.0	0.0	0.0	0.1	0.0	0.0	0.5	0.1	0.1	2.4	0.2	0.0	0.5	3.9	1.1	0.5	1.5		
1961	0.0	0.0	0.0	0.0	0.0	0.0	6.6	0.3	0.2	2.3	0.1	0.0	1.2	1.5	1.1	0.6	2.9		
1962	0.2	0.0	0.0	0.0	0.0	0.0	6.3	0.5	0.2	3.3	0.7	0.5	2.4	7.5	3.6	1.9	4.6		
1963	0.1	0.0	0.0	0.0	0.5	0.4	8.2	3.9	1.4	2.9	4.0	0.4	5.2	1.3	4.6	3.5	4.9		
1964	0.0	0.4	0.0	0.0	0.0	0.0	2.5	0.5	0.3	0.0	0.0	0.1	0.8	0.3	0.2	0.3	3.0		
1965	0.0	0.0	0.0	0.0	0.1	0.6	0.0	0.9	0.0	0.4	0.4	0.2	1.0	0.8	0.6	0.9	1.5		
1966	0.0	0.0	0.0	0.0	0.3	0.0	1.0	0.6	0.0	0.8	1.8	0.1	0.7	0.1	0.9	1.2	1.1		
1967	0.1	0.0	0.0	0.0	0.1	3.8	2.9	0.6	0.1	2.0	0.2	0.0	1.1	1.8	1.6	2.3	0.7		
1968	0.0	0.0	0.0	0.0	0.0	0.2	0.4	1.9	1.3	0.4	0.1	0.2	0.8	1.0	1.7	0.8	2.7		
1969	0.0	0.0	0.0	0.0	0.0	0.5	0.9	0.0	1.0	2.1	0.0	1.2	1.5	4.7	3.7	2.0	1.8		
1970	0.0	0.1	0.6	0.0	6.8	2.7	17.3	2.3	2.0	0.5	0.0	2.3	2.5	7.3	5.4	6.8	7.0		
1971	0.0	0.1	0.1	0.0	3.4	1.4	6.8	1.3	0.5	0.3	0.8	1.6	5.3	3.8	2.9	2.7	0.7		
1972	0.0	0.0	0.0	0.0	9.6	4.9	7.5	2.4	0.0	0.7	2.0	1.8	9.7	10.7	9.5	15.6	15.9		
1973	0.5	2.3	0.2	0.5	0.2	0.2	0.9	0.5	0.5	0.2	0.9	1.4	6.4	6.8	0.5	8.2	4.1		
1974	0.5	1.1	0.2	0.5	0.5	0.9	0.9	1.4	0.2	0.9	2.3	2.7	13.2	20.9	5.9	11.8	5.9		
1975	0.9	1.0	0.9	0.2	1.4	0.5	1.8	1.4	0.2	0.2	0.5	4.1	14.1	8.6	1.8	6.4	6.8		
1976	0.2	1.4	0.5	0.5	0.5	0.9	4.1	1.8	0.5	0.9	1.4	2.7	11.8	8.2	1.8	5.9	6.4		
1977	0.2	3.6	0.5	0.9	1.4	0.9	3.6	1.4	0.9	0.5	11.3	3.6	16.8	12.7	2.7	5.9	5.9		
1978	2.0	5.0	0.5	6.0	0.5	1.0	2.0	4.0	1.0	1.0	7.0	1.0	14.0	11.0	3.0	6.0	5.0		
1979	1.0	5.0	1.0	1.0	0.5	3.0	3.0	1.0	1.0	1.0	8.0	3.0	25.0	20.0	7.0	6.0	9.0		
1980	4.0	3.0	3.0	4.0	4.0	4.0	4.0	0.5	1.0	1.0	7.0	4.0	18.0	16.0	6.0	7.0	12.0		
1981	2.4	5.3	0.4	1.2	0.7	1.2	0.9	1.2	0.2	0.7	3.4	1.0	11.8	26.1	5.2	8.4	8.5		
1982	1.7	0.5	0.4	1.1	0.8	0.2	1.8	0.5	0.9	0.4	5.8	2.7	6.9	14.1	6.8	4.5	11.6	0.4	5.0
1983	3.1	1.3	0.8	4.7	0.3	3.1	0.8	2.3	1.6	1.5	8.5	5.2	17.1	15.3	8.7	7.5	12.3	0.5	0.8
1984	3.9	2.0	6.0	2.7	6.8	3.4	2.3	2.6	0.0	0.2	8.1	0.8	6.5	9.9	1.7	2.7	24.0	1.8	4.8
1985	1.5	1.4	1.3	10.7	1.4	5.4	5.5	0.4	0.1	4.1	12.6	0.2	13.6	11.3	2.6	6.6	27.9	0.0	2.9
1986	3.4	1.8	0.2	7.0	4.3	6.7	7.4	1.3	0.4	1.1	9.2	2.2	31.2	50.8	9.6	10.6	45.6	0.0	7.7
1987	2.9	1.3	1.4	6.1	4.5	8.1	3.6	6.4	0.4	12.3	37.0	5.8	22.4	62.6	37.1	13.1	46.1	0.0	4.7
1988	3.5	2.7	5.7	3.9	22.1	11.9	50.2	5.4	10.1	2.8	24.3	8.5	14.1	27.8	6.8	5.8	19.4	0.3	1.2
1989	22.5	3.4	1.0	13.5	13.1	12.3	17.1	11.4	3.1	11.0	27.5	4.1	8.9	17.1	6.5	7.9	37.4	1.5	5.5
1990	14.4	5.3	0.9	15.2	7.8	27.6	18.6	12.7	9.4	29.6	40.2	13.9	22.2	77.7	16.6	27.4	35.5	0.5	10.3
1991	32.0	1.6	7.9	39.2	13.2	23.0	49.5	7.8	6.5	6.0	32.1	15.1	11.2	32.3	14.8	9.8	49.9	0.0	5.3
1992	14.4	5.8	1.4	2.1	36.6	20.1	41.5	5.3	0.7	1.6	82.5	4.7	14.1	14.6	9.3	22.5	45.2	26.8	8.1
1993	10.7	8.4	0.9	15.9	9.4	12.9	24.8	0.6	0.4	0.3	8.5	3.0	3.1	14.5	3.4	14.2	112.5	0.0	14.8
1994	4.6	11.2	1.8	21.9	7.6	7.6	0.8	1.0	0.0	1.5	5.7	2.2	5.7	3.0	1.7	11.8	49.1	0.1	15.3
1995	24.0	16.3	2.3	28.0	6.2	9.0	3.0	0.7	0.8	3.6	5.4	1.9	5.2	7.7	7.6	3.5	23.2	2.1	13.6

