

Summary of Non-halibut Catch from the Standardized Stock Assessment Survey Conducted by the International Pacific Halibut Commission in British Columbia from June 1 to August 12, 2004

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**SUMMARY OF NON-HALIBUT CATCH FROM THE STANDARDIZED
STOCK ASSESSMENT SURVEY CONDUCTED BY THE
INTERNATIONAL PACIFIC HALIBUT COMMISSION IN
BRITISH COLUMBIA FROM JUNE 1 TO AUGUST 12, 2004**

by

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ABSTRACT

Lochead, J.K., Yamanaka, K.L., and Dykstra, C. 2006. Summary of non-halibut catch from the Standardized Stock Assessment Survey conducted by the International Pacific Halibut Commission in British Columbia from June 1 to August 12, 2004. Can. Tech. Rep. Fish. Aquat. Sci. 2657: ix + 52 p.

In 2004, an additional technician was deployed on the International Pacific Halibut Commission's standardized stock assessment survey in British Columbia (regulatory area 2B) to record fishing effort and catch data on a hook by hook basis, and to collect biological samples from sablefish (*Anoplopoma fimbria*) and rockfishes (*Sebastes spp.*). This marks the second consecutive year of complete catch enumeration and biological sampling of sablefish and rockfishes (Yamanaka *et al.*, 2004). In 2004, a total of 88 species and taxonomic groups were caught during the survey, including 15 rockfish and 48 other fish species. Over 3,100 rockfish and 2,000 sablefish were sampled for length, sex, age, and maturity data. This document summarizes all non-halibut catch by location and biological data for sablefish and rockfishes from the 2004 survey. This summary report also presents a comparison of 2003 and 2004 catch rate and biological data.

RÉSUMÉ

Lochead, J.K., Yamanaka, K.L., and Dykstra, C. 2006. Summary of non-halibut catch from the Standardized Stock Assessment Survey conducted by the International Pacific Halibut Commission in British Columbia from June 1 to August 12, 2004. Can. Tech. Rep. Fish. Aquat. Sci. 2657: ix + 52 p.

En 2004, un technicien supplémentaire a été affecté au recensement normalisé des stocks de la Commission internationale du flétan du Pacifique en Colombie-Britannique (zone réglementée 2B). Ses tâches consistaient à consigner les données de capture pour chaque hameçon et à prélever des échantillons biologiques de morues charbonnières (*Anoplopoma fimbria*) et de sébastes (*Sebastes* spp.). Il s'agissait de la deuxième année consécutive d'énumération complète des captures et d'échantillonnage biologique des morues charbonnières et des sébastes (Yamanka *et al.*, 2004). En 2004, un total de 88 espèces et groupes taxinomiques ont été capturés au cours du recensement, dont 15 espèces de sébastes et 48 autres espèces. On a échantillonné plus de 3 100 sébastes et 2 000 morues charbonnières afin d'étudier la longueur, le sexe, l'âge et la maturité. Le présent document résume les données de capture et les données biologiques provenant des prises autres que le flétan réalisées au cours du recensement de 2004. Le rapport présente aussi une comparaison des taux de captures et des données biologiques de 2003 et 2004.

1.0 INTRODUCTION

The International Pacific Halibut Commission's (IPHC) standardized stock assessment (SSA) survey is a fixed-station longline survey which extends from southern Oregon to the Bering Sea (www.iphc.washington.edu). This survey has been conducted in area 2B annually, in various configurations, since 1963. The survey provides distribution, biomass, age, growth and maturity data that are used in the IPHC's annual stock assessment of Pacific halibut (*Hippoglossus stenolepis*). In addition to halibut, many other groundfish species are commonly caught on the survey including spiny dogfish (*Squalus acanthias*), sablefish (*Anoplopoma fimbria*) and rockfishes (*Sebastes spp.*).

Since 2003, the IPHC has provided the opportunity to deploy an additional technician during the area 2B survey operations to enumerate and identify catch to species on a hook by hook basis, and to collect biological data for sablefish and rockfishes (Yamanaka *et al.*, 2004). A summary of non-halibut catch rockfish and sablefish biological data from the 2003 IPHC SSA survey, as well as a simulation model evaluation of the ability of the catch rate index to track abundance trends over time, was published in 2004 (Yamanaka *et al.*, 2004). Results from the simulation model indicated that, over the long term, the catch rate index from the SSA survey will be useful in tracking abundance trends for quillback (*S. maliger*), redbanded (*S. babcocki*), and yelloweye (*S. ruberrimus*) rockfishes.

This report summarizes the species composition of the non-halibut catch and the catch rate and biological data for rockfish by species and sablefish caught during the 2004 area 2B SSA survey. Yelloweye rockfish age data determined from samples collected during the 2003 IPHC SSA survey are also presented.

2.0 METHODS

2.1 IPHC Chartered Vessels

The *F/V Pender Isle*, *F/V Proud Venture* and *F/V Star Wars II* were chartered by the IPHC to conduct the Canadian portion (Area 2B) of the IPHC 2004 SSA survey. The *F/V Pender Isle* (CFV/VRN 27282) is a 70-foot steel vessel, skippered by Garth Roberts. The *F/V Proud Venture* (CFV/VRN 23197) is a 70-foot steel vessel, skippered by Charles Harper. The *F/V Star Wars II* (CFV/VRN 20492) is an 80-foot, wood vessel, skippered by Rob Tournier.

2.2 Survey Locations

The Canadian portion of the IPHC survey consists of 170 fixed survey stations and is divided into four charter regions: 'Vancouver', 'Goose Islands', 'St. James', and 'Charlotte'. Figure 1 shows the location of the IPHC fixed survey stations relative to the

IPHC charter regions and the DFO management regions: North Coast (NC), Queen Charlotte Islands (QCI), Central Coast (CC) and West Coast Vancouver Island (WCVI). Data within this report are summarized according to the four DFO management regions.

The *F/V Star Wars II* fished the southern regions ‘Vancouver’ and ‘Goose Islands’, the *F/V Pender Isle* fished the mid region ‘St. James’, and the *F/V Proud Venture* fished the northern region ‘Charlotte’ (Figure 1).

2.3 Fishing Gear and Operations

The chartered vessels used ‘conventional’ fishing gear and standardized fishing operations as required in the IPHC Charter Bid Specifications (www.iphc.washington.edu). Fishing gear specifications and fishing operations are detailed in Yamanaka *et al.* (2004).

2.4 Catch Data Collection

2.4.1 Hook by Hook

The hooks were observed as the gear was hauled onboard. The species caught, bait returned, or empty hook was recorded on a hook by hook basis.

2.4.2 Biological sampling

A detailed description of the biological sampling protocol is outlined in Appendix A.

Sampling of the sablefish and rockfish catch occurred after the hook observations were completed for the set. Rockfish were gutted and gilled by the crew as they came aboard and set aside for biological sampling.

A sub-sample of approximately 100 fish per rockfish species was measured for fork length prior to and after dressing to determine a conversion between dressed and round fork length. For rockfish species whose numbers exceeded 100, a linear regression was fit to the round and dressed fork length data. The conversion factor was calculated using combined 2003 and 2004 data to increase sample size, and all dressed lengths were subsequently converted to round lengths. This document summarizes and discusses round fork lengths, unless otherwise stated.

Priority species for biological sampling were yelloweye rockfish and sablefish, then other species such as redbanded, quillback, copper (*S. caurinus*), China (*S. nebulosus*), tiger (*S. nigrocinctus*), and black (*S. melanops*) rockfishes. Biological sampling consisted of measuring a dressed fork length (L) to the nearest millimetre (mm), visually examining the gonads to determine sex (S), and their state of sexual maturity (M) (Appendix B). Both sagittal otoliths (O) were excised for subsequent age determination. To keep the head intact and preserve the market value of the rockfish, otoliths were removed from the ventral-side of the skull, posterior to the palate.

Ages were determined by the break and burn method of MacLellan (1997). A summary of the yelloweye rockfish age data collected during the 2003 and 2004 IPHC SSA surveys are presented.

Catch and biological data collected are archived in DFO's GFBio database with TRIP_ID's 56913, 56914, and 56915.

2.5 Catch Rate

The catch rate (U) was defined as the total number of fish (N) divided by the number of intact skates returned (M) from the set. Mean catch rates (\bar{U}) were calculated as the sum of the catch rates by skate per set (U) divided by the number of sets (n), where s denotes the species, and i denotes the set.

$$U_{is} = \frac{N_{is}}{M_i} \qquad \bar{U} = \frac{1}{n} \sum_{i=1}^n \frac{N_{is}}{M_i}$$

3.0 RESULTS AND DISCUSSION

3.1 Survey Locations

The *F/V Proud Venture* conducted a single set at all 44 stations in the Charlotte region from June 1 through June 23, 2004. The *F/V Pender Isle* conducted one set at all 42 stations in the St. James region from July 2 through July 17, 2004. The *F/V Star Wars II* conducted a single set at all 84 stations in the Vancouver and Goose Islands regions from July 8 through August 12, 2004 (Figure 1 and Appendix C). Minimum and maximum set depths were 27 and 475 m, respectively, and the average set depth ranged from 36 to 455 m. All stations were fished during daylight hours with gear deployment taking place between 0452h and 1131h, and all gear was retrieved by 2300h (Appendix C).

The number of survey locations is distributed evenly among the IPHC survey regions but not among the DFO management regions. DFO management regions vary greatly in size with the NC containing the least number of survey locations and the CC the most (Table 1).

3.2 Catch Summary

Data from the 2004 IPHC SSA survey are archived in the DFO GFBio database. TRIP_ID's are 56913, 56914 and 56915.

3.2.1. Hook by Hook

Fifty one percent of the retrieved hooks were empty, 26 % yielded a fish or invertebrate, and 21 % had bait or bait skin returned (Table 2). Drop-offs, heads, and unobserved

hooks were uncommon, making up the remaining 2 % of the hooks retrieved. These hook yield percentages were very similar to 2003 (Yamanaka *et al.*, 2004).

3.2.2 Species composition

A total of 88 species and taxonomic groups were caught during the survey, including 15 species of rockfish and 48 other fish species (Table 3). Spiny dogfish were the most commonly encountered species at 11,814 fish caught, and together with 8,570 Pacific halibut and 5,609 sablefish, comprised 74 % of the total number of fish caught.

Arrowtooth flounder (*Atheresthes stomias*) was the fourth most common species making up 6% of the total catch, followed by redbanded and yelloweye rockfishes at 5.7 % and 4.4 % of the total catch, respectively. Other rockfish species encountered on the survey were roughey (*Sebastes aleutianus*), quillback, silvergray (*S. brevispinus*), bocaccio (*S. paucispinus*), shortraker (*S. borealis*), canary (*S. pinniger*), greenstriped (*S. elongates*), copper, yellowmouth (*S. reedi*), yellowtail (*S. flavidus*), China, rosethorn (*S. helvomaculatus*), and redstripe (*S. proriger*). Together, these other rockfishes accounted for 2.3 % of the total number of fish caught.

Species composition was consistent between the 2003 and the 2004 surveys. The greatest between year difference was for spiny dogfish which made up 44 % of the total catch in 2003 (Yamanaka *et al.*, 2004) and 34 % in 2004 (Table 3). The percentages of Pacific halibut, sablefish, and arrowtooth flounder in the overall catch were within 3 % of the previous year's values, and redbanded, yelloweye and roughey rockfishes were within 2 %. Greenstriped, copper, rosethorn, and redstripe rockfishes were not present in the catch in 2003, but were encountered in low numbers in 2004 (Table 3).

Based on validated landing weights from DFO's Dockside Monitoring Program, 34.0 tonnes (t) of halibut (fresh, dressed, head-off), 12.1 t of rockfish (fresh, gilled and gutted), and 6.7 t of sablefish (fresh, dressed, head-off) were landed on the survey (Table 4). Yelloweye rockfish and redbanded rockfish landed weights were similar at 5.5 t and 4.9 t, respectively. For every 1 kg of yelloweye rockfish and redbanded rockfish landed, 6.1 kg and 6.9 kg of halibut were landed, respectively. In 2003 the relative catch of these species was slightly lower (Yamanaka *et al.*, 2004).

Catch composition varied among the DFO management regions likely reflecting differences in habitat types and depths fished. Average depths fished ranged from 50 – 455 m in the QCI, from 50 – 142 m in the NC, from 49 – 354 m in the CC, and from 36 – 313 m off the WCVI (Table 1). Spiny dogfish, sablefish, and arrowtooth flounder were most commonly caught off the WCVI. For all rockfish species combined, 50 % were caught in the CC, 33 % in the QCI, 15 % off the WCVI, and 2 % in the NC. Similar to 2003, the greatest numbers of redbanded, yelloweye, and roughey rockfishes were caught in the QCI and CC management regions. In 2004, quillback rockfish were most common in the QCI, followed by the NC region. Unlike 2003 where quillback rockfish were most common in the WCVI followed by the QCI region (Yamanaka *et al.* 2004).

3.2.2. Biological Sampling

A total of 3,129 rockfish and 2,017 sablefish were sampled for length, sex and otoliths, and 3,122 rockfish and 2,010 sablefish maturities were recorded (Table 5).

Sex ratios for the four most frequently encountered rockfish species were close to 50:50 with percent females at 47 % for quillback rockfish, 62 % for redbanded rockfish, 55 % for rougheye rockfish, and 44 % for yelloweye rockfish (Figure 2). Sex ratios were also close to 50:50 in 2003 (Yamanaka *et al.*, 2004).

3.2.2.1 Fish fork lengths

Linear regressions of round fork lengths on dressed fork lengths by species for shortspine thornyheads and quillback, redbanded, rougheye, and yelloweye rockfishes are presented in Figure 3. Slopes are very close to 1 and the regression line passes almost directly through the origin for all species. The line equations presented in Figure 3 were used to convert dressed fork lengths to round fork lengths for these five species. Fork lengths for all other rockfish species were measured and recorded as round fork lengths.

Summary statistics for rockfish, sablefish and shortspine thornyhead round fork lengths are presented for all regions of the survey combined (Table 6), and by DFO management region (Tables 7 – 10). The smallest rockfish sampled on the survey was a 254 mm greenstriped rockfish and the largest was an 896 mm shortraker rockfish. The third largest shortspine thornyhead recorded in Canadian waters was captured on this survey in the QCI region and was 826 mm in length.

One-way analysis of variance tests for differences in round fork lengths between IPHC survey regions (ie. by latitude) revealed significant differences for redbanded and rougheye rockfishes, but not for quillback or yelloweye rockfishes (Table 11). Redbanded rockfish from the Charlotte, St. James and Goose Island regions were significantly ($p < 0.05$) larger than those from the Vancouver region. Goose Island rougheye rockfish were significantly ($p < 0.05$) larger than those caught in the Vancouver region. This pattern of increasing mean size with latitude was noted with yelloweye rockfish in the St. James to Vancouver regions from the 2003 IPHC survey and yelloweye rockfish taken from index sites in B.C. (Yamanaka *et al.*, 2004; Kronlund and Yamanaka, 2001).

Length frequency distributions by sex for quillback, redbanded, rougheye, and yelloweye rockfishes are shown in Figure 4. Histograms are generally normally distributed and females were generally larger than males.

3.2.2.2 Rockfish sexual maturity

Rockfish sexual maturity data are summarized by sex and maturity stage in Table 12. Female juvenile rockfish were infrequently encountered, making up only 5 % of female rockfish samples, compared to male juvenile rockfish which made up 14.5 % of the total

number of males sampled. For all rockfish species combined, over 50 % of males were in the ‘developing’ stage, and most females were either ‘mature’ (36 %) or ‘spent’ (42 %). For redbanded and yelloweye rockfishes, fertilization takes place in the fall and parturition takes place in the spring. Correspondingly, the majority of females are ‘spent’ by June, and males are either ‘developing’ or ‘developed’ by August (Figures 5 and 6).

3.2.2.3 *Rockfish age*

Yelloweye rockfish age summary statistics were computed, by year, using age data from the 2003 and 2004 IPHC SSA surveys (Tables 13 and 14). Age frequency histograms were plotted by sex and year and are shown in Figures 7 and 8. Yelloweye rockfish demographics did not change dramatically between 2003 and 2004 with an age range from 11 to 115 years and a mean age of 38 years. Males are younger than the females with mean ages of 36 and 42 years, respectively.

3.3 Catch Rates

Overall mean rockfish catch rates ranged from 0.0008 fish/skate for redstripe rockfish to 1.48 fish/skate for redbanded rockfish (Table 16). Overall median rockfish catch rates were 0 for all species, indicating that over half the skates did not catch a rockfish. The mean number of quillback rockfish per skate ranged from 0.04 in the CC to 0.44 in the NC, redbanded rockfish/skate ranged from 0.02 in the NC to 2.81 in the CC, and yelloweye rockfish/skate ranged from 0.52 in the NC to 1.57 in the QCI (Tables 16 – 19).

The spatial distribution of catch rates in numbers of fish/skate by species for rockfish and sablefish are illustrated in Figure 9. As in 2003, sablefish and quillback, redbanded, and yelloweye rockfishes were caught throughout all DFO Management regions (Yamanaka *et al.*, 2004). Bocaccio, canary, rougheye, shortraker, and silvergray rockfishes were caught in all regions except the NC. Catches of China, copper, redstripe, rosethorn, yellowmouth, and yellowtail rockfishes were small and sporadically distributed.

Catch rates were plotted against average set depths for sablefish, quillback, redbanded, rougheye, silvergray, and yelloweye rockfishes and are illustrated with capture depth ranges in Figure 10. Sablefish catch rates were distributed across a broad range of capture depths and generally increased as average set depth increased. Rockfish catch rates suggest depth preferences with peaks in abundance within specific depth ranges. The average depths at peak catch rates were 69 m for quillback rockfish (77 m in 2003), 221 m for redbanded rockfish (208 m in 2003), 366 m for rougheye rockfish (388 m in 2003), 187 m for sablefish (192 m in 2003), 221 m for silvergray rockfish (143 m in 2003), and 168 m for yelloweye rockfish (187 m in 2003) (Yamanaka *et al.*, 2004). Quillback rockfish catches were distributed across the most narrow capture depth range of 48 – 146 m, whereas yelloweye rockfish catches spanned the widest capture depth range of 40 – 355 m.

