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RESULTS FROM A BOTTOM TRAWL SURVEY OF ROCKFISH STOCKS OFF THE WEST COAST OF THE QUEEN CHARLOTTE ISLANDS, SEPTEMBER 5 TO 23, 1997

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Science Branch, Pacific Region
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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Workman, G.D., N. Olsen and A.R. Kronlund. 1998. Results from a bottom trawl survey of rockfish stocks off the west coast of the Queen Charlotte Islands, September 5 to 23, 1997. Can. Manuscr. Rep. Fish. Aquat. Sci. 2457: 86 p.

The M/V OCEAN SELECTOR was chartered to conduct a random, depth stratified, biomass survey of four commercially significant rockfish species off the west coast of the Queen Charlotte Islands between September 5 and 23, 1997. A total of 107 tows were performed during the cruise, of which 99 were usable; two sets were unusable due to gear fouling. An additional 6 sets, not included in the survey randomization, were performed to collect biological samples. A total of 92,333 kg of mixed groundfish species were caught, of which 77,900 kg were rockfishes (*Sebastes*). Of the total rockfish catch, 34,604 kg was Pacific ocean perch (*S. alutus*), 15,906 kg was rougheye rockfish (*S. aleutianus*), 7,341 kg was silvergray rockfish (*S. brevispinus*) and 6,082 kg was redstripe rockfish (*S. proriger*).

Of the 12,017 fish sampled during the survey, a total of 7,583 were examined for length and sex, while 4,434 were examined for length, sex, maturity and otoliths. Length, age, and maturity data were analyzed for Pacific ocean perch and other rockfish species abundant in the catch. The appearance of a relatively large year class at age 7 (1990 cohort) of Pacific ocean perch, redstripe and yellowmouth rockfishes was noteworthy.

The estimated biomass for Pacific ocean perch was 12,577 tonnes (6,625 to 28,621 tonnes, 95% confidence interval (CI)). An estimated 4,826 tonnes (3,373 to 6,845 tonnes, 95% CI) of rougheye rockfish were surveyed. Estimated biomass for redstripe rockfish was 5,556 tonnes, (618 to 13,682 tonnes, 95% CI) and for shortspine thornyhead, 921 tonnes (760 to 1,203, 95% CI). The biomass estimates were very similar to estimates obtained in 1978. However, most of the biomass (71 % of the POP and 63 % of the total rockfish) was encountered on Langara Spit, which was closed from 1991 to 1996, and survey methodology and gear have changed since 1978.

RÉSUMÉ

Workman, G.D., N. Olsen and A.R. Kronlund. 1998. Results from a bottom trawl survey of rockfish stocks off the west coast of the Queen Charlotte Islands, September 5 to 23, 1997. Can. Manuscr. Rep. Fish. Aquat. Sci. 2457: 86 p.

Le NM OCEAN SELECTOR a été affrété pour réaliser, entre le 5 et le 23 septembre 1997, un relevé aléatoire avec stratification bathymétrique de la biomasse de quatre espèces de sébastes, importantes sur le plan commercial, au large de la côte ouest des îles de la Reine-Charlotte. Sur le total de 107 traits effectués pendant la campagne, 99 étaient utilisables, et deux ne l'étaient pas à cause des salissures sur les engins. Six autres traits, qui visaient la collecte d'échantillons biologiques, n'ont pas été inclus dans la randomisation. Au total, 92 333 kg d'espèces mélangées de poissons de fond ont été capturés, dont 77 900 kg étaient constitués de sébastes (*Sebastes*). Sur le total des prises de sébastes, on retrouvait 34 604 kg de sébaste à longue mâchoire (*S. alutus*), 15 906 kg de sébaste à oeil épineux (*S. aleutianus*), 7 341 kg de sébaste argenté (*S. brevispinis*) et 6 082 kg de sébaste à raie rouge (*S. proriger*).

Au total, 12 017 poissons ont été capturés pendant la campagne; nous avons déterminé la longueur et le sexe de 7 583 spécimens; chez les 4 434 autres spécimens, nous avons déterminé la longueur, le sexe et le degré de maturité et examiné les otolithes. Nous avons analysé les données sur la longueur, l'âge et la maturité chez les sébastes à longue mâchoire et les autres sébastes abondants dans les prises. Nous avons noté l'apparition d'une classe relativement forte d'âge 7 (cohorte de 1990) chez le sébaste à longue mâchoire, le sébaste à raie rouge et le sébaste à bouche jaune.

Nous avons estimé la biomasse de sébaste à longue mâchoire à 12 577 tonnes (6 625 à 28 621 tonnes, intervalle de confiance de 95 %); celle de sébaste à oeil épineux à 4 826 tonnes (3 373 à 6 845 tonnes, IC de 95 %); celle de sébaste à raie rouge à 5 556 tonnes (618 à 13 682 tonnes, CI de 95 %); enfin, celle de sébastolobe à courtes épines à 921 tonnes (760 à 1 203 tonnes, CI de 95 %). Les estimations de la biomasse étaient très proches de celles de 1978. Toutefois, la plus grande partie de la biomasse (71 % du sébaste à longue mâchoire et 63 % du total des sébastes) se retrouvait sur le Langara Spit, qui a été fermé à la pêche de 1991 à 1996; par ailleurs, la méthodologie des relevés et les engins de pêche ont changé depuis 1978.

INTRODUCTION

In 1997, the F/V OCEAN SELECTOR was chartered to perform a three week trawl survey off the west coast of the Queen Charlotte Islands. This report describes the trawl survey design and sampling procedures, summarizes the catch and biological data, and presents biomass estimates for Pacific ocean perch (*Sebastes alutus*), redstripe rockfish (*S. proriger*), rougheye rockfish (*S. aleutianus*) and shortspine thornyhead (*Sebastolobus alascanus*) in the survey area. The main objectives of the 1997 survey were (1) to provide a fishery independent index of abundance for four rockfish species within the survey area, and (2) to collect synoptic biological samples of rockfishes caught in the survey area. Biological sampling was intended to provide representative size, age and maturity data for commercially important rockfish species and to collect spatially distinct biological samples from areas that have experienced different exploitation histories. In addition, it was hoped that opportunities would arise to sample species of potential commercial interest not previously collected in the survey area. A secondary objective of the survey was to collect samples for other investigations on an opportunistic basis.

Rockfish stocks off the west coast of the Queen Charlotte Islands have been exploited since the mid 1960's (Fig. 1). Foreign fleets, primarily Japanese, worked in the area until 1977 when extended jurisdiction was implemented. Total removals by foreign fleets were estimated at 82,000 tonnes between 1965 and 1977. Landings attributed to the Japanese fleet between 1965 and 1977 were mostly (80 percent) caught in the vicinity of Langara Spit (Ketchen 1980). Canadian fishermen began working in the area in 1977, however, domestic landings were modest until 1984 (Leaman and Nagtagaal 1986).

The Department of Fisheries and Oceans (DFO) has conducted independent and joint surveys to investigate the distribution, abundance, and biology of rockfishes in the northeast Pacific Ocean since 1963. Trawl surveys have been conducted sporadically in the waters off the West Coast of the Queen Charlotte Islands since 1966 (Fig. 2). Westrheim (1966, 1972) conducted exploratory fishing off Langara Island and Rennell Sound in 1966. Off Langara island the aggregate catch rate for POP was 5400 kg/hr. Westrheim (1972) surveyed Langara Spit again in 1971, however, during that survey no significant concentrations of rockfishes were encountered. A number of surveys were conducted in the area during 1978 and 1979. In 1978, the west coast of the Queen Charlotte Islands from Cape St. James to 54° N was surveyed by the M/V BLUE WATERS (Nagtegaal et al. 1980). In 1979, the M/V BLUE WATERS and the M/V SCOTIA BAY were chartered to conduct a two boat trawl survey of rockfishes off the west coast of the Queen Charlotte Islands from Cape St. James to Langara Island (Nagtegaal and Farlinger 1980, Lapi and Richards 1981). These surveys found an estimated 10,500 tonnes and 15,900 tonnes of marketable rockfishes in 1978 and 1979, respectively. These estimates did not include Langara Spit (Leaman and Nagtegaal 1982). An additional 3000 to 5000 tonnes was estimated to be present in the Langara Spit area in 1979. Ketchen et al. (1978), estimated

that the rockfish biomass in the area prior to the commencement of foreign fishing in 1965 may have been as high as 105,000 tons.

A depletion study in the Langara Spit area commenced in the spring of 1984. That study involved a period of unrestricted harvest from 1983 to 1990, followed by a period of closure from 1991 to 1996. The G.B. REED and the M/V FREE ENTERPRISE collected baseline biomass data from the area in the summer of 1983 (Leaman and Nagtegaal 1986). The biomass estimate from the 1983 survey was 1200 tonnes ± 67 percent. Surveys were conducted in 1993 and 1996 using the W.E. RICKER to track the recovery of the rockfish stock on Langara Spit following the period of unrestricted harvests (Leaman and Stanley 1993, Leaman et al. 1996, 1997). Rockfish biomass estimates were 9824 tonnes ± 32 percent and 12747 tonnes ± 29-34 percent. The modest increase in biomass between 1993 and 1996 was largely attributed to growth.

METHODS

VESSEL AND GEAR

The vessel employed for this survey was the F/V OCEAN SELECTOR, a 47.9 m, 800 hp, Canadian commercial stern trawler equipped with an Atlantic Western III box trawl (Fig. 3). The net had a 24 m (78 ft.) head rope and a 34 m (108 ft.) foot rope; the head rope had 102, 20 cm (8 in.) plastic spherical floats. The wings and body of the net were constructed of 12.7 cm (5 in.) stretched mesh webbing. The intermediate was constructed of 11.2 cm (4.5 in.) mesh webbing while the cod-end was constructed of 10.2 cm (4 in.) mesh webbing. A 3.75 cm (1.5 in.) mesh liner was in place in the cod-end for all tows performed during the survey. The ground line consisted of 16, 46 cm (18 in.) half eggs and rollers in each wing and 46 cm (18 in.) rubber disks separated by 15 cm (6 in.) rubber disks to form a "rock hopper" bosom in the middle of the ground line. The sweep and bridle wires were 27.7 m (90 ft.) in length. The doors were Thybron 107's, each weighing approximately 1250 kg. The net had vertical and horizontal openings of approximately 5 m and 13.7 m (Dave Clattenburg, pers. comm.). The net and doors were the same as those used during the 1994 and 1995 Goose Island Gully surveys (Hand et al. 1995, Yamanaka et al. 1996) with the exception of the replacement of the "tire gear" in the bosom of the net with the "rock hopper gear".

FISHING OPERATIONS

The locations of selected sampling units and alternates were input into an electronic charting system (Seaplot Ver.1.31, 1993) on a laptop computer. The computer was then connected to an on-board global positioning system (GPS) to allow the vessel's position relative to the sampling unit to be viewed. Typically, the vessel would steam to

each selected sampling unit and pass over the site to examine the bottom with an echo-sounder, unless the skipper's knowledge precluded the need for this step. At the discretion of the skipper, a tow was oriented along a depth contour within the depth range of the stratum. Once a start location for fishing was determined, the vessel would steam up to 1.5 km from the intended tow location, turn around, and begin to deploy the fishing gear. The skipper decided when to start the tow within the sampling unit.

Tows were standardized to 15 minutes in duration to limit the catch. This allowed for sorting and weighing of the entire catch for most tows. On previous surveys, the start time for the tow was designated to be when the main warps were locked. This survey departed from that practice by attempting to measure exact time on bottom by having one of the crew stand on the main warp cable and "feel" for contact with the bottom. Given the relatively short tow duration of 15 minutes, it was important to obtain as accurate a measure of on-bottom tow duration as possible. Tows were ended after 15 minutes, the exact stop time was deemed to be when the hydraulics used to retrieve the net were engaged.

SURVEY DESIGN

The geographic bounds of the survey area encompassed the major grounds where the commercial fishery is conducted: Buck Point, Rennell Sound (the Hogback), Hippa Island, Fredrick Island and Langara Spit (Fig. 2). Thus, the survey was confined between approximately 53° 00' and 54° 30' N latitude. Recent slope rockfish surveys in Queen Charlotte Sound and off the west coast of Vancouver Island between 1994 and 1996 were designed to estimate the abundance of Pacific ocean perch, redstripe rockfish and yellowmouth rockfish (Hand et al. 1995, Yamanaka et al. 1996, Olsen et al. 1997). The maximum depth fished was extended for this survey, relative to the depth fished in the 1994 through 1996 surveys, to accommodate the depth ranges of rougheye rockfish and shortspine thornyhead. Consequently, the depth strata for this survey were wider than those of surveys conducted in the recent past.

Data from the 1996 commercial fishery were analyzed to determine the bathymetric distribution of the target species. Catch per unit effort (kg/hr) was calculated from observer data and plotted against depth (Fig. 4). The plots were examined visually to determine which depths corresponded to the highest catches for each species. Based on these analyses, four depth intervals were designated corresponding roughly to the depth distributions of the target species:

1. 180 to 275 m (100 to 150 fa) redstripe and yellowmouth rockfish;
2. 275 to 365 m (150 to 200 fa) Pacific ocean perch;
3. 365 to 460 m (200 to 250 fa) rougheye rockfish and shortspine thornyhead;
4. 460 to 625 m (250 to 325 fa) lower bounds of distributions.

The survey followed a stratified random design, where the strata were defined by the four depth intervals. The sampling unit was an arbitrary area of dimension 2 km by 2 km. A geographic information system (Compugrid 7.1w, Geo-Spatial Systems Ltd. 1996) was used to superimpose a grid of the 4 km^2 sampling units on the survey area. The mean depth of each sampling unit was calculated from interpolated bathymetric contour data. Each sampling unit was assigned to a depth stratum using its mean depth value. A total sample size of 100 tows was allotted to the survey given the charter duration of 18 days. Initially, survey effort was allocated to the strata in approximate proportion to the variance in catch rates for Pacific ocean perch derived from the 1996 trawl observer data. However, this allocation scheme resulted in very few tows placed in the deepest stratum; tows in strata 2 and 3 were reduced to yield sample sizes of 15, 35, 30, and 20 in strata 1 through 4, respectively (Table 1). Sampling units were selected at random from each stratum independently and without replacement. Redundant sampling units were selected during the randomization step as alternates in anticipation of not being able to fish some of the tow locations.

BIOMASS ESTIMATION

Biomass for selected species within the survey area was estimated using stratified random sampling methods (Cochran 1977). The notation used for the various estimators is provided in the following table:

Symbol	Description
H	Stratum index
I	Haul index
C_{hi}	Observed catch in haul i for stratum h
k_{hi}	Area of bottom fished in haul i for stratum h
N	Total number of sampling units in the population
N_h	Total number of sampling units in stratum h
n	Number of units in the sample, or sample size
n_h	Number of units in the sample from stratum h
y_{hi}	Adjusted catch in haul i for stratum h
μ	The population mean
τ	The population total
$\bar{y}_h$	The estimated mean in stratum h
$\bar{y}_{st}$	The estimated population mean
$\hat{V}(\bar{y}_{st})$	The estimated variance of the population mean
$\hat{\tau}_{st}$	The estimated population total
$\hat{V}(\hat{\tau}_{st})$	The estimated variance of the population total
s_h^2	The sample variance in stratum h

For a given species, let C_{hi} be the catch observed in haul i for stratum h. The area of bottom fished in each haul, k_{hi}, was calculated as the product of distance towed and the effective path width of the trawl net. Since each sampling unit was 4 km^2, the observed catch was expanded to the area of the sampling unit using

$$y_{hi} = \left(\frac{4}{k_{hi}}\right) C_{hi} \quad .$$

The Seaplot software computed the total distance towed on each haul as the sum of distances determined at 30 second intervals using GPS data. The effective path width of the net was considered to be the distance between the trawl doors rather than the distance between trawl wing tips. This distance was calculated using the algorithm of Carrothers (1980) that requires the use of two wire-rope catenaries. One catenary is fitted to the ground-warp, upper wing leg and the forward one-eighth of the headline. The second catenary is fitted to the bight of the headline. Since wire-rope catenaries were unavailable for this survey, a mean value of 0.0317 nm (0.0587 km) was determined from a range of doorspread values obtained by varying the wire-rope catenary parameter from 600 to 1400 in 100 unit increments (Yamanaka et al. 1996). Each 15 minute haul fished an average of 0.0776 km^2.

The stratified random sampling estimators were applied to the set of adjusted observations, y_{hi}, to compute total biomass for each species. Estimators of the mean catch per area and the total biomass are given by

$$\bar{y}_{st} = \frac{1}{N} \sum_{h=1}^{H} N_h \bar{y}_h \quad ,$$

and

$$\hat{\tau}_{st} = N\bar{y}_{st} = \sum_{h=1}^{H} N_h \bar{y}_h \quad ,$$

respectively, where

$$\bar{y}_h = \sum_{i=1}^{n_h} \frac{y_{hi}}{n_h} \quad .$$

An estimator of the variance of the total biomass is given by the equation

$$\hat{V}\left(\hat{\tau}_{st}\right) = \hat{V}\left(N\bar{y}_{st}\right) = \sum_{h=1}^{H} N_h^2 \left(\frac{N_h - n_h}{N_h}\right) \frac{s_h^2}{n_h} \quad ,$$

where

$$s_h^2 = \frac{\sum_{i=1}^{n_h} \left(y_{hi} - \bar{y}_h\right)^2}{n_h - 1} = \frac{\sum_{i=1}^{n_h} y_{hi}^2 - \sum_{i=1}^{n_h} \left(y_{hi}\right)^2 \Big/ n_h}{n_h - 1} \quad .$$

Confidence intervals were computed for population biomass using a non-parametric bootstrap procedure (Efron and Tibshirani 1993, Mathsoft 1997). The Bootstrapping was conducted by randomly drawing a sample of size N from the observed data at random with replacement, and computing the stratified estimate of the total from each resample. For each resample, a sample of size n_h was drawn independently from each stratum. A total of 1000 samples were generated to yield a bootstrap distribution. Confidence limits were calculated using bias-corrected and adjusted (BCa) percentiles of 0.025 and 0.975 (Efron and Tibshirani 1993).

The estimation of biomass was contingent upon the following assumptions:

1. All fish in the water column within the path of the trawl doors are captured, *i.e.* no fish escape around the trawl doors or above or below the net so that the catch coefficient was assumed to be 1;

2. The catch rate and species composition observed in each haul is representative of the entire sampling unit (fish are distributed homogeneously within each 4 km^2 unit);

3. Fish distribution remains constant over the duration of the survey.

These assumptions are not met in practice. For example, fish can pass over the net. Thus, the estimates should be interpreted as a relative index rather than as an absolute measure of biomass.

CATCH PROCESSING

The net was "hauled back" and dumped in the stern hopper of the vessel. The catch moved via a conveyer belt from the stern tank to the catch processing area near midships. If the catch was less than 500 kg, the entire catch was sorted and weighed. Larger catches were sub-sampled. When in the stern tank of the vessel, catches tended to stratify by morphological grouping with flatfish species settling to the bottom, roundfish species in the middle, and rockfishes on top. The conveyor that moved the catch forward pulled fish from the bottom of the tank, therefore flatfishes would appear on the belt first, followed by roundfishes, the smaller rockfish species and finally large rockfishes (*e.g. S. brevispinis, S. borealis* and *S. babcocki*). Three baskets were selected from each of the start, middle, and end of the tow following the sub-sampling procedures outlined by Westrheim (1967). If the catch consisted primarily of larger species, the number of baskets was increased to three sets of 4 or 5 to ensure adequate numbers of fish for biological sampling. Whether collecting a sub-sample, or processing the entire catch, sorting was done to the lowest taxonomic level possible, usually to species. The sorted catch was then weighed using a Marel 2200 platform scale with a 60 kg load cell. For sub-sampled tows, the total catch weight was estimated upon retrieval of the cod-end by the vessel skipper, two

DFO biologists and an experienced Archipelago Marine Research (AMR) observer. These four estimates were reconciled by taking a mean of the closest three estimates. The accuracy of the visual estimates was examined by comparison with dockside validation records and fish slips obtained mid-way through the charter and at the end of the charter at offloads in Prince Rupert, B.C. and Bellingham, Washington (Table 2).

BIOLOGICAL SAMPLING

A minimum of 10 specimens of each species were sampled for weight, length, sex, maturity and double otoliths from each tow. For large catches of a given species, a sample of 2 to 3 baskets of randomly selected fish was chosen. All fish in a randomly selected basket were sampled. By doing so, it was hoped that selection bias on the part of the sampler could be avoided. Weight was determined to the nearest gram using a Marel 2200 top-loading scale. Fork lengths were measured to the nearest millimeter. Otoliths were removed and stored in "Tray-bien" sampling trays in a 50:50 solution of glycerin and water with a broad spectrum fungicide, "Thymol", added. Maturity stages were determined macroscopically using the criteria listed in Appendix 1.

Weight-length relationships for selected species were computed using a standard power function

$$w_i = \alpha l_i^{\beta} \quad ,$$

where w_i is the weight of fish i and l_i is the length of fish i. For convenience, actual estimation of parameters was performed by least squares using the linearized model form

$$\ln w_i = \ln \alpha + \beta \ln l_i \quad .$$

Growth curves were estimated using von Bertalanffy curves of the form (dropping the fish index i for convenience)

$$l_t = l_\infty \left[1 - e^{-K(t-t_0)}\right] \quad ,$$

where l_t is the length at time t, l_∞ is the asymptotic body length, K is the Brody growth coefficient, and t_0 allows for non-zero length at age 0.

RESULTS

FISHING OPERATIONS

A total of 107 tows were completed during the survey (Fig. 2, Fig. 5-Fig. 8) of which 99 were usable for biomass calculations. Tows number 6 and 107 were discarded due to gear fouling. Tows number 89, 99, 103, 104, 105, and 106 were not part of the biomass survey grid but were used to collect biological samples. Detailed bridge log and catch information is presented Appendix Table 2. A total of 92,333 kg of mixed groundfish species were caught, comprised of 21 species of rockfishes (77,900 kg), 10 roundfish species (4,556 kg), 9 flatfish species (9,411 kg), 5 species of sharks and skates (319 kg) and 3 invertebrate groups (147 kg) (Table 3). The dominant rockfish species by weight were Pacific ocean perch (34,604 kg), rougheye (15,905 kg), silvergray (7,341 kg), and redstripe (6,082 kg) rockfishes (Table 4). Of 105 completed tows, 32 were sub-sampled for species composition while 73 were sorted completely. The catches of each species by stratum for the target species are presented in Table 5.

SURVEY DESIGN

The survey design was altered in two significant ways during the cruise. The most significant departure involved extending the western limit of the survey. After consultation with the skipper, it was determined that a significant section of Langara Spit would be missed. In order to include this area, an additional 65 sampling units were identified on the western edge of Langara Spit. From these 65 units, ten were allocated to the four depth strata in the same proportions used in the balance of the survey. The second alteration occurred late in the survey when it was determined that five sampling sites in the deepest stratum off Rennell Sound were not fishable. The omission of these sites is unlikely to have a profound effect on biomass estimates, since the target species were not encountered in significant numbers in this stratum. A third minor alteration in survey design occurred when two survey sample units off Buck Point were dropped for the purposes of biomass estimation. These sites were not fishable and the advent of several weather days left insufficient time to search alternate sites for a fishable tow location. Therefore, biological samples were collected at two locations known to be fishable by the skipper.

The 10 additional tows allocated to the Langara Spit area do not constitute an expansion of the original stratified design. Although these tows were randomly selected from the four depth strata, the additional sampling units were selected only from the area around Langara Spit, rather than from all possible sampling units in the survey frame. Nevertheless, these additional sites are included in analyses as though they were part of the original randomization.

BIOMASS ESTIMATES AND CATCH DATA

Biomass estimates obtained by bootstrapping are presented in Table 6 and Table 7 for the west coast of the Queen Charlotte Islands and Langara Spit, respectively. In addition, bootstrap estimates appearing in Table 8 were computed after post-stratification of the data to reproduce the scheme used by Leaman et al. (1996). This was done to facilitate comparison of this survey with the results of the 1996, 1993, 1983, and 1979 surveys (Table 9, Table 10). Catch per unit effort (CPUE) estimates are presented in Table 11, while post-stratified CPUE estimates for Langara Spit are presented in Table 12 with estimates from Leaman et al. (1996) for comparison.

Pacific ocean perch

Of the estimated 12,577 metric tonnes of Pacific ocean perch in the survey area, 95 percent came from strata 1 and 2. The 95 % confidence limits are 6625 to 28,621 tonnes. Of the 99 tows used for biomass calculations, 38 tows contained more than 100 kg of perch, including 9 tows yielding more than 1000 kg of perch. Of the total estimated biomass, 71 percent was found on Langara Spit which accounts for only 45 percent of the total area. Catch densities (tonnes/km^2) by depth strata are presented in Fig. 9. Prior to the cruise it was anticipated that most of the catch for this species would come from stratum 1. The figure suggests that Pacific ocean perch were equally abundant in strata 1 and 2, with peak densities at the boundary between the two strata. Catch densities have been plotted on a map of the Queen Charlotte Islands as sized circles, where the area of the circle is proportional to the catch density (Fig. 10). The panel for Pacific ocean perch show that most of the fish were caught on the outside edge of Langara Spit with secondary catches at Fredrick Island. Despite prior expectations, Hippa Island and Rennel Sound (the Hogback) yielded few fish. Several factors may have contributed to this result including the distribution of survey sites, full moon, and fall tides. Other authors have commented on the temporal and spatial variability in CPUE associated with diurnal, semi-diurnal and fortnightly tidal effects (Leaman and Nagtegaal 1982, 1986, Nagtegaal et al. 1986).

Rougheye rockfish

The biomass estimate for rougheye rockfish was 4,826 tonnes, with a 95% confidence interval bounded by 3,373 tonnes and 6,845 tonnes. Rougheye rockfish were most abundant in the middle two depth strata (Fig. 9). Thirty one tows had more than 100 kg of rougheye rockfish, with 3 tows yielding greater than 1,000 kg. The panel for rougheye rockfish shown in Fig. 10 indicates that catches were quite consistent along the entire continental slope at depths greater than 175 fm.

Redstripe rockfish

A total of 5,556 metric tonnes of redstripe rockfish were estimated to be in the survey area, all of which was encountered in the shallowest depth stratum (Fig. 9). The 95% confidence interval for this estimate ranged from 618 tonnes to 13,682 tonnes. The large uncertainty associated with the estimate reflects the highly skewed nature of the catch data for this species. Only six tows contained more than 100 kg of redstripe rockfish and of these six, only one tow produced more than 1,000 kg. This species was caught on top of bank structures with the largest catch taken on top of Langara Spit.

Shortspine thornyhead

The estimate of biomass for shortspine thornyhead was 921 tonnes with a 95% confidence interval of 760 to 1,203 tonnes. Shortspine thornyheads were most abundant in strata 2 and 3. The ubiquitous nature of this species is reflected in the narrow confidence intervals associated with the biomass estimate. Although only four tows caught more than 100 kg of this species, they were present in 88 of the 107 tows. The plot of catch density against depth (Fig. 9) indicates that this species was distributed from 130 fm to greater than 325 fm, but never at a density greater than 10 tonnes/nm^2. Shortspine thornyhead were distributed throughout the survey area, but were most abundant in deeper mud bottom habitats such as the deep trench between Langara Spit and the north end of the Queen Charlotte Islands (Fig. 10).

CATCH PROCESSING

A comparison of the estimated catches and landed catches by species is presented in Table 2. These estimates show a maximum difference of 3069 kg. There are three potential sources of discrepancy between the two sets of data: (1) error in the sub-sampling process, (2) error due to non-retention of species, and (3) error in the estimation of the total catch weight.

Discrepancies in the weights for species with small total landed weights are expected for two reasons. First, these species are unlikely to occur in a basket sub-sample, which leads to an underestimate of catch weight. Second, if the species does occur in a basket sub-sample, particularly in a large haul, the sub-sampling fraction will inflate the total contribution for the species. This source of overestimation is especially true of species which are larger (Boccacio, red-banded and shortraker rockfish, lingcod).

The most significant source of error contributing to differences in the species weights is non-retention. For several species (*e.g.* redstripe, sharpchin, rosethorn, splitnose, and greenstripe rockfishes, shortspine thornyheads, Dover sole) size grading is significant. Fish under 33 cm have a lower recovery rate and are not processed at the plants; discards of

these species can amount to half or more of the total weight caught. For example, 62 percent of redstripe rockfish, 88 percent of splitnose rockfish and 87 percent of sharpchin rockfish were under 33 cm. Another reason species are discarded relates to flesh quality. Several species of flatfishes and rockfishes have short holding times (*e.g.* yellowtail, widow, and canary rockfishes, Boccacio, Dover sole, turbot) and are routinely discarded early in a trip but retained near the end. A third reason for7 non-retention during this cruise was biological sampling for sex and maturity data; when the abdominal cavity is cut open it becomes a potential source of bacterial contamination for the rest of the catch and sampled fish are thus discarded.

The third source of potential error is the visual estimation of the total catch weight. During the first leg of the survey, the estimated weights for Pacific ocean perch, rougheye rockfish and shortspine thornyhead were 8, 25 and 42 percent greater than landed. The positive bias in visual weights can be accounted for by discarding of sampled carcasses during the first leg of trip when 2660 kg of Pacific ocean perch , 2304 kg of rougheye rockfish and 690 kg of shortspine thornyhead where discarded. Correcting for discarding leaves a 2.2 and 1.4 percent deficit of Pacific ocean perch and rougheye rockfish, and a 12 percent surplus of shortspine thornyhead to assign to estimation error. Similarly, the discrepancies for the second leg were negligible after accounting for the carcass discards, with the exception of Pacific ocean perch which showed an 18 percent deficit. This deficit was probably associated with the last 10 "payfish" tows which were not closely examined. Not all sampled fish were discarded, many that were examined for length and sex were sexed externally and were retained.

BIOLOGICAL SAMPLING

A total of 12,017 fish were sampled during the cruise. Length and sex (LS) data were collected from 7,583 specimens over 10 species. Length, sex, maturity and age structures (LSMO) were collected from 4,434 specimen over 13 species. Table 13 contains a summary of samples sizes by species and sample type. Table 14 summarizes the samples collected by species and stratum. Length frequency data are presented in Appendix Tables 3 through 9. Pacific ocean perch, rougheye rockfish and shortspine thornyhead were sampled most intensively, followed by redstripe, yellowmouth and silvergray rockfishes. Sampling effort by species among strata was approximately proportional to the species catches by strata. For all catches containing one of the target species, a minimum of ten fish were sampled for LSMO data. Catches permitting, two LS samples of 2 to 5 baskets per day for each of the target species were collected. Sampling of shortraker rockfish (*S. borealis*) was a notable exception to the 10 specimen minimum since this species occurred very infrequently; only three tows had more than 10 specimens. Thus, the total catch of shortraker rockfish was sampled from every tow.