Table 12. Red snapper longline and handline/troll landings (t), nominal effort in days fished and total red snapper landings by year and management region.

Region	Year	Longline		Handline/Troll		Total
		Landings	Effort	Landings	Effort	
SG	1982	9.6	183	12.6	1676	22.2
	1983	7.8	264	19.0	2295	26.8
	1984	14.0	301	32.4	2863	46.4
	1985	23.1	410	58.9	3608	82.0
	1986	51.0	478	42.9	2459	93.9
	1987	71.4	651	29.2	2549	100.6
	1988	71.7	1034	59.1	3831	130.8
	1989	65.7	691	59.8	3960	125.5
	1990	75.2	1049	60.0	4688	135.2
	1991	31.5	832	83.4	2918	114.9
	1992	11.5	332	18.6	1273	30.1
	1993	28.6	331	13.0	1278	41.6
	1994	77.0	297	9.4	848	86.4
	1995	28.0	673	10.0	1513	38.0
WCVI	1982	7.1	190	13.4	2240	20.5
	1983	18.9	131	14.8	1738	33.7
	1984	50.8	231	16.3	1121	67.1
	1985	74.2	266	32.8	1456	107.0
	1986	286.6	801	77.2	1437	363.8
	1987	266.4	1007	82.8	1914	349.2
	1988	266.8	1088	47.3	941	314.1
	1989	395.9	691	52.7	858	448.6
	1990	420.3	1677	84.7	2179	505.0
	1991	419.0	3604	56.5	1305	475.5
	1992	245.0	1353	75.6	1927	320.6
	1993	386.6	1576	68.3	1672	454.9
	1994	185.6	967	32.8	670	218.4
	1995	181.9	1109	9.2	931	191.1
QCI	1982	17.6	565	1.2	862	18.8
	1983	16.4	311	1.4	741	17.8
	1984	21.3	430	5.8	1035	27.1
	1985	74.2	647	2.2	563	76.4
	1986	106.8	647	8.8	402	115.6
	1987	122.5	674	5.7	407	128.2
	1988	184.3	809	5.0	465	189.3
	1989	169.7	1026	23.6	485	193.3
	1990	298.2	1028	21.1	887	319.3
	1991	310.3	2761	21.3	256	331.6
	1992	352.0	1180	34.4	457	386.4
	1993	351.0	1458	22.7	596	373.8
	1994	269.7	1253	20.6	599	290.3
	1995	190.7	688	18.0	1004	208.7
NC	1982	4.3	191	0.8	129	5.1
	1983	4.5	160	3.8	241	8.3
	1984	10.9	110	7.3	191	18.2
	1985	19.6	314	4.2	161	23.8
	1986	10.8	234	6.3	170	17.1