Mean 2003 and 2004 catch rates plus 95 % confidence intervals were plotted for sablefish and the top eight most frequently encountered rockfish species (Figure 11). Although

within year variability was high for all species, only small differences in mean catch rates were found between years. Wilcoxon rank sum tests did not reveal any significant differences in catch rates between years for sablefish, and redbanded, yelloweye, rougheye, or quillback rockfishes (Table 20).

4.0 SUMMARY

A total of 88 species and taxonomic groups, including 15 rockfish species and 48 other fish species, were caught during the IPHC SSA survey in area 2B during 2004. Spiny dogfish, Pacific halibut and sablefish comprised 74% of the total number of fish caught. Redbanded and yelloweye rockfishes were the 5th and 6th most commonly caught fish, respectively. Catch composition between the 2003 and the 2004 surveys were similar with the largest between year difference for spiny dogfish, lower by 10% in 2004. No significant differences in catch rate were found between 2003 and 2004 for sablefish, redbanded, yelloweye, rougheye, and quillback rockfishes.

A total of 3,129 rockfish and 2,017 sablefish were sampled for biological data. Yelloweye rockfish caught in the 2003 and 2004 surveys range in age from 11 to 115 years. A strong age class mode is observed as 24 year olds in 2003 and 25 year olds in 2004.

ACKNOWLEDGEMENTS

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REFERENCES

- International Pacific Halibut Commission Homepage. 2003. www.iphc.washington.edu.
- Kronlund, A.R., and Yamanaka, K.L. 2001. Yelloweye rockfish (*Sebastes ruberrimus*) life history parameters assessed from areas with contrasting fishing histories. P. 257-277. In Spatial processes and management of marine populations, G.H. Kruse, N. Bex, A. Booth, M.W. Dorn, S. Hills, R.N. Lipcius, D. Pelletier, C. Roy, S.J. Smith and D. Witherell (eds.). University of Alaska Sea Grant, AK-SK-01-02, Fairbanks.
- MacLellan, S.E. 1997. How to age rockfish (*Sebastes*) using *S. alutus* as an example – The otolith burnt section technique. Can. Tech. Rep. Fish. Aquat. Sci. 2146: 39p.
- Yamanaka, K.L., Lochead, K.L., and Dykstra, C. 2004. Summary of non-halibut catch from the standardized stock assessment survey conducted by the International Pacific Halibut Commission in British Columbia from May 27 to August 11, 2003. Can. Tech. Rep. Fish. Aquat. Sci. 2535: iv + 53p.

Table 1. Numbers of IPHC survey stations within IPHC survey regions and DFO management regions.

IPHC Survey Region	# of sites	Average depths (m)
Charlotte	44	50 - 455
St. James	42	86 - 393
Goose Island	43	49 - 306
Vancouver	41	36 - 313
DFO Management Region	# of sites	Average depths (m)
QCI	44	50 - 455
NC	12	50 - 142
CC	60	49 - 354
WCVI	54	36 - 313

Table 2. Summary of hook observations by description, DFO GFBio database code, number of hooks retrieved, and percent of total hooks.

Description	GFBio Code	# hooks	% of total
Empty hook	1	69076	51.06
Bait on hook	2	18224	13.47
Animal on hook (fish or invertebrate)	3	35361	26.14
Species head on hook	4	291	0.22
Species dropped off hook	5	363	0.27
Bait skin on hook	6	9993	7.39
Hook not observed	7	1980	1.46
Total		135288	100.00

Table 3. Summary of catch in numbers and percent of fish species total by common name, taxonomic name, and DFO management region of capture.

Common Name	Taxonomic Name	Total	WCVI	QCI	NC	CC	% Total
SPINY DOGFISH	<i>SQUALUS ACANTHIAS</i>	11814	5190	2398	490	3736	33.73
PACIFIC HALIBUT	<i>HIPPOGLOSSUS STENOLEPIS</i>	8570	1709	3216	1121	2524	24.47
SABLEFISH	<i>ANOPLOPOMA FIMBRIA</i>	5609	2338	1736	19	1516	16.02
ARROWTOOTH FLOUNDER	<i>ATHERESTHES STOMIAS</i>	2135	841	415	351	528	6.10
REDBANDED ROCKFISH	<i>SEBASTES BABCOCKI</i>	2011	201	463	2	1345	5.74
YELLOW EYE ROCKFISH	<i>SEBASTES RUBERRIMUS</i>	1543	331	563	50	599	4.41
LONGNOSE SKATE	<i>RAJA RHINA</i>	1147	230	292	143	482	3.28
ROUGHEYE ROCKFISH	<i>SEBASTES ALEUTIANUS</i>	474	39	252	0	183	1.35
SUNFLOWER STARFISH	<i>PYCNOPODIA HELIANTHOIDES</i>	383	109	45	175	54	-
PACIFIC COD	<i>GADUS MACROCEPHALUS</i>	333	47	102	131	53	0.95
LINGCOD	<i>OPHIODON ELONGATUS</i>	308	89	116	20	83	0.88
BIG SKATE	<i>RAJA BINOCULATA</i>	254	29	73	88	64	0.73
SHORTSPINE THORNYHEAD	<i>SEBASTOLOBUS ALASCANUS</i>	190	19	70	0	101	0.54
QUILLBACK ROCKFISH	<i>SEBASTES MALIGER</i>	142	22	57	42	21	0.41
BLUE SHARK	<i>PRIONACE GLAUCA</i>	125	57	17	0	51	0.36
SEA PENS	<i>PENNATULACEA</i>	88	1	0	0	87	-
PINK SCALLOP	<i>CHLAMYS RUBIDA</i>	73	54	0	0	19	-
SILVERGRAY ROCKFISH	<i>SEBASTES BREVISPINIS</i>	68	5	55	0	8	0.19
TUBE WORMS	<i>SEDENTARIA</i>	51	2	1	48	0	-
FISH-EATING STAR	<i>STYLASTERIAS FORRERI</i>	50	25	15	3	7	-
SPOTTED RATFISH	<i>HYDROLAGUS COLLIEI</i>	47	6	11	18	12	0.13
JELLYFISH	<i>SCYPHOZOA</i>	36	8	0	0	28	-
BOCACIO	<i>SEBASTES PAUCISPINIS</i>	32	2	19	0	11	0.09
SOUPFIN SHARK	<i>GALEORHINUS ZYOPTERUS</i>	30	23	0	1	6	0.09
PETRALE SOLE	<i>EOPSETTA JORDANI</i>	27	13	6	2	6	0.08
SHORTRAKER ROCKFISH	<i>SEBASTES BOREALIS</i>	27	11	14	0	2	0.08
CANARY ROCKFISH	<i>SEBASTES PINNIGER</i>	25	9	14	0	2	0.07
ANEMONE	<i>ACTINIARIA</i>	25	1	14	1	9	-
BASKET STARS	<i>EURYALAE</i>	24	16	5	0	3	-
STARFISH	<i>ASTERIODEA</i>	22	2	4	0	16	-
PACIFIC SLEEPER SHARK	<i>SOMNIOSUS PACIFICUS</i>	21	3	17	0	1	0.06
HYDROID	<i>HYDROZOA</i>	19	0	8	0	11	-
SANDPAPER SKATE	<i>BATHYRAJA INTERRUPTA</i>	19	0	5	9	5	0.05
METRIDIUM	<i>METRIDIUM</i>	18	13	1	0	4	-
SPONGES	<i>PORIFERA</i>	16	2	4	0	10	-
GLASS SPONGES	<i>HEXACTINELLIDA</i>	16	2	1	2	11	-
OREGONTRITON	<i>FUSITRITON OREGONENSIS</i>	15	11	1	0	3	-
TEALIA	<i>TEALIA</i>	15	7	3	0	5	-
PINK SHORT-SPINED STAR	<i>PISASTER BREVISPINUS</i>	14	0	2	9	3	-
ASCIDIANS AND TUNICATES	<i>ASCIDIACEA</i>	13	9	0	0	4	-
OCTOPUS	<i>OCTOPODA</i>	11	2	5	3	1	-
INANIMATE OBJECT(S)	<i>INANIMATE OBJECT(S)</i>	11	1	9	1	0	-
SOFT CORALS	<i>ALCYONACEA</i>	9	0	3	3	3	-
GREENSTRIPED ROCKFISH	<i>SEBASTES ELONGATUS</i>	8	7	0	0	1	0.02
PARAGORGIA PACIFICA	<i>PARAGORGIA PACIFICA</i>	8	1	5	0	2	-
SEA URCHINS	<i>ECHINACEA</i>	7	4	0	0	3	-
GIANT RED SEA CUCUMBER	<i>PARASTICHOPUS CALIFORNICUS</i>	7	3	1	0	3	-
SKATES	<i>RAJIDAE</i>	6	4	1	1	0	0.02
SOLASTERIDAE	<i>SOLASTERIDAE</i>	6	1	3	1	1	-
COPPER ROCKFISH	<i>SEBASTES CAURINUS</i>	6	0	1	5	0	0.02
YELLOWMOUTH ROCKFISH	<i>SEBASTES REEDI</i>	6	0	0	0	6	0.02
YELLOWTAIL ROCKFISH	<i>SEBASTES FLAVIDUS</i>	5	5	0	0	0	0.01

Table 3 continued on next page

Table 3 continued. Summary of catch in numbers and percent of fish species total by common name, taxonomic name, and DFO management region of capture.

Common Name	Taxonomic Name	Total	WCVI	QCI	NC	CC	% Total
LONG-ARMED SEA STAR	<i>ORTHASTERIAS KOEHLERI</i>	5	3	0	2	0	-
STRIPED SUN STARFISH	<i>SOLASTER STIMPSONI</i>	5	2	3	0	0	-
CHINA ROCKFISH	<i>SEBASTES NEBULOSUS</i>	5	2	3	0	0	0.01
SEA WHIP	<i>OSTEOCELLA SEPTENTRIONALIS</i>	5	2	2	1	0	-
PACIFIC HAKE	<i>MERLUCCIIUS PRODUCTUS</i>	5	2	0	0	3	0.01
SEA LILIES AND FEATHER STARS	<i>CRINODEA</i>	5	1	3	0	1	-
ROCKFISHES	<i>SEBASTINAE</i>	4	4	0	0	0	0.01
BIVALVE MOLLUSCS	<i>BIVALVIA</i>	4	0	1	0	3	-
DOVER SOLE	<i>MICROSTOMUS PACIFICUS</i>	3	2	0	0	1	0.01
GASTROPODS	<i>GASTROPODA</i>	3	0	0	2	1	-
RIGHT-HANDED HERMITS	<i>PAGURIDAE</i>	2	1	1	0	0	-
SALMON SHARK	<i>LAMNA DITROPIS</i>	2	1	1	0	0	0.01
ROSETHORN ROCKFISH	<i>SEBASTES HELVOMACULATUS</i>	2	1	1	0	0	0.01
SOUTHERN ROCK SOLE	<i>LEPIDOPSETTA BILINEATA</i>	2	1	0	0	1	0.01
BIGEYE THRESHER	<i>ALOPIAS SUPERCILIOSUS</i>	2	1	0	0	1	0.01
BRYOZOA	<i>BRYOZOA</i>	2	0	2	0	0	-
PACIFIC HAGFISH	<i>EPTATRETUS STOUTI</i>	2	0	2	0	0	0.01
FLATHEAD SOLE	<i>HIPPOGLOSSOIDES ELASSODON</i>	2	0	0	2	0	0.01
WALLEYE POLLOCK	<i>THERAGRA CHALCOGRAMMA</i>	2	0	0	1	1	0.01
CHEIRASTER DAWSONI	<i>CHEIRASTER DAWSONI</i>	2	0	0	1	1	-
BOX CRABS	<i>LOPHOLITHODES</i>	1	1	0	0	0	-
PACIFIC STAGHORN SCULPIN	<i>LEPTOCOTTUS ARMATUS</i>	1	1	0	0	0	0.00
PACIFIC SANDDAB	<i>CITHARICHTHYS SORDIDUS</i>	1	1	0	0	0	0.00
SCALLOP	<i>PECTINIDAE</i>	1	1	0	0	0	-
BUTTER SOLE	<i>ISOPSETTA ISOLEPIS</i>	1	0	0	1	0	0.00
SAND STAR	<i>LUIDIA FOLIOLATA</i>	1	0	0	0	1	-
ROSE STARFISH	<i>CROSSASTER PAPPOSUS</i>	1	0	0	0	1	-
SIXGILL SHARK	<i>HEXANCHUS GRISEUS</i>	1	0	0	0	1	0.00
REDSTRIPE ROCKFISH	<i>SEBASTES PRORIGER</i>	1	0	0	0	1	0.00
BATH SPONGES	<i>DEMOSPONGIAE</i>	1	0	1	0	0	-
PACIFIC GRENADIER	<i>CORYPHAENOIDES ACROLEPIS</i>	1	0	1	0	0	0.00
WOLF EEL	<i>ANARRHICHTHYS OCELLATUS</i>	1	0	1	0	0	0.00
HENRICIA ASPERA	<i>HENRICIA ASPERA</i>	1	0	0	0	1	0.00
COHO SALMON	<i>ONCORHYNCHUS KISUTCH</i>	1	0	0	0	1	0.00
ALASKA SKATE	<i>RAJA PARMIFERA</i>	1	0	0	0	1	0.00
GORGONIAN CORALS	<i>GORGONACEA</i>	1	0	0	0	1	-
Marine Fish Totals		35022	11246	9922	2497	11357	100.00

Table 4. Summary of validated landing weights, by species, for all 170 survey stations combined.

Common Name	Fish state	Kilograms
Pacific halibut	Fresh, dressed, head-off	34032.6
Sablefish	Fresh, dressed, head-off	6736.3
Yelloweye rockfish	Fresh, gilled and gutted	5546.1
Redbanded rockfish	Fresh, gilled and gutted	4913.3
Rougheye rockfish	Fresh, gilled and gutted	963.9
Pacific cod	Fresh, round	625.5
Shortspine thornyhead	Fresh, gilled and gutted	225.9
Shortraker rockfish	Fresh, gilled and gutted	183.3
Silvergray rockfish	Fresh, gilled and gutted	166.5
Quillback rockfish	Fresh, gilled and gutted	162.8
Bocaccio	Fresh, gilled and gutted	109.3
Lingcod	Unknown	102.5
Canary rockfish	Fresh, gilled and gutted	43.1
Yellowmouth rockfish	Fresh, gilled and gutted	9.1
Yellowtail rockfish	Fresh, gilled and gutted	8.2
Copper rockfish	Fresh, gilled and gutted	5.0
China rockfish	Fresh, gilled and gutted	4.1
Greenstriped rockfish	Fresh, gilled and gutted	2.7
Darkblotched rockfish	Fresh, gilled and gutted	1.8
Rosethorn rockfish	Fresh, gilled and gutted	0.5
Total Kilograms Rockfish		12119.5

Table 5. Summary of total number of biological samples of length, sex, maturity, and otoliths (LSMO) collected by species.

LSMO samples	Lengths	Sex	Maturities	Otoliths
Sablefish	2017	2017	2010	2017
Redbanded rockfish	1312	1312	1305	1312
Yelloweye rockfish	1201	1201	1194	1201
Rougheye rockfish	292	292	291	292
Quillback rockfish	120	120	119	120
Shortspine Thornyhead	111	111	111	111
Silvergray rockfish	24	24	24	24
Canary rockfish	19	19	19	19
Bocaccio	14	14	14	14
Shortraker rockfish	10	10	10	10
Greenstriped rockfish	8	8	8	8
Copper rockfish	5	5	4	5
China rockfish	5	5	5	5
Yellowtail rockfish	5	5	5	5
Yellowmouth rockfish	2	2	2	2
Redstripe rockfish	1	1	1	1
All rockfish	3129	3129	3112	3129

Table 6. Summary statistics for rockfish and sablefish fork lengths (mm) over all DFO management regions.

All Areas	Bocaccio	Canary	China	Copper	Greenstriped	Quillback	Redbanded	Redstripe
Mean	694	478	348	375	323	393	511	310
Standard Error	16.80	12.13	11.32	6.38	11.18	2.83	1.49	0.00
Median	680	462	344	374	326	391	511	310
Mode	680	481	-	-	-	371	498	-
Standard Deviation	50.39	52.89	25.31	14.26	31.61	32.59	53.84	-
Sample Variance	2539.19	2797.60	640.70	203.30	999.07	1062.35	2899.00	-
Range	156	211	66	36	100	171	333	0
Minimum	622	404	315	359	254	316	314	310
Maximum	778	615	381	395	354	487	647	310
Count	9	19	5	5	8	133	1312	1

All Areas	Rougheye	Sablefish	Shortraker	SSThornyhead	Silvergray	Yelloweye	Yellowmouth	Yellowtail
Mean	516	626	733	449	545	565	450	498.75
Standard Error	2.99	1.72	33.61	6.73	10.34	1.82	25.00	17.86
Median	515	609	738	435	553	568	450	510
Mode	523	574	-	433	523	613	-	-
Standard Deviation	51.13	92.81	88.93	73.77	50.67	64.18	35.36	35.72
Sample Variance	2613.86	8614.07	7909.29	5442.16	2567.22	4118.71	1250.00	1276.25
Range	317	669	287	526	197	345	50	82
Minimum	365	346	609	300	435	377	425	447
Maximum	682	1015	896	826	632	722	475	529
Count	292	2917	7	120	24	1240	2	4

Table 7. Summary statistics for rockfish and sablefish fork lengths (mm) from the Queen Charlotte Islands management region.