The length data are summarized in Table 14 through Table 16, the age data in Table 17, which list the unweighted mean median and modal lengths and ages by species

and sex. Maturity data are summarized in Table 18. Observed length frequencies are plotted in Fig. 11 through Fig. 13, and observed age frequencies in Fig. 14 through Fig. 17.

Pacific ocean perch

Pacific ocean perch length frequency histograms (Fig. 11) show that males ranged from 18 cm to 49 cm with a mode at 38 cm; females ranged from 19 cm to 51 cm with modes at 39 and 43 cm.). A total of 1242 otoliths were collected from *S. alutus*, 621 of which were aged. Ages ranged from 3 to 87 years for males and 3 to 82 years for females. The age frequency distributions show prominent modes at 7, 10, 13, 17 and 21 years of age, which correspond to the 1990, 1987, 1984, 1980, and 1976 year classes (Fig. 14). The age frequency for both sexes shows four relatively strong years classes occurring in sequence between 1984 and 1987. Age 7 fish show up as a prominent mode accounting for more than 5 percent of the males aged. Generally, this species is not fully recruited until age 12 to 15, with males recruiting earlier than females, this is why age 7 fish are present among males but not females. Thus, the relative size of this age class suggests that the 1990 cohort may be strong. Seventy-nine percent of males were in maturity stage 6 or spent, while 79 percent of females were in maturity stage 3, or developing. The latter result indicates that these fish had copulated but the females had not yet fertilized the eggs. Differences in size and age composition among sexes and depth strata were tested using a Kruskal-Wallace Chi-square approximation (Richards 1986). Females were significantly larger than the males ($p<0.05$), males and females were significantly larger and older in the deepest depth strata in which they were encountered.

Rougheye rockfish

Males ranged from 23 to 69 cm in length with a mode at 46 cm. Female rougheye rockfish ranged from 19 to 72 cm in length with a mode at 45 cm (Fig. 12). A total of 824 otoliths were collected from rougheye rockfish and a random sample of 423 otoliths was aged. Male rougheye rockfish ranged in age from 10 to 119 years. Females ranged from 8 to 91 years with most fish being between 17 and 50 years. The age distributions for rougheye rockfish are not clearly dominated by any one age class (Fig. 15). Stronger modes do occur at age 17, 26, 29, 35-36, 40-42, 47 and correspond to the 1980, 1971, 1968, 1961-62, 1957-58, 1950 cohorts. The absence of clearly dominant age classes on the west coast of the Queen Charlotte Islands raises the possibility that these fish may experience less variability in year class strength than Pacific ocean perch or yellowmouth rockfish. However, it may be that rougheye rockfish are more difficult to age than other species, with resultant smearing of age classes. Most of the fish examined were either immature or maturing with 42 percent of males in a developing (stage 3) maturity stage. Of the females, 36 percent were maturing (stage 2), and 25 percent were developing (stage 3). There was no significant difference in size or age between the sexes, females were significantly larger at depth and both males and females were older in the deepest strata in which they were encountered.

Redstripe rockfish

Males ranged from 24 to 37 cm in length; females from 26 cm to 44 cm with modes at 32 cm and 37 cm respectively (Fig. 12). All 292 otoliths collected were aged; males were 5 to 40 years of age while females were 6 to 43 years of age. The age frequency histogram was clearly dominated by 15 and 16 year olds for both sexes, corresponding to the 1982 and 1981 cohorts (Fig. 16). There was also a minor mode in the distribution at age 7, as was the case for Pacific ocean perch. Males were either in developing (45 percent, stage 3) or spent (36 percent, stage 6) maturity stages. Females were either developing (32 percent, stage 3) or resting (47 percent, stage 7). Females were significantly larger than males.

Shortspine thornyhead

Males ranged from 10 to 68 cm in length with modes at 24 and 27 cm. Females ranged from 12 to 79 cm in length, with modes at 19, 24 and 27 cm (Fig. 13). Although 767 otoliths were collected, no ageing was performed. Age determination for shortspine thornyhead is extremely uncertain due to the occurrence of false annuli in the otoliths (S. MacLellan, pers. comm.). Similarly, the reproductive stages for *Sebastelobus* are not well understood. For males, testes development is similar to *Sebastes,* with mature fish having brownish flattened, slightly triangular testes. Females are oviparous, rather than ovoviviparous, releasing a gelatinous mass of eggs. Anecdotal reports indicate mid-June to be the peak of egg deposition. Most the fish examined, 51 percent of males and 59 percent of females, were in maturity stage 7 or resting. Males were significantly larger than females. Males and females were significantly larger in depth stratum 3 than in any other.

Yellowmouth

The length frequencies were bimodal for yellowmouth rockfish (Fig. 13). Males ranged from 26 to 52 cm in length, with modes at 31 and 45-46 cm. Females ranged from 28 to 52 cm with modes at 31 and 47 cm. The entire sample of 312 otoliths was aged, with ages ranging from 6 to 67 years for males and 5 to 59 years for females. Two prominent modes occurred in the age distribution, one at age 7 and a second at age 45 (Fig. 17). Minor modes occurred at 15 and 29 years. The dominant age classes correspond to the 1990 and 1952 cohorts, while the minor modes correspond to the 1982 and 1969 year classes. Males were either in developing, (34 percent at stage 3) or running ripe (31 percent at stage 5) maturity stages; females were in developing (53 percent stage 3) or resting (27 percent stage 7) maturity stages. Females were significantly larger than males. There was no significant difference in age composition between the sexes. Both males and females were older at depth.

Other Species

Length frequency histograms for silvergray and sharpchin rockfishes are presented in Fig. 13 and Fig. 14, respectively. Other notable result from the biological sampling include no significant difference in length between sexes for redbanded, shortraker and silvergray rockfishes. Dover sole were significantly larger at depth. Redbanded and shortraker rockfishes were largest in the shallowest depth strata in which they were encountered.

Length-weight relationships for six species are presented in Fig. 18, length-weight regression parameters are presented in Table 21. Growth curves based on the von-Bertalanffy model were superimposed on length at age data plotted in Fig. 19 through Fig. 22. Von-Bertalanffy growth curve parameters are presented in Table 22. The plots for Pacific ocean perch, redstripe rockfish and yellowmouth rockfish suggest differences in length at age between the sexes. Females reach a higher proportion of their asymptotic growth at an earlier age, continuing to increase in length at an age beyond which males have ceased to grow. The growth curves for rougheye rockfish suggest that although females do reach a higher proportion of their astymptotic growth at an earlier age it is the males that continue to grow throughout life. Determining whether this departure from the "normal" rockfish pattern is simply a sampling artifact or real will require more sampling and analysis.

The following samples were collected for other investigations or agencies:

1. Liver tissue samples from 20 Pacific ocean perch and opurcular punches from 100 perch from three distinct locations were collected and stored in 95% ethanol. These fish were collected for the genetics section at the Pacific Biological Station for investigation of stock identification using DNA electrophoresis.

2. The Andrus Gerontology Center and USC in Los Angeles have established a tissue bank for long-lived animals, and rockfishes are among the longest-lived. The west coast of the Queen Charlotte Islands is one of the few remaining areas where old fish are relatively abundant. A total of 80 Pacific ocean perch and 100 rougheye rockfish samples were collected, twenty samples of each species in each estimated 20 year age class. For example 20 age 1-20 POP, 20 age 21-40 POP up to age 80, the age range was extended to 100 years for rougheye rockfish. Age category was guessed using the thickness of the otolith. Heart, liver, muscle and brain tissues were collected from these fish and stored in 95% ethanol.

3. Samples of testes, sperm ducts and intromittant organs were collected for the University of British Columbia from Pacific ocean perch, rougheye and redstripe rockfish. Seven samples of each species were collected for an investigation of proteins in sperm that bind DNA.

4. The Juneau Center for Fisheries and Ocean Sciences has undertaken a coast-wide study of the stock structure of Pacific ocean perch and shortspine thornyhead. As part of this study, heart tissue samples from 40 fish of each species were collected from a single tow at the southern tip of the Queen Charlotte Islands. The samples were stored in a DNA buffer solution of DMSO (Dimethyl Sulfoxide), EDTA (Ethylenediamine-Tetra-Acetic Acid) and NaCl (Sodium Chloride).

DISCUSSION

BIOMASS ESTIMATES

Biomass estimates for Pacific ocean perch obtained from this survey are larger than those observed in 1978 despite almost a decade of intensive fishing pressure with annual landings averaging 1675 tonnes (Richards and Olsen 1996). Interpreting the results of the current survey in the context of previous surveys is complicated by many factors:

1. Changes in vessels and fishing gear. Most vessels operating today have significantly more horsepower than in the past allowing them to tow larger nets at higher speeds over rougher terrain. Net design has changed over time; modern rockfish nets have higher mouth openings, are built of heavier webbing and are fished with heavier groundlines. These factors contribute to increased catching efficiency or allow the exploitation of previously unfished areas.

2. Survey methodology. This survey employed a random, depth-stratified survey design. Surveys completed in 1993 and 1996 (Leaman et al. 1993, 1996) employed a similar stratified random survey design and obtained comparable results. Earlier surveys used a variety of designs, including systematic and "encounter-response" strategies (Leaman and Nagtegaal 1982, 1986). Although the concept of area-swept expansion of catch rates to estimate biomass is essentially unchanged over the last two decades, sample selection, the designation of strata and the survey area have changed.

3. Fish behaviour. Pacific ocean perch are known to aggregate in larger, denser schools when not subject to fishing pressure (Leaman and Stanley 1993). Langara Spit, which comprised 45 percent of the survey area, has been closed to Pacific ocean perch fishing since 1990. Of the estimated Pacific ocean perch biomass, 65 percent or 8,768 tonnes were estimated to occur in the vicinity of Langara Spit. Redstripe rockfish biomass was likewise concentrated on Langara Spit, where 72 percent or 3,703 tonnes were estimated to be present. Although recruitment or growth may have occurred since 1990 (Leaman et al. 1996, 1997), it may be that high catch rates were observed in part due to aggregation of undisturbed fish.

4. Catch estimation. Visual catch estimation may have contributed a positive bias to estimates of total weight. However, this source of bias is probably small relative to other factors.

5. Tow duration. If on-bottom time was not measured accurately, then imprecision in estimates of area fished would contribute to uncertainty in biomass estimates.

Many authors have discussed the problems associated with estimating absolute biomass from fishing survey data (Smith 1981 and references therein). Leaman and Stanley (1993) suggested that trawl survey indices are capable of capturing population trends. The absolute estimate obtained from the survey area is almost three times that obtained in 1978. However, given the slow turnover rate rockfish populations and the scale of removals, it is unlikely that there has been a significant change in biomass over the last two decades.

Future work on surveys should focus on a comprehensive review of historic survey data. This review will be facilitated by entry of historical data into the GFBIO relational database maintained by the Pacific Biological Station to warehouse biological and survey data. Further analysis of the spatial pattern of catch should be undertaken to examine differences in catch rates among the major fishing grounds and among depth strata to refine the survey design. Analysis will be required to determine whether biomass estimates are the most useful indices to be derived from trawl data. Alternative indices such as the number of tows achieving a minimum catch, or the number of tows with zero catch, may also prove to be useful indices (Bannerot and Austin 1983).

BIOLOGICAL SAMPLING

One noteworthy result is the synchronous occurrence of a relatively large proportion of age 7 fish for Pacific ocean perch, yellowmouth and redstripe rockfishes. The absolute magnitude of this year class will not be apparent until examined in the context of an age-structured model. The Fish Ageing Unit at the Pacific Biological Station reports that a relatively strong age 7 cohort is present among several other rockfish species (S. McClellan, per. comm.).

Age distributions for Pacific ocean perch show that the 1952 cohort is still detectable as a dominant year class. However, these fish were encountered in areas not subject to heavy commercial exploitation which suggests that these older fish may exhibit site affinity. Site specific differences in age composition will be the subject of separate analysis. The modal sizes are one centimeter larger than those obtained during the 1996 Langara survey by Leaman et al. (1997). Given the slow growth rate for Pacific ocean perch, it seems unlikely that the modal size would have increased by a centimeter in one year. It is more likely that large, older fish were encountered during this survey in comparison with previous surveys because a large number of tows were completed in areas

that are not traditionally fished. The maturity data indicate that ripening female fish do not co-occur with copulating fish. The relative absence of fertilized females suggests that they undertake a spawning migration either to the mid-water, areas off the continental slope, or into areas that are not trawlable.

The truncated age distributions observed for yellowmouth rockfish raise the possibilities that yellowmouth stocks have experienced heavy fishing pressure. Although poor recruitment could explain the age distributions, it is unlikely that recruitment has been poor for most of the past four decades. Commercial catch of this species peaked in area 5ES in 1977 and has declined since. Similarly, the commercial catch in 5EN peaked in 1986 and has also declined (Richards and Olsen 1996). Age data from Goose Island Gully show a strong 1982 year class, which also appears as a minor mode in these data. Surveys that fished shallower depths using both mid-water and bottom gear would be required to determine the status of this stock, provided the survey provides a valid index.

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TABLES

Table 1. Depth interval, area, and numbers of tows per stratum. Each sampling unit was of dimension 2 km by 2 km.

Stratum	Depth Interval (fa)	Depth Interval (m)	Area nm^2	Proportion of total area.	Number of sampling units	Number of tows
1	100 – 150	180 - 275	363	38.3	311	21
2	151 – 200	275 - 365	260	27.4	223	40
3	201 – 250	365 - 460	217	22.9	186	31
4	251 – 325	460 - 625	109	11.5	93	15

Table 2. Species catches (kg) for each leg of the charter. The validation record and estimated catch (Est. catch) data for the first leg of the charter, offloaded in Prince Rupert, B.C., include tows 1 through 69. Data for the second leg of the charter, offloaded in Bellingham, Washington, include tows 70 through 106 and ten additional "payfish tows" intended to catch the research allocation for the survey.

Species	Prince Rupert validation	Est. catch	Difference	Bellingham validation	Est. catch	Difference	Total landed	Total est. catch	Sample weight
Pacific ocean perch	23790	25885	2095	26953	23764	-3189	50743	49649	3670
Rougheye rockfish	8698	10878	2180	4239	5149	910	12937	16027	4068
Redstripe rockfish	2044	5113	3069	1057	1846	789	3101	6959	363
Silvergrey rockfish	3329	3232	-97	7167	8065	898	10496	11297	1085
Sharpchin rockfish	336	2704	2368	15	475	460	351	3179	160
Shortspine Thornyhead	1279	2242	963	523	801	278	1802	3043	1114
Dover sole	283	1442	1159	592	1665	1073	875	3107	326
Canary rockfish	837	1239	402	1406	1795	389	2243	3034	396
Yellowmouth rockfish	390	599	209	11248	10155	-1093	11638	10754	524
Redbanded rockfish	366	573	207	279	404	125	645	977	79
Shortraker rockfish	75	328	253	342	582	240	417	910	439
Lingcod	39	233	194	120	210	90	159	443	
Splitnose rockfish	0	181	181	59	345	286	59	526	73
Widow rockfish	25	52	27	563	786	223	588	838	40
Rosethorn rockfish	0	50	50	0	61	61	0	111	
Darkblotch rockfish	56	38	-18	32	116	84	88	154	
Bocacio	5	35	30	242	74	-168	247	109	
Petrale sole	12	20	8	1	3	2	13	23	
Yellowtail rockfish	0	11	11	1822	1831	9	1822	1842	
Longnose skate	0	0	0	0	102	102	0	102	
Big Skate	0	0	0	49	0	-49	49	0	
Pacific Cod	0	0	0	24	312	288	24	312	
Pollock	0	0	0	7	143	136	7	143	
English sole	0	0	0	100	39	-61	100	39	
Turbot	0	0	0	1644	4985	3341	1644	4985	
Yelloweye rockfish	7	0	-7	24	0	-24	31	0	
Total	41571	54855	13284	58508	63708	5200	100079	118563	12342

Table 3. Total catch weight (kg) by species for all hauls. Catch weights are in kilograms, % Total is the percentage of the total catch of all species for each given species, and Hauls is the number of hauls in which the species occurred.

Code	Common name	Taxonomic Name	Catch	% Total	Hauls
396	Pacific ocean perch	*Sebastes alutus*	34604	37.48	71
394	Rougheye rockfish	*Sebastes aleutianus*	15905	17.23	84
405	Silvergray rockfish	*Sebastes brevispinis*	7341	7.95	40
439	Redstripe rockfish	*Sebastes proriger*	6082	6.59	17
602	Turbot	*Atheresthes stomias*	5277	5.72	88
451	Shortspine thornyhead	*Sebastolobus alascanus*	2966	3.21	88
437	Canary rockfish	*Sebastes pinniger*	2873	3.11	9
450	Sharpchin rockfish	*Sebastes zacentrus*	2773	3.00	28
440	Yellowmouth rockfish	*Sebastes reedi*	2496	2.70	19
626	Dover sole	*Microstomus pacificus*	1741	1.89	84
225	Hake	*Merluccius productus*	1733	1.88	83
455	Sablefish	*Anoplopoma fimbria*	1663	1.80	73
614	Halibut	*Hippoglosssus stenolepis*	1463	1.58	25
610	Rex sole	*Glyptocephalus zachirus*	893	0.97	87
403	Shortraker rockfish	*Sebastes borealis*	714	0.77	28
401	Redbanded rockfish	*Sebastes babcocki*	680	0.74	52
412	Splitnose rockfish	*Sebastes diploproa*	526	0.57	4
222	Pacific cod	*Gadus macrocephalus*	438	0.47	19
467	Lingcod	*Ophiodon elongatus*	393	0.43	12
417	Widow rockfish	*Sebastes entomelas*	376	0.41	10
228	Pollock	*Theragra chalcogramma*	224	0.24	31
446	Harlequin rockfish	*Sebastes variegatus*	182	0.20	16
59	Long nose skate	*Raja rhina*	175	0.19	15
92A	Squid	*Teuthoidea (Order)*	139	0.15	44
418	Yellowtail rockfish	*Sebastes flavidus*	129	0.14	6
421	Rosethorn rockfish	*Sebastes helvomaculatus*	102	0.11	38
66	Ratfish	*Hydrolagus colliei*	78	0.08	19
410	Darkblotch rockfish	*Sebastes crameri*	67	0.07	6
435	Boccacio rockfish	*Sebastes paucispinis*	53	0.06	3
58	Sandpaper skate	*Raja kincaidi*	50	0.05	11
519	Blackfin Sculpin	Malacocottus kincaidi	47	0.05	40
249	Rattail	*Macrouridae (Family)*	39	0.04	5
607	Petrale (Brill) sole	*Eopsetta jordani*	20	0.02	3
44	Dogfish	*Squalus acanthias*	15	0.02	4
427	Blackgill rockfish	*Sebastes melanostomus*	14	0.02	6
625	Slender sole	*Lyopsetta exilis*	12	0.01	12
220	Pacific flatnose	*Antimora microllepis*	7	0.01	5
453	Longspine thornyhead	*Sebastolobus altivelis*	7	0.01	7
96	Pacific herring	*Clupea harengus*	7	0.01	1
97A	Octopus	*Octopoda (Order)*	6	0.01	2
231	Eelpout	*Zoarcidae (Family)*	5	0.01	4
400	Aurora rockfish	*Sebastes aurora*	5	0.01	4
414	Greenstripe rockfish	*Sebastes elongatus*	5	0.01	3
605	Deepsea sole	*Embassichthys bathybius*	2	0.00	2
628	Lemon (English) sole	*Parophrys vetulus*	2	0.00	2
SEE	Sidestrip shrimp	*Pandalus dispar*	2	0.00	2
38	Brown cat shark	*Apisturus brunneus*	1	0.00	1
621	Rock sole	*Lepidopsetta bilileata*	1	0.00	1
Total Catch all species			92333		

Table 4. Catch composition by species for rockfish. Weights are in kilograms and the proportion is the proportion of the rockfish catch only.

Code	Common Name	Catch	% Rockfish	Hauls
396	Pacific ocean perch	34604	44.42	71
394	Rougheye rockfish	15905	20.42	84
405	Silvergray rockfish	7341	9.42	40
439	Redstripe rockfish	6082	7.81	17
451	Shortspine thornyhead	2966	3.81	88
437	Canary rockfish	2873	3.69	9
450	Sharpchin rockfish	2773	3.56	28
440	Yellowmouth rockfish	2496	3.20	19
403	Shortraker rockfish	714	0.92	28
401	Redbanded rockfish	680	0.87	52
412	Splitnose rockfish	526	0.68	4
417	Widow rockfish	376	0.48	10
446	Harlequin rockfish	182	0.23	16
418	Yellowtail rockfish	129	0.17	6
421	Rosethorn rockfish	102	0.13	38
410	Darkblotch rockfish	67	0.09	6
435	Boccacio rockfish	53	0.07	3
427	Blackgill rockfish	14	0.02	6
453	Longspine thornyhead	7	0.01	5
414	Greenstripe rockfish	5	0.01	3
400	Aurora rockfish	5	0.01	4

Table 5. Species catch weight (kg) by strata for target rockfish species.

Species	Stratum	Catch weight
Rougheye rockfish	1	69
Rougheye rockfish	2	6623
Rougheye rockfish	3	6805
Rougheye rockfish	4	2408
Pacific ocean perch	1	9350
Pacific ocean perch	2	23313
Pacific ocean perch	3	1813
Pacific ocean perch	4	128
Redstripe rockfish	1	6062
Redstripe rockfish	2	11
Redstripe rockfish	4	1
Yellowmouth rockfish	1	2128
Yellowmouth rockfish	2	368
Shortspine thornyhead	1	92
Shortspine thornyhead	2	1434
Shortspine thornyhead	3	1021
Shortspine thornyhead	4	419

Table 6. Bootstrapped biomass estimates (mean and 95% confidence intervals) for selected slope rockfish species by stratum for the west coast of the Queen Charlotte Islands.

Species	Stratum	Biomass (t)	95% Confidence limits	
Pacific ocean perch	1	6,341	1,396	22,598
	2	5,595	3,123	12,281
	3	598	272	1,384
	4	43	0	127
	All strata	12,577	6,625	28,621
Redstripe rockfish	1	5,556	618	13,682
	2	-	-	-
	3	-	-	-
	4	-	-	-
	All strata	5,556	618	13,682
Rougheye rockfish	1	26	7	54
	2	1,923	982	3,519
	3	2,107	1,236	4,075
	4	770	404	1,397
	All strata	4,826	3,373	6,845
Shortspine thornyhead	1	33	7	118
	2	415	309	606
	3	339	242	557
	4	134	99	211
	All strata	921	760	1,203

Tows used to calculate biomass for the survey area:
1, 2, 3, 4, 5, 7, 8, 9, 10 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 90, 91, 92, 93, 94, 95, 96, 97, 98, 100, 101, 102, 106.

Table 7. Bootstrapped biomass estimates (mean and 95% confidence intervals) for selected slope rockfish species by stratum for the Langara region off the north west coast of Graham Island.

Species	Stratum	Biomass (t)	95% Confidence limits	
Pacific ocean perch	1	4,735	550	15,779
	2	3,781	1,769	9,196
	3	378	136	1,070
	4	26	0	54
	All strata	8,921	4,032	20,433
Redstripe rockfish	1	3,664	19	10,269
	2	-	-	-
	3	-	-	-
	4	-	-	-
	All strata	3,664	19	10,269
Rougheye rockfish	1	12	0	29
	2	1,168	516	2,447
	3	651	329	1,535
	4	92	26	182
	All strata	1,923	1,162	3,340
Shortspine thornyhead	1	23	0	66
	2	216	150	342
	3	163	118	244
	4	47	27	81
	All strata	450	356	589

Tows used to calculate biomass for the Langara spit portion of the study area:
3, 4, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78.

Table 8. Bootstrapped biomass estimates (mean and 95% confidence intervals) for selected slope rockfish species by stratum for the Langara region off the north west tip of Graham Island. Estimates were calculated using after post stratification to facilitate comparison with the 1996 survey by Leaman et al. (1997).

		1997 Survey			1996 Survey		
Species	Stratum	Biomass (t)	Confidence	limits	Biomass (t)	Confidence	limits
Pacific ocean	1	295	182	503	371	110	939
Perch	2	116	30	208	2,043	985	3,578
	3	7,977	2,776	17,048	2,976	1,778	6,562
	4	136	71	180	538	52	1,452
	5	340	164	580	1,580	387	3,988
	6	28	0	77	1,184	183	2,919
	All Strata	8,893	3,667	17,880	8,662	5,611	11,957
Redstripe	1	-	-	-	27	4	89
Rockfish	2	-	-	-	-	-	-
	3	2,528	1	7,283	1	0	2
	4	-	-	-	13	0	25
	5	-	-	-	1	0	2
	6	481	0	1,370	10	0	20
	All Strata	3,009	14	8,185	51	11	100
Rougheye	1	194	90	309	-	-	-
Rockfish	2	576	255	987	242	17	684
	3	112	30	237	3	0	10
	4	23	0	66	-	-	-
	5	609	266	1,060	610	20	1,785
	6	0	0	0	5	0	9
	All Strata	1,513	975	2,128	860	87	2,089
Shortspine	1	9	5	14	-	-	-
Thornyhead	2	54	33	82	47	18	118
	3	225	122	387	171	111	233
	4	35	11	58	19	17	21
	5	376	255	594	420	245	645
	6	2	0	6	102	58	165
	All Strata	701	519	947	760	542	987

Tows used to calculate biomass for Langara spit using the stratification scheme, study area boundaries and bottom area estimates of Leaman et al. 1996. Langara - post stratified:
1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 14, 15, 16, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78.

Table 9. Estimates of biomass in metric tonnes for Langara Spit. Bootstrapped 95% confidence intervals are presented for the 1993, 1996 and 1997 surveys.

Year	Pacific ocean perch	Rougheye rockfish	Redstripe rockfish	Shortspine thornyhead
97	8893	1513	3009	466
	3667-17880	975-2128	14-8185	354-601
96[1]	8662	860	51	760
	5611-11957	87-2089	11-101	542-987
93[2]	6143	337	84	428
	3880-9033	48-843	26-152	276-594
83[3]	1184	n/a	18	n/a
79[4]	4151	451	243	264
79[5]	1808	1157	76	391

[1] These figures are from the 1996 R/V W.E. RICKER - Leaman et al., 1997.
[2] These figures are from the 1993 R/V W.E. RICKER - Leaman et al., 1996.
[3] These figures are from the 1983 M/V FREE ENTERPRISE charter Leaman and Nagtagaal, 1986.
[4] These figures are from the 1979a M/V SCOTIA BAY charter - Leaman and Nagtegaal, 1986.
[5] These figures are from the 1979b M/V BLUE WATERS charter - Leaman and Nagtegaal, 1986

Table 10. Biomass estimates for the entire west coast of the Queen Charlotte Islands. Biomass is expressed in metric tons. Bootstrapped 95% confidence intervals are presented for the 1997 survey.

Year	Pacific ocean perch	Rougheye rockfish	Redstripe rockfish	Shortspine thornyhead
97	13417	4881	5152	954
	6998-25494	3388-6970	621-13283	780-1195
79[1]	4683	2368	2382	636
78[2]	2473	507	397	282

[1] These figures are the sum of published figures for the 1979 M/V BLUE WATERS charter - Leaman and Nagtegaal, 1982, and Leaman and Nagtegaal, 1986.
[2] These figures are from the 1978 M/V BLUE WATERS charter Leaman and Nagtegaal, 1982. They represent an estimate for only the southern half of the study area from 54°N southward.

Table 11. Bootstrapped CPUE estimates (mean and 95% confidence intervals) for selected species by stratum for the west coast of the Queen Charlotte Islands.

Species	Stratum	CPUE (kg/h)	95 % Confidence limits	
Pacific ocean perch	1	1,744.26	302.36	3,912.38
	2	2,043.98	857.26	3,661.46
	3	242.46	98.28	444.42
	4	31.74	0.00	96.00
	All strata	1,159.76	591.14	1,846.90
Redstripe rockfish	1	1,192.89	179.21	2,910.09
	2	0.06	0.00	0.22
	3	0.00	0.00	0.00
	4	0.13	0.00	0.38
	All strata	238.62	35.88	582.06
Rougheye rockfish	1	13.10	2.97	27.97
	2	695.52	289.18	1,128.99
	3	857.88	429.76	1,437.44
	4	623.23	279.17	1,021.44
	All strata	595.28	386.03	806.05
Shortspine thornyhead	1	16.21	1.53	38.09
	2	148.39	101.51	201.64
	3	133.73	85.73	197.31
	4	110.53	72.25	159.22
	All strata	112.02	87.06	139.18

Tows used to calculate biomass for the survey area:
1, 2, 3, 4, 5, 7, 8, 9, 10 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 90, 91, 92, 93, 94, 95, 96, 97, 98, 100, 101, 102, 106.

Table 12. Bootstrapped CPUE estimates (mean and 95% confidence intervals) for selected species by stratum for the Langara region off the north west tip of Graham Island. Results from the 1996 survey are presented for comparison.

Species	Stratum	1997 Survey CPUE (kg/h)	1997 Survey 95% Confidence limits		1996 Survey CPUE (kg/h)	1996 Survey 95% Confidence limits	
Pacific ocean perch	1	3,745.90	2,017.33	5,837.38	4,675.68	1,514.57	12,883.61
	2	247.88	53.52	448.76	4,717.47	2,274.95	8,265.54
	3	3,626.00	881.05	7,315.73	1,443.81	862.66	3,183.39
	4	790.60	400.00	1,144.00	3,447.19	332.29	9,298.29
	5	165.13	71.99	273.27	788.57	193.15	1,989.70
	6	37.03	0.00	100.52	1,367.00	211.49	3,370.86
	All Strata	1,447.77	672.98	2,456.25	1,549.61	1,003.09	2,140.17
Redstripe rockfish	1	-	-	-	372.52	54.82	1,222.03
	2	-	-	-	-	-	-
	3	921.26	0.24	2,803.37	0.39	0.00	1.16
	4	-	-	-	80.75	0.00	161.51
	5	-	-	-	0.40	0.00	0.80
	6	519.56	0.00	1,598.27	11.50	0.00	23.01
	All Strata	293.42	1.58	843.10	9.27	2.06	18.25
Rougheye rockfish	1	2,590.80	1,172.24	4,092.11	-	-	-
	2	1,229.79	522.36	1,988.32	559.68	38.42	1,580.39
	3	49.83	13.09	103.22	1.68	0.00	5.04
	4	131.79	0.00	380.00	-	-	-
	5	286.52	122.88	496.17	304.21	10.18	890.57
	6	0.00	0.00	0.00	5.48	0.00	10.43
	All Strata	523.47	349.88	709.13	151.92	15.38	368.83
Shortspine thornyhead	1	113.43	59.49	167.88	0.98	0.00	2.93
	2	115.22	67.34	168.33	108.84	41.55	272.43
	3	98.29	46.45	158.55	82.89	53.87	113.00
	4	199.62	64.00	448.00	123.06	109.50	134.63
	5	177.48	107.77	264.70	209.71	122.22	321.58
	6	2.74	0.00	8.00	118.12	66.67	191.05
	All Strata	127.31	93.87	163.69	135.17	96.70	175.27

Tows used to calculate biomass for Langara spit using the stratification scheme, study area boundaries and bottom area estimates of Leaman et al. 1996. Langara - post stratified:
1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 14, 15, 16, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78.