Region	Year	Longline		Handline/Troll		Total
		Landings	Effort	Landings	Effort	
	1987	43.2	406	9.2	203	52.4
	1988	24.4	299	23.1	325	47.5
	1989	53.0	329	25.1	298	78.1
	1990	48.0	352	6.8	146	54.8
	1991	46.6	609	10.7	137	57.3
	1992	59.3	513	27.2	240	86.5
	1993	88.7	634	9.7	177	98.4
	1994	39.1	390	7.8	113	46.9
	1995	165.6	734	18.1	436	183.7
CC	1982	2.5	207	1.8	87	4.3
	1983	3.9	87	3.6	196	7.5
	1984	1.8	125	10.6	216	12.4
	1985	21.9	144	6.4	151	28.3
	1986	86.6	155	9.5	236	96.1
	1987	37.3	311	11.6	277	48.9
	1988	44.7	343	24.8	724	69.5
	1989	94.1	678	23.9	387	118.0
	1990	126.8	698	27.8	640	154.6
	1991	157.6	1114	19.4	423	177.0
	1992	113.4	845	19.0	443	132.4
	1993	106.9	624	6.8	193	113.7
	1994	102.3	665	2.9	101	105.2
	1995	50.2	289	10.2	217	60.4



Table 13. Other rockfish longline and handline/troll landings (t), nominal effort in days fished and total other rockfish landings by year and management region.

Region	Year	Longline		Handline/Troll		Total
		Landings	Effort	Landings	Effort	
SG	1982	18.8	573	240.2	9097	259.0
	1983	20.7	575	251.2	8090	271.9
	1984	27.4	619	273.5	8065	300.9
	1985	69.5	952	285.1	7193	354.6
	1986	115.1	1498	316.4	7001	431.5
	1987	49.5	1038	272.6	6451	322.1
	1988	67.9	1456	297.8	6740	365.7
	1989	22.9	569	311.8	7476	334.7
	1990	27.3	797	307.4	7926	334.7
	1991	12.9	320	352.8	7977	365.7
	1992	6.9	245	140.7	3084	147.6
	1993	9.5	239	147.8	3304	157.3
	1994	32.5	320	155.5	2057	188.0
	1995	15.7	534	143.8	1951	159.5
WCVI	1982	21.7	536	45.2	10634	66.9
	1983	19.4	515	50.1	10514	69.5
	1984	36.1	507	37.6	7704	73.7
	1985	49.3	548	42.4	4885	91.7
	1986	133.5	1142	86.8	3732	220.3
	1987	158.3	1501	149.7	4173	308.0
	1988	173.0	1438	66.8	4968	239.8
	1989	137.4	1122	56.7	3551	194.1
	1990	163.4	1687	148.5	5501	311.9
	1991	193.3	2562	108.8	1763	302.1
	1992	133.5	1264	117.3	3831	250.8
	1993	251.2	1361	90.9	3729	342.1
	1994	401.7	1200	46.4	2499	448.1
	1995	521.4	1177	45.3	2948	566.7
QCI	1982	24.1	807	6.1	1424	30.2
	1983	20.0	649	3.8	1537	23.8
	1984	68.7	489	4.8	1292	73.5
	1985	75.0	714	3.7	818	78.7
	1986	78.1	636	4.6	365	82.7
	1987	181.4	1403	4.1	790	185.5
	1988	109.2	927	6.3	753	115.5
	1989	89.5	623	7.8	487	97.3
	1990	124.7	856	9.6	767	134.3
	1991	124.8	2361	17.6	230	142.4
	1992	155.0	1186	20.7	624	175.7
	1993	187.8	1374	11.4	521	199.2
	1994	358.9	1271	10.5	986	369.4
	1995	698.9	722	21.7	1881	720.6
NC	1982	1.5	123	0.9	158	2.4
	1983	2.3	150	1.8	264	4.1
	1984	3.7	134	1.4	241	5.1
	1985	7.1	316	9.3	292	16.4
	1986	15.4	315	5.6	314	21.0