Queen Charlotte Islands	Bocaccio	Canary	China	Copper	Greenstriped	Quillback	Redbanded	Redstripe
Mean	687	496	360	-	-	383	487	-
Standard Error	19.29	18.28	13.08	-	-	3.52	3.93	-
Median	680	486	363	-	-	381	483	-
Mode	-	-	-	-	-	381	489	-
Standard Deviation	51.05	57.81	22.65	-	-	26.31	52.08	-
Sample Variance	2605.95	3342.18	513.00	-	-	691.97	2712.05	-
Range	156	175	45	-	-	148	285	-
Minimum	622	440	336	-	-	316	355	-
Maximum	778	615	381	-	-	464	640	-
Count	7	10	3	-	-	56	176	-

Queen Charlotte Islands	Rougheye	Sablefish	Shortraker	SSThornyhead	Silvergray	Yelloweye	Yellowmouth	Yellowtail
Mean	518	644	609	442	542	550	-	-
Standard Error	4.27	3.27	0.00	9.74	12.24	3.07	-	-
Median	515	625	609	438	545	543	-	-
Mode	506	711	-	440	523	613	-	-
Standard Deviation	53.53	94.30	-	76.68	53.34	67.42	-	-
Sample Variance	2865.83	8892.99	-	5879.09	2845.65	4545.70	-	-
Range	317	554	0	526	197	312	-	-
Minimum	365	461	609	300	435	391	-	-
Maximum	682	1015	609	826	632	702	-	-
Count	157	834	1	62	19	483	-	-

Table 8. Summary statistics for rockfish and sablefish fork lengths (mm) from the North Coast management region.

North Coast	Bocaccio	Canary	China	Copper	Greenstriped	Quillback	Redbanded	Redstripe
Mean	-	-	-	374.6	-	406	523	-
Standard Error	-	-	-	6.37652	-	5.20	15.58	-
Median	-	-	-	374	-	407	523	-
Mode	-	-	-	-	-	407	-	-
Standard Deviation	-	-	-	14.26	-	33.32	22.04	-
Sample Variance	-	-	-	203.30	-	1110.14	485.61	-
Range	-	-	-	36	-	139	31	-
Minimum	-	-	-	359	-	324	508	-
Maximum	-	-	-	395	-	462	539	-
Count	-	-	-	5	-	41	2	-

North Coast	Rougheye	Sablefish	Shortraker	SSThornyhead	Silvergray	Yelloweye	Yellowmouth	Yellowtail
Mean	-	514	-	-	-	586	-	-
Standard Error	-	17.80	-	-	-	8.07	-	-
Median	-	520	-	-	-	575	-	-
Mode	-	-	-	-	-	563	-	-
Standard Deviation	-	73.40	-	-	-	56.51	-	-
Sample Variance	-	5386.93	-	-	-	3193.71	-	-
Range	-	306	-	-	-	232	-	-
Minimum	-	373	-	-	-	470	-	-
Maximum	-	679	-	-	-	701	-	-
Count	-	17	-	-	-	49	-	-

Table 9. Summary statistics for rockfish and sablefish fork lengths (mm) from the Central Coast management region.

Central Coast	Bocaccio	Canary	China	Copper	Greenstriped	Quillback	Redbanded	Redstripe
Mean	-	-	-	-	254	386	518	310
Standard Error	-	-	-	-	2.7559E-308	7.48	1.61	0.00
Median	-	-	-	-	254	386	519	310
Mode	-	-	-	-	-	-	498	-
Standard Deviation	-	-	-	-	-	34.27	51.42	-
Sample Variance	-	-	-	-	-	1174.69	2644.51	-
Range	-	-	-	-	0	157	333	0
Minimum	-	-	-	-	254	331	314	310
Maximum	-	-	-	-	254	487	647	310
Count	-	-	-	-	1	21	1016	1

Central Coast	Rougheye	Sablefish	Shortraker	SSThornyhead	Silvergray	Yelloweye	Yellowmouth	Yellowtail
Mean	520	611	-	441	-	581	450	-
Standard Error	4.84	2.86	-	9.79	-	2.86	25.00	-
Median	519	598	-	429	-	590	450	-
Mode	504	563	-	433	-	580	-	-
Standard Deviation	47.44	91.11	-	63.44	-	59.67	35.36	-
Sample Variance	2250.75	8300.81	-	4024.38	-	3560.81	1250.00	-
Range	267	628	-	253	-	314	50	-
Minimum	391	352	-	341	-	408	425	-
Maximum	658	980	-	594	-	722	475	-
Count	96	1014	-	42	-	436	2	-

Table 10. Summary statistics for rockfish and sablefish fork lengths (mm) from the West Coast Vancouver Island management region.

West Coast Vancouver Island	Bocaccio	Canary	China	Copper	Greenstriped	Quillback	Redbanded	Redstripe
Mean	719	457	330	-	330	404	478	-
Standard Error	39	13.39	14.50	-	5.79	9.56	5.10	-
Median	719	461	330	-	326	406	472	-
Mode	-	-	-	-	-	-	470	-
Standard Deviation	55.15	40.18	20.51	-	14.18	37.03	55.44	-
Sample Variance	3042.00	1614.44	420.50	-	201.07	1371.45	3073.14	-
Range	78	109	29	-	40	145	271	-
Minimum	680	404	315	-	311	317	337	-
Maximum	758	513	344	-	351	462	608	-
Count	2	9	2	-	6	15	118	-

West Coast Vancouver Island	Rougheye	Sablefish	Shortraker	SSThornyhead	Silvergray	Yelloweye	Yellowmouth	Yellowtail
Mean	499	628	713	497	554	561	-	499
Standard Error	7.63	2.78	14.67	18.35	19.03	3.60	-	17.86
Median	504	608	715	498	569	565	-	510
Mode	516	574	-	-	-	513	-	-
Standard Deviation	47.63	90.03	29.34	73.40	42.55	59.38	-	35.72
Sample Variance	2268.66	8106.22	860.92	5387.18	1810.30	3526.06	-	1276.25
Range	209	618	55	289	101	327	-	82
Minimum	415	346	684	368	509	377	-	447
Maximum	624	964	739	657	610	704	-	529
Count	39	1052	4	16	5	272	-	4

Table 11. Summary of one-way analysis of variance tests for differences in fork length (mm) by IPHC survey region for quillback, redbanded, roughey, and yelloweye rockfish.

QUILLBACK	Mean	N	F	df	p
Charlotte	394.28	92	1.19	3, 129	0.3159
St. James	383.52	20			
Goose Island	390.71	7			
Vancouver	404.70	14			
REDBANDED	Mean	N	F	df	p
Charlotte	511.48	164	11.46	3, 1308	<0.0001*
St. James	515.52	663			
Goose Island	508.21	388			
Vancouver	482.09	97			
Pairwise Comparisons: Charlotte, St. James and Goose Island significantly larger (p<0.05) than Vancouver (t>3.632)					
ROUGHEYE	Mean	N	F	df	p
Charlotte	518.96	129	5.59	3, 288	0.001*
St. James	505.95	55			
Goose Island	529.98	77			
Vancouver	490.45	31			
Pairwise Comparisons: Goose Island significantly larger (p<0.05) than Vancouver (t>3.632)					
YELLOWEYE	Mean	N	F	df	p
Charlotte	568.07	258	1.02	3, 1236	0.3821
St. James	560.87	479			
Goose Island	567.58	316			
Vancouver	565.29	187			

Table 12. Sexual maturity assessments presented for rockfish by species and sex, showing the number of fish (proportion) in each maturity stage and the total number of fish sampled.

MALE ROCKFISH	Number (Proportion) of Individuals in Each Maturity Stage							Total N
	Immature	Maturing	Developing	Developed	Running	Spent	Resting	
Bocaccio	1 (0.125)	0	4 (0.500)	3 (0.375)	0	0	0	8
Canary	0	1 (0.143)	4 (0.571)	1 (0.143)	0	1 (0.143)	0	7
China	0	0	0	0	0	2 (0.667)	1 (0.333)	3
Copper	0	0	0	0	0	3 (1.000)	0	3
Greenstriped	0	2 (1.000)	0	0	0	0	0	2
Quillback	0	4 (0.057)	32 (0.457)	0	0	28 (0.400)	6 (0.086)	70
Redbanded	1 (0.002)	13 (0.026)	278 (0.562)	186 (0.376)	0	12 (0.024)	5 (0.010)	495
Rougheye	4 (0.031)	6 (0.046)	78 (0.595)	21 (0.160)	0	6 (0.046)	16 (0.122)	131
Shortraker	0	0	2 (0.500)	0	0	2 (0.500)	0	4
Silvergray	0	2 (0.118)	4 (0.235)	0	0	3 (0.176)	8 (0.471)	17
Yelloweye	35 (0.051)	138 (0.201)	350 (0.511)	7 (0.010)	0	108 (0.158)	47 (0.069)	685
Yellowmouth	0	0	2 (1.000)	0	0	0	0	2
Total Number	41 (0.029)	166 (0.116)	754 (0.528)	218 (0.153)	0 (0.00)	165 (0.116)	83 (0.058)	1427

FEMALE ROCKFISH	Number (Proportion) of Individuals in Each Maturity Stage							Total N
	Immature	Maturing	Mature	Fertilized	Larvae	Spent	Resting	
Bocaccio	0	0	2 (0.333)	1 (0.167)	0	2 (0.333)	1 (0.167)	6
Canary	0	7 (0.583)	4 (0.333)	0	0	0	1 (0.083)	12
China	0	0	0	0	0	2 (1.000)	0	2
Copper	0	0	1 (0.500)	0	1 (0.500)	0	0	2
Greenstriped	0	0	0	0	1 (0.167)	5 (0.833)	0	6
Quillback	1 (0.016)	2 (0.032)	16 (0.254)	0	1 (0.016)	38 (0.603)	5 (0.079)	63
Redbanded	0	31 (0.038)	401 (0.495)	9 (0.011)	4 (0.005)	290 (0.358)	75 (0.093)	810
Redstripe	0	0	0	0	0	0	1 (1.000)	1
Rougheye	1 (0.006)	13 (0.081)	26 (0.163)	4 (0.025)	0	49 (0.306)	67 (0.419)	160
Shortraker	0	0	1 (0.167)	0	0	1 (0.167)	4 (0.667)	6
Silvergray	0	1 (0.143)	0	1 (0.143)	1 (0.143)	3 (0.429)	1 (0.143)	7
Yelloweye	0	33 (0.060)	128 (0.234)	17 (0.031)	15 (0.027)	297 (0.542)	58 (0.106)	548
Yellowmouth	0	0	1 (0.250)	0	0	3 (0.750)	0	4
Total Number	2 (0.001)	87 (0.053)	580 (0.356)	32 (0.020)	23 (0.014)	690 (0.424)	213 (0.131)	1627

Table 13. Summary of age statistics by DFO management region for yelloweye rockfish by combined sexes and by sex, collected on the IPHC 2003 SSA Survey.

Male and Female Ages (years)	ALL REGIONS	WCVI	CC	NC	QCI
Mean	39.5	35.9	43.4	37.5	36.8
Standard Error	0.66	1.33	1.03	5.41	1.07
Median	35.0	27.0	42.0	26.5	30.0
Mode	23	23	23	25	23
Standard Deviation	18.98	17.03	19.37	24.17	18.35
Sample Variance	360.09	290.14	375.26	584.37	336.79
Minimum	13	13	18	20	16
Maximum	115	87	98	115	100
Count	833	164	356	20	293
Confidence Level (95.0%)	1.29	2.63	2.02	11.31	2.11

Male Ages (years)	ALL REGIONS	WCVI	CC	NC	QCI
Mean	37.0	31.7	41.8	42.0	32.9
Standard Error	0.84	1.53	1.28	9.32	1.33
Median	29.5	25.0	40.0	27.0	25.0
Mode	23	23	20	22	23
Standard Deviation	18.10	14.55	18.68	30.92	16.18
Sample Variance	327.56	211.70	349.10	955.80	261.64
Minimum	13	13	18	20	17
Maximum	115	75	98	115	100
Count	462	90	212	11	149
Confidence Level (95.0%)	1.65	3.05	2.53	20.77	2.62

Female Ages (years)	ALL REGIONS	WCVI	CC	NC	QCI
Mean	42.6	41.1	45.7	31.9	40.9
Standard Error	1.02	2.14	1.68	3.80	1.63
Median	41.0	41.5	44.5	25.0	39.5
Mode	23	24	23	25	50
Standard Deviation	19.59	18.45	20.18	11.40	19.59
Sample Variance	383.91	340.42	407.28	129.86	383.95
Minimum	15	15	18	23	16
Maximum	100	87	97	55	100
Count	371	74	144	9	144
Confidence Level (95.0%)	2.00	4.27	3.32	8.76	3.23

Table 14. Summary of age statistics by DFO management region for yelloweye rockfish by combined sexes and by sex, collected on the IPHC 2004 SSA Survey.

Male and Female Ages (years)	ALL REGIONS	WCVI	CC	NC	QCI
Mean	37.8	38.3	42.5	32.7	33.3
Standard Error	0.50	1.11	0.87	5.96	0.67
Median	32.0	31.0	41.0	23.0	27.0
Mode	24	22	24	23	22
Standard Deviation	17.38	18.19	18.22	18.85	14.80
Sample Variance	302.18	330.87	331.95	355.34	218.92
Minimum	11	11	14	15	13
Maximum	105	89	105	73	101
Count	1195	270	434	10	481
Confidence Level (95.0%)	0.99	2.18	1.72	13.48	1.33

Male Ages (years)	ALL REGIONS	WCVI	CC	NC	QCI
Mean	34.7	34.2	39.7	21.8	30.7
Standard Error	0.62	1.36	1.05	1.97	0.84
Median	27.0	25.5	37.0	23.0	24.0
Mode	24	24	23	23	24
Standard Deviation	15.86	16.37	16.44	4.83	13.73
Sample Variance	251.57	268.12	270.40	23.37	188.47
Minimum	11	11	14	15	13
Maximum	101	86	92	29	101
Count	661	144	247	6	264
Confidence Level (95.0%)	1.21	2.70	2.06	5.07	1.66

Female Ages (years)	ALL REGIONS	WCVI	CC	NC	QCI
Mean	41.5	43.1	46.2	49.0	36.4
Standard Error	0.80	1.70	1.45	10.45	1.05
Median	40.0	41.5	47.0	50.5	34.0
Mode	22	22	24	-	22
Standard Deviation	18.44	19.05	19.78	20.90	15.45
Sample Variance	339.95	362.87	391.09	436.67	238.70
Minimum	13	13	14	22	13
Maximum	105	89	105	73	89
Count	534	126	187	4	217
Confidence Level (95.0%)	1.57	3.36	2.85	33.25	2.07

Table 15. Summary statistics for rockfish and sablefish catch rates in number of fish per skate over all DFO management regions.

All Areas	Bocaccio	Canary	China	Copper	Quillback	Redbanded	Redstripe	Rosethorn
Mean	0.024	0.019	0.004	0.004	0.106	1.481	0.001	0.002
Standard Error	0.007	0.006	0.003	0.003	0.034	0.234	0.001	0.001
Median	0	0	0	0	0	0	0	0
Standard Deviation	0.094	0.076	0.035	0.036	0.442	3.049	0.010	0.014
Sample Variance	0.009	0.006	0.001	0.001	0.196	9.295	0.000	0.000
Minimum	0	0	0	0	0	0	0	0
Maximum	0.75	0.63	0.38	0.38	3.75	21.75	0.13	0.13
Total Number of Skates	170	170	170	170	170	170	170	170
Confidence Level (95.0%)	0.014	0.012	0.005	0.005	0.067	0.462	0.002	0.002
Coefficient of Variation	3.937	4.068	9.388	8.078	4.163	2.058	13.038	9.192

All Areas	Rougheye	Sablefish	Shortraker	Silvergray	Yelloweye	Yellowmouth	Yellowtail
Mean	0.380	4.252	0.020	0.050	1.138	0.005	0.004
Standard Error	0.119	0.490	0.011	0.014	0.197	0.003	0.002
Median	0	0.565	0	0	0	0	0
Standard Deviation	1.548	6.388	0.144	0.189	2.574	0.034	0.032
Sample Variance	2.397	40.800	0.021	0.036	6.627	0.001	0.001
Minimum	0	0	0	0	0	0	0
Maximum	13.63	34.25	1.38	1.63	16.88	0.38	0.38
Total Number of Skates	170	170	170	170	170	170	170
Confidence Level (95.0%)	0.234	0.967	0.022	0.029	0.390	0.005	0.005
Coefficient of Variation	4.076	1.502	7.174	3.745	2.262	7.434	8.567

Table 16. Summary statistics for rockfish and sablefish catch rates in numbers of fish per skate for the Queen Charlotte Islands management region.

Queen Charlotte Islands	Bocaccio	Canary	China	Copper	Quillback	Redbanded	Redstripe	Rosethorn
Mean	0.053	0.040	0.008	0.003	0.164	1.288	-	0.003
Standard Error	0.018	0.018	0.008	0.003	0.096	0.527	-	0.003
Median	0	0	0	0	0	0	-	0
Standard Deviation	0.121	0.123	0.057	0.019	0.642	3.536	-	0.019
Sample Variance	0.015	0.015	0.003	0.000	0.412	12.505	-	0.000
Minimum	0	0	0	0	0	0	-	0
Maximum	0.5	0.63	0.38	0.13	3.75	21.75	-	0.13
Total Number of Skates	45	45	45	45	45	45	45	45
Confidence Level (95.0%)	0.036	0.037	0.017	0.006	0.193	1.062	-	0.006
Coefficient of Variation	2.268	3.110	6.708	6.708	3.915	2.746	-	6.708

Queen Charlotte Islands	Rougheye	Sablefish	Shortraker	Silvergray	Yelloweye	Yellowmouth	Yellowtail
Mean	0.817	5.299	0.039	0.154	1.568	-	-
Standard Error	0.351	1.085	0.028	0.050	0.398	-	-
Median	0	0.88	0	0	0	-	-
Standard Deviation	2.355	7.275	0.188	0.335	2.672	-	-
Sample Variance	5.545	52.932	0.035	0.112	7.139	-	-
Minimum	0	0	0	0	0	-	-
Maximum	13.63	23.13	1.25	1.63	9	-	-
Total Number of Skates	45	45	45	45	45	45	45
Confidence Level (95.0%)	0.707	2.186	0.057	0.101	0.803	-	-
Coefficient of Variation	2.882	1.373	4.788	2.177	1.704	-	-

Table 17. Summary statistics for rockfish and sablefish catch rates in numbers of fish per skate for the North Coast management region.