Table 13. Numbers of fish sampled for length and sex (L/S) or length, sex, maturity and double sagittal otoliths (L/S/M/O) during the 1997 west coast of the Queen Charlotte Islands biomass survey.

Species	L/S	L/S/M/O
Pacific cod	54	0
Rougheye rockfish	1638	824
Pacific ocean perch	2623	1242
Redbanded rockfish	0	44
Shortraker rockfish	0	93
Silvergray rockfish	192	387
Splitnose rockfish	113	50
Widow rockfish	0	18
Canary rockfish	0	153
Redstripe rockfish	338	294
Yellowmouth rockfish	66	313
Sharpchin rockfish	435	50
Shortspine thornyhead	1886	767
Dover sole	238	199

Table 14. Summary of samples collected by species and stratum.

Species	Stratum	LSMO	LS
Pacific cod	1	0	54
Rougheye rockfish	2	270	460
Rougheye rockfish	3	417	720
Rougheye rockfish	4	137	458
Pacific ocean perch	1	335	756
Pacific ocean perch	2	685	1555
Pacific ocean perch	3	172	312
Redbanded rockfish	1	17	0
Redbanded rockfish	2	27	0
Shortraker rockfish	2	9	0
Shortraker rockfish	3	19	0
Shortraker rockfish	4	65	0
Silvergray rockfish	1	387	192
Splitnose rockfish	2	50	113
Widow rockfish	1	18	0
Canary rockfish	1	153	0
Redstripe rockfish	1	294	338
Yellowmouth rockfish	1	181	66
Yellowmouth rockfish	2	132	0
Sharpchin rockfish	1	50	435
Shortspine thornyhead	1	10	0
Shortspine thornyhead	2	310	634
Shortspine thornyhead	3	322	626
Shortspine thornyhead	4	125	626
Dover sole	2	0	52
Dover sole	3	130	136
Dover sole	4	69	50

Table 15. Summary statistics for length (cm) by species sampled during the west coast Queen Charlotte Islands survey, September 5 to 23, 1997.

Species	N	Mean	Standard Deviation	Minimum.	Maximum.	Median	Mode
Pacific cod	54	64.48	7.54	50	79	66	70
Rougheye rockfish	2462	46.56	4.36	19	72	46	45
Pacific ocean perch	3865	39.57	4.18	18	51	40	39
Redbanded rockfish	44	44.43	9.62	16	59	46.5	44
Shortraker rockfish	93	62.72	12.77	10	97	59	57
Silvergray rockfish	579	50.98	4.42	39	67	50	50
Splitbnose rockfish	163	30.07	2.55	24	39	30	30
Widow rockfish	18	54.06	3.61	48	60	53	51
Canary rockfish	153	52.73	3.71	42	64	53	51
Redstripe rockfish	632	33.95	4.22	24	44	34	34
Yellowmouth rockfish	379	44.05	5.11	26	52	45	48
Sharpchin rockfish	485	25.90	5.02	15	39	25	23
Shortspine thornyhead	2653	26.84	6.94	10	79	26	24
Dover sole	437	42.85	4.64	31	59	42	42

Table 16. Summary statistics for length (cm) by species and strata sampled during the west coast Queen Charlotte Islands survey, September 5 to 23, 1997.

Species	Stratum	N	Mean	Standard deviation	Min.	Max.	Median	Mode
Pacific cod	1	54	64.48	7.54	50	79	66	70
Rougheye rockfish	2	730	45.91	5.11	19	72	46	45
Rougheye rockfish	3	1137	46.74	3.99	23	69	46	46
Rougheye rockfish	4	595	47.03	3.91	32	65	47	47
Pacific ocean perch	1	1091	38.38	5.16	18	50	39	39
Pacific ocean perch	2	2290	39.86	3.59	18	51	40	38
Pacific ocean perch	3	484	40.85	3.60	30	50	40.5	39
Redbanded rockfish	1	17	48.82	5.53	37	59	49	44
Redbanded rockfish	2	27	41.67	10.66	16	57	44	47
Shortraker rockfish	2	9	74.00	12.85	57	95	79	57
Shortraker rockfish	3	19	71.53	18.90	10	97	74	59
Shortraker rockfish	4	65	58.58	7.41	45	82	57	55
Silvergray rockfish	1	579	50.98	4.42	39	67	50	50
Splitbnose rockfish	2	163	30.07	2.55	24	39	30	30
Widow rockfish	1	18	54.06	3.61	48	60	53	51
Canary rockfish	1	153	52.73	3.71	42	64	53	51
Redstripe rockfish	1	632	33.95	4.22	24	44	34	34
Yellowmouth rockfish	1	247	43.33	5.88	26	52	45	46
Yellowmouth rockfish	2	132	45.41	2.75	38	52	45	48
Sharpchin rockfish	1	485	25.90	5.02	15	39	25	23
Shortspine thornyhead	1	10	28.70	9.36	13	50	27.5	26
Shortspine thornyhead	2	944	26.15	6.64	12	75	25	24
Shortspine thornyhead	3	948	27.91	6.91	10	71	28	27
Shortspine thornyhead	4	751	26.32	7.14	12	79	26	24
Dover sole	2	52	42.17	3.33	34	48	42	42
Dover sole	3	266	42.34	4.58	31	55	42	42
Dover sole	4	119	44.29	4.98	36	59	44	42

Table 17. Summary statistics for length (cm) by species, strata and sex sampled during the west coast Queen Charlotte Islands survey, September 5 to 23, 1997.

Species	Stratum	Sex	N	Mean	Std. Dev.	Min.	Max.	Med.	Mode
Pacific cod	1	0	54	64.48	7.54	50	79	66	70
Rougheye rockfish	2	1	345	45.70	5.03	26	63	46	45
Rougheye rockfish	3	1	576	46.71	4.02	23	69	46	46
Rougheye rockfish	4	1	313	47.29	3.85	33	65	47	49
Rougheye rockfish	2	2	385	46.10	5.19	19	72	46	45
Rougheye rockfish	3	2	561	46.77	3.97	26	66	47	45
Rougheye rockfish	4	2	282	46.73	3.95	32	61	47	47
Pacific ocean perch	1	1	522	37.44	4.31	18	45	38	39
Pacific ocean perch	2	1	1194	39.15	3.10	18	49	39	38
Pacific ocean perch	3	1	210	39.09	2.24	31	46	39	38
Pacific ocean perch	1	2	569	39.25	5.71	19	50	40	39
Pacific ocean perch	2	2	1095	40.65	3.91	20	51	41	40
Pacific ocean perch	3	2	274	42.21	3.85	30	50	42	43
Pacific ocean perch	2	3	1	33.00	.	33	33	33	33
Redbanded rockfish	1	1	10	46.90	2.88	43	52	46.5	44
Redbanded rockfish	2	1	16	42.56	6.86	28	51	44	44
Redbanded rockfish	1	2	7	51.57	7.35	37	59	54	37
Redbanded rockfish	2	2	11	40.36	14.89	16	57	42	41
Shortraker rockfish	2	1	5	75.40	8.02	65	84	79	65
Shortraker rockfish	3	1	9	69.00	8.73	59	84	69	59
Shortraker rockfish	4	1	27	59.85	7.04	47	79	59	59
Shortraker rockfish	2	2	4	72.25	18.64	57	95	68.5	57
Shortraker rockfish	3	2	10	73.80	25.19	10	97	77.5	75
Shortraker rockfish	4	2	38	57.68	7.62	45	82	56	52
Silvergray rockfish	1	1	279	50.61	4.10	39	63	50	50
Silvergray rockfish	1	2	300	51.33	4.68	39	67	51	50
Splitbnose rockfish	2	1	64	29.16	2.33	25	39	29	29
Splitbnose rockfish	2	2	99	30.66	2.52	24	37	31	31
Widow rockfish	1	1	9	51.00	1.58	48	53	51	51
Widow rockfish	1	2	9	57.11	2.03	53	60	57	56
Canary rockfish	1	1	93	51.48	3.17	42	58	52	51
Canary rockfish	1	2	59	54.61	3.70	47	64	55	57
Canary rockfish	1	.	1	57.00	.	57	57	57	57
Redstripe rockfish	1	1	256	31.33	2.87	24	37	32	33
Redstripe rockfish	1	2	376	35.73	4.06	26	44	37	38
Yellowmouth rockfish	1	1	117	43.10	5.24	29	50	45	46
Yellowmouth rockfish	2	1	64	44.92	2.51	38	52	45	44
Yellowmouth rockfish	1	2	130	43.53	6.42	26	52	46	48

Table 17... cont'd

Species	Stratum	Sex	N	Mean	Std. Dev.	Min.	Max.	Med.	Mode
Yellowmouth rockfish	2	2	68	45.87	2.90	38	51	47	48
Sharpchin rockfish	1	1	161	23.97	3.41	16	34	24	27
Sharpchin rockfish	1	2	323	26.89	5.38	15	39	26	23
Sharpchin rockfish	1	3	1	17.00	.	17	17	17	17
Shortspine thornyhead	1	1	7	25.57	6.65	13	34	26	26
Shortspine thornyhead	2	1	577	26.32	6.00	13	62	26	24
Shortspine thornyhead	3	1	489	28.32	6.24	10	51	28	27
Shortspine thornyhead	4	1	420	26.67	6.63	12	68	27	24
Shortspine thornyhead	1	2	3	36.00	12.12	29	50	29	29
Shortspine thornyhead	2	2	362	25.99	7.51	12	75	25	24
Shortspine thornyhead	3	2	438	28.09	7.18	14	71	27	27
Shortspine thornyhead	4	2	326	26.01	7.69	12	79	25	24
Shortspine thornyhead	2	3	5	17.00	1.58	15	19	17	15
Shortspine thornyhead	3	3	21	14.90	1.70	13	20	15	14
Shortspine thornyhead	4	3	5	16.80	2.49	15	20	15	15
Dover sole	2	1	48	41.83	3.21	34	48	42	42
Dover sole	3	1	208	41.43	3.91	31	51	41	41
Dover sole	4	1	86	42.40	3.65	36	49	42	42
Dover sole	2	2	4	46.25	1.71	44	48	46.5	44
Dover sole	3	2	58	45.60	5.30	32	55	46	46
Dover sole	4	2	33	49.24	4.58	39	59	49	48

Table 18. Summary statistics for length by species and sex sampled during the west coast Queen Charlotte Islands survey, September 5 to 23, 1997.

Species	Sex	N	Mean	Std. Dev.	Min.	Max.	Med.	Mode
Pacific cod	0	54	64.48	7.54	50	79	66	70
Rougheye rockfish	1	1234	46.58	4.32	23	69	46	46
Rougheye rockfish	2	1228	46.55	4.39	19	72	47	45
Pacific ocean perch	1	1926	38.68	3.48	18	49	39	38
Pacific ocean perch	2	1938	40.46	4.60	19	51	41	39
Pacific ocean perch	3	1	33.00	.	33	33	33	33
Redbanded rockfish	1	26	44.23	5.99	28	52	46	44
Redbanded rockfish	2	18	44.72	13.46	16	59	49.5	41
Shortraker rockfish	1	41	63.76	9.35	47	84	61	59
Shortraker rockfish	2	52	61.90	14.96	10	97	57	52
Silvergray rockfish	1	279	50.61	4.10	39	63	50	50
Silvergray rockfish	2	300	51.33	4.68	39	67	51	50
Splitbnose rockfish	1	64	29.16	2.33	25	39	29	29
Splitbnose rockfish	2	99	30.66	2.52	24	37	31	31
Widow rockfish	1	9	51.00	1.58	48	53	51	51
Widow rockfish	2	9	57.11	2.03	53	60	57	56
Canary rockfish	.	1	57.00	.	57	57	57	57
Canary rockfish	1	93	51.48	3.17	42	58	52	51
Canary rockfish	2	59	54.61	3.70	47	64	55	57
Redstripe rockfish	1	256	31.33	2.87	24	37	32	33
Redstripe rockfish	2	376	35.73	4.06	26	44	37	38
Yellowmouth rockfish	1	181	43.75	4.54	29	52	45	46
Yellowmouth rockfish	2	198	44.33	5.58	26	52	46	48
Sharpchin rockfish	1	161	23.97	3.41	16	34	24	27
Sharpchin rockfish	2	323	26.89	5.38	15	39	26	23
Sharpchin rockfish	3	1	17.00	.	17	17	17	17
Shortspine thornyhead	1	1493	27.07	6.32	10	68	27	24
Shortspine thornyhead	2	1129	26.84	7.52	12	79	26	24
Shortspine thornyhead	3	31	15.55	2.00	13	20	15	15
Dover sole	1	342	41.73	3.77	31	51	42	42
Dover sole	2	95	46.89	5.22	32	59	47	48

Table 19. Summary statistics of age by species, stratum and sex sampled during the West coast Queen Charlotte Islands survey, September 5 to 23, 1997.

Species	Stratum	Sex	N	Mean	Std. Dev.	Min.	Max.	Med.	Mode
Rougheye rockfish			423	36.88	16.72	8	119	34	35
Pacific ocean perch			621	19.62	13.96	3	87	15	10
Redstripe rockfish			292	15.53	5.91	5	43	15	15
Yellowmouth rockfish			312	26.76	13.40	5	67	27	7
Rougheye rockfish	2		148	34.05	14.48	8	119	33.5	35
Rougheye rockfish	3		207	37.22	17.29	10	118	34	29
Rougheye rockfish	4		68	42.03	18.35	16	96	40	32
Pacific ocean perch	1		167	15.69	10.42	3	55	13	7
Pacific ocean perch	2		370	20.68	15.05	4	87	16	13
Pacific ocean perch	3		84	22.81	13.59	8	73	20	21
Yellowmouth rockfish	1		181	22.51	13.32	5	67	19	7
Yellowmouth rockfish	2		131	32.62	11.16	11	59	32	45
Rougheye rockfish	2	1	77	33.68	16.47	12	119	32	35
Rougheye rockfish	3	1	112	39.63	20.25	10	118	34.5	22
Rougheye rockfish	4	1	44	43.64	19.54	16	96	40	29
Rougheye rockfish	2	2	71	34.45	12.08	8	87	35	35
Rougheye rockfish	3	2	95	34.39	12.49	14	79	33	29
Rougheye rockfish	4	2	24	39.08	15.90	17	91	38	48
Pacific ocean perch	1	1	75	13.52	7.83	3	52	12	7
Pacific ocean perch	2	1	174	22.68	17.05	4	87	16	10
Pacific ocean perch	3	1	41	20.24	9.87	10	48	16	12
Pacific ocean perch	1	2	92	17.46	11.89	3	55	13.5	7
Pacific ocean perch	2	2	195	18.96	12.81	7	82	14	13
Pacific ocean perch	3	2	43	25.26	16.11	8	73	21	21
Yellowmouth rockfish	1	1	89	23.25	13.67	6	67	19	7
Yellowmouth rockfish	2	1	64	32.13	10.73	14	54	31	45
Yellowmouth rockfish	1	2	92	21.80	13.00	5	48	20	7
Yellowmouth rockfish	2	2	67	33.09	11.61	11	59	33	45
Rougheye rockfish		1	233	38.42	19.21	10	119	35	36
Rougheye rockfish		2	190	35.01	12.84	8	91	34	29
Pacific ocean perch		1	290	19.97	14.78	3	87	15	11
Pacific ocean perch		2	330	19.36	13.22	3	82	16	21
Redstripe rockfish		1	123	16.19	6.55	5	40	15	15
Redstripe rockfish		2	169	15.06	5.37	6	43	15	15
Yellowmouth rockfish		1	153	26.96	13.24	6	67	27	7
Yellowmouth rockfish		2	159	26.56	13.60	5	59	28	7

Table 20. Summary of maturity data for all species.

Species name	Specimen sex / Specimen maturity stage												
	1							2					
	1	2	3	4	5	6	7	1	2	3	5	6	7
Canary rockfish	0	2	22	0	38	31	0	3	10	38	1	0	7
Dover sole	0	1	42	8	79	16	10	6	12	19	1	0	5
Pacific cod	0	0	0	0	0	0	0	0	0	0	0	0	0
Pacific Ocean Perch	26	31	35	8	14	446	10	38	95	486	0	0	2
Redbanded rockfish	1	2	18	3	0	0	2	6	1	4	0	0	7
Redstripe rockfish	0	3	56	9	11	45	1	18	17	54	0	1	79
Rougheye rockfish	19	58	178	24	2	82	56	105	146	102	0	1	51
Sharpchin rockfish	2	6	17	0	0	0	0	1	10	3	0	0	10
Shortraker rockfish	0	1	18	3	3	14	2	1	2	28	0	0	21
Shortspine thornyhead	24	69	54	24	0	39	221	31	77	9	0	17	196
Silvergray rockfish	5	8	127	9	0	0	32	10	9	17	0	0	170
Splitnose rockfish	0	0	18	3	0	0	1	4	9	8	0	0	7
Widow rockfish	0	0	7	2	0	0	0	0	0	2	0	0	7
Yellowmouth rockfish	15	1	52	16	47	20	2	26	7	84	0	0	43

Table 21: Length weight parameters for 6 rockfish species. The relationship is:

$$w_i = \alpha l_i^{\beta} \quad ,$$

where w_i = the weight of fish i, l_i = the length of fish i and α and β are regression parameters corresponding to the intercept and slope of the linearized model.

Species	Intercept (α)	Exponent (β)
Pacific ocean perch	0.007479	24.04283
Redstripe	0.015396	19.28697
Rougheye	0.013321	20.98572
Shortspine thornyhead	0.007311	23.562
Silvergray	0.016521	19.20247
Yellowmouth	0.012648	21.43446

Table 22: Length at age Von Bertalanffy parameters by sex for 4 species of rockfish. The relationship is :

$$l_t = l_\infty \left[1 - e^{-K(t-t_0)}\right] \quad ,$$

where l_t is the length at time t, l_∞ is the asymptotic body length, K is the Brody growth coefficient, and t_0 allows for non-zero length at age 0.

Species	N	Sex	l_∞	K	t_0
Rougheye rockfish	190	F	511.2041	0.063466	-6.7524
	233	M	530.1675	0.042235	-17.1006
Pacific ocean perch	315	F	458.3416	0.139577	-1.5733
	280	M	418.2303	0.169057	-1.1564
Redstripe rockfish	169	F	397.4181	0.178514	-1.2669
	123	M	340.8826	0.147876	-5.0686
Yellowmouth rockfish	159	F	463.6244	0.248463	2.1420
	153	M	451.7764	0.216811	1.0915

FIGURES

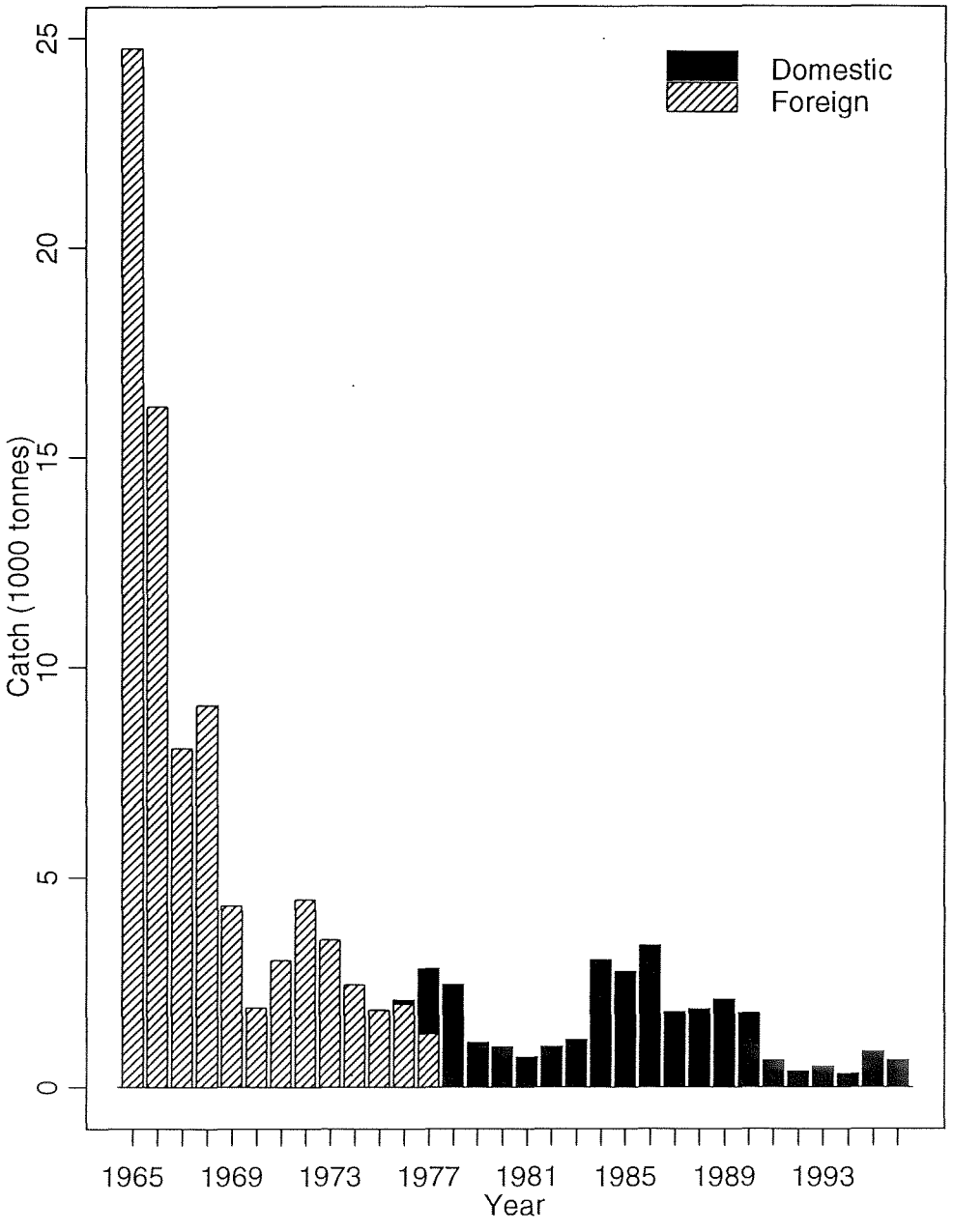

Fig. 1. Historic foreign and domestic catches in Area 5E (west coast of Queen Charlotte Islands) from 1965 to 1996.

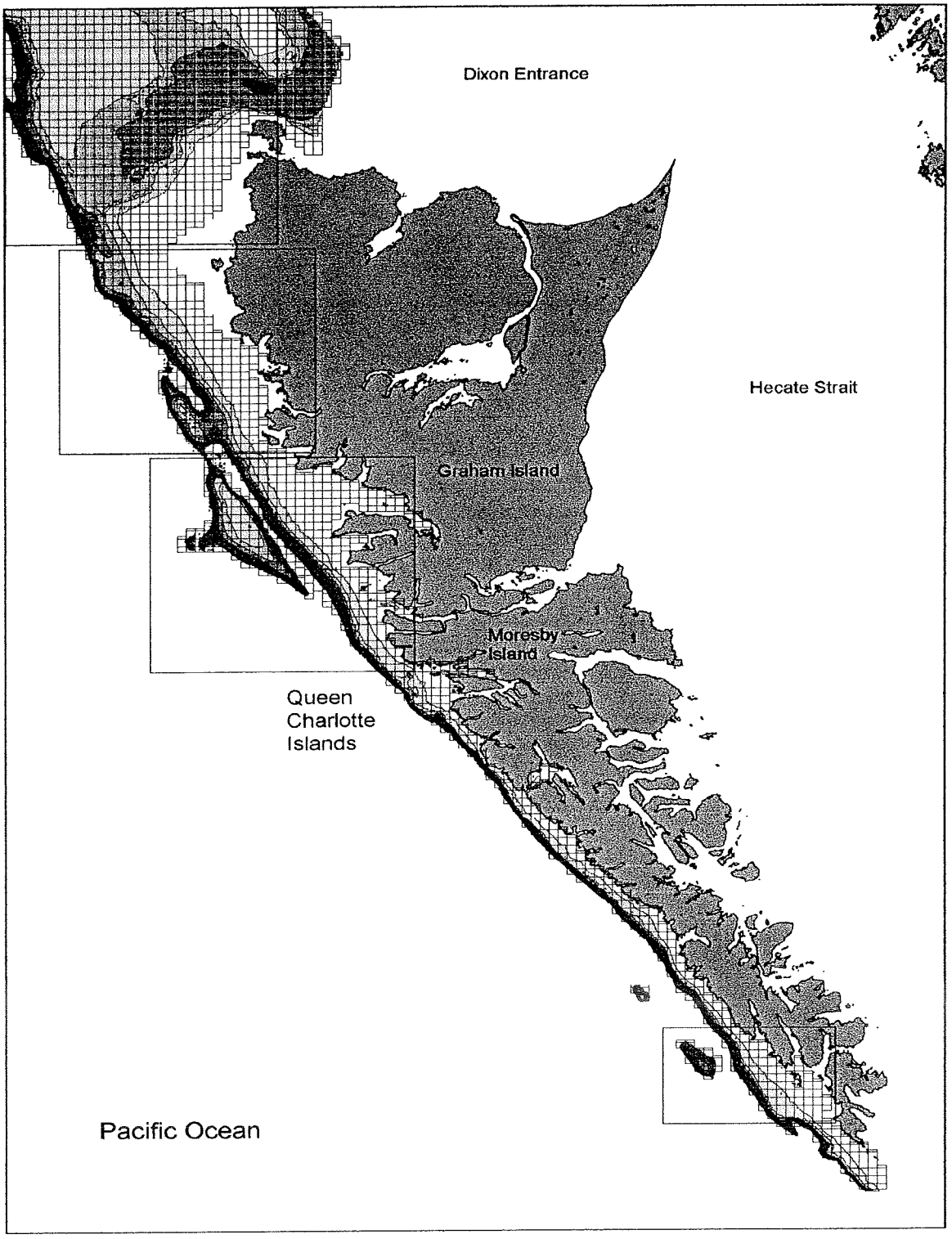

Fig. 2. An overview of the survey area showing the complete survey grid, the Queen Charlotte Islands, the four depth strata used for the survey and the four inset maps.

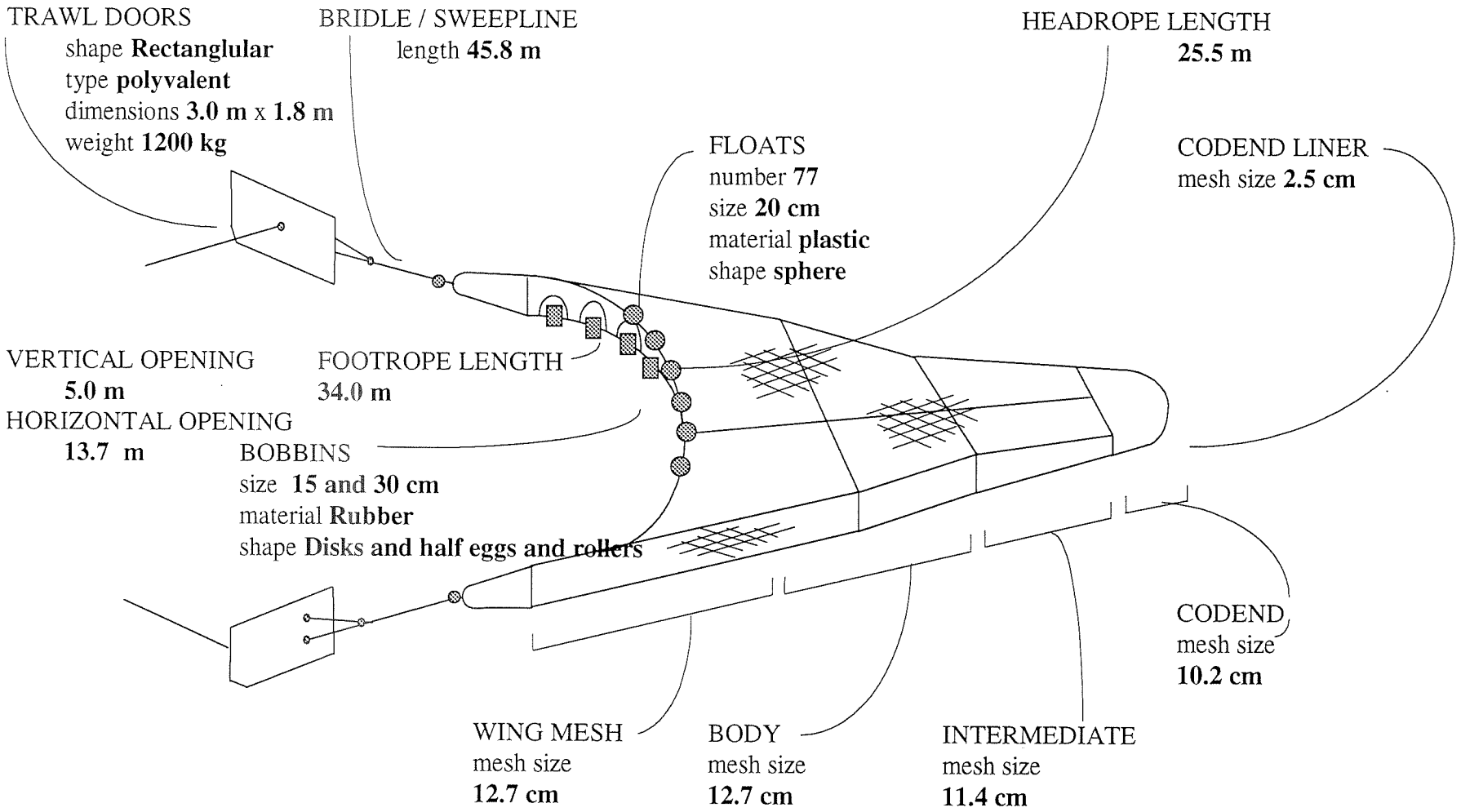

Fig. 3. Specifications for the Atlantic Western IIIa used by the F/V OCEAN SELECTOR during the West Coast Queen Charlotte Islands Biomass Survey, June 19-30, 1993.