Region	Year	Longline		Handline/Troll		Total
		Landings	Effort	Landings	Effort	
	1987	24.6	452	3.2	318	27.8
	1988	7.0	194	9.0	403	16.0
	1989	13.6	225	2.5	252	16.1
	1990	34.7	378	17.2	249	51.9
	1991	23.0	584	49.6	672	72.6
	1992	24.9	401	12.7	275	37.6
	1993	48.4	582	16.5	266	64.9
	1994	38.9	317	23.5	218	62.4
	1995	354.6	748	20.2	618	374.8
CC	1982	9.7	246	3.4	719	13.1
	1983	6.0	230	6.7	1057	12.7
	1984	8.3	227	6.5	826	14.8
	1985	20.2	302	9.3	438	29.5
	1986	38.2	368	11.5	682	49.7
	1987	60.8	733	21.2	725	82.0
	1988	53.9	509	56.0	1064	109.9
	1989	39.9	507	31.0	736	70.9
	1990	144.1	744	70.1	836	214.2
	1991	82.5	592	73.5	327	156.0
	1992	79.5	757	50.3	914	129.8
	1993	78.2	654	32.1	353	110.3
	1994	119.2	562	8.1	198	127.3
	1995	111.2	283	25.7	384	136.9

Table 14. Preliminary 1996 trawl catch from onboard observer and dockside monitoring data.

species	SG	WCVI	QCI	NC	CC	coastwide
rougeye	0.1	211.5	773.5	0.2	61.3	835.0
redbanded		52.6	52.0	11.5	207.1	323.1
silvergray		484.4	426.9	5.8	202.3	119.4
copper		0.4	3.2	8.3	4.5	13.5
quillback		3.9	3.1	3.3	1.3	11.6
black	0.1	0.6	1.2	0.3	5.5	7.7
china		0.1	0.1	0.3	0.1	0.6
canary		354.4	40.6	9.0	102.3	506.2
yelloweye		19.7	4.1	0.5	6.9	31.1

Table 15. Total rockfish recreational catch (t) by statistical area for the months covered by the creel survey 1983 to 1996 (Shardlow and Collicutt 1989a-e, Collicutt and Shardlow 1990, 1992a, 1992b, L. Collicutt and L. Nagy pers. comm.). Area 19A refers to Saanich inlet and area 19B covers the remaining portion of area 19 and includes the portion of area 20 east of Sheringham Point. These catch figures are not comparable over the entire series as the surveys subsequent to 1992 have not covered the entire year.

Year	months	Statistical Area <sup>a</sup>										
		12	13	14	15	16	17	18	19a	19b	28	29
1983	Jan-Dec	-	26.0	12.5	2.7	29.4	16.4	16.5	7.1	19.0	10.4	6.4
1984	Jan-Dec	-	15.9	10.1	3.0	11.3	24.7	14.2	3.6	14.4	7.6	5.6
1985	Jan-Dec	-	10.1	8.7	1.2	27.0	14.5	8.5	3.9	10.3	5.0	4.6
1986	Jan-Dec	-	14.8	14.5	1.9	34.2	12.9	9.0	4.2	15.9	4.9	5.0
1987	Jan-Dec	-	11.5	15.9	2.1	14.4	16.1	10.4	4.1	15.5	2.9	2.5
1988	Jan-Dec	-	17.3	21.0	2.0	26.7	21.4	12.0	4.4	20.0	4.2	7.4
1989	Jan-Dec	-	13.1	22.3	2.2	33.9	23.6	13.9	3.5	16.9	4.2	6.3
1990	Jan-Dec	-	13.0	16.7	1.7	30.2	11.1	5.6	5.8	14.3	4.4	5.5
1991	Jan-Dec	9.2 <sup>b</sup>	12.0	16.4	1.5	33.8	14.4	5.9	3.1	9.3	8.3	16.6
1992	Jan-Dec	10.3 <sup>c</sup>	10.4	9.7	0.9	30.5	12.6	6.7	2.9	11.5	5.1	4.7
1993	Jan-Sep	9.3 <sup>c</sup>	11.1	6.5	0.9	14.6	10.5	3.7	1.1	13.6	3.9	7.1
1994	Jan-Oct	-	20.0	17.6	2.0	21.6	14.3	4.6	3.0	4.0	9.1	9.1
1995	Mar-Oct	-	13.5	8.7	1.6	20.0	10.5	3.9	3.0	6.8	3.7	5.8
1996	Apr-Sep	-	16.4	3.0	1.3	19.8	5.6	2.9	3.8	7.4	1.7	5.4

<sup>a</sup>All catch converted from pieces to kg using average weight of 0.7 kg.