North Coast	Bocaccio	Canary	China	Copper	Quillback	Redbanded	Redstripe	Rosethorn
Mean	-	-	-	0.053	0.439	0.021	-	-
Standard Error	-	-	-	0.036	0.248	0.021	-	-
Median	-	-	-	0	0	0	-	-
Standard Deviation	-	-	-	0.126	0.859	0.072	-	-
Sample Variance	-	-	-	0.016	0.737	0.005	-	-
Minimum	-	-	-	0	0	0	-	-
Maximum	-	-	-	0.38	2.88	0.25	-	-
Total Number of Skates	12	12	12	12	12	12	12	12
Confidence Level (95.0%)	-	-	-	0.080	0.546	0.046	-	-
Coefficient of Variation	-	-	-	2.394	1.955	3.464	-	-

North Coast	Rougheye	Sablefish	Shortraker	Silvergray	Yelloweye	Yellowmouth	Yellowtail
Mean	-	0.198	-	-	0.522	-	-
Standard Error	-	0.115	-	-	0.413	-	-
Median	-	0	-	-	0	-	-
Standard Deviation	-	0.397	-	-	1.431	-	-
Sample Variance	-	0.158	-	-	2.048	-	-
Minimum	-	0	-	-	0	-	-
Maximum	-	1.25	-	-	5	-	-
Total Number of Skates	12	12	12	12	12	12	12
Confidence Level (95.0%)	-	0.253	-	-	0.909	-	-
Coefficient of Variation	-	2.004	-	-	2.743	-	-

Table 18. Summary statistics for rockfish and sablefish catch rates in numbers of fish per skate for the Central Coast management region.

Central Coast	Bocaccio	Canary	China	Copper	Quillback	Redbanded	Redstripe	Rosethorn
Mean	0.023	0.004	-	-	0.044	2.808	0.002	-
Standard Error	0.014	0.003	-	-	0.033	0.440	0.002	-
Median	0	0	-	-	0	1.625	0	-
Standard Deviation	0.110	0.024	-	-	0.255	3.405	0.017	-
Sample Variance	0.012	0.001	-	-	0.065	11.596	0.000	-
Minimum	0	0	-	-	0	0	0	-
Maximum	0.75	0.13	-	-	1.88	13.25	0.13	-
Total Number of Skates	60	60	60	60	60	60	60	60
Confidence Level (95.0%)	0.028	0.006	-	-	0.066	0.880	0.004	-
Coefficient of Variation	4.730	5.431	-	-	5.792	1.213	7.746	-

Central Coast	Rougheye	Sablefish	Shortraker	Silvergray	Yelloweye	Yellowmouth	Yellowtail
Mean	0.382	3.160	0.004	0.017	1.254	0.013	-
Standard Error	0.198	0.535	0.003	0.007	0.394	0.007	-
Median	0	1.315	0	0	0	0	-
Standard Deviation	1.534	4.144	0.024	0.055	3.051	0.056	-
Sample Variance	2.354	17.170	0.001	0.003	9.306	0.003	-
Minimum	0	0	0	0	0	0	-
Maximum	11	14.13	0.13	0.25	16.88	0.38	-
Total Number of Skates	60	60	60	60	60	60	60
Confidence Level (95.0%)	0.396	1.070	0.006	0.014	0.788	0.014	-
Coefficient of Variation	4.019	1.311	5.431	3.206	2.433	4.366	-

Table 19. Summary statistics for rockfish and sablefish catch rates in numbers of fish per skate for the West Coast Vancouver Island management region.

West Coast Vancouver Is.	Bocaccio	Canary	China	Copper	Quillback	Redbanded	Redstripe	Rosethorn
Mean	0.005	0.022	0.005	-	0.052	0.475	-	0.002
Standard Error	0.005	0.010	0.005	-	0.020	0.233	-	0.002
Median	0	0	0	-	0	0	-	0
Standard Deviation	0.034	0.069	0.034	-	0.146	1.698	-	0.018
Sample Variance	0.001	0.005	0.001	-	0.021	2.884	-	0.000
Minimum	0	0	0	-	0	0	-	0
Maximum	0.25	0.38	0.25	-	0.75	11.88	-	0.13
Total Number of Skates	53	53	53	53	53	53	53	53
Confidence Level (95.0%)	0.009	0.019	0.009	-	0.040	0.468	-	0.005
Coefficient of Variation	7.280	3.193	7.280	-	2.796	3.579	-	7.280

West Coast Vancouver Is.	Rougheye	Sablefish	Shortraker	Silvergray	Yelloweye	Yellowmouth	Yellowtail
Mean	0.092	5.518	0.026	0.012	0.782	-	0.012
Standard Error	0.052	1.069	0.026	0.010	0.279	-	0.008
Median	0	0.75	0	0	0	-	0
Standard Deviation	0.380	7.781	0.190	0.071	2.028	-	0.057
Sample Variance	0.144	60.548	0.036	0.005	4.111	-	0.003
Minimum	0	0	0	0	0	-	0
Maximum	2.5	34.25	1.38	0.5	9	-	0.38
Total Number of Skates	53	53	53	53	53	53	53
Confidence Level (95.0%)	0.105	2.145	0.052	0.019	0.559	-	0.016
Coefficient of Variation	4.113	1.410	7.280	5.942	2.593	-	4.742

Table 20. Results of Wilcoxon rank sum tests for differences in catch rates (# fish/skate) between 2003 and 2004 for sablefish, redbanded, yelloweye, roughey, and quillback rockfishes.

Catch Rates (#fish/skate)	2003 Mean	2003 CV	2004 Mean	2004 CV	2003 U Statistic	2004 U Statistic	2-tailed p value
Sablefish	3.06	1.64	4.25	1.50	13445	15456	0.2524
Redbanded Rockfish	0.96	2.84	1.48	2.06	13522	15378	0.2558
Yelloweye Rockfish	0.90	2.75	1.14	2.26	14188	14712	0.7464
Roughey Rockfish	0.21	5.28	0.38	4.08	13808	15093	0.2541
Quillback Rockfish	0.11	3.02	0.11	4.16	174.6	166.4	0.2317

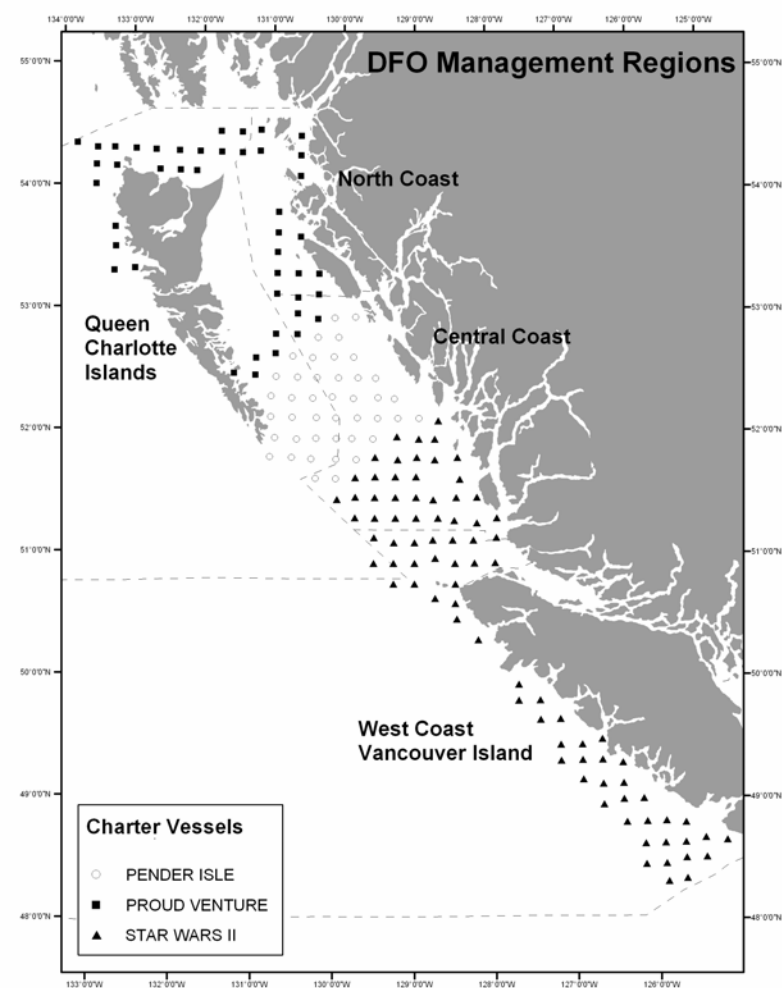
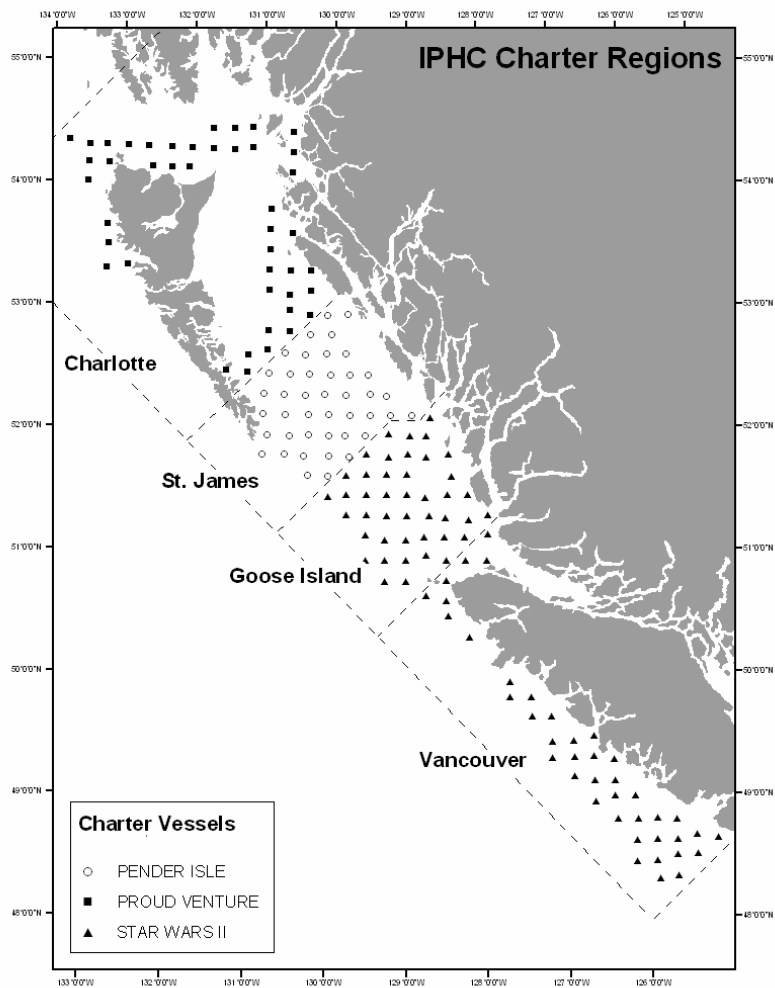


Figure 1. Distribution of IPHC survey stations by charter vessel illustrating IPHC charter region boundaries (left panel) and DFO management region boundaries (right panel).

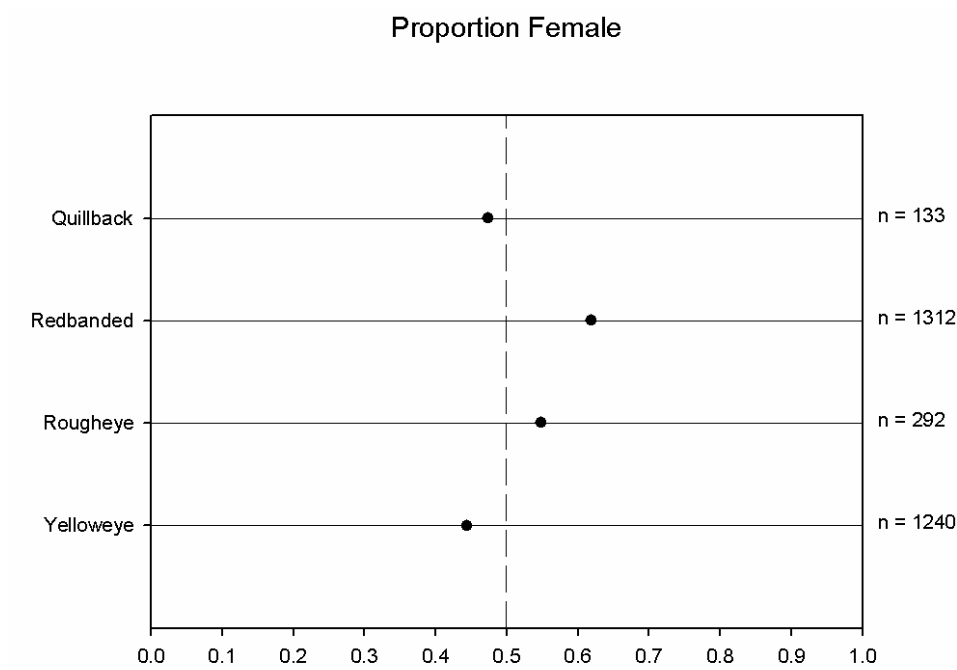


Figure 2. Proportion females for rockfish commonly caught on the survey with sample size (n).

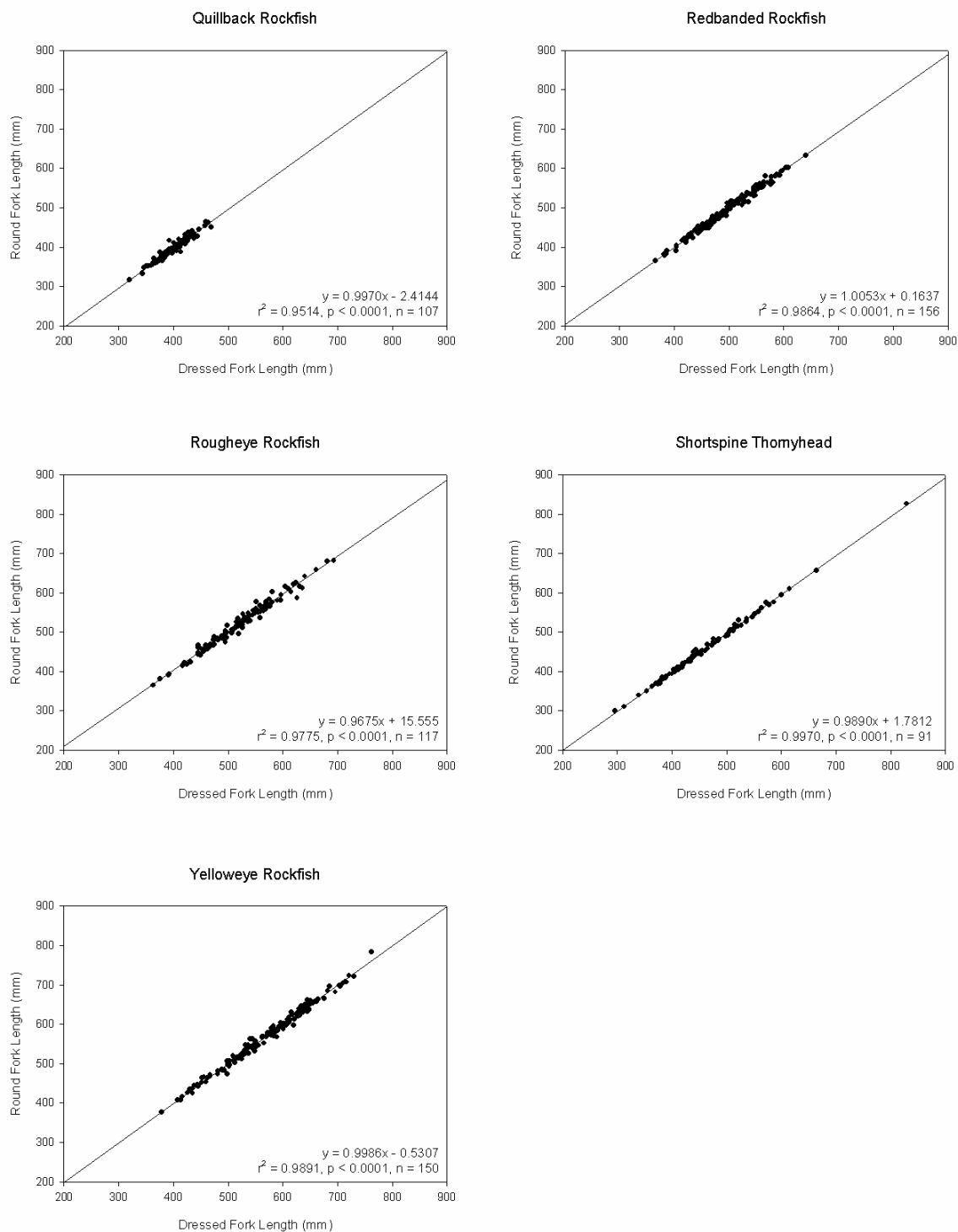


Figure 3. Linear regression of round fork length on dressed fork length by species for quillback rockfish, redbanded rockfish, rougheye rockfish, shortspine thornyhead, and yelloweye rockfish.