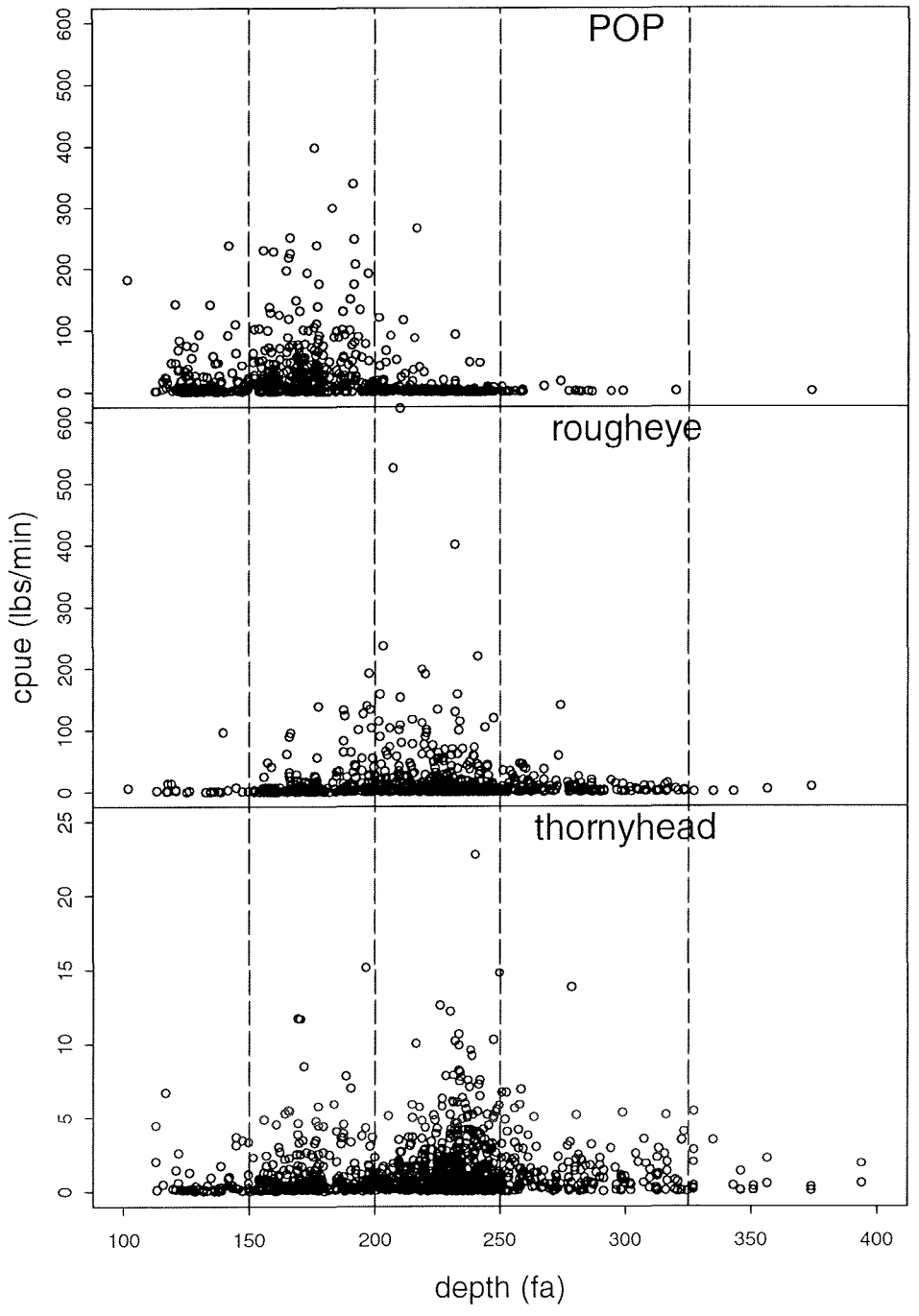

Fig. 4. Catch per unit effort (kg/hr) was calculated from the 1996 domestic trawl observer database and plotted against depth by species for the target species. This data was used to establish the upper and lower bounds of each of our depth strata for the survey.

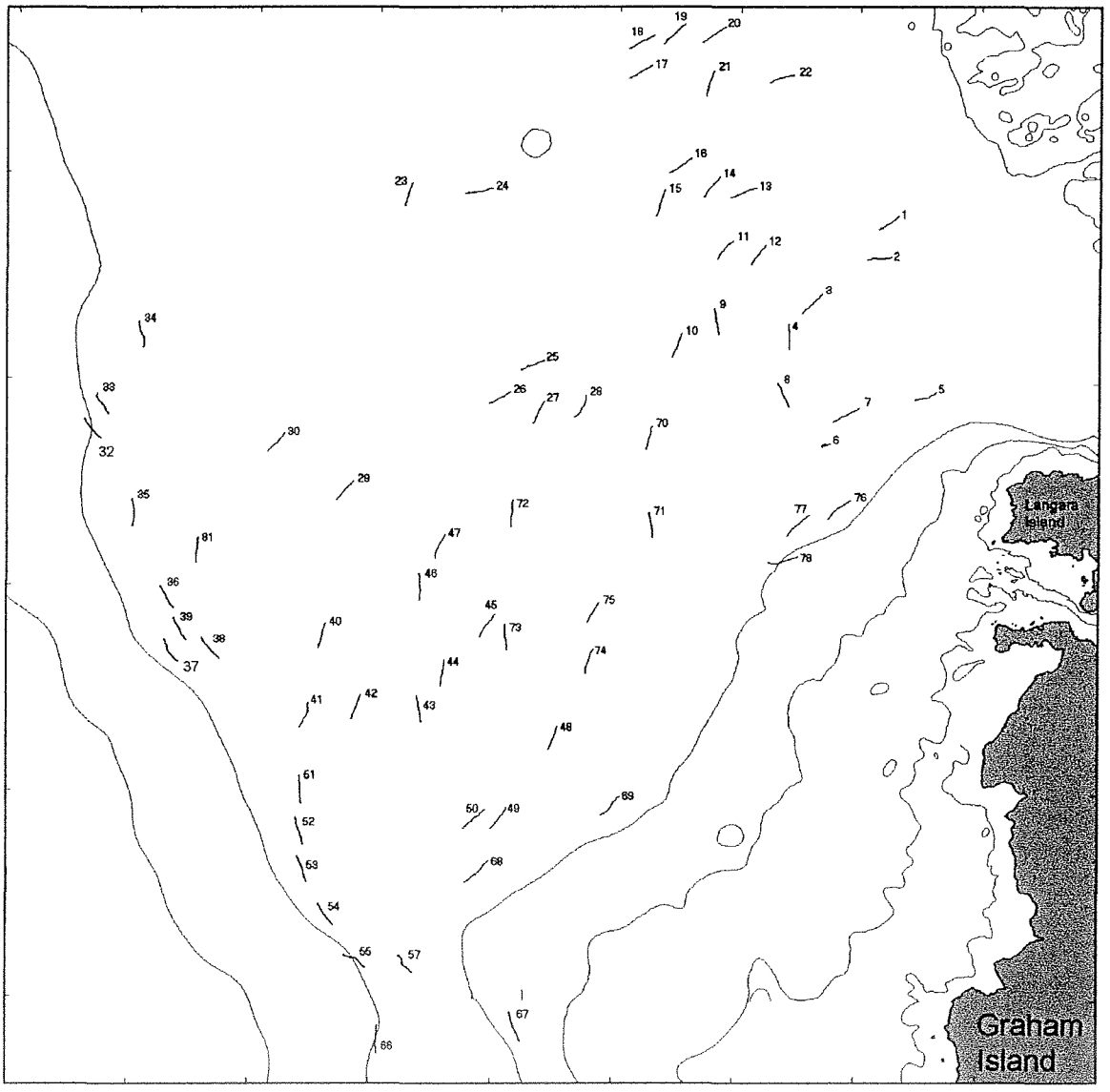

Fig. 5. Closeup of the Langara Spit portion of the survey area showing tow locations and bathymetry. Trawl tracks are labeled with haul number.

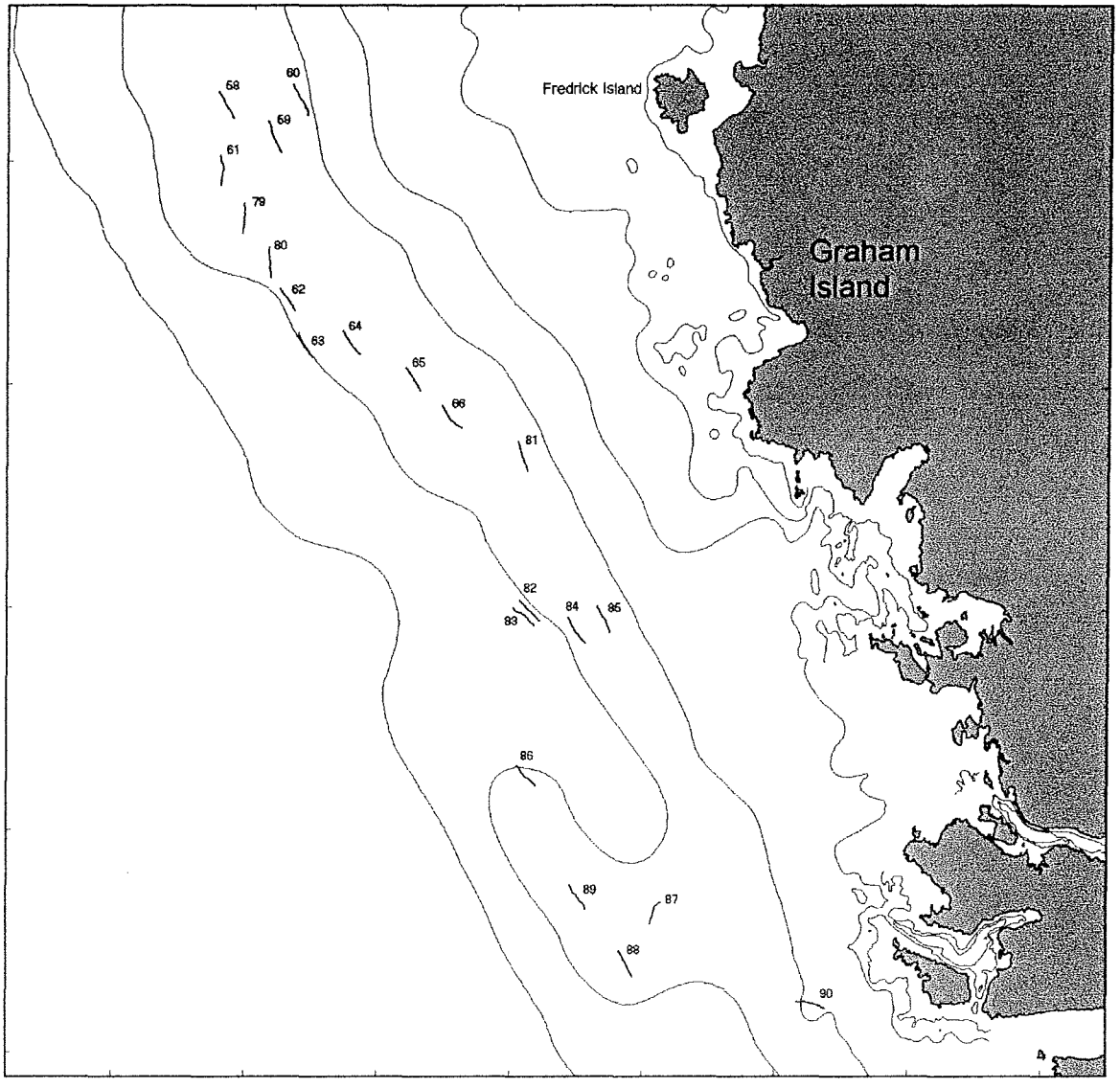

Fig. 6. Fredrick Island to Hippa portion of the survey area showing tow locations and bathymetry. Trawl tracks are labeled with haul number.

Fig. 7. Closeup of the Rennel Sound portion of the survey area showing tow locations and bathymetry. Trawl tracks are labeled with haul number.

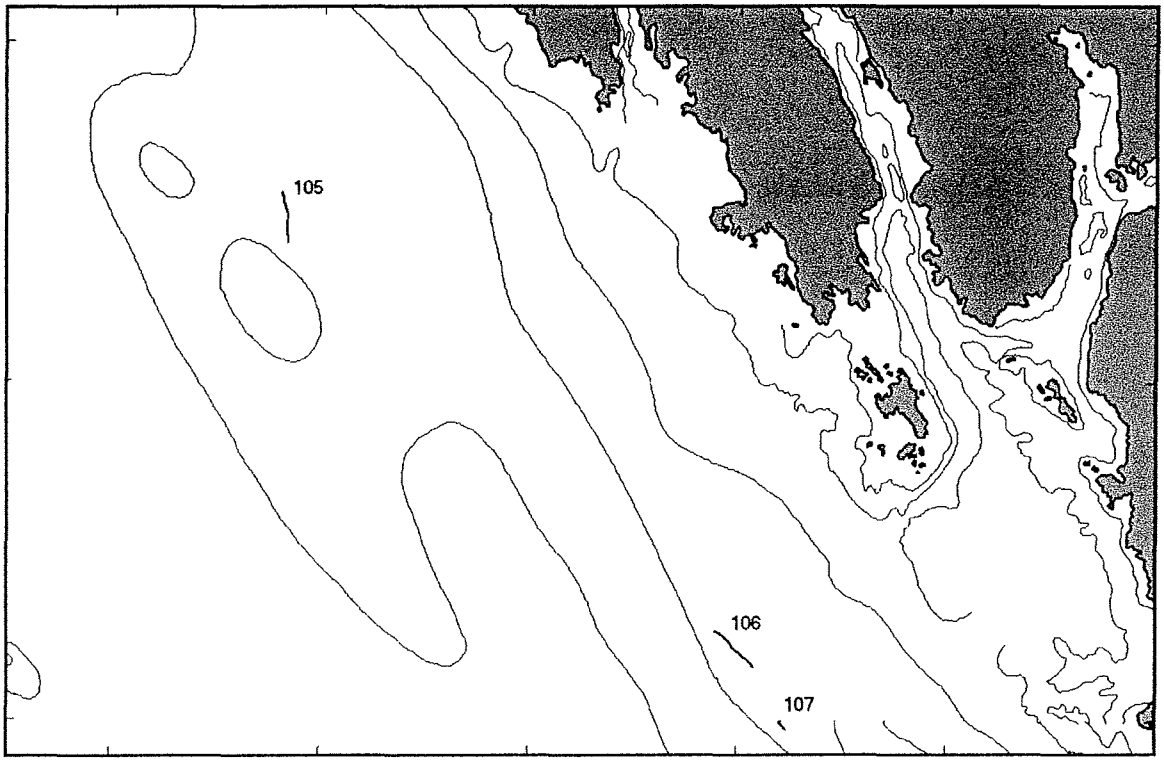

Fig. 8. Flamingo Inlet portion of the survey area showing tow locations and bathymetry. Trawl tracks are labeled with haul number.

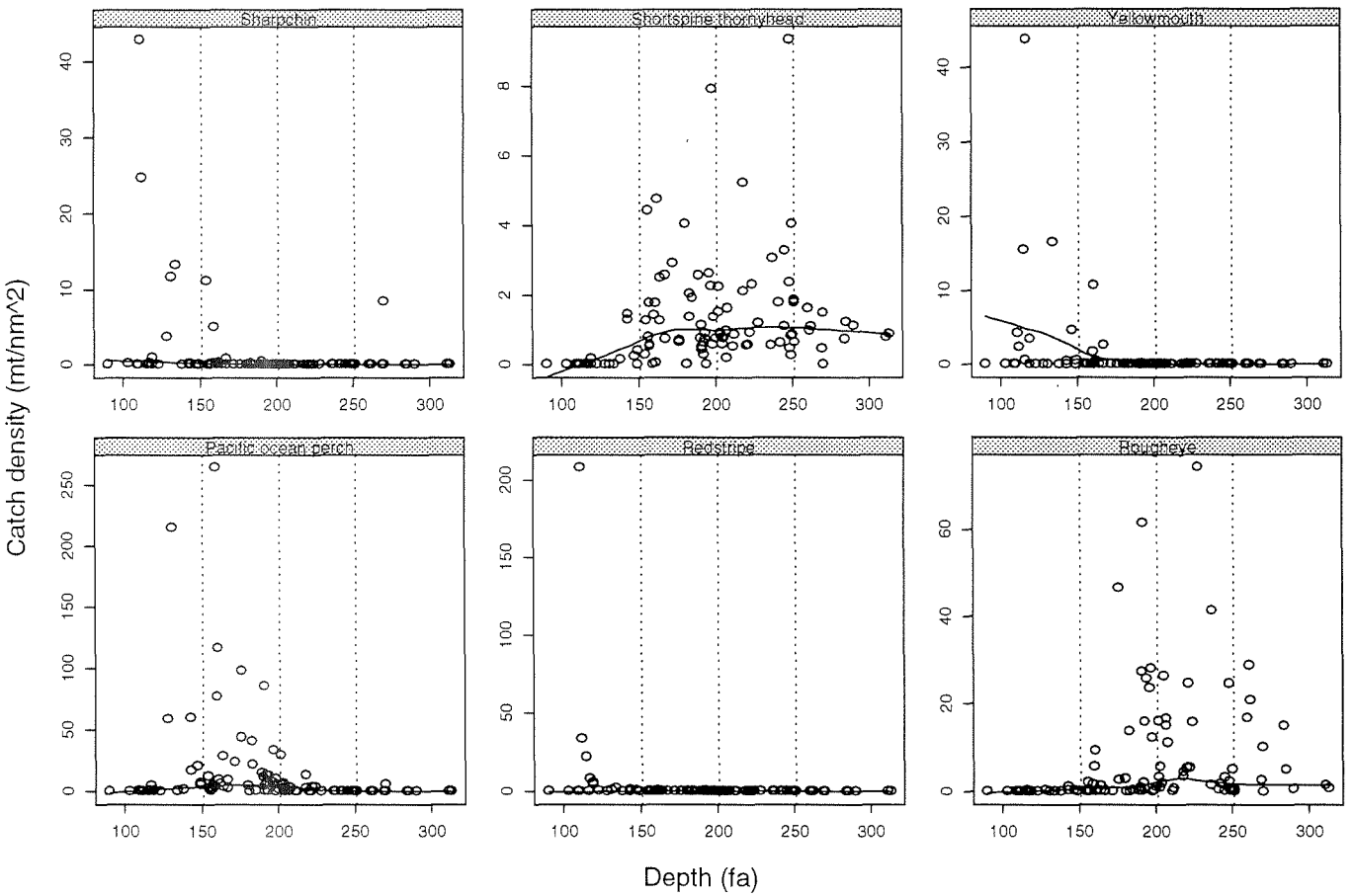

Fig. 9. Catch densities for selected rockfish species. Dotted vertical lines denote depth stratum boundaries. The solid lines indicate lowess smooth.

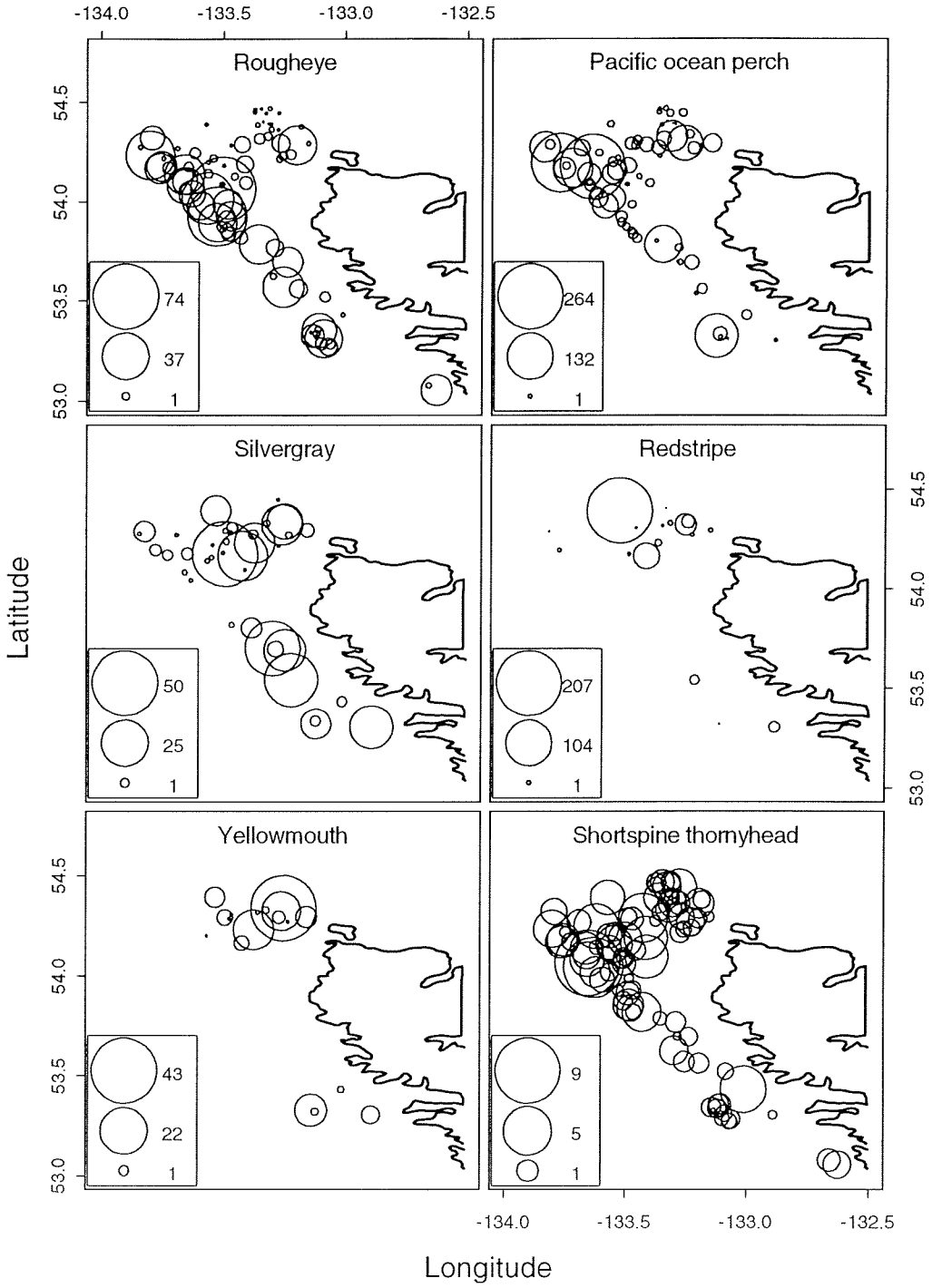

Fig. 10. Catch density (mt/nm^2) at each tow location for selected rockfishes. The areas of the circles are sized in proportion to the catch density; boxed insets indicate scale.

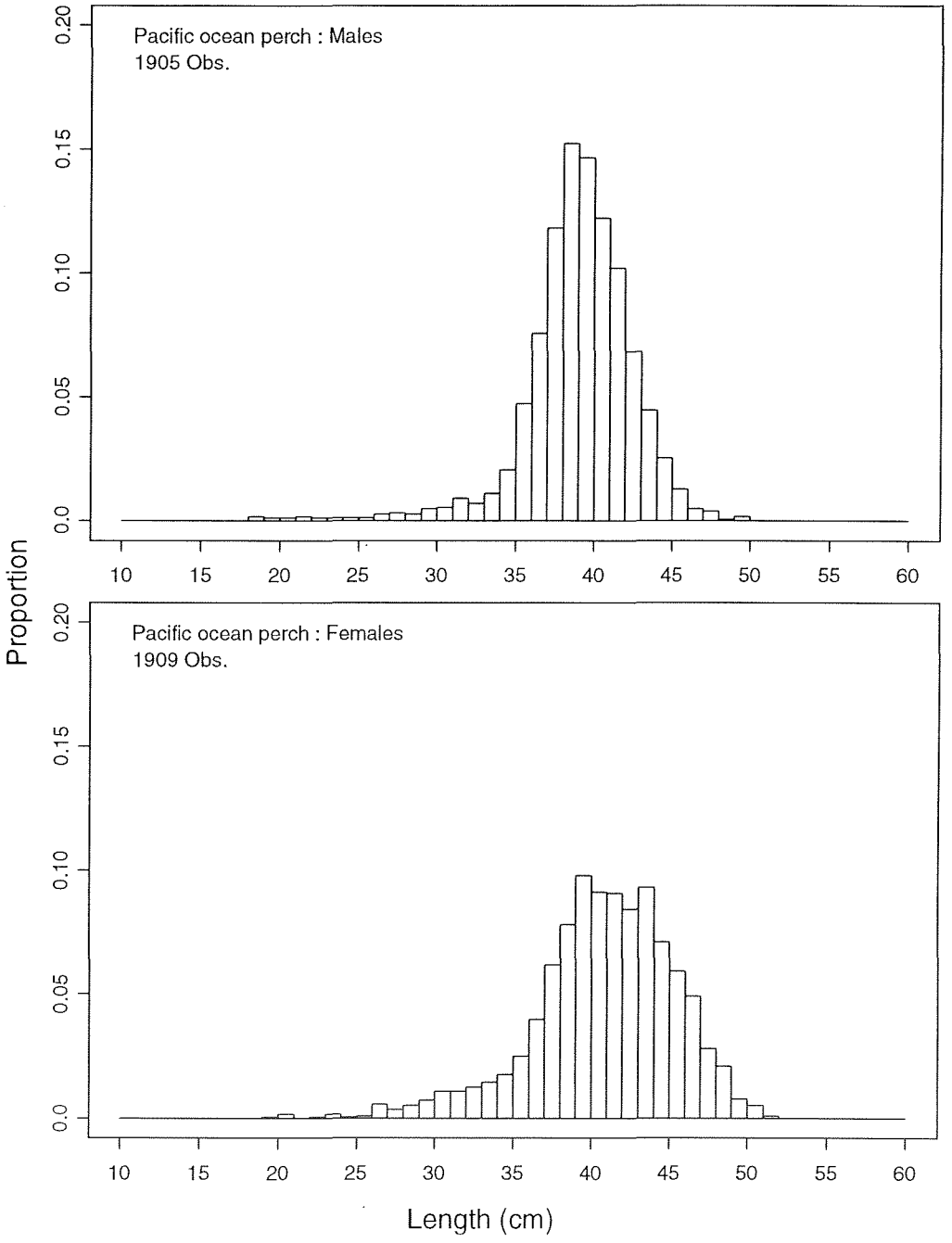

Fig. 11. Observed length frequency for male and female Pacific ocean perch.

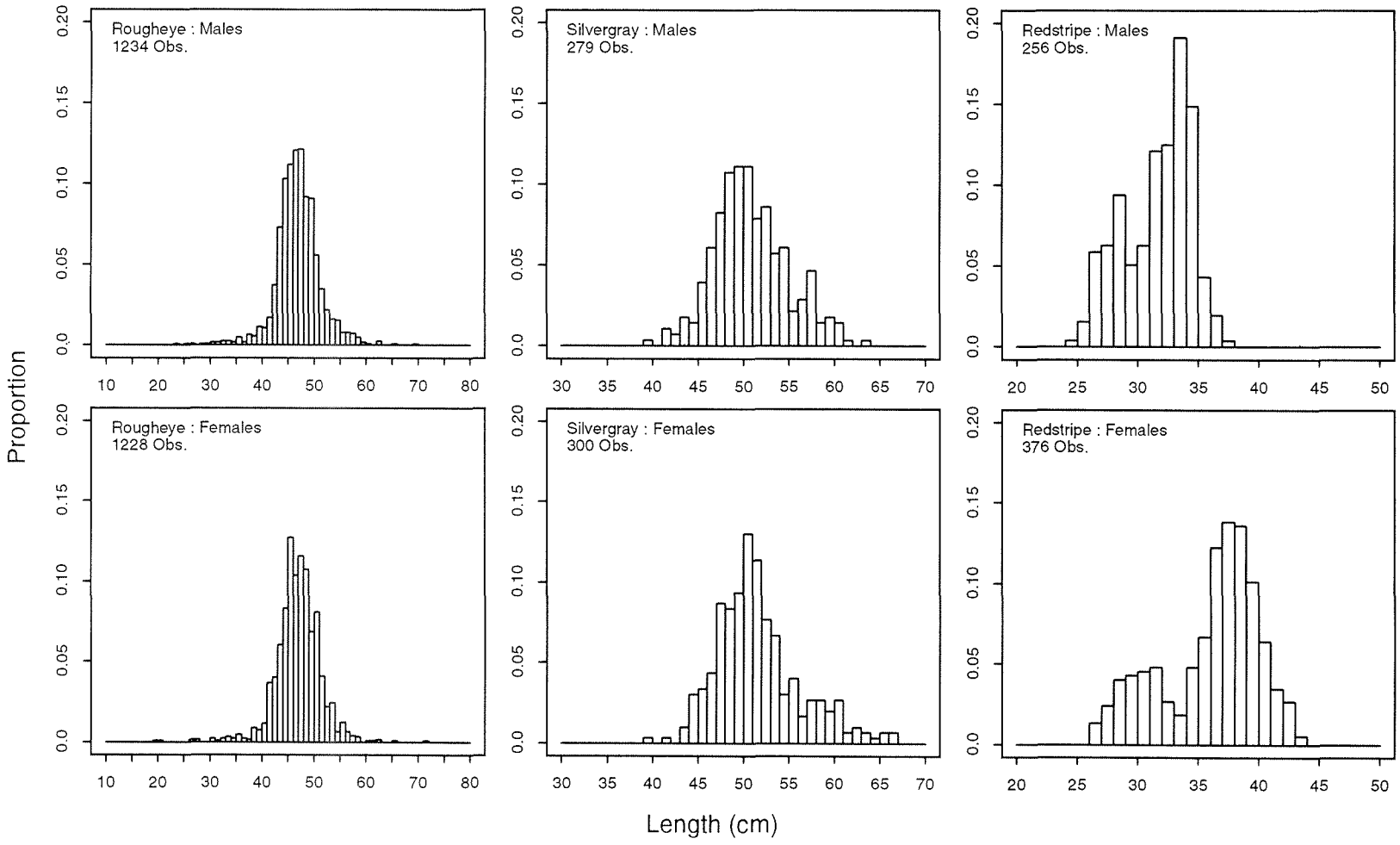

Fig. 12. Observed length frequency by sex for rougheye, silvergray, and redstripe rockfishes.