<sup>b</sup>For July and August only.

<sup>c</sup>For June, July and August only.

Table 16. Total rockfish recreational catch (t) by statistical area, total effort (boat trips), and overall catch per effort (kg per 10 boat trips) for the West Coast Vancouver Island statistical areas 23 A (Alberni Inlet), 23 B (Barkley Sound including statistical area 123) and 24 (and 124, survey limited to southern portion) from the creel survey July - September 1989 - 1995 (W. Luedke pers. comm.).

Year	AREA 23 A			AREA 23 B			AREA 24		
	Catch	Effort	C/E	Catch	Effort	C/E	Catch	Effort	C/E
1989	0.3	2,705	0.13	15.9	4,219	3.76			
1990	0.1	2,651	0.03	17.5	4,929	3.55			
1991	0.0	4,312	0.00	10.0	4,466	2.23			
1992	0.4	5,301	0.08	13.9	5,823	2.39	2.9	383	7.52
1993	0.2	3,691	0.06	11.3	4,312	2.62	1.8	456	3.86
1994	0.1	3,393	0.03	12.9	5,287	2.43			
1995	0.0	821	0.01	7.5	3,639	2.06	1.7	708	2.35
1996	0.1	10,075	0.08	8.0	6,278	1.27	2.3	790	0.29

<sup>a</sup>catch converted from pieces to kg using average weight of 0.7 kg

Table 17. Recreational rockfish catch by year in pieces and tonnes for statistical areas 1 to 10 inclusive (S. Cox-Rogers, T. Gjernes and E. Fast pers comm).

Year	pieces	weight <sup>a</sup> (t)
1990	2961	2.1
1991	3064	2.1
1992	3084	2.2
1993	4552	3.2
1994	8319	5.8
1995	14,703	10.3
1996	17,240	12.1

<sup>a</sup>catch converted from pieces to kg using average weight of 0.7 kg

Table 18. Comparable recreational rockfish catch rates (pieces per 10 boat trips) by statistical area in the Strait of Georgia by year for the combined months from June to August.

Year	Statistical Area									
	13	14	15	16	17	18	19a	19b	28	29
1983	1.99	1.51	4.23	7.81	2.27	5.22	2.77	2.57	3.98	5.18
1984	1.46	1.51	3.33	1.57	4.03	4.58	1.7	2.36	2.93	2.59
1985	0.80	1.03	1.42	5.19	3.38	3.36	1.79	1.78	2.33	2.73
1986	1.46	2.11	2.11	8.14	3.08	4.47	2.26	2.79	2.66	3.55
1987	1.24	2.19	2.43	4.00	2.96	5.61	1.89	1.75	2.12	1.96
1988	1.79	2.13	2.39	5.94	4.41	5.19	2.87	2.78	3.85	4.03
1989	1.09	2.39	3.57	12.27	4.87	7.16	2.85	1.29	4.16	4.06
1990	1.29	1.69	3.13	9.97	2.69	3.06	4.1	4.10	6.29	3.16
1991	1.83	3.22	2.55	17.16	5.09	3.41	6.64	1.13	8.47	7.45
1992	1.54	1.41	2.26	6.17	4.58	5.12	3.09	1.76	5.43	6.51
1993	1.35	0.74	1.38	4.10	2.04	3.22	3.93	3.93	6.10	5.00
1994	2.20	1.67	1.69	6.81	3.11	5.86	14.43	1.49	8.46	5.34
1995	2.55	2.26	2.84	7.27	4.10	5.22	35.4	1.00	4.83	8.70
1996	3.59	1.05	1.81	7.97	2.72	4.45	3.39	1.58	2.49	8.51

Figure 1. Recreational rockfish catch rates (rockfish pieces per 10 boat trips) for areas 13, 17 and 18 from 1983 to 1996.