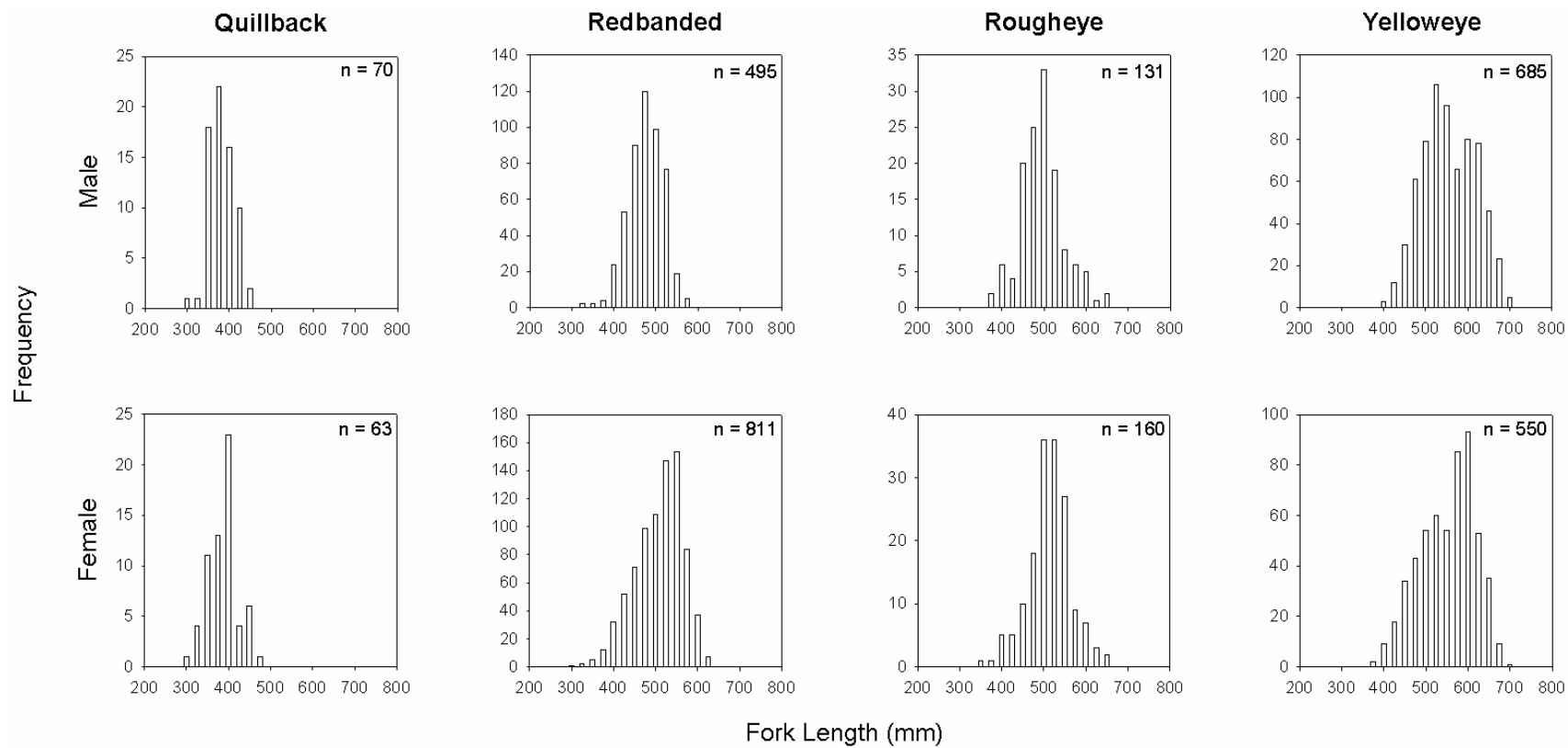


Figure 4. Length frequency distributions by sex for quillback, redbanded, rougheye, and yelloweye rockfishes with sample sizes (n).

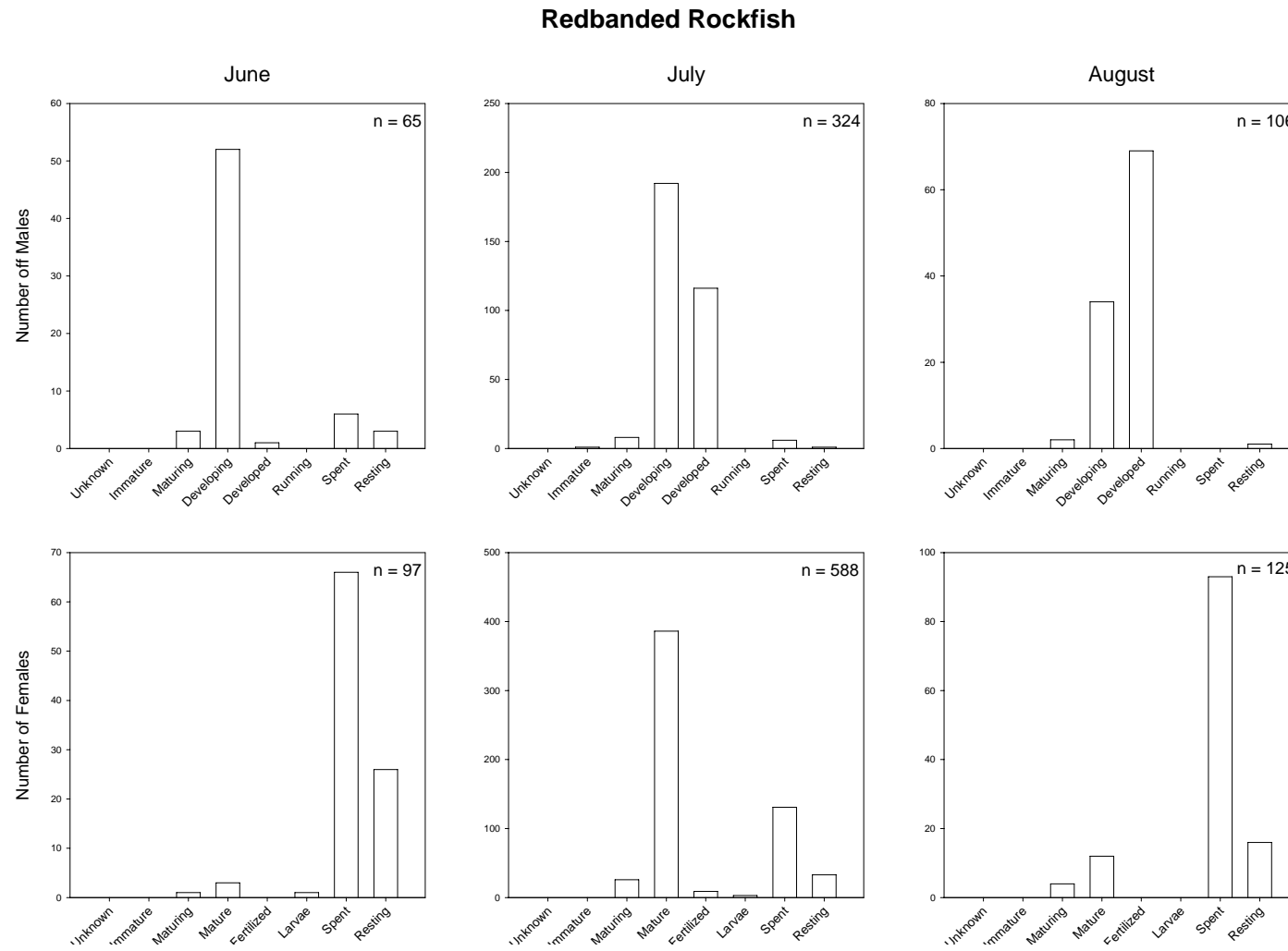


Figure 5. Redbanded rockfish maturity frequencies by sex and month with sample sizes (n).

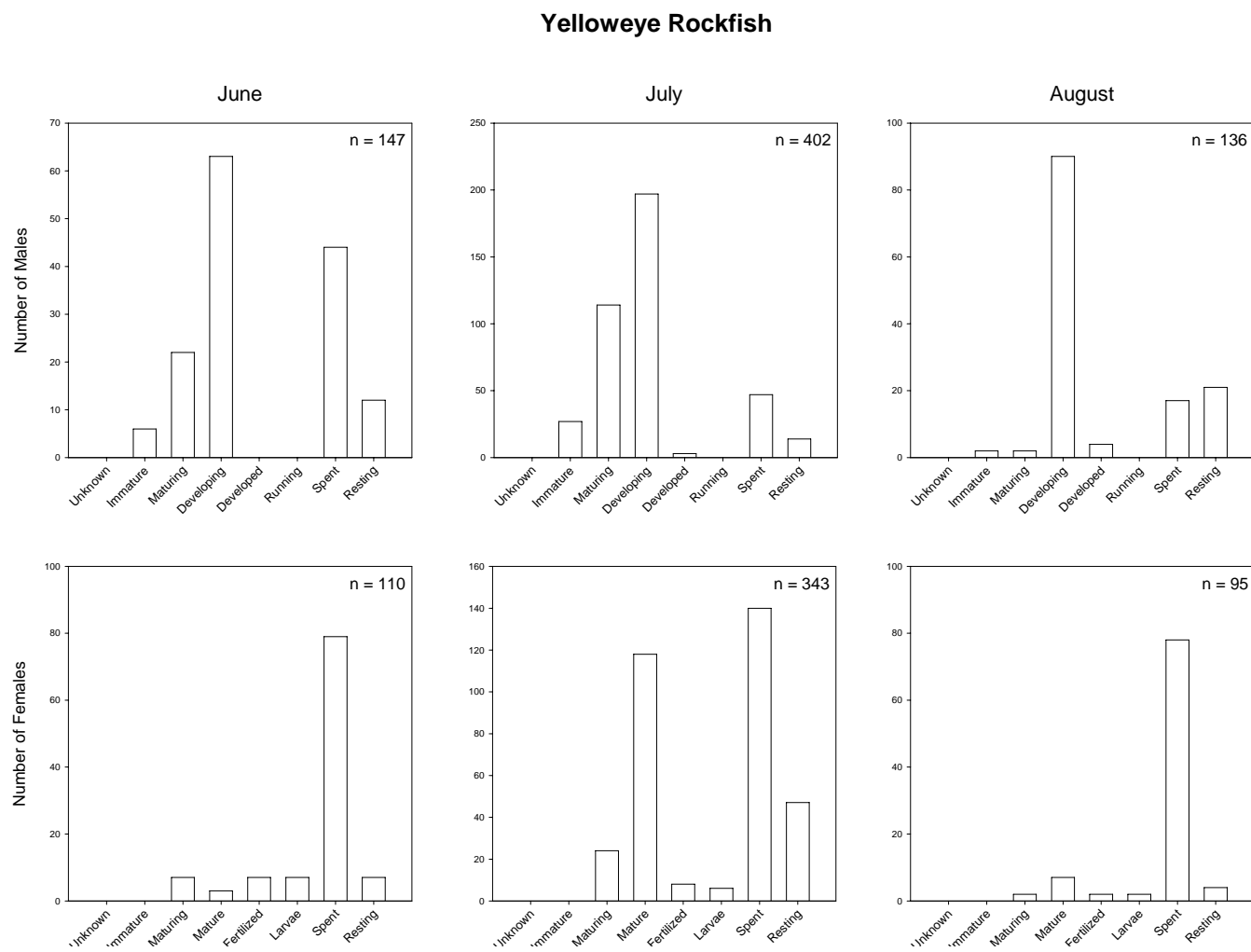


Figure 6. Yelloweye rockfish maturity frequencies by sex and month with sample sizes (n).

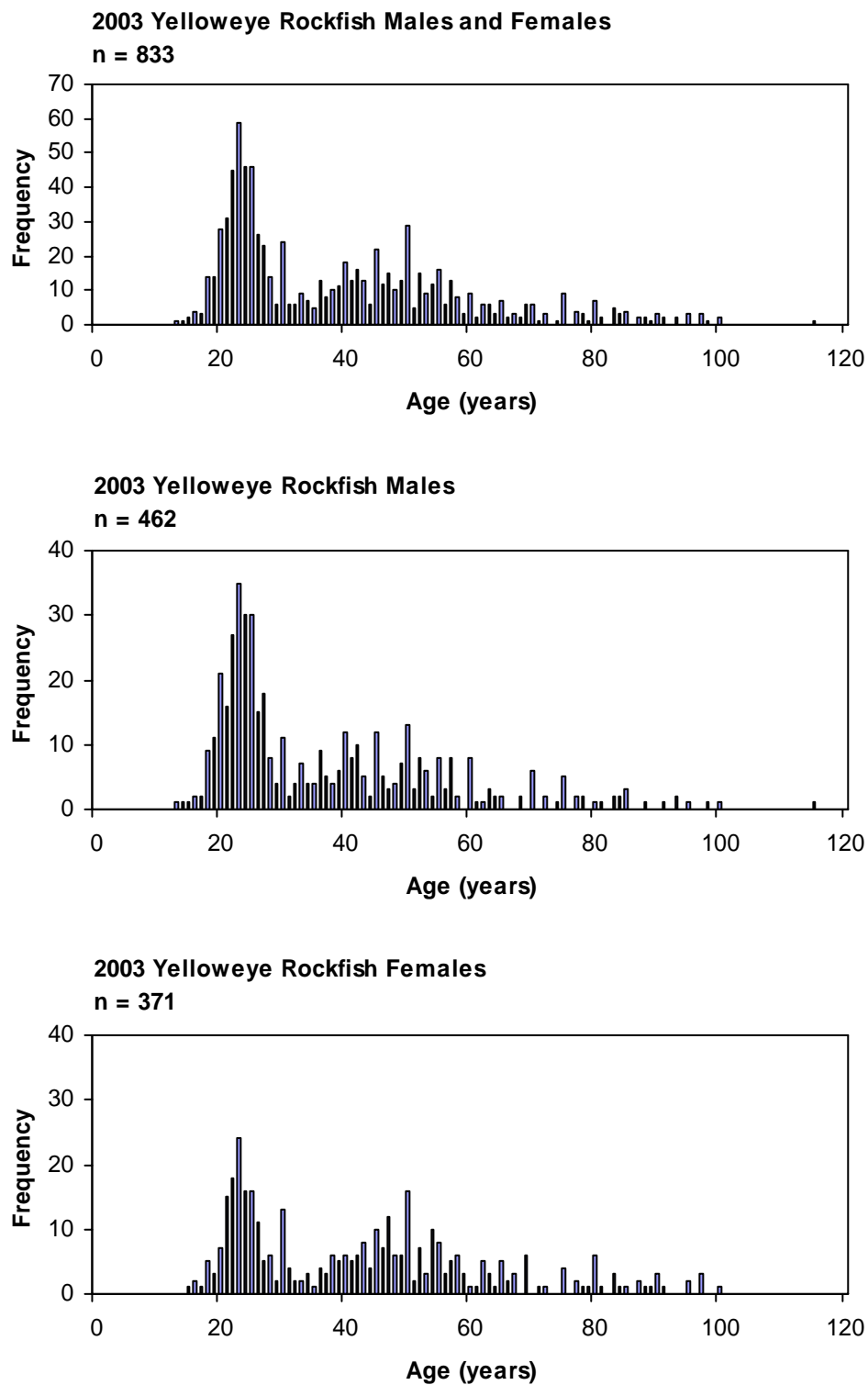


Figure 7. Yelloweye rockfish age frequency histograms by sex using data collected on the 2003 IPHC SSA Survey.

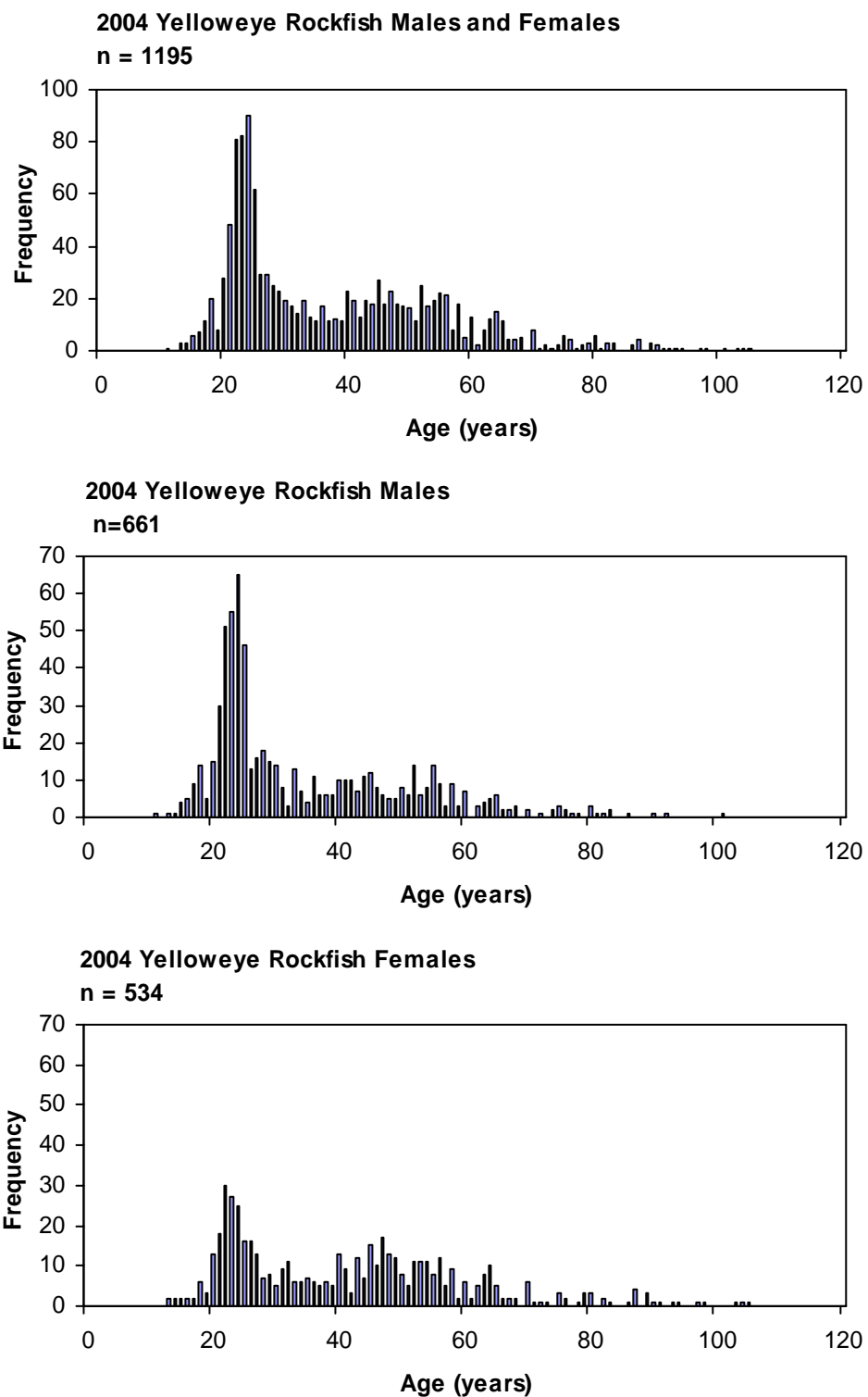


Figure 8. Yelloweye rockfish age frequency histograms by sex using data collected on the 2004 IPHC SSA Survey.