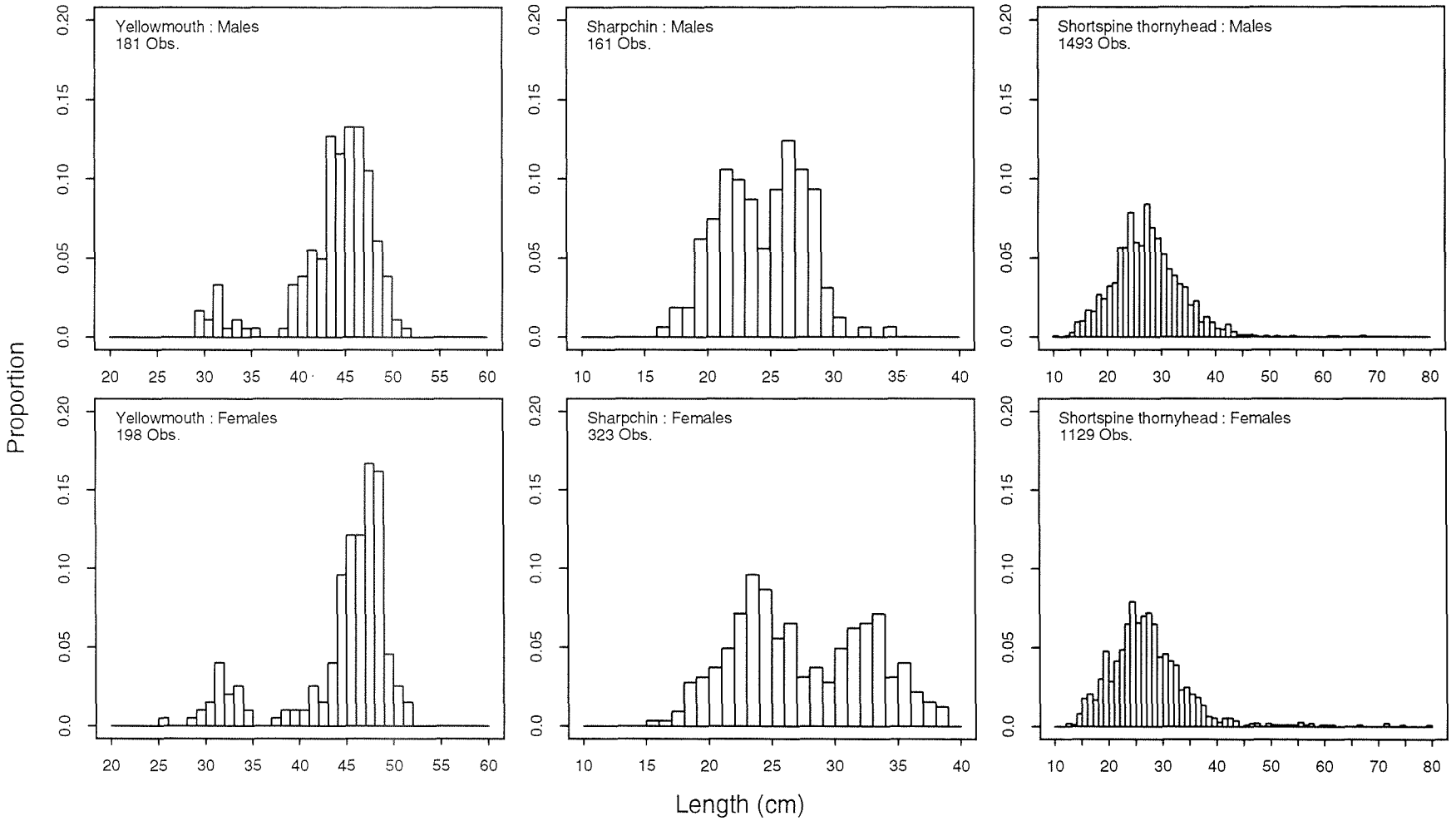

Fig. 13. Observed length frequency by sex for yellowmouth and sharpchin rockfishes, and shortspine thornyhead.

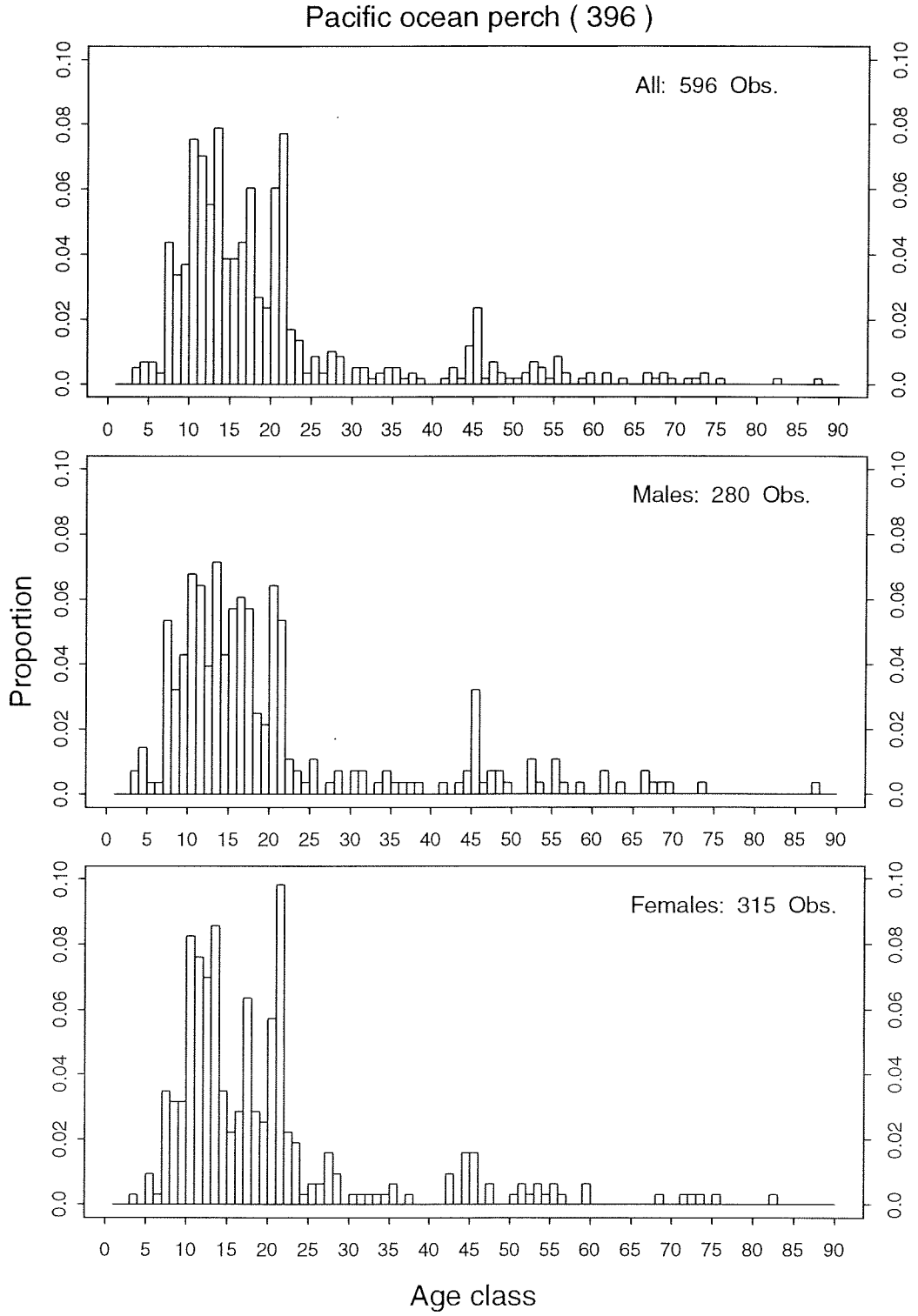

Fig. 14. Observed age frequency for Pacific ocean perch.

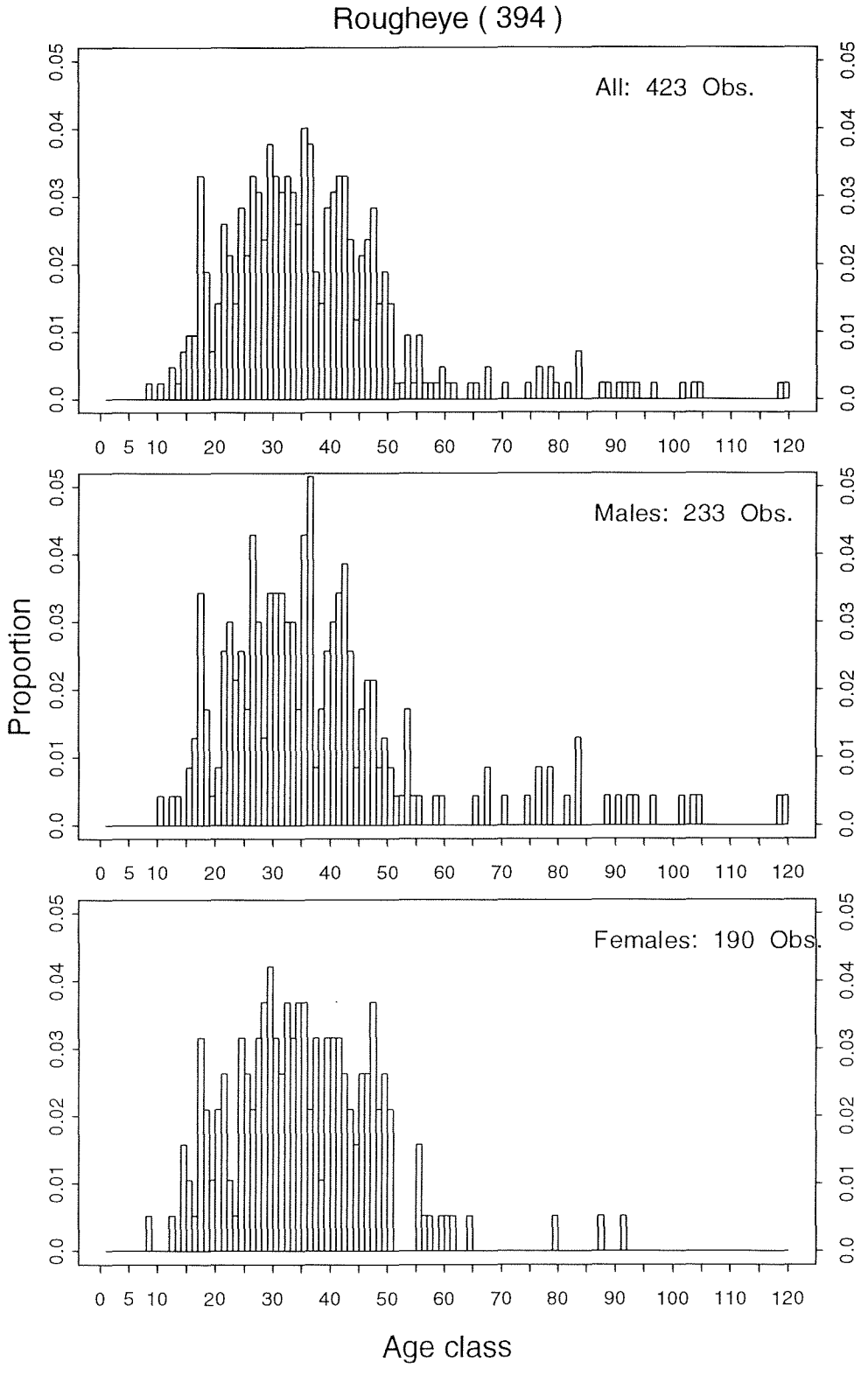

Fig. 15. Observed age frequency for rougheye rockfish.

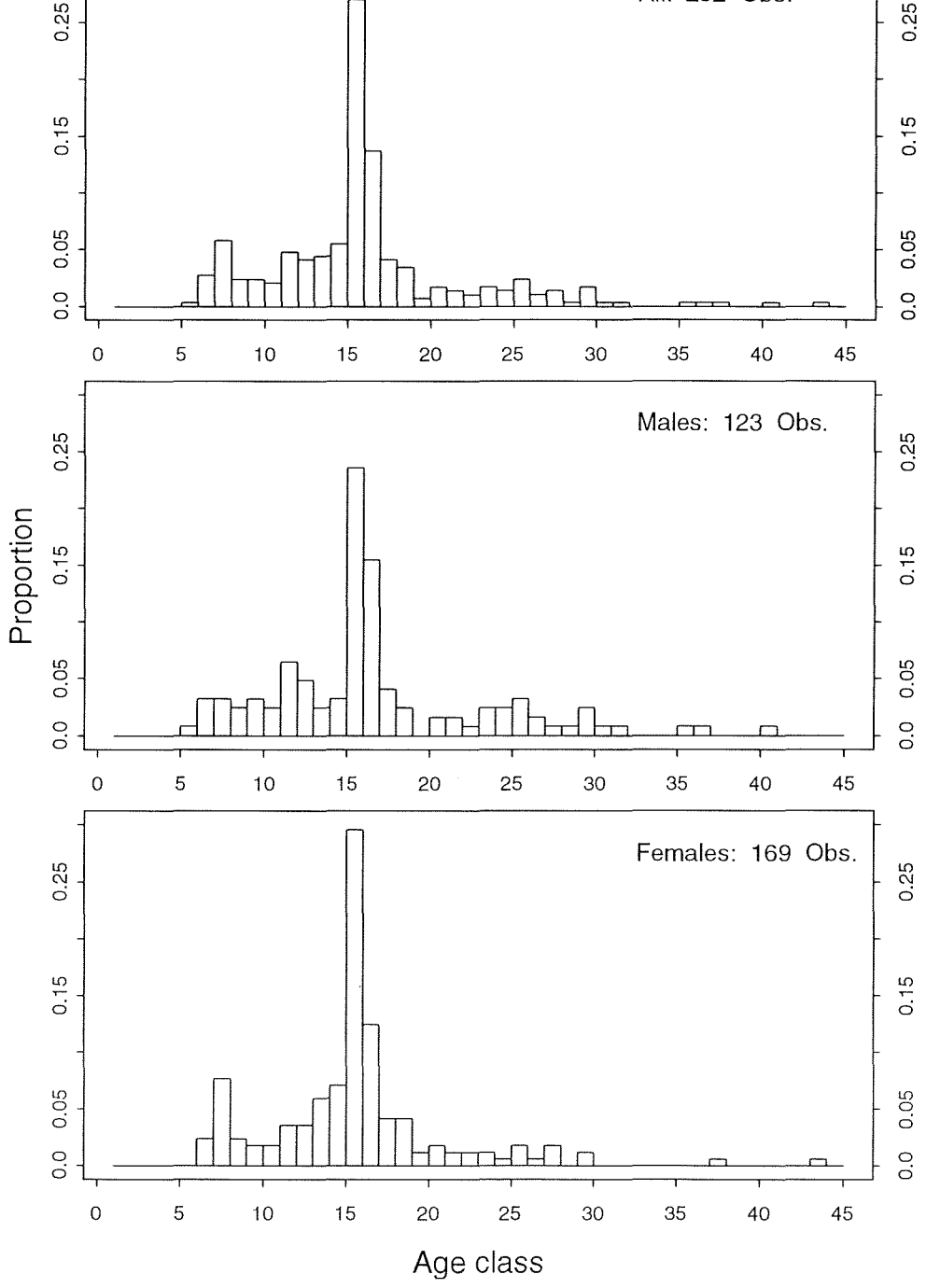

Fig. 16. Observed age frequency for redstripe rockfish.

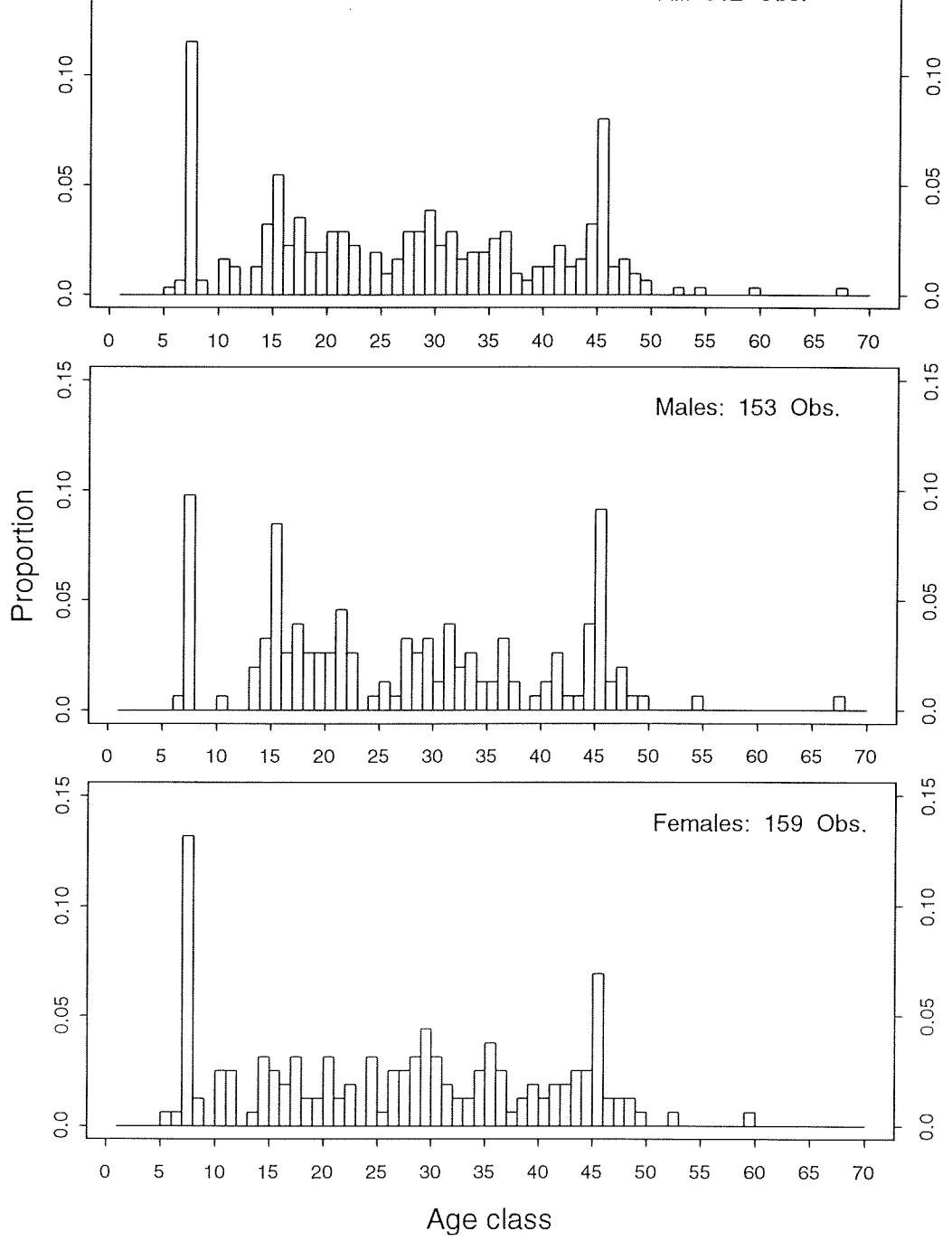

Fig. 17. Observed age frequency for yellowmouth rockfish.

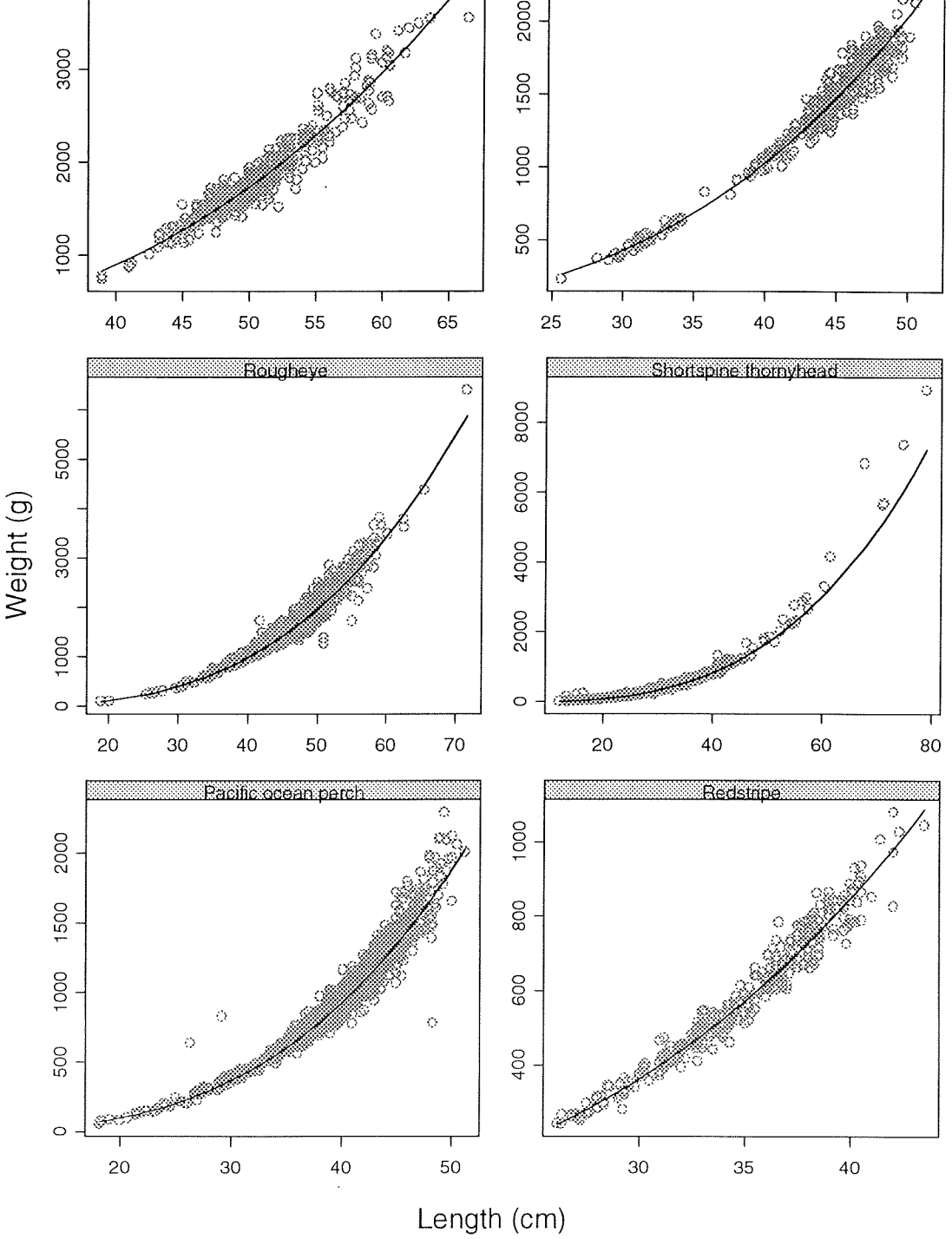

Fig. 18. Weight-length relationships for selected species.

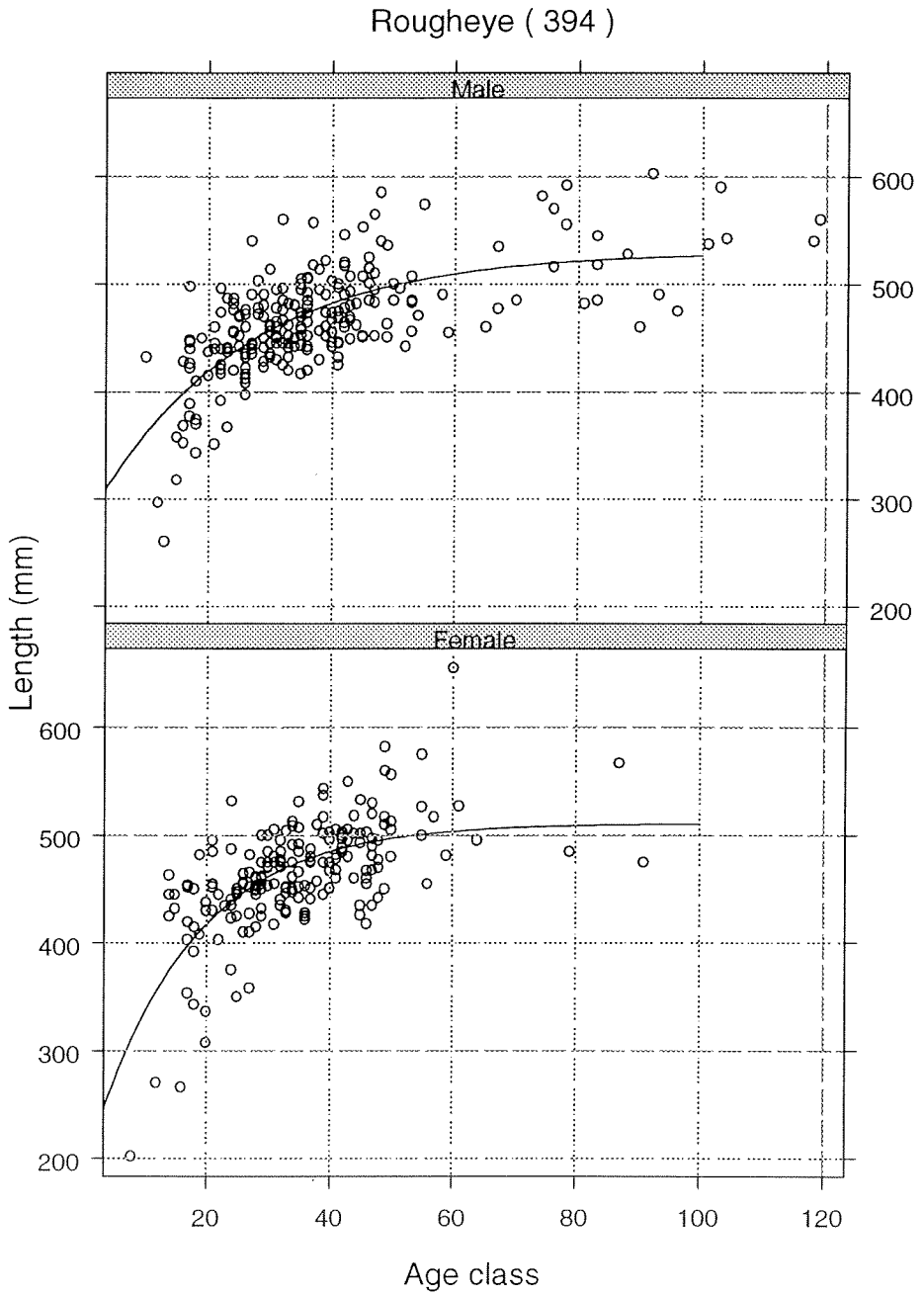

Fig. 19. Growth curves for male and female rougheye rockfish.

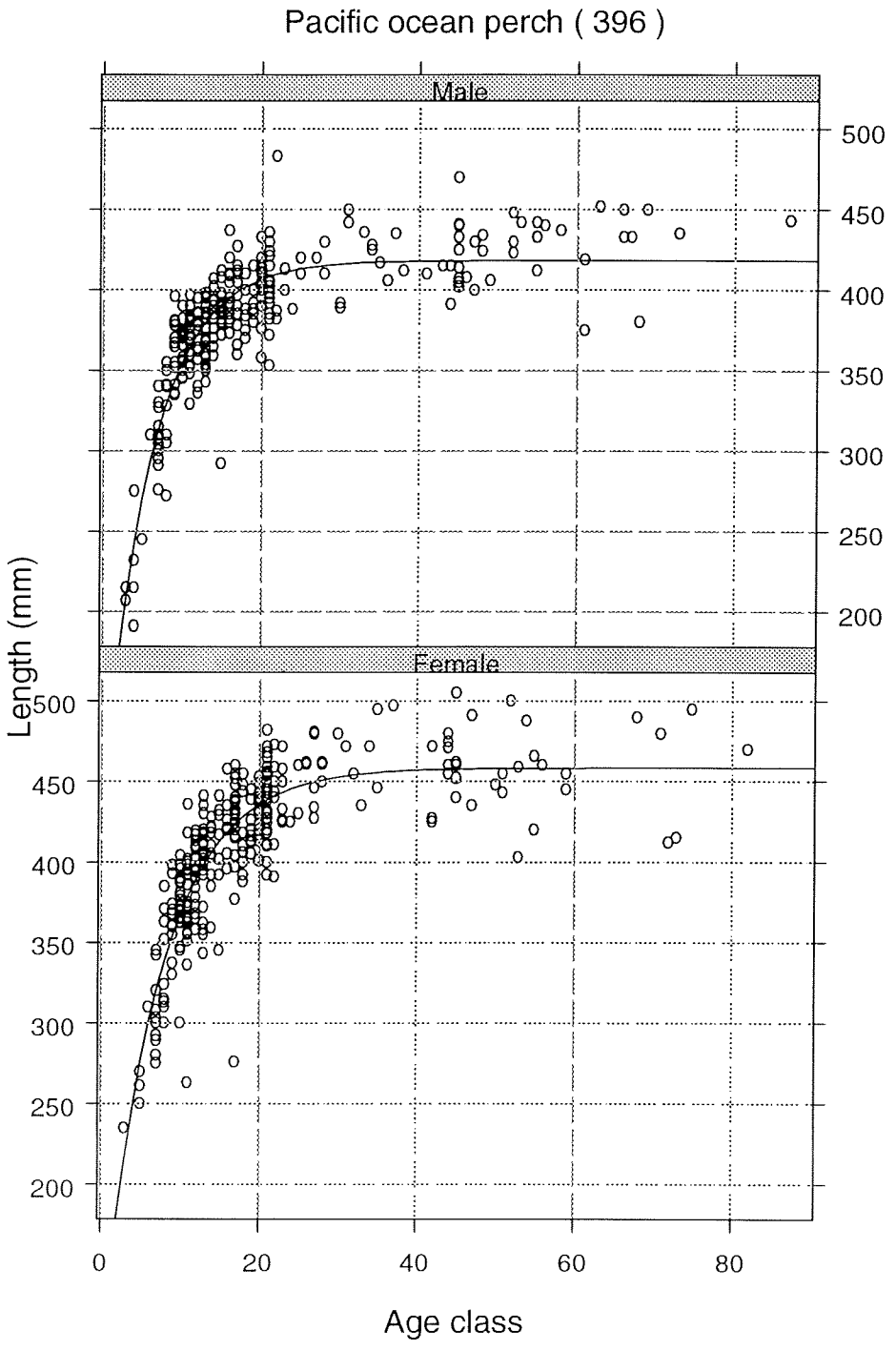

Fig. 20. Growth curves for male and female Pacific ocean perch.