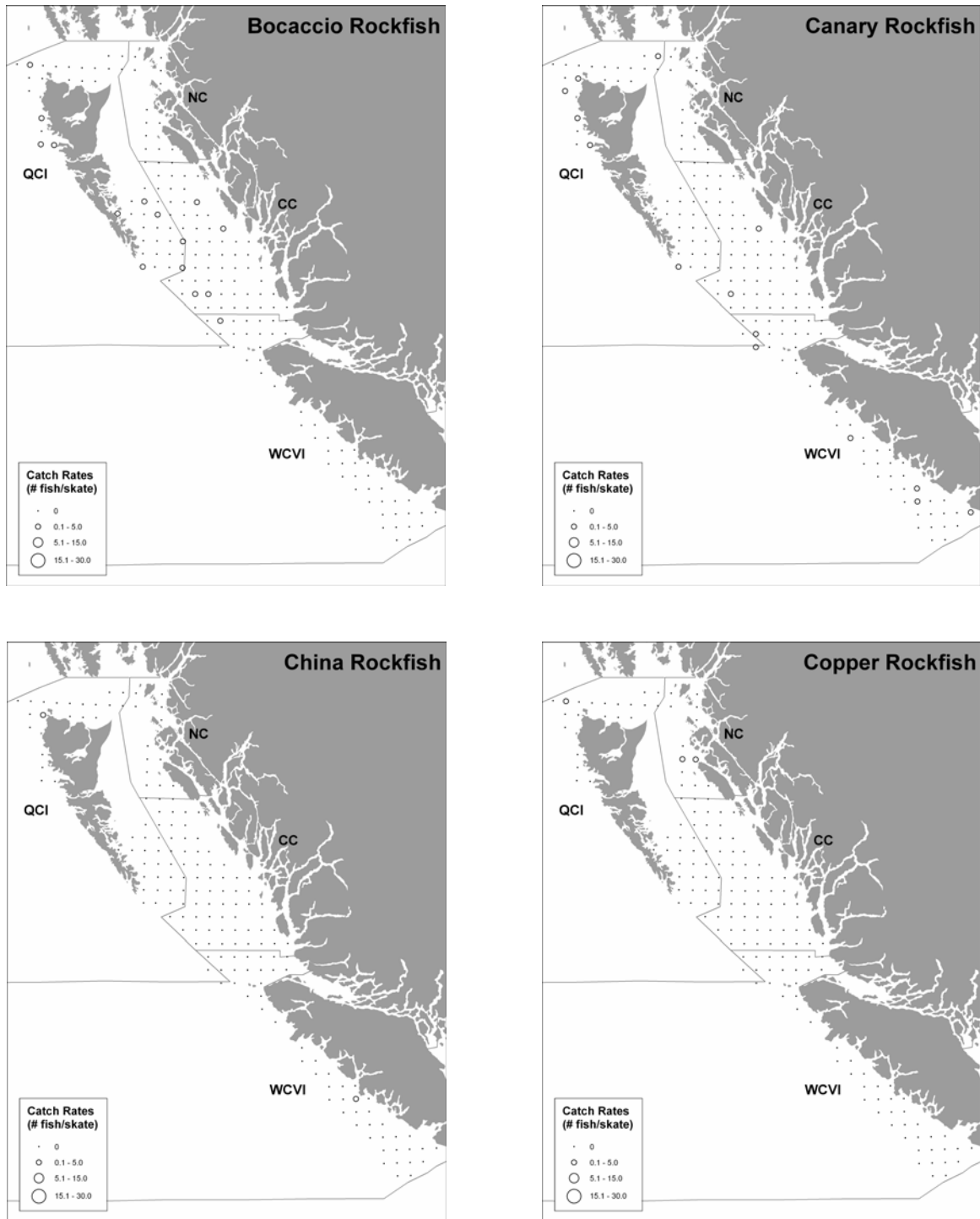


Figure 9. Spatial distribution of catch rate in numbers of fish per skate for rockfishes and sablefish. The common name of the species appears in the upper right corner of the panel.

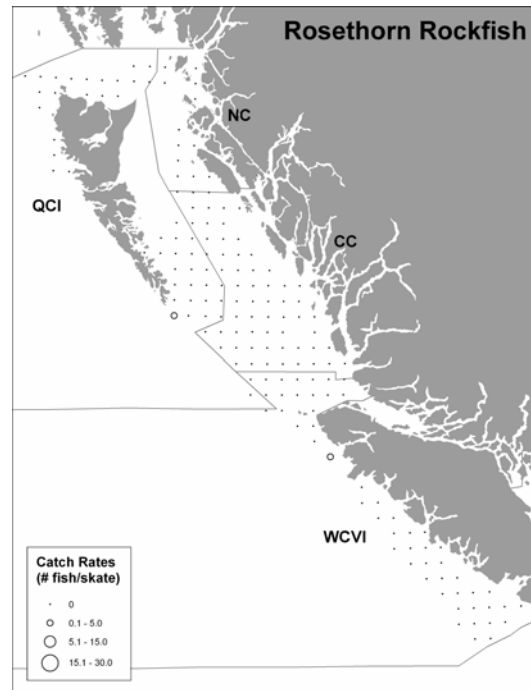
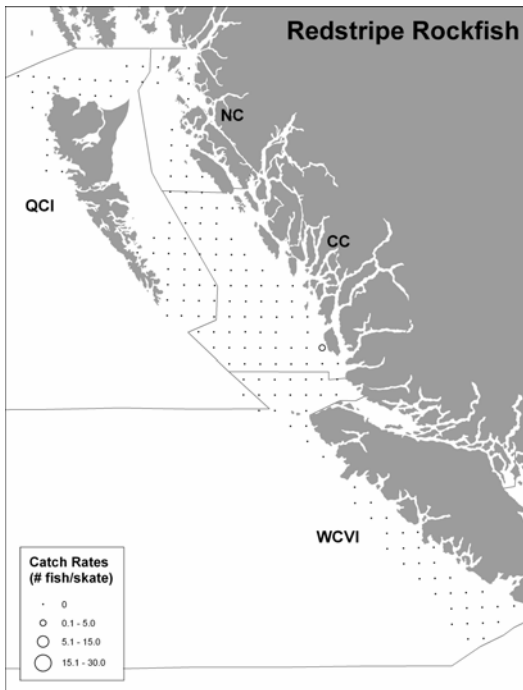
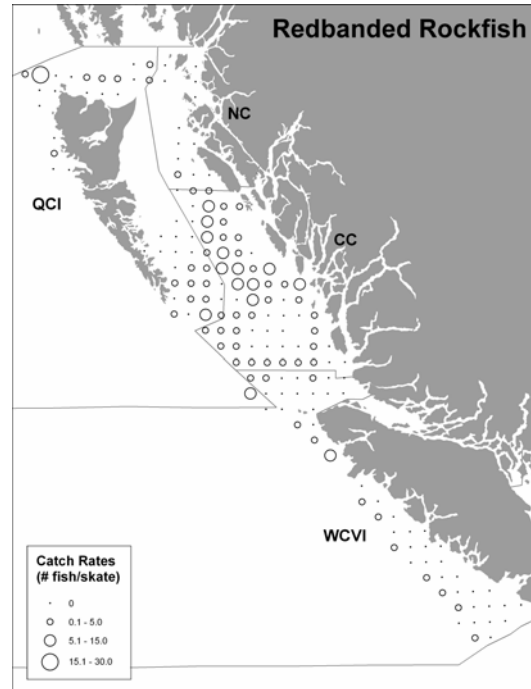
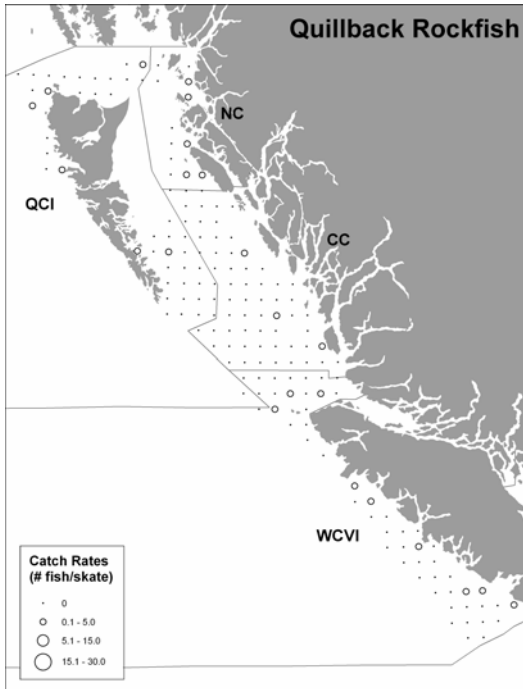


Figure 9. continued.

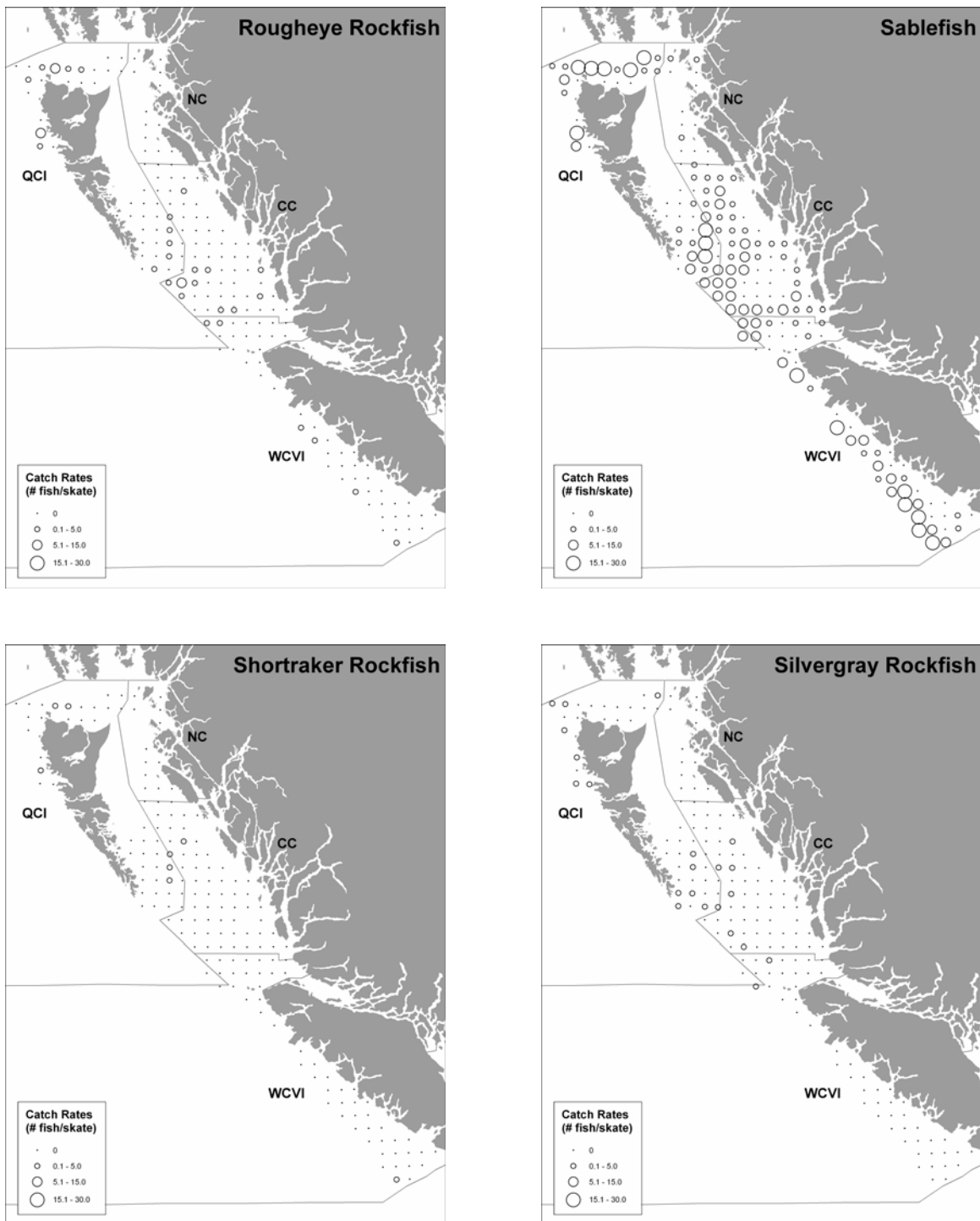


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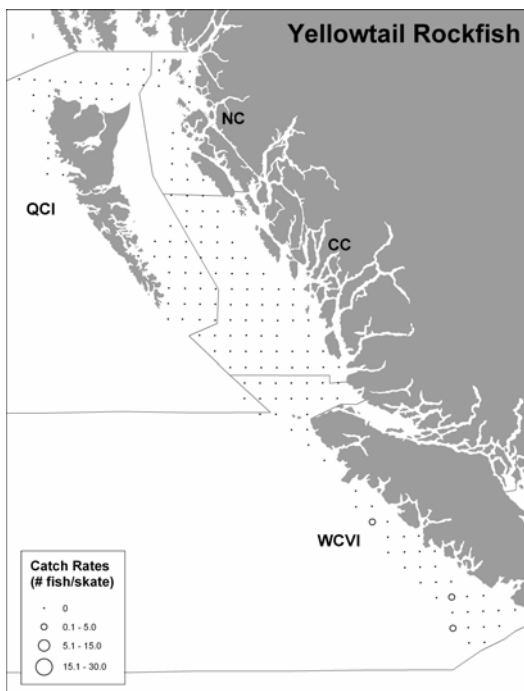
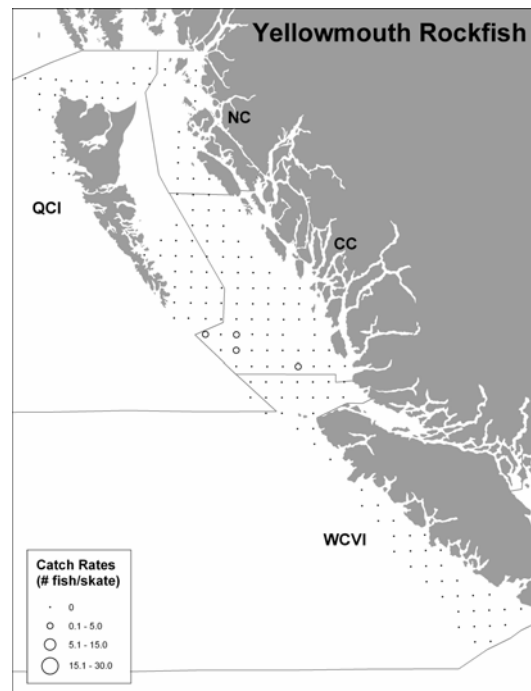
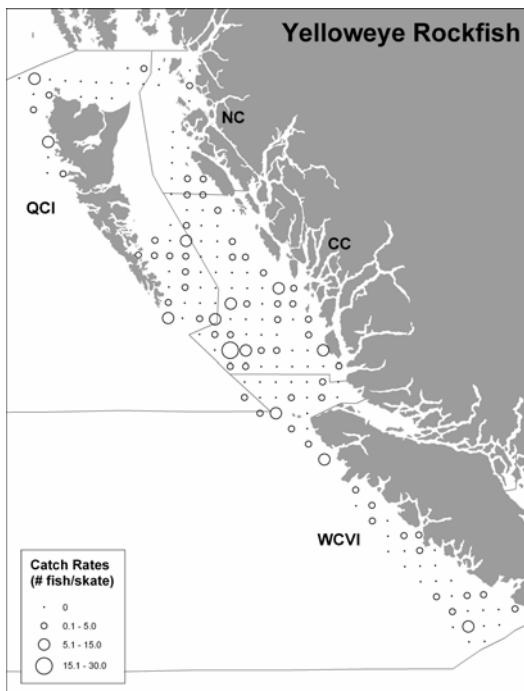


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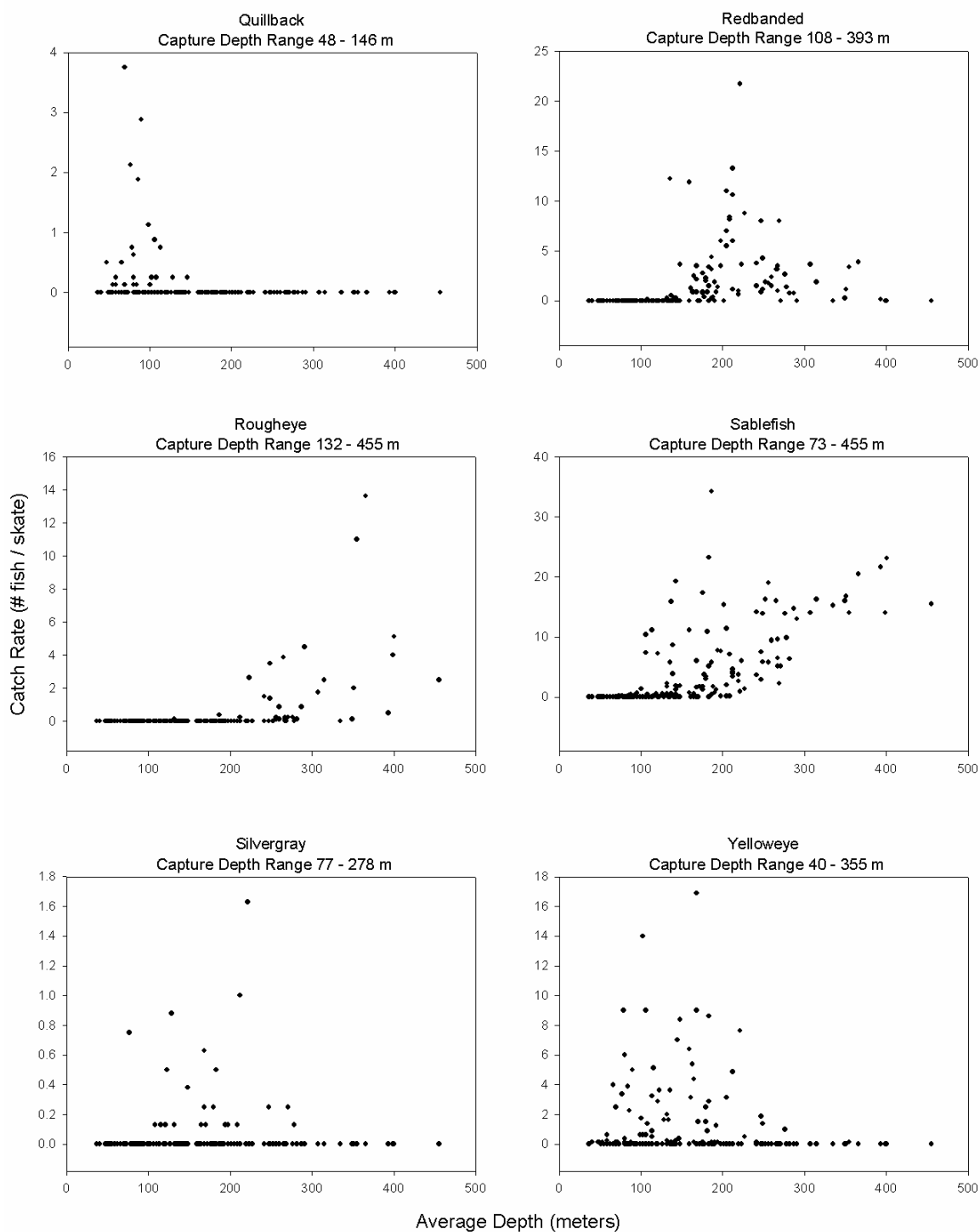


Figure 10. Relationships between catch rate (fish/skate) and average depth (m) for sablefish, quillback, redbanded, rougheye, silvergray, and yelloweye rockfishes.

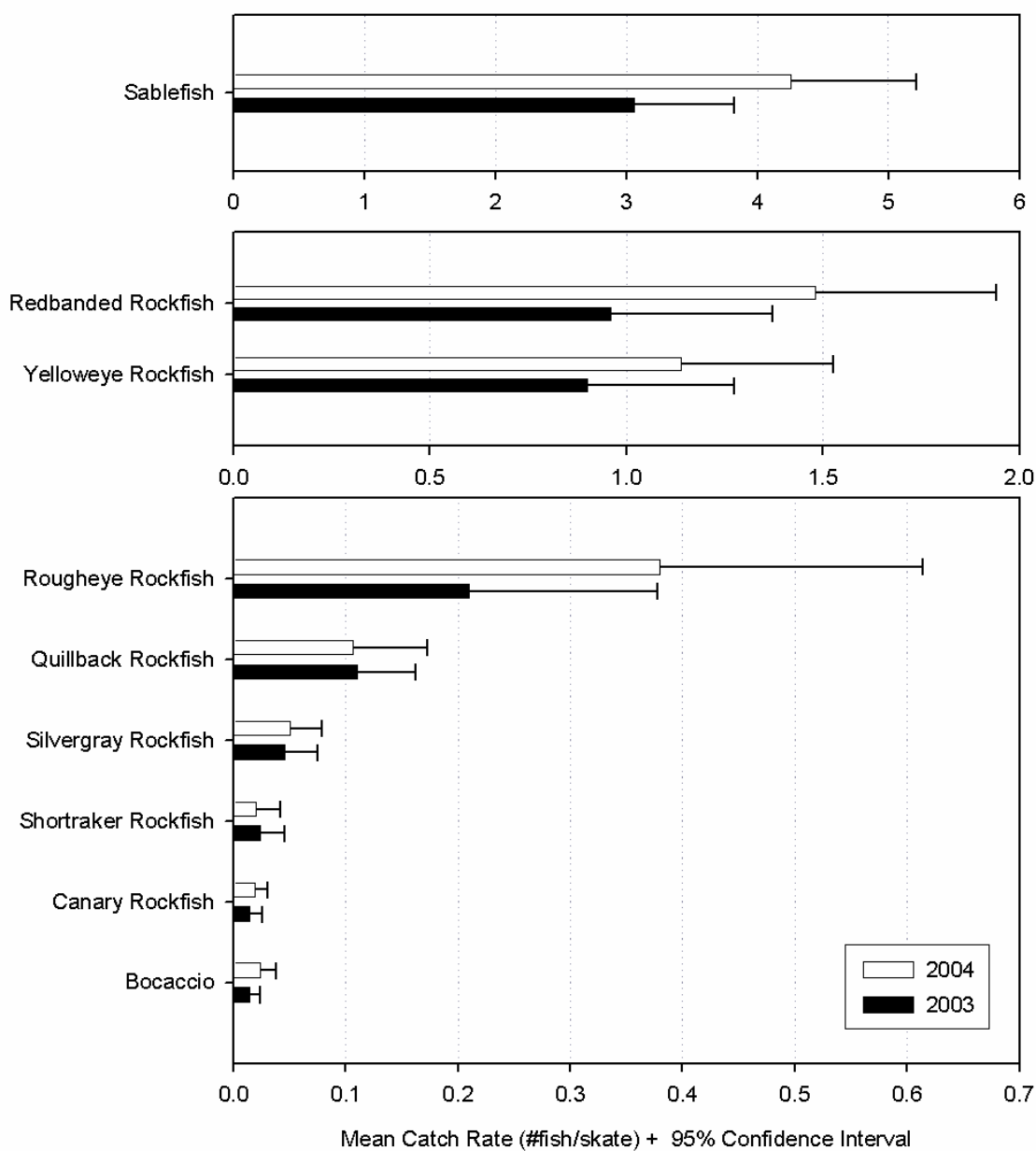


Figure 11. Mean catch rates (#fish/skate) plus 95% confidence intervals by year for sablefish and the top eight most frequently encountered rockfish species on the 2003 and 2004 surveys. Wilcoxon rank sum tests performed on catch rates for sablefish and redbanded, yelloweye, rougheye, and quillback rockfishes did not reveal any significant differences between years.

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Appendix A

2004 IPHC Survey Sampling Protocol

Priority work for the observer is to determine the hook-by-hook catch. The biological sampling of sablefish and rockfish should be done opportunistically and in no way should impinge upon the IPHC setline survey objectives.

Data Reporting and Delivery

Vessels involved in the survey will land fish every 5-6 days. When the vessels land, the Catch by Hook data and the T23 data must be faxed to AMR. The original data forms and otoliths should be kept on board the vessel until the vessel has completed the survey. At the end of the survey, all original data forms and otoliths will be delivered to AMR.

Recording Catch By Hook Header Information

The vessel will set and haul up to 3 strings per day depending on weather and running times between stations. Obtain all header information on the Catch by Hook data sheet from the IPHC set form. Positional information (lat and long) and depth should be recorded for the start and end of the set and can be obtained from the IPHC set form. This information only needs to be recorded on skate 1 and skate 8 on the Catch By Hook data form. This information can be completed for all 3 strings after the gear has been set in the morning and prior to hauling of the gear. Record the Hook 001 position (start or end) for the string and the time for first flag out of water when the hauling begins. The vessel crew will identify which end of the string is to be hauled first.

Hook by Hook Catch Recording

Identify to species (for fish and invertebrates) and record the hook-by-hook catch in the order in which the hooks are retrieved. An abbreviation list should be maintained for all species and include empty hooks, bait, skin etc. Also note the start/end of each skate so that any missed hooks will be confined to a skate. There will be 8 skates of approximately 100 hooks per set for a total of 800 hooks per set. The end of each skate will be indicated by an anchor/shackle and will be verbally confirmed by either the vessel crew or IPHC staff.

Empty hooks, missing /bent hooks and hooks with bait or skin must also be recorded. (see abbreviations list)

Fish that are lost at the rail should also be recorded as such. (see abbreviations list)

When two fish are caught on the same hook, both fish should be recorded. The predator species should be recorded first, followed by a slash (/) then the prey species. (see Hook by Hook Catch example)

At the end of each set (or end of the day), compare the catch data for rockfish and sablefish to the T23 data. Record comments on the T23 form as to why any discrepancies exist between the number of species caught and the number sampled.

Biological Sampling

During the survey both sablefish and rockfish will be sampled. It is usually best to begin sampling the sablefish that will need to be j-cut. This will allow the crew to provide assistance in cutting the fish and then get on to other duties, and will maintain the vessel's quality standards for saleable fish. Sampling should commence after all gear is on board the vessel and the vessel is transiting to the next station.

There may be times when you will not be able to complete all the required rockfish sampling before it is time to haul the next string. If this situation is encountered, the fish should be placed in baskets or buckets and stored out of the way, (and separate from fish on the next string) until there is sufficient time to complete the sampling. There will usually be time to complete the sampling at the end of the day. If the

situation arises where there are fish from several sets that could not be sampled, the fish can be zap strapped through the operculum and iced in the hold. A different colour strap should be used in order to differentiate fish from different sets and the information should be recorded on the Dockside Sampling Inventory Form. These fish can then be sampled at the dock when the vessel lands.

Dock sampling is logistically difficult and negatively affects the quality of the fish and should be avoided if at all possible. If fish have to be sampled at the dock, AMR must be contacted prior to landing in order to arrange sampling facilities and personnel.

IPHC staff will assist in recording data on the T22's and T 23's and vessel crew will assist with cutting sablefish and dressing rockfish. It is best to have the crew pre-dress rockfish as the fish come on board (remove the gills and slit the bellies, leaving gonads in tact). This will speed up the sampling and limit the time required from IPHC staff and vessel crew. (see Collection of Length Conversion Data)

During periods of heavy by-catch, there may not be enough time to properly clean otoliths as they are extracted. Otoliths can simply be extracted and stored in a tray until they can be properly cleaned later. Record each sample on the appropriate B01 form after each set. Mornings (while the gear is being set) are a good time to catalogue T23's and clean otolith samples collected the previous day. Remove and clean all otoliths from the collection tray, and place them in the correct cell of the clean delivery tray for that species. (use one label per tray) Check each sample against the B01 form for that species, to ensure there is no overlap in fish numbers.

Otoliths will be stored in separate trays for each species and otolith numbers for each species will run consecutively. Use the following numbering system: for

Species	Otolith # Range
Yelloweye	0001-1000
Sablefish	1001- 2000
Redbanded	2001-2500
Quillback	2501-3000
Copper	3001-3500
China	3501-4000
Tiger	4001-4500
Black	4501-5000
Other Rockfish	*5001-6000

* use blocks of 100 per species

DFO has requested that we collect gonad samples from each of the rockfish maturity states encountered. The gonads should be carefully removed and frozen in a Ziploc bag with a label stating the species and maturity state.

Sampling Protocols

Rockfish

All rockfish will be retained from each set. Sample up to 50 rockfish per set for Length/Sex/Maturity/Otoliths (LSMO). The priority species is yelloweye rockfish followed by redbanded, quillback, copper, China, tiger and black rockfish. If there are more than 50 yelloweye rockfish per set then randomly sub-sample 50 pieces for LSMO. If there is less than 50 yelloweye rockfish then sample them all and make up the rest of the 50 pieces with other rockfish i.e. redbanded, quillback, copper, China, tiger and black rockfish for a total of 50 rockfish sampled per set. Other rockfish species can also be sampled if time permits.

Rockfish Maturities

There is new clarification of rockfish cycles on the rockfish maturity sheet for 2004:

Rockfish cycle back to maturity stage #3, after the resting stage #7, for example: 1-2-3-4-5-6-7-3-4...

Females- look for the presence of eyed larvae (small black dots on ovaries) to distinguish mature females (stage 3) from maturing females (stage 2) which do not have eyed larvae present.
 Males – look for the presence of residual milt in the seminal vesicle to distinguish developing testes (stage 3) from maturing testes (stage 2), which will not have residual milt present.

Sablefish

Retain the first 50 sablefish from each set for sampling and release the rest.

If there are less than 20 sablefish, collect LSM.

If there are more than 20 sablefish, collect LSMO

Sets with High Catch Rates of Both Rockfish and Sablefish

On the majority of sets, there will be a manageable number of rockfish and sablefish and both species can be sampled. If there is more than 50 rockfish and also a high number of sablefish and time does not allow the full sampling of both species:

Perform L/S/M/O on a sub-sample of 50 rockfish and perform an L/S/M sample on a sub-sample of 25 sablefish.

Documenting Collection Methods and Utilizations on T23 Data Forms

The following guidelines should be used for recording collection methods and utilizations for rockfish and sablefish:

All rockfish/sablefish caught are sampled and retained:

Collection = 01 (whole haul) and Util = 1

All rockfish/sablefish caught are sampled but some are discarded (poor quality/ undersized sablefish):

Collection = 01 (whole haul) and Util = blank

Sub-sample of rockfish/sablefish caught are used for sampling:

Collection = 03 (random ungraded) and Util = blank

* Use this when sampling the “first 50 sablefish caught”

Sub-sample of rockfish are used for sampling but all rockfish are retained:

Collection = 02 (random graded) and Util = 1

Collection of Length Conversion Data

DFO has requested that we collect some length conversion (CF) data for each species of rockfish sampled during the survey. Procedures for this sampling follow:

Step 1) Collect up to 50 individuals of each species for sampling. These should be the same fish that you are sampling for otoliths during the survey. In order to collect 50 fish of each species you may have to do this sampling for several sets (samples). As the number of fish encountered for some species (i.e. Quillback) will be quite low, you should sample all individuals encountered. For species that are more numerous (i.e. yelloweye), spread the collection of this data out – do the first 10 fish of each sample until you have collected the data for 50 fish. This will spread out the time required for this sampling into manageable proportions.

Step 2) Each fish sampled for length CF data should be measured for fork length to the nearest millimetre before the crew has dressed the fish. Pre dressed fish lengths can be recorded onto a separate t23 data form with the fish number (otolith number) but no sex or maturity data. The fish number should match the LSMO data collected for the fish during actual (post dressed) otolith sampling. On these data sheets record “Length CF Data” under the header information for the form, as it will be a duplicate of the actual otolith data recorded during sampling.

Step 3) Allow the crew to gill (dress) the fish in the same manner to what has been done for otolith sampled fish to date.

Step 4) Proceed with normal (post dressed) otolith sampling procedures ensuring that the post dressed length data can be matched to the pre dressed length information using the “otolith” fish number assigned to each individual
(see Length Conversion Data Example)

Documenting Gear Problems on Catch by Hook Data Form

Gear snarl

The most frequent problem encounter during longline operations is the snarling of the line and the hooks. When the gear becomes snarled the recording of hooks and catch in sequential order becomes difficult at best. There are two basic scenarios.

The crew will bring the entire snarl aboard, remove the hooks and untangle the snarl. Then depending on the size of the snarl, they will throw the line outboard again and resume haul back. In this scenario you will be able to determine the total number of hooks involved because all the hooks involved will have been removed. However, you may not know the order of the hooks and the catch. In this situation record all hooks and catch in the boxes provided (do your best at estimating the sequential order) and then separate those hooks involved in the snarl with a set of brackets (figure 1). The brackets will inform the data transcribers that these items were caught, but the order is unclear because of a gear snarl.

The crew may bring the entire snarl aboard, but may not untangle the hooks and line at that time. In this particular situation you should record in the appropriate boxes all items caught, estimate the number of hooks, and then place brackets around those items. You will need to ask the crew to inform you about the total number of hook involved after they have untangled the snarl and you will need to note that in the comment section.

Hook snarl example:

Vessel Name: U.King Sea Vessel Code: UKS ASOP File: 24999

Station: 234, Set Number: 022, Skate Number: 1 Date: 07/25/04 Time of First Flag Out of Water: 1350
 Hook 001 Position: Set Start ☒ End ☐ Latitude: 53 12 6, Longitude: 127 13 2, Depth: 85 fm

Hook	Species	Hook	Species	Hook	Species	Hook	Species	Hook	Species	Hook	Species	Hook	Species	Hook	Species	Hook	Species	Hook	Species
001	X	013	YE	025		037		049		061		073		085		097		109	
002	X	014	YE	026		038		050		062		074		086		098		110	
003	DF	015	X	027		039		051		063		075		087		099		111	
004	DF	016	X	028		040		052		064		076		088		100		112	
005	X	017	H	029		041		053		065		077		089		101		113	
006	X	018	S	030		042		054		066		078		090		102		114	
007	DF	019	DF	031		043		055		067		079		091		103		115	
008	H	020	X	032		044		056		068		080		092		104		116	
009	X	021	X	033		045		057		069		081		093		105		117	
010	X	022		034		046		058		070		082		094		106		118	
011	X	023		035		047		059		071		083		095		107		119	
012	H	024		036		048		060		072		084		096		108		120	

Comments: Parted gear after hook 21 (Go to skate #3)

Handwritten notes: 7 Hook Snarl Start of snarl (bracketed around hooks 005-012), End of snarl (bracketed around hooks 010-012)

Parting of the gear

When the longline parts the vessel must travel to the other end of the string (hereafter referred to as second end) in order to retrieve the gear. At the time when the longline parts you should place a double backslash after the last retrieved hook and then record what happened in the comment section provided. When the haul back resumes from the second end, you will need to record hook status in reverse order starting with hook #105 for the second end. You will record hook status in reverse order for each skate for the remainder of the string. (start on hook #105 for each skate and record backwards).