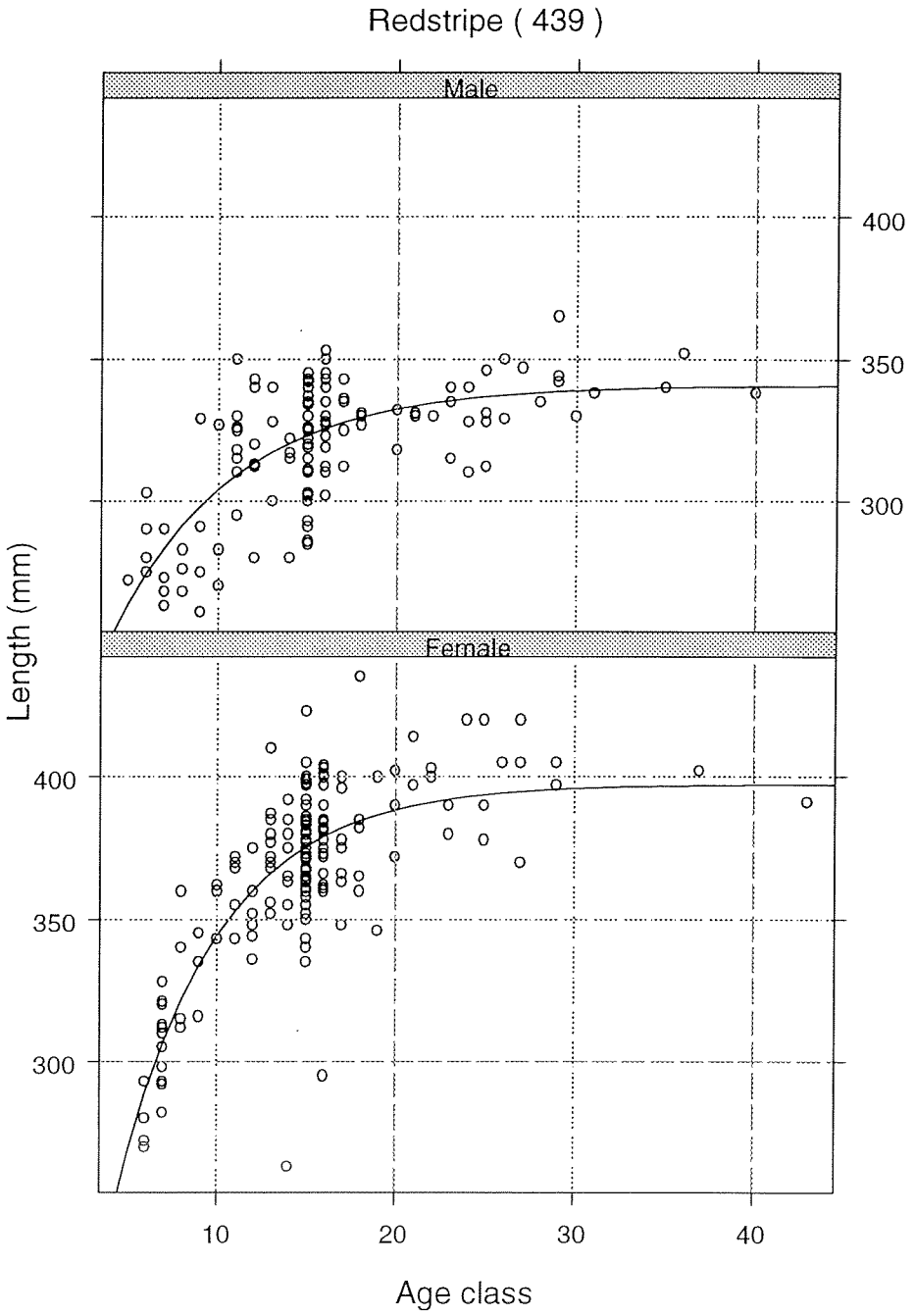

Fig. 21. Growth curves for male and female redstripe rockfish.

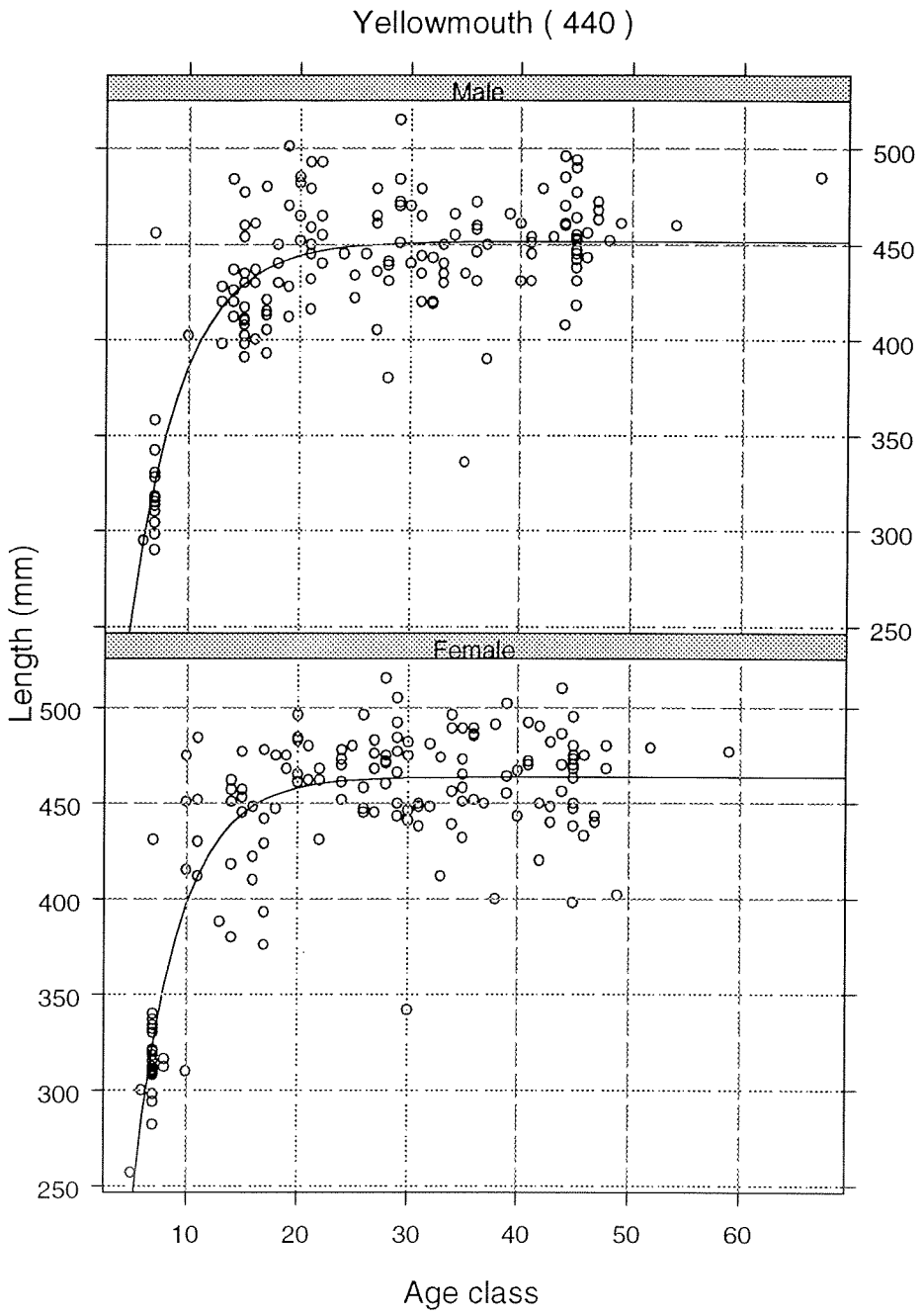

Fig. 22. Growth curves for male and female yellowmouth rockfish.

APPENDICES

Appendix 1: Sex and maturity codes used during the 1997 swept area biomass survey of the west coast of the Queen Charlotte Islands.

Sex Code	Condition
0	Not examined
1	Male
2	Female
3	Examine but undetermined

Maturity Code	Gonad Condition	Male	Female
	M/F		
0 or Null	Unknown	Not examined	Not examined
1	Immature	Translucent pinkish brown , string-like	Small translucent, individual eggs not visible, granular texture, skein cloudy
2	Maturing	Translucent. String like, slight swelling, 2-4 mm, width	Small, yellow eggs; translucent or opaque, no black spots (evidence of previous spawning)
3	Developing / mature	Swelling, brown-white, brown in the center when broken and whitish at the marginsless than 15 % volume of the body cavity	Large, yellow or orange eggs; opaque. Some black spots indicating reabsorbed larvae from previous spawning
4	Developed / fertilized	Large, white; easily broken;15-20 % of the volume of the abdominal cavity	Hydrated/fertilized eggs. Large, orange-yellow eggs; translucent.
5	Running / embryos	Very large, running sperm, milt easily expressed by squeezing the abdomen	Embryos or larvae, include eyed eggs; translucent
6	Spent	White-brown; sperm still in duct. Brown at the margins and white in the center. Small, 10-15% the volume of the abdominal cavity	Large, flaccid, red ovaries skein translucent. A few larvae and eggs may be present
7	Resting	Triangular in cross-section; small, brown, leathery, < 10 % the volume of the abdominal cavity	Moderate size, firm, orange-grey ovaries: some with dark blotches, skein cloudy, whitish, quite tough
8	Resorbing	No Stage	Large mass of eggs and or larvae, often forming a black tar-like nodule in the ovary, may be caused by damage from parasites
9	Unknown	Examined but unknown	Examined but unknown

Appendix 2: Tow and Catch information for the F/V OCEAN SELECTOR during the 1997 west coast of the Queen Charlotte Islands rockfish survey, September 5 - 23, 1997.

Set Number	1	2	3	4	5	6	7	8	9	10	11	12
Date (yy/mm/dd)	970907	970907	970907	970907	970907	970907	970907	970907	970907	970907	970907	970908
Start lat. deg.	54	54	54	54	54	54	54	54	54	54	54	54
Start lat. min.	22.864	21.67	20.597	19.722	17.757	16.233	16.885	17.316	19.413	19.425	21.626	21.468
Start long. deg.	133	133	133	133	133	133	133	133	133	133	133	133
Start long. min.	10.083	10.43	13.842	15.462	8.159	13.347	13.227	15.435	18.953	20.804	19.08	17.386
End lat. deg.	54	54	54	54	54	54	54	54	54	54	54	54
End lat. min.	22.486	21.595	20.043	18.992	17.528	16.162	17.268	17.994	20.175	18.748	22.137	22.008
End long. deg.	133	133	133	133	133	133	133	133	133	133	133	133
End long. min.	11.04	11.622	14.79	15.444	9.201	13.766	11.965	15.996	19.192	21.235	18.306	16.698
Start time, DST	0744	0904	0955	1046	1227	1331	1416	1521	1621	1714	1820	0749
Duration, minutes	15	15	16	15	15	8	15	15	15	16	15	15
Modal depth, fathoms	251	250	249	248	248	245	250	251	249	251	241	245
Start depth, fathoms	248	250	249	248	248	244	249	255	249	251	243	246
Finish depth, fathoms	254	249	249	248	248	246	251	247	249	250	239	244
Warp length, fathoms	NA	575	575	575	550	NA	550	550	550	575	550	550
Distance trawled Nmi.	0.68	0.71	0.79	0.73	0.67	0.28	0.84	0.76	0.78	0.73	0.70	0.68
Area trawled sq. Nmi.	0.0200	0.0209	0.0233	0.0215	0.0197	0.0082	0.0247	0.0224	0.0230	0.0215	0.0206	0.0200
Depth Strata	4	3	3	3	3	3	4	4	3	4	3	3
Species												
Rougheye rockfish	8	6	8	13	46	27	125	15	3	-	10	3
Pacific Ocean Perch	-	-	-	-	-	-	-	-	-	-	-	-
Aurora rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Redbanded rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Shortraker rockfish	-	-	-	-	23	-	9	-	-	-	-	-
Silvergrey rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Darkblotch rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Splitnose rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Greenstripe rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Widow rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Yellowtail rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Rosethorn rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Blackgill rockfish	-	-	-	-	3	-	-	-	-	-	-	-
Boccacio rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Canary rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Redstripe rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Yellowmouth rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Harlequin rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Sharpchin rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Shortspine thornyhead	13	18	6	10	184	27	100	40	19	40	37	22
Longspine thornyhead	-	-	-	-	-	-	-	-	-	-	-	-
Turbot	2	3	-	3	40	30	24	14	15	10	12	2
Deepsea sole	-	-	-	-	-	-	-	-	-	-	-	-
Petrale (Brill) sole	-	-	-	-	-	-	-	-	-	-	-	-
Rex sole	15	20	12	17	3	4	10	9	73	16	60	46
Halibut	119	-	24	-	-	-	-	-	-	30	-	-
Rock sole	-	-	-	-	-	-	-	-	-	-	-	-
Slender sole	-	-	-	-	-	-	-	-	-	-	-	-
Dover sole	44	22	62	44	12	10	25	16	53	51	55	59
Lemon (English) sole	-	-	-	-	-	-	-	-	-	-	-	-
Sablefish	44	30	27	28	40	-	72	32	19	38	10	26
Pacific cod	-	-	-	-	-	-	-	-	-	-	-	-
Lingcod	-	-	-	-	-	-	-	-	-	-	-	-
Hake	62	14	11	12	18	12	20	30	7	3	8	11
Pollock	-	-	-	-	1	-	-	1	-	-	-	-
Herring	-	-	-	-	-	-	-	-	-	-	-	-
Eelpout	-	-	-	-	-	-	-	-	-	-	-	-
Rattail	-	-	-	-	-	-	-	-	-	-	-	-
Blackfin Sculpin	-	-	-	-	1	1	1	-	-	-	-	-
Pacific flatnose	-	-	-	-	-	-	-	-	-	-	-	-
Ratfish	-	-	-	4	-	-	-	-	-	-	-	-
Long-nosed skate	-	-	-	-	-	-	-	15	19	-	5	-
Sandpaper skate	-	-	-	-	2	-	10	2	-	5	-	-
Brown cat-shark	-	-	-	-	-	-	-	-	-	-	-	-
Dogfish	-	-	-	-	-	-	-	-	-	-	-	-
Octopus	-	-	-	-	-	-	-	-	-	-	-	-
Squid	6	6	6	7	12	1	5	4	7	12	5	6
Shrimp	-	1	-	-	-	-	-	-	-	-	-	-
Total Catch (Kg)	313	120	156	138	385	112	401	178	215	205	202	175
Catch estimation	Sorted	Sorted	Sorted	Sorted	Sorted	Sorted	Sorted	Sorted	Sorted	Sorted	Sorted	Sorted
Remarks	Usable	Usable	Usable	Usable	Usable	Unusable	Usable	Usable	Usable	Usable	Usable	Usable

Appendix 2: Tow and Catch information for the F/V OCEAN SELECTOR during the 1997 west coast of the Queen Charlotte Islands rockfish survey, September 5 - 23, 1997.

Set Number	13	14	15	16	17	18	19	20	21	22	23	24
Date (yy/mm/dd)	970908	970908	970908	970908	970908	970908	970908	970908	970908	970908	970909	970909
Start lat. deg.	54	54	54	54	54	54	54	54	54	54	54	54
Start lat. min.	23.669	23.406	22.855	24.101	26.858	27.703	27.859	27.94	27.071	26.966	23.13	23.633
Start long. deg.	133	133	133	133	133	133	133	133	133	133	133	133
Start long. min.	17.181	19.791	22.133	21.491	23.543	23.593	21.834	19.879	19.324	15.327	34.704	30.341
End lat. deg.	54	54	54	54	54	54	54	54	54	54	54	54
End lat. min.	23.391	24.007	23.611	24.525	27.234	28.108	28.427	28.361	26.356	26.745	23.781	23.483
End long. deg.	133	133	133	133	133	133	133	133	133	133	133	133
End long. min.	18.439	18.985	21.714	20.415	22.406	22.319	20.808	18.745	19.701	16.546	34.342	31.708
Start time, DST	0905	0952	1056	1143	1304	1356	1445	1543	1629	1725	0744	0931
Duration, minutes	15	16	16	15	16	15	15	15	15	15	16	15
Modal depth, fathoms	211	198	185	181	157	156	155	157	164	167	111	149
Start depth, fathoms	212	200	185	180	156	156	156	157	162	164	110	132
Finish depth, fathoms	210	195	185	181	157	155	154	156	166	170	111	128
Warp length, fathoms	450	NA	425	425	350	NA	350	375	400	400	275	300
Distance trawled Nmi.	0.79	0.77	0.80	0.76	0.77	0.85	0.83	0.79	0.75	0.75	0.69	0.82
Area trawled sq. Nmi.	0.0233	0.0227	0.0236	0.0224	0.0227	0.0250	0.0244	0.0233	0.0221	0.0221	0.0203	0.0241
Depth Strata	3	2	2	2	2	2	2	2	2	2	1	1
Species												
Rougheye rockfish	3	1	9	1	4	4	2	3	4	6	-	-
Pacific Ocean Perch	3	1	18	2	33	16	38	79	89	64	-	130
Aurora rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Redbanded rockfish	3	1	3	3	4	1	2	1	1	5	51	1
Shortraker rockfish	-	-	-	9	-	-	-	-	-	-	-	-
Silvergrey rockfish	-	-	-	-	-	-	-	-	2	-	222	34
Darkblotch rockfish	-	-	-	5	5	-	-	-	-	-	-	-
Splitnose rockfish	-	-	1	-	-	-	-	-	-	-	-	-
Greenstripe rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Widow rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Yellowtail rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Rosethorn rockfish	-	-	-	-	-	-	-	-	1	1	-	1
Blackgill rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Boccacio rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Canary rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Redstripe rockfish	-	-	-	1	-	-	-	-	-	-	4223	5
Yellowmouth rockfish	-	-	-	-	-	-	-	-	-	-	85	2
Harlequin rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Sharpchin rockfish	-	-	1	-	-	-	-	-	-	-	872	3
Shortspine thornyhead	12	13	45	-	13	20	31	41	55	57	-	-
Longspine thornyhead	-	-	-	-	-	-	-	-	-	-	-	-
Turbot	4	1	14	13	29	10	7	25	34	18	-	7
Deepsea sole	-	-	-	-	-	-	-	-	-	-	-	-
Petrale (Brill) sole	-	-	-	-	-	-	-	-	-	-	-	1
Rex sole	17	30	16	43	32	14	5	9	28	36	-	9
Halibut	-	-	-	-	11	-	-	-	-	-	-	12
Rock sole	-	-	-	-	-	-	-	-	-	-	-	-
Slender sole	-	-	-	-	-	-	-	-	-	-	-	-
Dover sole	31	41	22	31	8	8	17	25	29	57	-	1
Lemon (English) sole	-	-	-	1	-	-	-	-	-	-	-	-
Sablefish	8	18	3	10	7	9	4	4	-	5	-	1
Pacific cod	-	-	-	-	-	2	-	-	2	2	-	13
Lingcod	-	-	-	-	-	-	-	-	8	8	-	-
Hake	14	20	2	22	3	2	1	3	1	3	-	-
Pollock	-	2	4	5	1	-	2	1	5	1	-	1
Herring	-	-	-	-	-	-	-	-	-	-	-	-
Eelpout	-	-	-	-	-	-	-	-	-	-	-	-
Rattail	-	-	-	-	-	-	-	-	-	-	-	-
Blackfin Sculpin	-	-	1	-	-	1	2	2	1	1	-	-
Pacific flatnose	-	-	-	-	-	-	-	-	-	-	-	-
Ratfish	1	-	-	-	-	-	-	3	1	1	-	1
Long-nosed skate	-	-	-	-	-	-	-	-	-	-	-	-
Sandpaper skate	-	-	-	-	-	-	-	-	-	2	-	-
Brown cat-shark	-	-	-	-	-	-	-	-	-	-	-	-
Dogfish	-	-	-	-	-	-	-	-	-	-	-	-
Octopus	-	-	-	-	-	-	-	-	-	-	-	-
Squid	2	1	1	3	-	-	-	-	-	-	-	-
Shrimp	-	-	-	-	-	1	-	-	-	-	-	-
Total Catch (Kg)	98	128	139	149	150	87	111	196	260	267	5455	221
Catch estimation	Sorted	Sorted	Sorted	Sorted	Sorted	Sorted	Sorted	Sorted	Sorted	Sorted	Sampled	Sorted
Remarks	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable

Appendix 2: Tow and Catch information for the F/V OCEAN SELECTOR during the 1997 west coast of the Queen Charlotte Islands rockfish survey, September 5 - 23, 1997.

Set Number	25	26	27	28	29	30	31	32	33	34	35	36
Date (yy/mm/dd)	970909	970909	970909	970909	970909	970909	970909	970910	970910	970910	970910	970910
Start lat. deg.	54	54	54	54	54	54	54	54	54	54	54	54
Start lat. min.	18.349	17.386	17.443	16.987	14.536	16.465	12.679	16.266	17.58	19.679	14.501	11.357
Start long. deg.	133	133	133	133	133	133	133	133	133	133	133	133
Start long. min.	28.801	30.387	27.626	26.11	37.951	40.555	44.877	49.675	49.896	47.854	48.1	45.941
End lat. deg.	54	54	54	54	54	54	54	54	54	54	54	54
End lat. min.	18.627	17.71	16.799	17.629	15.076	15.939	13.408	16.818	16.981	18.925	13.72	11.978
End long. deg.	133	133	133	133	133	133	133	133	133	133	133	133
End long. min.	27.66	29.309	28.183	25.538	37.106	41.385	44.798	50.519	49.333	47.617	48.081	46.618
Start time, DST	1051	1151	1315	1427	1620	1721	1832	0742	0841	0946	1135	1320
Duration, minutes	15	15	15	15	16	15	16	15	15	16	16	15
Modal depth, fathoms	167	191	218	156	143	128	270	270	237	131	202	176
Start depth, fathoms	150	167	195	205	156	144	125	255	240	134	203	172
Finish depth, fathoms	148	167	187	231	156	142	130	284	233	127	200	180
Warp length, fathoms	400	425	500	500	400	400	275	600	550	375	500	400
Distance trawled Nmi.	0.73	0.72	0.73	0.76	0.73	0.73	0.73	0.75	0.71	0.79	0.80	0.74
Area trawled sq. Nmi.	0.0215	0.0212	0.0215	0.0224	0.0215	0.0215	0.0215	0.0221	0.0209	0.0233	0.0236	0.0218
Depth Strata	2	2	3	2	1	1	4	4	3	1	3	2
Species												
Rougheye rockfish	-	3	95	47	8	8	-	224	863	-	379	56
Pacific Ocean Perch	200	100	286	75	361	1263	128	-	-	5002	696	2132
Aurora rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Redbanded rockfish	1	-	31	12	1	-	1	-	-	-	-	-
Shortraker rockfish	-	-	-	-	-	-	-	25	60	-	-	-
Silvergrey rockfish	8	4	-	-	4	4	112	-	-	36	-	28
Darkblotch rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Splitnose rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Greenstripe rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Widow rockfish	2	-	-	-	-	-	-	-	-	36	-	-
Yellowtail rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Rosethorn rockfish	1	2	2	1	2	2	1	-	-	-	2	-
Blackgill rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Boccacio rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Canary rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Redstripe rockfish	-	-	-	-	-	-	1	-	-	18	-	-
Yellowmouth rockfish	56	2	-	-	-	-	-	-	-	-	-	-
Harlequin rockfish	-	-	-	-	-	-	3	-	-	-	-	-
Sharpchin rockfish	18	1	-	-	-	80	181	-	-	272	-	-
Shortspine thornyhead	16	24	112	99	28	-	-	33	64	-	53	14
Longspine thornyhead	-	-	-	-	-	-	-	-	-	-	-	-
Turbot	1	5	121	40	10	-	2	14	49	54	29	-
Deepsea sole	-	-	-	-	-	-	-	-	-	-	-	-
Petrale (Brill) sole	-	-	-	-	-	-	-	-	-	-	-	-
Rex sole	2	2	-	5	4	4	2	18	4	-	5	-
Halibut	-	-	-	-	-	-	-	-	-	36	-	-
Rock sole	-	-	-	-	-	-	-	-	-	-	-	-
Slender sole	-	-	-	-	-	-	-	-	-	-	-	-
Dover sole	1	3	6	10	4	4	-	53	53	-	19	14
Lemon (English) sole	-	-	-	-	-	-	-	-	-	-	-	-
Sablefish	-	-	7	6	2	-	-	13	19	-	101	14
Pacific cod	4	3	-	-	4	-	3	-	-	-	-	-
Lingcod	-	-	-	-	3	-	-	-	-	-	-	-
Hake	1	3	5	9	3	-	-	15	23	-	77	14
Pollock	1	-	6	-	-	-	-	-	-	-	-	-
Herring	-	-	-	-	-	-	-	-	-	-	-	-
Eelpout	-	-	-	-	-	-	-	-	-	-	-	-
Rattail	-	-	-	-	-	-	-	1	-	-	-	-
Blackfin Sculpin	1	2	1	1	1	2	-	-	-	-	-	-
Pacific flatnose	-	-	-	-	-	-	-	1	-	-	-	-
Ratfish	1	-	-	-	-	-	-	-	-	-	-	-
Long-nosed skate	-	-	-	-	-	-	-	-	-	-	-	-
Sandpaper skate	-	-	-	-	-	-	-	-	-	-	-	-
Brown cat-shark	-	-	-	-	-	-	-	-	-	-	-	-
Dogfish	-	-	-	-	-	-	-	-	-	-	-	-
Octopus	-	-	-	-	-	-	-	-	-	-	-	-
Squid	-	-	1	3	1	-	-	-	4	-	5	-
Shrimp	-	-	-	-	-	-	-	-	-	-	-	-
Total Catch (Kg)	314	154	672	307	435	1368	433	397	1136	5455	1366	2273
Catch estimation	Sorted	Sorted	Sorted	Sorted	Sorted	Sampled	Sorted	Sorted	Sampled	Sampled	Sampled	Sampled
Remarks	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable

Appendix 2: Tow and Catch information for the F/V OCEAN SELECTOR during the 1997 west coast of the Queen Charlotte Islands rockfish survey, September 5 - 23, 1997.

Set Number	37	38	39	40	41	42	43	44	45	46	47	48
Date (yy/mm/dd)	970910	970910	970910	970910	970911	970911	970911	970911	970911	970911	970911	970911
Start lat. deg.	54	54	54	54	54	54	54	54	54	54	54	54
Start lat. min.	10.439	10.499	11.073	10.933	8.616	8.857	8.094	9.892	10.573	11.636	12.851	7.986
Start long. deg.	133	133	133	133	133	133	133	133	133	133	133	133
Start long. min.	46.385	44.54	45.948	38.384	39.185	36.609	33.59	32.469	30.696	33.731	33.008	26.823
End lat. deg.	54	54	54	54	54	54	54	54	54	54	54	54
End lat. min.	9.785	9.883	10.408	10.207	7.906	8.154	8.863	9.137	11.249	12.42	13.54	7.299
End long. deg.	133	133	133	133	133	133	133	133	133	133	133	133
End long. min.	45.656	43.631	45.291	38.722	39.59	37.028	33.838	32.658	29.939	33.763	32.512	27.255
Start time, DST	1440	1546	1712	1835	0749	0857	1008	1104	1157	1333	1418	1552
Duration, minutes	16	15	16	15	16	15	16	15	15	15	15	15
Modal depth, fathoms	224	159	197	164	172	189	199	200	203	191	193	208
Start depth, fathoms	222	157	200	164	171	188	199	200	202	192	193	209
Finish depth, fathoms	226	160	194	164	173	189	198	199	204	190	193	206
Warp length, fathoms	475	450	500	425	450	475	500	500	NA	475	475	475
Distance trawled Nmi.	0.81	0.82	0.78	0.75	0.77	0.75	0.79	0.77	0.82	0.79	0.76	0.73
Area trawled sq. Nmi.	0.0238	0.0241	0.0230	0.0221	0.0227	0.0221	0.0233	0.0227	0.0241	0.0233	0.0224	0.0215
Depth Strata	3	2	2	2	2	2	2	2	3	2	2	3
Species												
Rougheye rockfish	375	40	644	30	-	3	7	23	21	3	12	241
Pacific Ocean Perch	89	6380	769	624	544	334	135	38	40	16	10	63
Aurora rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Redbanded rockfish	1	20	5	-	-	4	-	1	1	3	14	2
Shortraker rockfish	-	-	-	-	-	-	-	11	15	-	-	-
Silvergrey rockfish	-	40	-	6	6	3	-	2	-	-	-	-
Darkblotch rockfish	-	20	-	-	-	-	-	-	-	-	-	-
Splitnose rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Greenstripe rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Widow rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Yellowtail rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Rosethorn rockfish	-	-	3	2	1	-	-	-	-	-	-	-
Blackgill rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Boccacio rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Canary rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Redstripe rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Yellowmouth rockfish	-	-	-	-	-	-	1	-	-	-	-	-
Harlequin rockfish	-	-	-	1	-	1	-	1	-	-	-	-
Sharpchin rockfish	-	120	-	-	-	-	1	-	-	-	-	-
Shortspine thornyhead	55	-	52	28	66	57	32	17	21	12	20	35
Longspine thornyhead	-	-	-	-	-	-	-	-	-	-	-	-
Turbot	-	60	-	15	10	12	4	13	14	39	190	33
Deepsea sole	1	-	-	-	-	-	-	-	-	-	-	-
Petrale (Brill) sole	-	-	-	-	-	-	-	-	-	-	-	-
Rex sole	2	-	5	6	3	4	14	13	15	4	7	4
Halibut	-	-	-	-	-	-	-	-	-	11	-	-
Rock sole	-	-	-	-	-	-	-	-	-	-	-	-
Slender sole	-	-	-	1	-	-	-	-	1	1	1	-
Dover sole	26	20	110	12	9	10	21	27	18	8	15	6
Lemon (English) sole	-	-	-	-	-	-	-	-	-	-	-	-
Sablefish	20	120	-	4	11	27	14	48	27	35	49	6
Pacific cod	-	-	-	-	4	-	-	-	-	-	-	-
Lingcod	-	-	-	-	-	-	3	-	-	-	-	-
Hake	5	-	5	5	7	9	23	57	35	65	41	33
Pollock	-	-	-	-	-	-	-	-	-	1	1	-
Herring	-	-	-	-	-	-	-	-	-	-	-	-
Eelpout	-	-	-	-	-	-	-	-	-	-	-	-
Rattail	-	-	-	-	-	-	-	-	-	-	-	-
Blackfin Sculpin	-	-	-	1	2	1	-	1	-	-	1	1
Pacific flatnose	-	-	-	-	-	-	-	-	-	-	-	-
Ratfish	-	-	-	-	-	-	-	-	-	-	-	-
Long-nosed skate	-	-	-	-	-	-	-	-	4	-	-	-
Sandpaper skate	1	-	-	-	-	-	-	-	-	-	-	-
Brown cat-shark	-	-	-	-	-	-	-	-	-	-	-	-
Dogfish	-	-	-	-	-	-	-	-	-	-	-	-
Octopus	-	-	-	-	-	-	-	-	-	-	-	-
Squid	-	-	-	1	-	2	1	2	3	1	1	1
Shrimp	-	-	-	-	-	-	-	-	-	-	-	-
Total Catch (Kg)	574	6818	1594	736	663	467	255	253	215	199	361	425
Catch estimation	Sorted	Sampled	Sampled	Sorted	Sorted	Sorted	Sorted	Sorted	Sorted	Sorted	Sorted	Sorted
Remarks	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable

Appendix 2: Tow and Catch information for the F/V OCEAN SELECTOR during the 1997 west coast of the Queen Charlotte Islands rockfish survey, September 5 - 23, 1997.

Set Number	49	50	51	52	53	54	55	56	57	58	59	60
Date (yy/mm/dd)	970911	970911	970912	970912	970912	970912	970912	970912	970912	970912	970912	970912
Start lat. deg.	54	54	54	54	54	54	54	53	54	53	53	53
Start lat. min.	5.596	4.998	6.5	5.274	4.154	2.76	0.906	58.423	1.277	55.176	54.255	55.291
Start long. deg.	133	133	133	133	133	133	133	133	133	133	133	133
Start long. min.	29.326	31.455	39.597	39.774	39.662	38.563	36.207	35.617	34.601	30.902	28.748	27.536
End lat. deg.	54	54	54	54	54	54	54	53	54	53	53	53
End lat. min.	5.001	5.545	5.675	4.493	3.385	2.155	1.282	59.244	0.794	55.901	55.111	56.118
End long. deg.	133	133	133	133	133	133	133	133	133	133	133	133
End long. min.	30.076	30.367	39.493	39.372	39.171	37.823	37.304	35.584	33.88	31.583	29.341	28.211
Start time, DST	1642	1746	0749	0837	1005	1117	1217	1355	1504	1639	1747	1710
Duration, minutes	15	15	15	15	15	15	16	16	15	15	15	15
Modal depth, fathoms	196	198	183	183	176	192	285	284	0194	0202	0157	0109
Start depth, fathoms	196	196	181	183	173	186	293	275	210	204	155	108
Finish depth, fathoms	196	200	185	182	178	198	277	292	178	201	159	111
Warp length, fathoms	450	475	450	450	450	NA	650	650	525	550	400	275
Distance trawled Nmi.	0.74	0.86	0.83	0.82	0.83	0.75	0.78	0.82	0.74	0.83	0.93	0.93
Area trawled sq. Nmi.	0.0218	0.0253	0.0244	0.0241	0.0244	0.0221	0.0230	0.0241	0.0218	0.0244	0.0274	0.0274
Depth Strata	2	2	2	2	2	2	4	4	2	3	2	1
Species												
Rougheye rockfish	512	312	-	331	1136	1356	116	364	560	83	-	-
Pacific Ocean Perch	165	263	534	985	1077	174	-	-	107	136	149	24
Aurora rockfish	-	-	-	-	-	-	-	-	2	-	-	-
Redbanded rockfish	2	2	5	-	-	-	-	-	-	1	28	2
Shortraker rockfish	-	-	-	-	-	50	46	6	31	5	-	-
Silvergrey rockfish	7	5	-	-	-	-	-	-	-	-	10	136
Darkblotch rockfish	-	-	8	-	-	-	-	-	-	-	-	-
Splitnose rockfish	-	-	-	-	-	-	-	-	-	-	180	-
Greenstripe rockfish	-	-	-	-	-	-	-	-	-	-	-	3
Widow rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Yellowtail rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Rosethorn rockfish	2	4	1	-	4	-	-	-	-	1	2	-
Blackgill rockfish	-	-	-	-	-	-	1	1	-	-	-	-
Boccacio rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Canary rockfish	-	-	-	-	-	-	-	-	-	-	-	10
Redstripe rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Yellowmouth rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Harlequin rockfish	-	-	-	-	-	-	-	-	-	-	1	-
Sharpchin rockfish	-	-	1	5	-	-	-	-	-	-	7	-
Shortspine thornyhead	57	200	50	33	17	6	28	18	-	37	14	-
Longspine thornyhead	-	-	-	-	-	-	2	1	-	-	-	-
Turbot	57	25	18	-	-	6	16	11	6	27	97	201
Deepsea sole	-	-	-	-	-	-	-	-	-	-	-	-
Petrale (Brill) sole	-	-	-	-	-	-	-	-	-	-	-	4
Rex sole	20	5	3	-	-	-	3	14	2	10	13	7
Halibut	-	57	13	-	-	-	38	28	-	20	9	-
Rock sole	-	-	-	-	-	-	-	-	-	-	-	-
Slender sole	-	-	-	-	-	-	-	-	-	-	1	-
Dover sole	10	29	25	-	-	-	26	24	9	15	11	4
Lemon (English) sole	-	-	-	-	-	-	-	-	-	-	-	-
Sablefish	47	5	15	-	42	-	17	14	-	8	4	1
Pacific cod	-	-	5	-	-	-	-	-	-	-	-	28
Lingcod	-	-	-	-	-	-	-	-	-	-	-	1
Hake	34	8	5	9	-	-	10	20	6	67	69	-
Pollock	-	-	-	-	-	-	-	-	-	2	15	73
Herring	-	-	-	-	-	-	-	-	-	-	-	-
Eelpout	-	-	-	-	-	-	-	-	-	-	-	-
Rattail	-	-	-	-	-	-	-	-	-	-	-	-
Blackfin Sculpin	2	1	3	2	-	-	-	-	-	1	-	-
Pacific flatnose	-	-	-	-	-	-	1	-	-	-	-	-
Ratfish	-	2	-	-	-	-	-	-	-	-	-	-
Long-nosed skate	-	11	-	-	-	-	4	-	-	-	-	-
Sandpaper skate	-	-	-	-	-	-	-	-	6	-	-	-
Brown cat-shark	-	-	-	-	-	-	-	-	-	-	-	-
Dogfish	-	-	-	-	-	-	-	-	-	-	-	-
Octopus	-	-	-	-	-	-	-	-	-	-	-	-
Squid	-	1	-	-	-	-	-	1	-	1	-	-
Shrimp	-	-	-	-	-	-	-	-	-	-	-	-
Total Catch (Kg)	914	930	684	1366	2277	1591	307	501	730	413	610	494
Catch estimation	Sampled	Sorted	Sampled	Sampled	Sampled	Sampled	Sorted	Sorted	Sampled	Sorted	Sorted	Sorted
Remarks	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable

Appendix 2: Tow and Catch information for the F/V OCEAN SELECTOR during the 1997 west coast of the Queen Charlotte Islands rockfish survey, September 5 - 23, 1997.

Set Number	61	62	63	64	65	66	67	68	69	70	71	72
Date (yy/mm/dd)	970913	970913	970913	970913	970913	970913	970914	970914	970914	970916	970916	970916
Start lat. deg.	53	53	53	53	53	53	53	54	54	54	54	54
Start lat. min.	53.385	50.015	48.778	48.85	47.887	46.891	58.799	3.429	5.951	16.722	14.219	13.794
Start long. deg.	133	133	133	133	133	133	133	133	133	133	133	133
Start long. min.	31.457	28.043	27.196	25.049	22.266	20.399	28.502	31.366	23.688	22.234	22.342	29.221
End lat. deg.	53	53	53	53	53	53	53	54	54	54	54	54
End lat. min.	54.172	50.614	49.424	49.481	48.508	47.492	59.64	4.045	5.4	16.052	13.49	14.579
End long. deg.	133	133	133	133	133	133	133	133	133	133	133	133
End long. min.	31.471	28.726	27.848	25.837	22.924	21.276	29.037	30.172	24.623	22.508	22.163	29.129
Start time, DST	800	928	1047	1153	1337	1437	820	924	1130	752	843	957
Duration, minutes	15	15	15	15	15	15	15	15	15	15	15	15
Modal depth, fathoms	0191	0207	0228	0180	0154	0134	0090	0123	0112	0242	0236	0212
Start depth, fathoms	182	208	225	180	155	134	89	120	114	243	235	214
Finish depth, fathoms	200	206	231	180	152	133	92	126	109	241	237	211
Warp length, fathoms	475	475	550	450	375	325	250	300	250	550	550	550
Distance trawled Nmi.	0.81	0.73	0.77	0.79	0.73	0.82	0.90	0.94	0.80	0.70	0.74	0.79
Area trawled sq. Nmi.	0.0238	0.0215	0.0227	0.0233	0.0215	0.0241	0.0265	0.0277	0.0236	0.0206	0.0218	0.0233
Depth Strata	2	3	3	2	2	1	1	1	1	3	3	3
Species												
Rougheye rockfish	652	322	1682	69	-	-	-	-	-	38	33	17
Pacific Ocean Perch	2036	81	-	106	268	22	-	-	-	-	-	-
Aurora rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Redbanded rockfish	-	6	-	20	128	207	-	-	-	-	-	1
Shortraker rockfish	-	15	-	23	-	-	-	-	-	-	-	-
Silvergrey rockfish	-	-	-	2	24	454	11	1388	684	-	-	2
Darkblotch rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Splitnose rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Greenstripe rockfish	-	-	-	-	-	-	1	3	-	-	-	-
Widow rockfish	-	-	-	-	-	-	-	14	-	-	-	-
Yellowtail rockfish	-	-	-	-	-	11	-	-	-	-	-	-
Rosethorn rockfish	-	-	-	4	6	11	-	-	5	-	-	-
Blackgill rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Boccacio rockfish	-	-	-	-	-	-	-	35	-	-	-	-
Canary rockfish	-	-	-	-	-	1176	32	21	-	-	-	-
Redstripe rockfish	-	-	-	-	-	56	-	14	795	-	-	-
Yellowmouth rockfish	-	-	-	-	-	398	-	-	55	-	-	-
Harlequin rockfish	-	1	-	1	-	3	-	-	55	-	-	1
Sharpchin rockfish	-	-	-	1	240	319	-	-	582	-	1	1
Shortspine thornyhead	10	4	27	94	6	-	-	-	-	13	12	20
Longspine thornyhead	-	-	-	-	-	-	-	-	-	-	-	-
Turbot	-	9	-	102	146	22	7	532	65	13	9	21
Deepsea sole	-	-	-	-	-	-	-	-	-	-	-	-
Petrale (Brill) sole	-	-	-	-	-	-	15	-	-	-	-	-
Rex sole	10	5	7	8	18	3	2	-	-	1	1	1
Halibut	-	-	-	5	-	-	-	490	-	-	-	-
Rock sole	-	-	-	-	-	-	1	-	-	-	-	-
Slender sole	-	-	-	1	2	-	1	-	-	-	-	-
Dover sole	10	16	20	10	61	-	-	-	-	11	3	14
Lemon (English) sole	-	-	-	-	-	-	-	-	-	-	-	-
Sablefish	-	-	-	27	12	-	-	35	-	19	91	32
Pacific cod	-	-	-	-	-	-	9	21	37	-	-	-
Lingcod	-	-	-	6	-	45	-	159	-	-	-	-
Hake	10	78	82	65	-	-	-	-	-	21	49	40
Pollock	-	1	-	8	-	6	2	-	-	-	-	-
Herring	-	-	-	-	-	-	-	-	-	-	-	-
Eelpout	-	2	3	1	-	-	-	-	-	-	-	-
Rattail	-	-	-	-	-	-	-	-	-	-	-	-
Blackfin Sculpin	5	1	3	2	-	-	-	-	-	-	-	-
Pacific flatnose	-	-	-	-	-	-	-	-	-	-	-	-
Ratfish	-	-	-	-	-	-	1	21	-	1	-	-
Long-nosed skate	-	-	-	15	-	-	-	-	-	15	18	2
Sandpaper skate	-	-	-	-	-	-	-	-	-	-	-	-
Brown cat-shark	-	-	-	-	-	-	-	-	-	-	-	-
Dogfish	-	-	-	-	-	-	-	-	-	-	-	-
Octopus	-	-	-	-	-	-	-	-	-	-	-	-
Squid	-	-	-	-	-	-	-	-	-	1	1	2
Shrimp	-	-	-	-	-	-	-	-	-	-	-	-
Total Catch (Kg)	2732	540	1825	568	911	2733	81	2731	2277	133	218	153
Catch estimation	Sampled	Sorted	Sampled	Sorted	Sampled	Sampled	Sorted	Sampled	Sampled	Sorted	Sorted	Sorted
Remarks	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable

Appendix 2: Tow and Catch information for the F/V OCEAN SELECTOR during the 1997 west coast of the Queen Charlotte Islands rockfish survey, September 5 - 23, 1997.

Set Number	73	74	75	76	77	78	79	80	81	82	83	84
Date (yy/mm/dd)	970916	970916	970916	970916	970916	970916	970917	970917	970917	970918	970918	970918
Start lat. deg.	54	54	54	54	54	54	53	53	53	53	53	53
Start lat. min.	10.943	9.535	11.004	14.607	14.173	12.962	52.912	51.722	46.532	41.695	42.046	41.787
Start long. deg.	133	133	133	133	133	133	133	133	133	133	133	133
Start long. min.	29.463	25.444	25.364	12.341	14.364	14.926	30.376	29.207	17.798	16.765	17.947	15.461
End lat. deg.	54	54	54	54	54	54	53	53	53	53	53	53
End lat. min.	10.203	10.231	11.588	14.047	13.571	12.774	52.087	50.896	45.727	42.252	41.584	41.108
End long. deg.	133	133	133	133	133	133	133	133	133	133	133	133
End long. min.	29.367	25.062	24.8	13.465	15.494	16.391	30.438	29.112	17.39	17.658	17.013	14.673
Start time, DST	1106	1207	1256	1504	1604	1659	824	927	1125	454	601	748
Duration, minutes	15	15	15	15	15	16	15	16	15	15	15	15
Modal depth, fathoms	0204	0218	0222	0110	0138	0103	0193	0203	0119	0261	0204	0162
Start depth, fathoms	204	217	220	110	140	103	191	194	118	258	316	162
Finish depth, fathoms	204	220	223	110	136	102	195	212	120	265	291	163
Warp length, fathoms	525	550	525	275	375	250	500	500	275	600	650	400
Distance trawled Nmi.	0.75	0.74	0.67	0.87	0.90	0.90	0.83	0.83	0.84	0.77	0.74	0.83
Area trawled sq. Nmi.	0.0221	0.0218	0.0197	0.0256	0.0265	0.0265	0.0244	0.0244	0.0247	0.0227	0.0218	0.0244
Depth Strata	3	3	3	1	1	1	2	3	1	4	3	2
Species												
Rougheye rockfish	43	75	106	-	-	-	389	139	-	654	42	8
Pacific Ocean Perch	76	66	73	7	48	-	316	165	20	-	-	153
Aurora rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Redbanded rockfish	2	-	1	-	4	-	2	4	-	-	-	29
Shortraker rockfish	-	-	26	-	-	-	-	6	-	61	7	-
Silvergrey rockfish	-	-	-	916	81	539	-	-	827	-	-	29
Darkblotch rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Splitnose rockfish	-	-	-	-	-	-	-	-	-	-	-	344
Greenstripe rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Widow rockfish	-	-	-	-	-	61	-	-	-	-	-	-
Yellowtail rockfish	-	-	-	41	-	17	-	-	46	-	-	-
Rosethorn rockfish	-	-	-	-	1	-	-	1	-	-	-	2
Blackgill rockfish	-	-	-	-	-	-	-	-	-	-	5	-
Boccacio rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Canary rockfish	-	-	-	68	-	628	-	-	827	-	-	-
Redstripe rockfish	-	-	-	-	-	-	-	-	111	-	-	-
Yellowmouth rockfish	-	-	-	-	-	-	-	-	-	-	-	12
Harlequin rockfish	-	-	-	3	-	111	-	-	-	-	-	2
Sharpchin rockfish	-	-	-	-	1	6	-	-	-	-	-	8
Shortspine thornyhead	17	46	18	-	4	-	18	22	-	22	13	116
Longspine thornyhead	-	-	-	-	-	-	-	-	-	-	1	-
Turbot	60	14	12	1079	442	167	18	17	215	-	2	190
Deepsea sole	-	-	-	-	-	-	-	-	-	-	-	-
Petrale (Brill) sole	-	-	-	-	-	-	-	-	-	-	-	-
Rex sole	12	11	14	-	1	-	12	7	3	7	3	4
Halibut	-	-	-	68	-	-	-	35	176	-	-	-
Rock sole	-	-	-	-	-	-	-	-	-	-	-	-
Slender sole	-	-	-	-	-	-	2	1	3	-	-	-
Dover sole	23	13	14	-	-	-	18	7	-	18	8	25
Lemon (English) sole	-	-	-	-	-	-	-	-	-	-	-	-
Sablefish	28	1	23	-	5	-	-	8	7	25	22	29
Pacific cod	-	-	-	-	12	245	-	-	33	-	-	-
Lingcod	-	-	-	81	14	44	-	-	-	-	-	-
Hake	49	13	85	-	-	-	21	64	-	7	4	37
Pollock	-	-	4	-	34	-	3	3	7	-	-	4
Herring	-	-	-	-	-	-	-	-	7	-	-	-
Eelpout	-	-	-	-	-	-	-	-	-	-	-	2
Rattail	-	-	-	-	-	-	-	-	-	-	3	-
Blackfin Sculpin	-	1	-	-	-	-	2	1	-	-	-	-
Pacific flatnose	-	-	-	-	-	-	-	-	-	-	1	-
Ratfish	-	-	-	14	4	3	-	-	-	-	-	-
Long-nosed skate	-	3	-	-	-	-	-	-	-	-	18	25
Sandpaper skate	-	-	-	-	-	-	-	-	-	-	-	-
Brown cat-shark	-	-	-	-	-	-	-	-	-	-	-	-
Dogfish	3	-	1	-	4	-	-	-	-	-	-	-
Octopus	-	-	-	-	-	-	-	-	-	-	-	-
Squid	1	-	1	-	-	-	-	-	-	-	1	8
Shrimp	-	-	-	-	-	-	-	-	-	-	-	-
Total Catch (Kg)	314	243	378	2276	654	1821	800	479	2279	795	129	1029
Catch estimation	Sorted	Sorted	Sorted	Sampled	Sorted	Sampled	Sampled	Sorted	Sampled	Sampled	Sorted	Sampled
Remarks	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable

Appendix 2: Tow and Catch information for the F/V OCEAN SELECTOR during the 1997 west coast of the Queen Charlotte Islands rockfish survey, September 5 - 23, 1997.

Set Number	85	86	87	88	89	90	91	92	93	94	95	96
Date (yy/mm/dd)	970918	970918	970918	970918	970918	970918	970918	970919	970919	970919	970919	970920
Start lat. deg.	53	53	53	53	53	53	53	53	53	53	53	53
Start lat. min.	41.378	37.289	34.118	32.123	33.932	31.252	25.556	18.555	16.996	16.768	16.177	19.3
Start long. deg.	133	133	133	133	133	133	133	132	133	133	133	133
Start long. min.	13.559	16.93	11.156	12.434	14.572	3.677	0.211	53.892	4.959	2.757	3.031	7.903
End lat. deg.	53	53	53	53	53	53	53	53	53	53	53	53
End lat. min.	42.092	37.809	33.537	32.826	34.577	31.446	26.17	17.977	17.446	17.17	16.458	20.008
End long. deg.	133	133	133	133	133	133	133	132	133	133	133	133
End long. min.	14.154	17.769	11.64	13.058	15.29	4.95	0.624	53.291	5.872	3.744	4.094	7.974
Start time, DST	837	1004	1138	1352	1511	1647	1816	1711	2005	2127	2254	817
Duration, minutes	16	16	15	16	15	15	15	16	15	15	15	15
Modal depth, fathoms	0119	0269	0311	0220	0161	0116	0190	0313	0262	0221	0290	0260
Start depth, fathoms	119	274	288	220	158	115	189	305	262	219	289	271
Finish depth, fathoms	119	264	334	219	163	117	190	321	261	222	290	248
Warp length, fathoms	300	575	650	500	425	275	400	650	650	550	675	675
Distance trawled Nmi.	0.80	0.73	0.69	0.80	0.79	0.80	0.77	0.73	0.71	0.72	0.70	0.71
Area trawled sq. Nmi.	0.0236	0.0215	0.0203	0.0236	0.0233	0.0236	0.0227	0.0215	0.0209	0.0212	0.0206	0.0209
Depth Strata	1	4	4	3	2	1	2	4	4	3	4	4
Species												
Rougheye rockfish	-	57	31	128	216	8	20	16	434	522	12	352
Pacific Ocean Perch	16	-	-	-	2705	22	274	-	-	4	-	-
Aurora rockfish	-	1	-	1	-	-	-	-	-	-	-	-
Redbanded rockfish	27	2	-	-	-	-	1	-	-	-	-	-
Shortraker rockfish	-	38	50	14	-	-	85	15	-	-	19	18
Silvergrey rockfish	516	-	-	-	-	250	28	-	-	-	-	-
Darkblotch rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Splitnose rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Greenstripe rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Widow rockfish	-	-	-	-	-	-	-	-	-	-	-	-
Yellowtail rockfish	-	-	-	-	-	12	2	-	-	-	-	-
Rosethorn rockfish	8	-	-	-	11	1	1	-	-	-	-	-
Blackgill rockfish	-	-	2	-	-	-	-	-	-	-	2	-
Boccacio rockfish	-	-	-	-	-	11	-	-	-	-	-	-
Canary rockfish	109	-	-	-	-	2	-	-	-	-	-	-
Redstripe rockfish	136	-	-	-	-	1	-	-	-	-	-	-
Yellowmouth rockfish	81	-	-	-	250	14	-	-	-	-	-	-
Harlequin rockfish	-	-	-	-	-	-	1	-	-	-	-	-
Sharpchin rockfish	23	-	-	-	-	1	11	-	-	-	-	-
Shortspine thornyhead	4	10	16	13	6	-	17	19	23	12	23	34
Longspine thornyhead	-	-	-	-	-	-	-	-	1	-	2	-
Turbot	167	1	18	-	-	46	35	47	-	-	2	5
Deepsea sole	-	-	1	-	-	-	-	-	-	-	-	-
Petrale (Brill) sole	-	-	-	-	-	-	-	-	-	-	-	-
Rex sole	4	1	1	1	-	5	1	1	3	3	-	2
Halibut	31	-	-	-	-	23	24	-	-	-	-	-
Rock sole	-	-	-	-	-	-	-	-	-	-	-	-
Slender sole	-	-	-	-	-	-	-	-	-	-	-	-
Dover sole	4	-	40	2	-	-	1	12	14	5	7	14
Lemon (English) sole	-	-	-	-	-	-	1	-	-	-	-	-
Sablefish	-	-	17	8	-	-	-	64	10	1	4	1
Pacific cod	4	-	-	-	-	7	-	-	-	-	-	-
Lingcod	-	-	-	-	-	-	21	-	-	-	-	-
Hake	-	1	1	3	-	1	13	8	8	10	10	5
Pollock	4	-	-	-	-	7	-	-	-	-	-	-
Herring	-	-	-	-	-	-	-	-	-	-	-	-
Eelpout	-	-	-	-	-	-	-	-	-	-	-	-
Rattail	-	-	-	-	-	-	-	27	3	-	5	-
Blackfin Sculpin	2	-	-	-	-	-	1	-	-	-	-	-
Pacific flatnose	-	-	-	-	-	-	-	1	1	1	-	-
Ratfish	4	-	-	-	-	10	2	-	-	-	-	-
Long-nosed skate	-	-	-	-	-	-	13	-	-	-	-	-
Sandpaper skate	-	-	1	-	-	-	9	-	7	-	-	-
Brown cat-shark	-	-	1	-	-	-	-	-	-	-	-	-
Dogfish	-	-	-	-	-	7	-	-	-	-	-	-
Octopus	-	-	-	-	-	-	-	-	-	-	-	-
Squid	-	-	1	-	-	-	-	1	-	-	-	-
Shrimp	-	-	-	-	-	-	-	-	-	-	-	-
Total Catch (Kg)	1138	111	179	170	3188	428	559	210	504	558	86	431
Catch estimation	Sampled	Sorted	Sorted	Sorted	Sampled	Sorted	Sorted	Sorted	Sorted	Sorted	Sorted	Sorted
Remarks	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable

Appendix 2: Tow and Catch information for the F/V OCEAN SELECTOR during the 1997 west coast of the Queen Charlotte Islands rockfish survey, September 5 - 23, 1997.

Set Number	97	98	99	100	101	102	103	104	105	106	107	Total
Date (yy/mm/dd)	970920	970920	970920	970920	970920	970920	970920	970920	970921	970921	970921	Catch
Start lat. deg.	53	53	53	53	53	53	53	53	52	52	51	by
Start lat. min.	20.233	18.934	19.894	21.055	21.231	18.454	4.386	3.622	8.455	1.6	59.854	Species
Start long. deg.	133	133	133	133	133	133	132	132	131	131	131	Kg
Start long. min.	8.058	6.215	6.236	6.499	5.237	4.363	38.774	38.134	30.998	18.616	16.567	
End lat. deg.	53	53	53	53	53	53	53	53	52	52	52	
End lat. min.	20.88	19.608	20.533	21.838	21.201	19.045	5.064	3.081	9.317	0.972	0	
End long. deg.	133	133	133	133	133	133	132	132	131	131	131	
End long. min.	8.512	6.97	7.118	6.717	6.387	5.306	39.503	37.542	31.169	17.523	16.693	
Start time, DST	930	1045	1146	1321	1431	1545	2231	2329	813	1038	1133	
Duration, minutes	15	15	15	15	15	15	15	15	16	15	10	
Modal depth, fathoms	0248	0207	0149	0117	0115	0147	0161	0205	0160	0143	0192	
Start depth, fathoms	245	209	143	118	113	146	159	205	147	149	197	
Finish depth, fathoms	250	204	155	116	117	147	163	204	172	137	187	
Warp length, fathoms	625	525	400	275	275	425	425	575	400	425	500	
Distance trawled Nmi.	0.76	0.84	0.84	0.80	0.70	0.84	0.81	0.67	0.88	0.93	0.22	
Area trawled sq. Nmi.	0.0224	0.0247	0.0247	0.0236	0.0206	0.0247	0.0238	0.0197	0.0259	0.0274	0.0065	
Depth Strata	3	3	1	1	1	1	2	3	2	1	2	
Species												
Rougheye rockfish	551	410	4	-	-	8	-	521	147	33	13	15906
Pacific Ocean Perch	-	24	177	108	-	511	231	11	1987	1639	86	34602
Aurora rockfish	2	-	-	-	-	-	-	-	-	-	-	5
Redbanded rockfish	-	-	1	-	5	1	6	-	15	7	-	679
Shortraker rockfish	21	-	-	-	-	-	14	12	-	-	-	715
Silvergrey rockfish	-	-	79	354	406	56	13	-	-	13	-	7341
Darkblotch rockfish	-	-	-	-	-	-	-	-	-	27	2	66
Splitnose rockfish	-	-	-	-	-	-	1	-	-	-	-	525
Greenstripe rockfish	-	-	-	-	-	-	-	-	-	-	-	7
Widow rockfish	-	-	4	12	162	43	-	-	22	20	-	377
Yellowtail rockfish	-	-	-	-	-	-	-	-	-	-	-	128
Rosethorn rockfish	-	-	4	3	11	3	-	-	7	3	1	115
Blackgill rockfish	-	-	-	-	-	-	-	-	-	-	-	13
Boccacio rockfish	-	-	7	-	-	-	-	-	-	-	-	53
Canary rockfish	-	-	-	-	-	-	-	-	-	-	-	2873
Redstripe rockfish	-	-	-	192	455	23	16	-	-	33	2	6080
Yellowmouth rockfish	-	-	14	1032	319	115	2	-	44	13	1	2498
Harlequin rockfish	-	-	-	-	3	-	1	-	-	-	-	186
Sharpchin rockfish	-	-	-	6	-	-	4	-	-	7	-	2769
Shortspine thornyhead	53	24	10	-	-	6	42	15	37	40	4	2970
Longspine thornyhead	-	-	-	-	-	-	-	-	-	-	-	
Turbot	-	6	2	-	-	3	220	74	-	7	6	5275
Deepsea sole	-	-	-	-	-	-	-	-	-	-	-	1
Petrale (Brill) sole	-	-	-	-	-	-	-	-	-	-	-	20
Rex sole	1	5	-	-	-	-	-	2	7	7	-	897
Halibut	-	-	-	-	-	20	5	5	-	173	-	1463
Rock sole	-	-	-	-	-	-	-	-	-	-	-	1
Slender sole	-	-	-	-	-	-	1	-	-	-	-	12
Dover sole	11	17	-	-	-	-	4	13	-	3	-	1744
Lemon (English) sole	-	-	-	-	-	-	-	-	-	-	-	2
Sablefish	5	-	-	-	-	-	28	50	-	-	-	1661
Pacific cod	-	-	-	-	-	-	-	-	-	-	-	437
Lingcod	-	-	-	-	-	-	-	-	-	-	-	393
Hake	2	48	2	-	-	-	23	4	7	20	-	1734
Pollock	-	-	-	-	-	-	18	-	-	-	-	223
Herring	-	-	-	-	-	-	-	-	-	-	-	7
Eelpout	-	-	-	-	-	-	-	-	-	-	-	8
Rattail	-	-	-	-	-	-	-	-	-	-	-	39
Blackfin Sculpin	-	1	1	-	-	1	1	-	4	-	-	52
Pacific flatnose	1	-	-	-	-	-	-	-	-	-	-	4
Ratfish	-	-	-	-	-	-	3	3	-	-	-	77
Long-nosed skate	-	8	-	-	-	-	-	-	-	-	-	175
Sandpaper skate	-	5	-	-	-	-	-	-	-	-	-	49
Brown cat-shark	-	-	-	-	-	-	-	-	-	-	-	1
Dogfish	-	-	-	-	-	-	-	-	-	-	-	15
Octopus	-	-	-	-	5	1	-	-	-	-	-	6
Squid	-	1	-	-	-	-	1	-	-	7	-	135
Shrimp	-	-	-	-	-	-	-	-	-	-	-	1
Total Catch (Kg)	647	549	305	1708	1366	790	633	710	2276	2052	115	92345
Catch estimation	Sorted	Sorted	Sorted	Sampled	Sampled	Sorted	Sorted	Sorted	Sampled	Sampled	Sampled	
Remarks	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Usable	Unusable	

Appendix 3. Length frequency data collected for rougheye rockfish during the 1997 west coast of the Queen Charlotte Islands rockfish survey aboard the F/V OCEAN SELECTOR, September 5 - 23, 1997.

Species : Rougheye rockfish

Haul	7	7	27	27	32	32	33	33	35	35	37	37	39	39	48	48	50	50
Sex	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Length																		
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
33	1	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
36	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3	0	0	0
38	2	0	0	1	0	0	0	0	0	0	1	0	1	1	0	0	0	0
39	1	3	1	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0
40	1	1	1	0	0	0	1	1	0	0	1	0	1	0	0	0	0	0
41	0	1	0	0	0	0	1	0	0	2	0	1	2	2	1	2	1	1
42	1	1	1	1	2	0	0	3	4	0	1	1	3	4	2	0	2	1
43	2	1	3	1	2	3	2	4	2	0	8	5	9	4	1	2	3	1
44	1	2	0	1	3	2	5	5	2	2	3	4	5	2	10	2	1	4
45	1	0	1	1	1	1	8	4	4	1	3	6	2	3	1	7	1	5
46	0	0	2	0	5	2	9	5	2	1	4	5	3	4	6	3	2	0
47	0	0	1	0	2	3	5	3	1	0	5	6	2	2	7	4	2	3
48	2	0	0	0	3	0	4	3	1	2	4	5	2	1	7	6	1	7
49	0	1	0	1	2	3	5	4	0	0	1	1	1	2	11	3	3	5
50	2	1	0	1	3	2	4	3	2	0	3	2	3	0	3	7	2	5
51	0	0	1	2	1	0	0	2	0	1	1	1	0	1	2	2	2	2
52	4	1	0	0	0	0	0	1	1	2	0	1	0	0	1	3	0	0
53	4	1	0	1	0	1	0	0	0	0	0	0	0	1	1	1	1	1
54	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0
55	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	2	0	0
56	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
57	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
58	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total by	29	22	15	14	24	17	44	38	20	11	35	38	39	29	57	48	23	35
Total by		51		29		41		82		31		73		68		105		58

Appendix 3. Length frequency data collected for rougheye rockfish during the 1997 west coast of the Queen Charlotte Islands rockfish survey aboard the F/V OCEAN SELECTOR, September 5 - 23, 1997.

Species : Rougheye rockfish

Haul	52	52	53	53	54	54	56	56	61	61	62	62	64	64	74	74	75	75
Sex	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Length																		
23	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
33	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0
39	0	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0
40	0	1	0	0	0	0	2	1	0	0	1	0	0	0	0	0	0	0
41	0	0	0	0	0	0	1	1	0	2	0	1	1	2	0	0	0	1
42	0	0	0	0	2	1	1	1	1	2	0	0	0	3	0	0	0	2
43	0	0	0	0	1	2	7	3	1	5	1	1	2	2	1	1	2	0
44	0	0	0	1	2	2	1	9	3	2	0	0	6	5	0	0	2	1
45	2	1	1	4	5	3	4	8	3	1	1	6	4	13	0	0	4	2
46	2	1	2	6	6	8	6	8	0	1	2	2	6	3	1	1	2	2
47	3	2	0	0	7	4	1	8	3	0	4	1	5	10	0	1	3	5
48	1	1	0	4	1	5	1	3	1	1	1	4	2	4	1	0	3	4
49	1	2	0	4	1	0	1	5	4	2	1	0	4	3	2	2	1	2
50	0	1	0	5	2	2	2	6	0	0	0	0	2	2	1	5	1	0
51	0	1	4	2	1	0	1	0	1	0	0	1	1	1	1	0	1	2
52	0	0	0	3	1	4	0	1	0	0	1	0	0	0	0	0	1	0
53	0	0	0	4	0	1	1	0	0	0	0	0	0	0	2	0	2	1
54	1	0	2	1	1	0	1	0	0	0	0	0	0	0	1	0	0	0
55	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0	1
56	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
57	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
58	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total by	13	13	11	37	33	32	33	54	18	16	13	16	33	48	12	12	25	24
Total by		26		48		65		87		34		29		81		24		49

Appendix 3. Length frequency data collected for rougheye rockfish during the 1997 west coast of the Queen Charlotte Islands rockfish survey aboard the F/V OCEAN SELECTOR, September 5 - 23, 1997.

Species : Rougheye rockfish

Haul	79	79	82	82	93	93	94	94	96	96	97	97	98	98	Total	Total	Total
Sex	M	F	M	F	M	F	M	F	M	F	M	F	M	F	Male	Female	Combined
Length																	
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
31	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	4
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	5
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	5
38	0	2	0	0	0	0	0	0	0	0	0	0	0	0	5	6	11
39	1	1	0	0	0	0	0	0	0	0	0	0	0	0	8	6	14
40	1	1	0	0	0	0	0	0	0	0	0	0	0	1	9	6	15
41	4	0	0	1	0	0	1	4	0	1	0	2	0	4	12	28	40
42	3	2	1	2	0	0	1	2	0	2	0	1	0	0	25	29	54
43	7	4	3	1	1	1	6	3	0	0	3	1	1	1	68	46	114
44	8	7	3	4	0	0	11	6	4	0	5	3	6	3	81	67	148
45	4	1	13	7	4	2	9	10	3	3	9	5	3	6	91	100	191
46	4	4	7	9	3	6	5	15	7	5	15	1	8	3	109	95	204
47	5	2	16	13	10	2	9	15	3	8	11	4	5	6	110	102	212
48	1	3	11	8	3	5	8	6	8	10	8	10	1	2	75	94	169
49	4	1	7	6	4	4	3	2	15	7	5	6	3	2	79	68	147
50	3	2	3	3	2	7	2	5	3	2	2	4	2	2	47	67	114
51	1	3	3	0	2	1	0	5	2	2	1	1	2	3	28	33	61
52	1	0	0	1	0	2	0	1	2	0	0	1	2	0	14	21	35
53	0	0	0	3	0	1	0	1	0	1	1	1	0	1	12	20	32
54	0	0	0	1	0	1	0	0	0	0	0	0	0	0	10	5	15
55	0	0	0	0	0	2	0	0	0	0	0	0	0	0	3	9	12
56	0	0	0	1	0	0	0	0	0	0	0	0	0	0	3	4	7
57	0	0	0	0	0	0	0	0	0	1	0	0	0	0	3	4	7
58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	4
59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	3
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Total by	47	33	67	60	29	34	55	76	47	42	60	40	33	34	815	823	1638
Total by		80		127		63		131		89		100		67			

Appendix 4. Length frequency data collected for Pacific ocean perch during the 1997 west coast of the Queen Charlotte Islands rockfish survey aboards the F/V OCEAN SELECTOR, September 5 - 23, 1997.

Species : Pacific Ocean perch

Haul	19	19	20	20	21	21	22	22	24	24	25	25	26	26	27	27
Sex	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Length																
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
20	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
23	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	1	2	0	0	0	0	1	6	1	0	0	0	0	0
27	0	2	1	0	0	0	0	0	1	0	0	0	0	0	0	0
28	1	0	1	0	0	0	0	0	1	5	0	0	0	1	0	0
29	0	0	0	2	0	0	0	0	3	4	0	0	0	0	0	0
30	0	0	0	1	0	1	0	0	2	6	0	0	0	1	0	0
31	0	1	1	1	1	0	0	0	1	8	0	0	1	2	0	0
32	0	0	0	0	0	1	0	0	5	9	1	1	0	1	0	0
33	0	0	1	2	1	0	0	0	5	8	0	0	1	0	0	0
34	0	0	1	2	1	0	0	0	5	3	2	0	1	2	0	0
35	2	0	2	0	1	3	0	0	2	4	1	2	1	0	0	0
36	2	0	6	0	6	1	0	0	3	1	4	2	1	2	0	0
37	1	0	7	0	2	1	0	0	4	3	9	3	3	2	1	1
38	2	3	3	4	6	0	1	0	7	1	6	4	9	5	2	2
39	5	1	6	3	0	4	1	3	6	8	8	3	3	5	3	1
40	0	1	6	3	2	2	3	1	3	1	3	5	6	4	1	1
41	1	2	5	4	2	6	1	1	2	3	4	3	6	3	2	1
42	1	0	2	4	5	1	2	2	5	6	3	2	3	1	3	1
43	0	2	0	2	7	5	0	1	1	1	5	1	5	6	2	3
44	0	0	0	2	2	4	1	4	0	1	2	3	2	0	1	3
45	0	0	0	1	0	3	3	0	1	3	1	4	1	4	0	8
46	0	0	0	0	1	2	3	0	0	2	0	0	1	2	1	8
47	0	0	0	0	1	0	4	1	0	2	0	0	0	0	0	8
48	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	3
49	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	4
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total by sex	16	13	43	34	38	35	22	13	61	88	50	33	44	41	16	47
Total by set		29		77		73		35		149		83		85		63

Appendix 4. Length frequency data collected for Pacific ocean perch during the 1997 west coast of the Queen Charlotte Islands rockfish survey aboards the F/V OCEAN SELECTOR, September 5 - 23, 1997.

Species : Pacific Ocean perch

Haul	28	28	29	29	30	30	34	34	35	35	36	36	41	41	49	49
Sex	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Length																
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	5	2	0	0	0	0	0	1	0	1	0	0	0	0
34	0	0	1	1	1	0	1	1	0	1	4	1	1	1	0	0
35	1	0	3	3	1	2	6	2	2	1	11	2	3	1	0	0
36	0	0	3	1	9	2	8	7	6	6	6	4	12	2	0	0
37	3	0	7	4	22	6	10	13	5	8	16	8	7	5	0	2
38	2	0	16	6	15	7	11	13	11	8	13	11	17	6	0	3
39	2	0	26	4	13	12	4	14	8	11	6	10	18	4	1	2
40	0	2	9	3	9	6	1	7	9	6	5	11	17	6	0	3
41	2	1	3	4	9	7	3	4	4	7	2	1	11	2	0	1
42	1	1	0	3	2	2	2	2	1	5	2	2	4	4	2	2
43	5	3	1	4	1	4	0	2	1	8	1	1	2	3	1	2
44	1	1	0	3	0	3	0	3	0	9	0	0	0	1	1	4
45	0	1	1	0	0	1	1	0	0	1	0	1	1	1	0	2
46	0	3	0	1	0	0	0	0	0	3	0	0	0	0	0	3
47	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	3
48	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	1
49	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total by sex	17	20	76	55	82	52	47	68	47	75	66	53	93	36	5	28
Total by set		37		131		134		115		122		119		129		33

Appendix 4. Length frequency data collected for Pacific ocean perch during the 1997 west coast of the Queen Charlotte Islands rockfish survey aboards the F/V OCEAN SELECTOR, September 5 - 23, 1997.

Species : Pacific Ocean perch

Haul	50	50	51	51	53	53	59	59	61	61	64	64	74	74	75	75
Sex	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Length																
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	1	0	0	1	0	2	0	0	0	0
33	0	0	0	0	0	0	0	1	0	1	0	5	1	0	0	0
34	0	0	0	0	0	0	0	1	1	2	3	3	0	0	0	0
35	0	0	1	0	0	0	0	2	3	4	9	1	1	0	1	0
36	4	1	2	0	6	1	3	5	3	2	7	4	4	2	2	1
37	7	0	2	2	7	1	6	10	7	3	12	3	7	1	2	1
38	8	2	8	1	9	1	5	9	3	13	10	7	4	1	3	0
39	10	3	12	1	6	3	10	3	7	13	10	3	4	4	2	1
40	14	1	18	2	6	5	5	3	6	12	6	2	5	3	5	2
41	10	1	12	3	3	11	8	7	0	10	0	3	9	5	5	3
42	16	1	11	3	2	6	7	3	5	10	2	3	3	2	3	5
43	5	2	7	1	1	2	5	4	1	14	1	6	0	7	1	4
44	5	0	12	3	1	3	5	2	0	4	0	2	1	3	0	4
45	2	0	3	0	0	3	0	1	0	6	0	3	1	1	0	2
46	1	1	1	1	0	2	0	2	0	1	0	1	0	2	0	3
47	0	1	0	2	0	1	0	1	0	0	0	0	0	1	0	1
48	0	1	0	1	0	2	0	1	0	0	0	0	0	1	0	1
49	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
51	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total by sex	82	14	89	21	41	41	55	58	36	96	61	48	40	34	24	29
Total by set		96		110		82		113		132		109		74		53

Appendix 4. Length frequency data collected for Pacific ocean perch during the 1997 west coast of the Queen Charlotte Islands rockfish survey aboards the F/V OCEAN SELECTOR, September 5 - 23, 1997.

Species : Pacific Ocean perch

Haul	79	79	102	102	105	105	106	106	Total	Total	Total
Sex	M	F	M	F	M	F	M	F	Males	Females	Combined
Length											
18	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	1	1	2
20	0	0	0	0	0	0	0	0	1	2	3
21	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	1	0	1
23	0	0	0	0	0	0	0	0	0	1	1
24	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	1	0	1
26	0	0	0	0	0	0	0	0	3	9	12
27	0	0	0	0	0	0	0	0	2	3	5
28	0	0	0	0	0	0	0	0	3	8	11
29	0	0	0	0	0	0	0	0	4	8	12
30	0	0	0	0	0	0	0	0	2	14	16
31	0	0	0	0	0	0	0	0	5	15	20
32	0	0	0	0	0	0	0	0	7	18	25
33	0	1	0	0	0	0	0	0	14	22	36
34	1	2	0	0	0	0	0	0	23	20	43
35	1	3	0	0	0	0	1	0	53	30	83
36	3	7	3	0	0	0	2	1	105	52	157
37	11	10	0	1	2	1	1	1	161	90	251
38	7	7	6	0	8	5	7	2	199	121	320
39	8	12	9	0	12	5	8	4	208	137	345
40	5	11	7	3	11	8	14	5	176	119	295
41	6	6	7	3	7	8	14	6	138	116	254
42	1	5	3	4	0	15	11	8	102	103	205
43	0	2	4	10	0	7	2	13	59	120	179
44	0	3	1	8	0	4	1	6	36	83	119
45	0	1	0	10	0	5	0	4	15	66	81
46	0	0	0	18	0	2	0	5	8	62	70
47	0	0	0	5	0	0	0	4	5	34	39
48	0	0	0	4	0	0	0	0	0	20	20
49	0	0	0	0	0	0	0	0	3	7	10
50	0	0	0	1	0	0	0	0	0	6	6
51	0	0	0	0	0	0	0	0	0	1	1
52	0	0	0	0	0	0	0	0	0	0	0
Total by sex	43	70	40	67	40	60	61	59	1335	1288	2623
Total by set		113		107		100		120			

Appendix 5. Length frequency data collected for silvergrey rockfish during the 1997 west coast of the Queen Charlotte Islands rockfish survey aboards the F/V OCEAN SELECTOR, September 5 - 23, 1997.

Species : Silvergrey rockfish

Haul	68	68	78	78	85	85	Total	Total	Total
Sex	M	F	M	F	M	F	Male	Female	Combined
Length									
41	0	0	0	0	0	1	0	1	1
42	0	0	1	0	0	0	1	0	1
43	0	0	0	0	2	1	2	1	3
44	0	1	1	0	0	1	1	2	3
45	0	1	0	2	2	1	2	4	6
46	4	0	2	1	1	3	7	4	11
47	3	5	1	0	2	6	6	11	17
48	0	3	3	1	5	2	8	6	14
49	2	5	0	1	8	5	10	11	21
50	4	4	1	2	5	5	10	11	21
51	6	6	4	1	2	1	12	8	20
52	6	3	0	2	2	2	8	7	15
53	3	3	0	2	2	4	5	9	14
54	2	1	0	1	4	1	6	3	9
55	0	3	1	1	0	0	1	4	5
56	1	0	3	0	2	0	6	0	6
57	3	1	3	1	1	0	7	2	9
58	0	1	2	0	0	2	2	3	5
59	0	0	2	0	0	1	2	1	3
60	0	0	1	0	0	2	1	2	3
61	0	0	0	1	0	0	0	1	1
62	0	0	0	1	0	0	0	1	1
63	0	0	1	1	0	0	1	1	2
64	0	1	0	0	0	0	0	1	1
Total by sex	34	38	26	18	38	38	98	94	192
Total by set		72		44		76			

Appendix 6. Length frequency data collected for redstripe rockfish during the 1997 west coast of the Queen Charlotte Islands rockfish survey aboards the F/V OCEAN SELECTOR, September 5 - 23, 1997.

Species: Redstripe rockfish

Haul	23	23	69	69	101	101	Total	Total	Total
Sex	M	F	M	F	M	F	Male	Female	Combined
Length									
24	0	0	1	0	0	0	1	0	1
25	0	0	4	0	0	0	4	0	4
26	1	0	10	4	0	0	11	4	15
27	1	0	9	7	0	0	10	7	17
28	1	1	16	12	0	0	17	13	30
29	0	0	7	11	0	0	7	11	18
30	3	3	7	12	0	0	10	15	25
31	7	2	3	9	0	0	10	11	21
32	9	4	1	3	1	0	11	7	18
33	14	4	1	0	8	0	23	4	27
34	10	3	0	4	7	0	17	7	24
35	3	6	0	8	2	0	5	14	19
36	2	7	0	8	2	3	4	18	22
37	0	15	1	8	0	4	1	27	28
38	0	8	0	5	0	8	0	21	21
39	0	7	0	4	0	10	0	21	21
40	0	3	0	0	0	6	0	9	9
41	0	7	0	0	0	4	0	11	11
42	0	4	0	0	0	2	0	6	6
43	0	0	0	0	0	1	0	1	1
Total by sex	51	74	60	95	20	38	131	207	338
Total by set		125		155		58			

Appendix 7. Length frequency data collected for sharpchin rockfish during the 1997 west coast of the Queen Charlotte Islands rockfish survey aboards the F/V OCEAN SELECTOR, September 5 - 23, 1997.

Species : Sharpchin rockfish

Haul	23	23	66	66	69	69	Total	Total	Total
Sex	M	F	M	F	M	F	Male	Female	Combined
Length									
15	0	0	0	1	0	0	0	1	1
16	0	0	0	1	1	0	1	1	2
17	0	0	2	0	1	3	3	3	6
18	0	0	1	2	0	6	1	8	9
19	0	0	1	4	7	6	8	10	18
20	2	0	0	5	8	6	10	11	21
21	1	0	1	2	14	12	16	14	30
22	1	1	0	6	14	16	15	23	38
23	3	1	0	4	9	24	12	29	41
24	1	0	3	2	3	25	7	27	34
25	7	0	2	0	4	17	13	17	30
26	6	2	6	1	1	16	13	19	32
27	8	2	7	4	0	4	15	10	25
28	7	3	6	1	0	8	13	12	25
29	4	4	1	2	0	3	5	9	14
30	2	9	0	3	0	2	2	14	16
31	0	11	0	8	0	1	0	20	20
32	1	18	0	1	0	0	1	19	20
33	0	16	0	6	0	0	0	22	22
34	0	7	1	1	0	0	1	8	9
35	0	7	0	4	0	0	0	11	11
36	0	1	0	5	0	0	0	6	6
37	0	0	0	3	0	0	0	3	3
38	0	1	0	1	0	0	0	2	2
Total by sex	43	83	31	67	62	149	136	299	435
Total by set		126		98		211			

Appendix 8. Length frequency data collected for shortspine thornyhead during the 1997 west coast of the Queen Charlotte Islands rockfish survey aboards the F/V OCEAN SELECTOR, September 5 - 23, 1997.

Species : Shortspine thornyhead

Haul	5	5	5	7	7	7	15	15	18	18	19	19	19	27	27	32	32	41	41
Sex	M	F	U	M	F	U	M	F	M	F	M	F	U	M	F	M	F	M	F
Length																			
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
15	0	0	0	0	0	3	0	0	0	1	0	0	1	0	0	0	0	0	0
16	0	0	0	0	0	0	2	0	0	0	3	0	1	0	0	1	0	0	0
17	0	0	0	0	0	0	1	0	0	0	4	1	1	0	0	0	0	1	1
18	0	0	0	2	0	0	0	0	2	1	5	1	1	0	0	1	0	2	2
19	0	0	0	0	0	1	0	1	0	0	5	11	1	0	0	3	2	2	0
20	1	0	1	1	0	1	1	0	1	2	8	0	0	2	0	2	1	3	0
21	1	0	0	3	0	0	0	1	1	1	5	5	0	1	0	1	1	3	3
22	1	0	0	4	0	0	6	4	3	3	7	5	0	0	2	5	1	4	3
23	1	1	0	2	1	0	4	5	0	3	0	2	0	6	1	3	1	6	4
24	0	2	0	2	1	0	5	5	2	1	11	8	0	3	2	5	4	10	7
25	5	1	0	4	1	0	4	2	1	0	6	2	0	1	5	3	4	7	12
26	5	2	0	4	0	0	3	7	2	0	7	7	0	2	3	3	2	5	6
27	5	2	0	3	1	0	2	2	0	4	6	5	0	5	5	8	2	16	4
28	5	6	0	1	3	0	4	5	2	0	4	5	0	7	2	6	2	8	6
29	7	3	0	4	2	0	3	2	1	1	4	1	0	3	0	3	0	10	5
30	9	3	0	0	4	0	4	1	3	0	5	1	0	6	2	6	4	2	0
31	3	4	0	1	3	0	3	1	2	0	3	0	0	7	4	3	3	3	0
32	6	5	0	2	5	0	7	0	2	1	2	1	0	3	1	3	2	2	0
33	6	5	0	1	2	0	4	0	1	1	2	0	0	3	0	4	0	1	1
34	5	6	0	0	1	0	2	1	1	2	3	1	0	7	0	2	2	1	0
35	3	3	0	3	2	0	1	0	2	0	0	0	0	5	0	2	4	0	0
36	5	5	0	3	4	0	2	0	1	0	1	0	0	1	0	3	0	0	2
37	2	5	0	2	0	0	0	1	0	0	0	0	0	0	0	1	1	1	0
38	3	1	0	1	0	0	2	0	0	0	0	0	0	1	0	1	1	0	0
39	4	1	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	1	0
40	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
41	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
49	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Total by sex	83	56	1	45	30	5	65	41	28	21	93	56	5	64	27	69	37	90	56
Total by set			140			80		106		49			154		91		106		146

Appendix 8. Length frequency data collected for shortspine thornyhead during the 1997 west coast of the Queen Charlotte Islands rockfish survey aboards the F/V OCEAN SELECTOR, September 5 - 23, 1997.

Species : Shortspine thornyhead

Haul	55	55	64	64	72	72	73	73	75	75	75	80	80	80	83	83	83	86	86
Sex	M	F	M	F	M	F	M	F	M	F	U	M	F	U	M	F	U	M	F
Length																			
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	1	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0
14	0	0	2	0	0	0	0	0	2	1	0	0	0	2	0	0	3	0	0
15	0	0	5	2	0	0	1	0	0	1	1	0	1	1	0	0	2	0	0
16	0	0	4	4	0	0	0	0	0	0	1	0	2	0	0	0	1	0	1
17	0	0	3	4	0	0	0	0	0	0	0	0	1	1	0	0	0	3	1
18	1	0	9	4	0	1	1	0	0	2	0	4	7	0	1	2	0	0	1
19	0	1	7	7	0	0	0	1	1	3	0	1	7	0	3	0	0	1	0
20	0	0	1	5	0	0	0	0	1	0	0	5	11	0	0	1	0	0	1
21	1	0	3	9	0	1	0	1	3	0	0	3	7	0	2	2	0	0	1
22	0	2	7	4	0	0	0	0	2	3	0	7	4	0	2	0	0	4	3
23	1	1	12	10	1	1	0	0	3	1	0	3	5	0	3	3	0	3	0
24	1	0	14	7	1	0	1	1	0	2	0	7	4	0	2	5	0	2	2
25	2	2	8	6	1	1	1	0	2	1	0	2	5	0	2	2	0	0	3
26	0	3	10	2	3	2	0	2	1	3	0	2	6	0	1	1	0	2	1
27	2	1	8	2	0	3	1	4	3	6	0	8	5	0	3	1	0	1	1
28	2	1	6	0	0	1	5	1	1	1	0	3	3	0	2	0	0	1	1
29	1	0	7	2	4	0	4	5	2	3	0	2	1	0	1	0	0	0	0
30	6	0	0	0	2	4	2	4	3	1	0	2	0	0	0	1	0	1	1
31	2	1	1	0	0	2	1	1	0	5	0	1	1	0	0	0	0	2	0
32	2	3	1	0	1	2	0	3	1	0	0	0	0	0	0	1	0	1	0
33	0	0	0	0	3	1	0	2	2	0	0	1	0	0	1	0	0	0	0
34	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	2	0
35	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	4	2	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	1	0
37	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	1	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0
39	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
42	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
43	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total by sex	30	20	109	70	20	22	17	27	30	33	2	51	70	8	26	19	6	24	17
Total by set		50		179		42		44			65			129			51		41

Appendix 8. Length frequency data collected for shortspine thornyhead during the 1997 west coast of the Queen Charlotte Islands rockfish survey aboards the F/V OCEAN SELECTOR, September 5 - 23, 1997.

Species : Shortspine thornyhead

Haul	88	88	92	92	93	93	96	96	Total	Total	Total	Total
Sex	M	F	M	F	M	F	M	F	Male	Female	Unknown	Combined
Length												
10	1	0	0	0	0	0	0	0	1	0	0	1
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	1	1	0	1	1	0	2
13	0	0	0	0	1	0	0	0	2	0	4	6
14	1	0	0	4	4	3	0	0	11	8	5	24
15	0	0	1	2	8	9	0	1	15	17	8	40
16	2	1	1	2	7	7	0	3	20	20	3	43
17	1	0	0	1	8	5	1	0	22	14	2	38
18	1	1	2	2	2	2	1	0	34	26	1	61
19	1	2	1	0	3	4	1	5	29	44	2	75
20	6	5	1	0	1	2	3	0	37	28	2	67
21	5	3	5	0	0	2	4	3	41	40	0	81
22	4	3	2	2	1	2	4	4	63	45	0	108
23	1	2	1	2	2	8	3	3	55	54	0	109
24	3	3	3	0	6	7	10	7	88	68	0	156
25	2	1	3	2	2	1	3	10	59	61	0	120
26	1	0	2	1	2	2	8	7	63	57	0	120
27	4	0	4	2	8	2	4	4	91	56	0	147
28	1	0	5	3	2	3	7	9	72	52	0	124
29	1	1	1	0	3	1	3	2	64	29	0	93
30	0	1	1	4	4	2	0	3	56	36	0	92
31	1	0	1	4	1	1	6	0	41	30	0	71
32	0	2	1	0	2	1	4	3	40	30	0	70
33	1	0	3	0	0	1	1	0	34	13	0	47
34	0	1	0	0	3	0	0	1	28	16	0	44
35	0	1	0	1	1	0	0	0	20	11	0	31
36	0	0	0	1	1	0	0	0	25	14	0	39
37	0	0	2	0	0	1	0	1	8	10	0	18
38	0	0	0	0	0	0	2	0	13	3	0	16
39	0	0	0	0	0	1	0	0	9	2	0	11
40	0	0	1	0	0	0	0	0	3	1	0	4
41	0	0	0	0	0	0	0	0	3	3	0	6
42	0	0	0	0	0	0	1	0	6	1	0	7
43	0	0	0	0	0	1	0	0	1	3	0	4
44	0	0	0	0	0	0	0	0	1	0	0	1
45	0	0	0	0	0	0	0	0	1	0	0	1
46	0	0	0	0	0	0	0	0	1	1	0	2
47	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0
49	0	0	0	0	0	0	0	0	1	0	0	1
50	0	0	0	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	1	0	1	0	1
52	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0	1	0	1
55	0	0	0	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	0	1	0	1
60	0	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	1	0	0	1
62	0	0	0	0	0	0	0	0	1	0	0	1
63	0	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	0	1	0	1
Total by sex	37	27	41	33	72	69	67	67	1061	798	27	1886
Total by set		64		74		141		134				

Appendix 9. Length frequency data collected for Dover sole during the 1997 west coast of the Queen Charlotte Islands rockfish survey aboards the F/V OCEAN SELECTOR, September 5 - 23, 1997.

Species : Dover sole

Haul	1	1	3	3	4	4	12	12	14	14	Total	Total	Total
Sex	M	F	M	F	M	F	M	F	M	F	Male	Female	Combined
Length													
34	0	0	0	0	0	0	0	0	3	0	3	0	3
35	0	0	0	0	0	0	0	0	0	0	0	0	0
36	4	0	1	0	0	0	0	0	0	0	5	0	5
37	0	0	0	0	0	0	1	0	1	0	2	0	2
38	2	0	4	0	1	0	2	0	3	0	12	0	12
39	2	0	1	0	2	0	2	0	0	0	7	0	7
40	3	0	3	0	1	0	5	0	6	0	18	0	18
41	3	0	2	0	3	0	3	0	7	0	18	0	18
42	6	2	2	0	4	0	4	0	9	0	25	2	27
43	3	0	2	0	2	0	6	0	4	0	17	0	17
44	5	1	1	1	3	0	4	0	8	1	21	3	24
45	5	0	5	1	2	0	3	2	1	0	16	3	19
46	3	0	3	2	4	2	5	2	3	1	18	7	25
47	0	1	6	2	2	1	1	2	1	1	10	7	17
48	1	3	2	0	0	3	1	3	2	1	6	10	16
49	2	0	2	1	1	0	1	1	0	0	6	2	8
50	0	2	0	1	2	2	0	0	0	0	2	5	7
51	0	1	0	2	0	0	0	0	0	0	0	3	3
52	0	1	0	0	0	3	0	2	0	0	0	6	6
53	0	0	0	0	0	2	0	0	0	0	0	2	2
54	0	0	0	0	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	2	0	0	0	0	0	2	2
Total by sex	39	11	34	10	27	15	38	12	48	4	186	52	238
Total by set		50		44		42		50		52			

Appendix 10. Length frequency data collected for other species during the 1997 west coast of the Queen Charlotte Islands rockfish survey aboards the F/V OCEAN SELECTOR, September 5 - 23, 1997.

Species :	Pacific cod	Splinose rockfish		Yellowmouth rockfish	
Haul	78	84	84	102	102
Sex	U	M	F	M	F
Length					
26	0	0	1	0	0
27	0	2	2	0	0
28	0	9	3	0	0
29	0	11	8	0	0
30	0	10	13	0	0
31	0	5	18	0	0
32	0	3	12	0	0
33	0	0	5	0	0
34	0	0	2	0	0
35	0	1	3	0	0
36	0	1	3	0	0
37	0	0	1	0	0
38	0	0	0	0	0
39	0	0	0	0	0
40	0	0	0	0	0
41	0	0	0	0	0
42	0	0	0	0	0
43	0	0	0	2	0
44	0	0	0	4	1
45	0	0	0	3	5
46	0	0	0	6	7
47	0	0	0	6	8
48	0	0	0	4	12
49	0	0	0	2	1
50	2	0	0	1	3
51	1	0	0	0	1
52	1	0	0	0	0
53	0	0	0	0	0
54	3	0	0	0	0
55	2	0	0	0	0
56	1	0	0	0	0
57	2	0	0	0	0
58	2	0	0	0	0
59	1	0	0	0	0
60	4	0	0	0	0
61	0	0	0	0	0
62	2	0	0	0	0
63	0	0	0	0	0
64	3	0	0	0	0
65	2	0	0	0	0
66	3	0	0	0	0
67	4	0	0	0	0
68	2	0	0	0	0
69	1	0	0	0	0
70	5	0	0	0	0
71	4	0	0	0	0
72	2	0	0	0	0
73	2	0	0	0	0
74	0	0	0	0	0
75	2	0	0	0	0
76	2	0	0	0	0
77	0	0	0	0	0
78	0	0	0	0	0
79	1	0	0	0	0
80	0	0	0	0	0
Total by sex	54	42	71	28	38
Total by set	54		113		66