Parting of gear example:

Vessel Name: L.V.King Sea Vessel Code: UKS ASOP File: Z49999

Station: 234, Set Number: 022, Skate Number: 1 Date: 07/25/04 Time of First Flag Out of Water: 1350
Hook 001 Position: Set Start ☒ End ☐ Latitude: 53° 12' N, Longitude: 127° 13' W, Depth: 85 fms

Hook	Species	Hook	Species	Hook	Species	Hook	Species	Hook	Species	Hook	Species	Hook	Species	Hook	Species	Hook	Species
001	X	013	YE	025		037		049		061		073		085		097	
002	X	014	YE	026		038		050		062		074		086		098	
003	DF	015	X	027		039		051		063		075		087		099	
004	DF	016	X	028		040		052		064		076		088		100	
005	(X)	017	H	029		041		053		065		077		089		101	
006	X	018	S	030		042		054		066		078		090		102	
007	DF	019	DF	031		043		055		067		079		091		103	
008	H	020	X	032		044		056		068		080		092		104	
009	X	021	X	033		045		057		069		081		093		105	
010	X	022	X	034		046		058		070		082		094		106	
011	X	023		035		047		059		071		083		095		107	
012	H	024		036		048		060		072		084		096		108	

Comments: Parted gear after hook 21 (Go to skate #8)

Station: 234, Set Number: 022, Skate Number: 8

Hook	Species	Hook	Species	Hook	Species	Hook	Species	Hook	Species	Hook	Species	Hook	Species	Hook	Species	Hook	Species
001		013		025		037		049		061		073		085		097	
002		014		026		038		050		062		074		086		098	
003		015		027		039		051		063		075		087		099	
004		016		028		040		052		064		076		088		100	
005		017		029		041		053		065		077		089		101	
006		018		030		042		054		066		078		090		102	
007		019		031		043		055		067		079		091		103	
008		020		032		044		056		068		080		092		104	
009		021		033		045		057		069		081		093		105	
010		022		034		046		058		070		082		094		106	
011		023		035		047		059		071		083		095		107	
012		024		036		048		060		072		084		096		108	

Comments: Start here after parting gear on skate #1

Archidona Marine Research Ltd. IPHC Set Line Survey Catch by Hook Data Form

Appendix B. Description of sexual maturity stages for rockfish, based on Westrheim (1975).

Maturity Stage	Code	Males
Immature	1	translucent pink, threadlike
Maturing	2	stringlike, slight swelling, translucent
Developing	3	swelling, brown-white
Developed	4	large, white; easily broken
Running	5	running sperm
Spent	6	white-brown; sperm still in duct
Resting	7	triangular in cross-section; small, brown

Maturity Stage	Code	Females
Immature	1	translucent pink, small
Maturing	2	small, yellow eggs, translucent or opaque;
Mature	3	large, yellow or orange eggs; opaque
Fertilized	4	large, orange-yellow eggs; translucent
Embryos or Larvae	5	include eyed eggs; translucent
Spent	6	large, flaccid, red ovaries; a few larvae may be present
Resting	7	moderate size, firm, orange-grey ovaries, some with dark blotches

Appendix C. Summary of set specifications by vessel, including set number, date, location (start and end latitudes and longitudes in degrees, decimal minutes), depths (minimum, maximum and average in metres) and times (start deployment, start retrieval and end retrieval).

Proud Venture											
Set	Date	Start Lat	Start Long	End Lat	End Long	Min Depth (m)	Max Depth (m)	Average Depth (m)	Begin Deploy Time	Begin Retrieve Time	End Retrieve Time
1	1-Jun-04	52 51.50	131 41.63	52 47.50	131 41.70	73	219	146	11:27 AM	4:36 PM	7:10 PM
2	3-Jun-04	52 51.05	131 13.25	52 47.02	131 13.40	62	165	113	5:07 AM	10:50 AM	3:00 AM
3	2-Jun-04	52 64.95	131 13.27	52 68.52	131 13.50	60	82	71	6:59 AM	4:45 PM	7:11 PM
4	2-Jun-04	52 68.92	130 86.78	52 65.08	130 86.68	88	97	92	8:33 AM	8:23 PM	11:00 PM
5	3-Jun-04	52 84.98	130 86.72	52 80.90	130 86.67	46	55	50	6:17 AM	11:32 AM	2:03 PM
6	3-Jun-04	52 84.90	130 58.42	52 81.05	130 58.33	108	117	112	8:10 AM	3:25 PM	5:35 PM
7	4-Jun-04	54 15.17	130 58.42	54 19.10	130 58.30	75	132	103	5:03 AM	10:58 AM	1:02 PM
8	4-Jun-04	54 31.90	130 58.30	54 35.87	130 58.28	73	123	98	6:38 AM	2:19 PM	4:41 PM
9	4-Jun-04	54 48.30	130 58.27	54 52.17	130 58.35	101	137	119	7:57 AM	5:37 PM	8:03 PM
10	5-Jun-04	54 51.82	131 15.23	54 48.62	131 14.80	128	157	142	5:36 AM	10:38 AM	1:05 PM
11	5-Jun-04	54 49.97	131 40.85	54 50.03	131 47.88	69	146	107	7:05 AM	2:47 PM	5:18 PM
12	6-Jun-04	54 34.97	131 15.33	54 31.32	131 14.88	60	73	66	5:25 AM	11:05 AM	1:31 PM
13	6-Jun-04	54 33.25	131 40.50	54 33.38	131 47.45	170	185	177	6:50 AM	3:15 PM	5:27 PM
14	6-Jun-04	54 33.30	131 68.67	54 33.18	131 75.85	181	199	190	8:00 AM	6:49 PM	8:48 PM
15	7-Jun-04	54 33.33	131 99.30	54 33.32	132 05.43	247	256	251	5:38 AM	10:38 AM	1:29 PM
16	7-Jun-04	54 50.05	131 70.83	54 50.00	131 77.93	326	344	335	8:15 AM	2:59 PM	5:30 PM
17	11-Jun-04	54 33.40	132 88.73	54 33.40	132 82.07	371	430	400	4:57 AM	10:02 AM	12:59 PM
18	11-Jun-04	54 33.33	132 61.02	54 33.38	132 54.15	252	278	265	6:10 AM	2:45 PM	5:15 PM
19	11-Jun-04	54 16.73	132 53.85	54 16.67	132 60.30	82	90	86	8:01 AM	7:08 PM	9:11 PM
20	12-Jun-04	54 33.42	133 18.90	54 33.32	133 12.58	454	457	455	9:21 AM	2:33 PM	4:10 PM
21	12-Jun-04	54 18.03	133 15.03	54 13.95	133 15.08	53	88	70	11:31 AM	5:35 PM	8:03 PM
22	13-Jun-04	54 32.13	133 43.35	54 36.05	133 43.33	205	238	221	5:51 AM	11:36 AM	2:23 PM
23	13-Jun-04	54 34.98	133 71.77	54 31.22	133 71.68	238	256	247	7:33 AM	3:42 PM	6:15 PM
24	13-Jun-04	54 17.93	133 43.42	54 14.28	133 43.38	393	402	397	9:44 AM	7:51 PM	10:36 PM
25	14-Jun-04	53 31.85	133 10.00	53 35.50	133 10.00	214	329	271	5:15 AM	11:18 AM	1:56 PM
26	14-Jun-04	53 34.80	132 81.77	53 30.77	132 81.77	110	146	128	7:16 AM	3:14 PM	5:47 PM
27	14-Jun-04	53 51.58	133 10.05	53 47.80	133 09.95	256	475	365	10:05 AM	7:25 PM	10:43 PM
28	15-Jun-04	54 01.73	133 41.67	53 98.10	133 41.63	71	84	77	5:12 AM	6:48 PM	9:07 PM
29	15-Jun-04	53 67.83	133 11.57	53 64.03	133 11.77	137	159	148	8:18 AM	1:18 PM	4:00 PM
30	16-Jun-04	54 33.28	132 27.73	54 33.38	132 34.80	210	216	213	5:20 AM	11:01 AM	1:25 PM
31	16-Jun-04	54 16.65	132 25.87	54 16.48	132 32.28	86	99	92	7:05 AM	2:42 PM	4:56 PM
32	16-Jun-04	54 16.62	132 03.00	54 16.63	131 96.52	68	77	72	8:37 AM	5:56 PM	8:10 PM
33	19-Jun-04	53 84.90	130 86.70	53 80.90	130 86.73	80	97	88	10:55 AM	4:00 PM	6:22 PM
34	20-Jun-04	53 65.00	130 55.57	53 66.67	130 62.43	31	79	55	4:56 AM	10:08 AM	12:09 PM
35	20-Jun-04	53 68.22	130 86.75	53 64.17	130 86.63	48	53	50	6:21 AM	1:52 PM	4:02 PM
36	20-Jun-04	53 51.65	130 86.65	53 47.58	130 86.65	90	102	96	7:46 AM	5:20 PM	7:32 PM
37	21-Jun-04	53 34.90	130 86.67	53 30.95	130 86.65	135	146	140	4:57 AM	10:01 AM	12:20 PM
38	21-Jun-04	53 18.23	130 86.67	53 14.32	130 86.68	104	110	107	6:18 AM	1:41 PM	3:40 PM
39	21-Jun-04	53 15.18	130 58.33	53 18.63	130 58.35	185	198	191	7:53 AM	5:03 PM	7:16 PM
40	22-Jun-04	53 01.58	130 58.33	52 97.67	130 58.33	88	99	93	5:00 AM	10:20 AM	12:50 PM
41	22-Jun-04	52 98.30	130 29.97	53 01.95	130 30.00	210	216	213	6:37 AM	2:15 PM	5:00 PM
42	22-Jun-04	53 18.33	130 30.03	53 14.27	130 30.12	102	219	160	8:24 AM	6:00 PM	8:18 PM
43	23-Jun-04	53 34.97	130 29.98	53 31.15	130 30.03	91	119	105	4:59 AM	10:01 AM	12:45 PM
44	23-Jun-04	53 34.95	130 58.30	53 30.95	130 58.28	57	123	90	6:40 AM	2:00 PM	4:50 PM

Appendix C continued.

Pender Isle											
Set	Date	Start Lat	Start Long	End Lat	End Long	Min Depth (m)	Max Depth (m)	Average Depth (m)	Begin Deploy Time	Begin Retrieve Time	End Retrieve Time
1	2-Jul-04	52 16.65	130 02.57	52 16.73	130 09.00	154	210	182	6:04 AM	11:13 AM	2:00 PM
2	2-Jul-04	52 16.68	130 28.60	52 16.65	130 34.63	369	417	393	7:13 AM	3:15 PM	5:55 PM
3	2-Jul-04	52 32.92	130 34.47	52 33.95	130 28.80	311	391	351	8:47 AM	7:24 PM	10:02 PM
4	3-Jul-04	52 50.05	130 00.17	52 49.97	130 06.10	262	276	269	5:04 AM	10:05 AM	12:45 PM
5	3-Jul-04	52 33.62	130 07.78	52 32.92	130 01.50	128	269	198	6:41 AM	2:03 PM	4:18 PM
6	3-Jul-04	52 33.28	129 79.70	52 33.33	129 73.57	205	210	207	7:54 AM	5:30 PM	6:45 PM
7	4-Jul-04	52 33.57	129 46.90	52 33.22	129 52.70	154	185	169	4:56 AM	9:59 AM	12:45 PM
8	4-Jul-04	52 16.92	129 47.20	52 16.40	129 53.17	203	214	208	6:21 AM	2:30 PM	4:40 PM
9	4-Jul-04	52 16.75	129 73.57	52 16.52	129 79.78	198	214	206	7:31 AM	6:00 PM	8:05 PM
10	5-Jul-04	51 83.42	129 75.33	51 83.18	129 81.63	240	274	257	5:04 AM	10:10 AM	12:50 PM
11	5-Jul-04	52 00.13	129 81.38	51 99.87	129 75.53	113	117	115	6:40 AM	2:03 PM	5:05 PM
12	5-Jul-04	52 00.02	129 53.32	52 00.00	129 47.13	199	210	204	7:54 AM	6:34 PM	8:55 PM
13	6-Jul-04	52 16.77	128 91.98	52 16.58	128 98.32	146	179	162	5:00 AM	10:30 AM	1:03 PM
14	6-Jul-04	52 16.68	129 20.35	52 16.65	129 26.48	172	177	174	6:26 AM	2:05 PM	4:20 PM
15	6-Jul-04	52 33.35	129 24.80	52 33.22	129 19.68	123	146	134	8:07 AM	5:36 PM	7:48 PM
16	7-Jul-04	52 49.68	129 50.15	52 50.23	129 55.85	68	104	86	5:05 AM	10:12 AM	12:41 PM
17	7-Jul-04	52 49.80	129 73.57	52 50.15	129 79.12	165	196	180	6:16 AM	1:35 PM	3:48 PM
18	7-Jul-04	52 66.80	129 79.82	52 66.57	129 73.38	144	212	178	7:56 AM	5:03 PM	7:25 PM
19	8-Jul-04	52 83.38	130 00.32	52 83.27	130 06.65	260	262	261	5:36 AM	10:45 AM	1:00 PM
20	8-Jul-04	52 99.43	130 06.22	53 00.50	130 01.27	137	234	185	7:01 AM	2:15 PM	4:15 PM
21	8-Jul-04	52 99.95	129 78.22	52 99.92	129 72.10	199	238	218	8:18 AM	5:12 PM	7:24 PM
22	11-Jul-04	52 83.38	130 28.47	52 83.32	130 34.80	192	219	205	5:02 AM	10:19 AM	12:45 PM
23	11-Jul-04	52 66.28	130 34.68	52 67.10	130 28.83	188	238	213	6:46 AM	2:26 PM	4:40 PM
24	11-Jul-04	52 66.63	130 06.32	52 66.67	130 00.30	267	269	268	8:14 AM	6:10 PM	8:50 PM
25	12-Jul-04	52 49.85	130 28.65	52 50.10	130 34.57	241	291	266	5:04 AM	10:05 AM	12:54 PM
26	12-Jul-04	52 49.97	130 55.13	52 50.03	130 60.98	101	141	121	6:19 AM	2:00 PM	4:01 PM
27	12-Jul-04	52 66.52	130 61.53	52 66.82	130 55.28	141	148	144	7:48 AM	5:30 PM	8:06 PM
28	13-Jul-04	52 50.17	130 83.58	52 49.78	130 89.95	91	134	112	4:58 AM	10:09 AM	12:26 PM
29	13-Jul-04	52 33.80	130 89.88	52 33.02	130 83.78	143	144	143	6:23 AM	1:37 PM	3:50 PM
30	13-Jul-04	52 33.27	130 61.50	52 33.38	130 55.48	163	168	165	7:42 AM	5:00 PM	7:30 PM
31	14-Jul-04	52 16.60	130 89.73	52 16.75	130 83.67	216	225	220	4:52 AM	9:57 AM	12:30 PM
32	14-Jul-04	52 16.65	130 61.38	52 16.58	130 55.65	188	196	192	6:10 AM	1:48 PM	4:22 PM
33	14-Jul-04	51 99.87	130 83.67	51 99.98	130 89.73	104	236	170	8:21 AM	5:56 PM	8:20 PM
34	15-Jul-04	51 83.77	130 89.80	51 83.08	130 85.18	134	205	169	5:03 AM	10:12 AM	1:09 PM
35	15-Jul-04	51 83.73	130 61.32	51 83.08	130 56.00	282	300	291	6:29 AM	2:30 PM	3:45 PM
36	15-Jul-04	51 99.35	130 55.48	52 00.63	130 61.47	236	322	279	7:55 AM	6:55 PM	9:17 PM
37	16-Jul-04	52 00.20	130 02.33	51 99.73	130 08.63	137	146	141	5:06 AM	10:03 AM	12:38 PM
38	16-Jul-04	51 99.90	130 28.65	51 99.98	130 34.85	318	380	349	6:17 AM	1:44 PM	3:55 PM
39	16-Jul-04	51 83.28	130 34.73	51 83.38	130 28.82	208	218	213	8:03 AM	5:20 PM	8:08 PM
40	17-Jul-04	51 83.48	130 01.88	51 83.18	130 08.33	177	188	182	5:06 AM	10:16 AM	12:35 PM
41	17-Jul-04	51 66.55	130 02.20	51 66.88	130 08.77	346	362	354	6:45 AM	1:50 PM	4:22 PM
42	17-Jul-04	51 66.72	130 28.92	51 66.57	130 35.40	251	283	267	7:52 AM	5:17 PM	7:27 PM

Appendix C continued.

Star Wars II

Set	Date	Start Latitude	Start Longitude	End Latitude	End Longitude	Min Depth (m)	Max Depth (m)	Average Depth (m)	Begin Deploy Time	Begin Retrieve Time	End Retrieve Time
1	8-Jul-04	48 68.48	125 38.33	48 64.80	125 38.33	62	82	72	5:00 AM	10:15 AM	12:20 PM
2	8-Jul-04	48 51.97	125 38.33	48 48.28	125 38.33	126	152	139	6:20 AM	1:28 PM	3:27 PM
3	8-Jul-04	48 64.83	125 11.67	48 68.73	125 11.67	48	69	58	8:25 AM	5:03 PM	7:03 PM
4	9-Jul-04	48 51.90	125 63.35	48 47.97	125 63.33	82	115	98	5:00 AM	10:52 AM	12:35 PM
5	9-Jul-04	48 35.30	125 63.33	48 31.53	125 63.33	137	143	140	6:15 AM	1:36 PM	3:40 PM
6	9-Jul-04	48 32.73	125 86.35	48 35.02	125 90.55	223	404	313	9:00 AM	4:52 PM	7:20 PM
7	10-Jul-04	48 48.08	125 88.33	48 51.98	125 88.33	90	121	105	5:00 AM	10:01 AM	12:06 PM
8	10-Jul-04	48 48.07	126 13.33	48 51.70	126 13.33	188	216	202	6:40 AM	1:20 PM	3:35 PM
9	10-Jul-04	48 64.80	126 13.33	48 68.62	126 13.33	137	146	141	7:56 AM	4:30 PM	6:35 PM
10	11-Jul-04	48 64.75	125 88.33	48 68.90	125 88.33	71	77	74	5:00 AM	10:05 AM	11:49 AM
11	11-Jul-04	48 64.85	125 63.33	48 68.90	125 63.33	66	177	121	6:42 AM	12:55 PM	3:05 PM
12	11-Jul-04	48 81.38	125 61.67	48 85.40	125 61.68	46	51	48	7:57 AM	3:56 PM	6:03 PM
13	12-Jul-04	48 83.33	125 85.52	48 83.33	125 91.80	55	64	59	5:00 AM	10:17 AM	12:13 PM
14	12-Jul-04	48 83.33	126 10.40	48 83.33	126 16.67	95	117	106	6:09 AM	1:05 PM	2:43 PM
15	12-Jul-04	48 83.33	126 35.40	48 83.33	126 41.20	174	177	175	7:25 AM	3:33 PM	5:19 PM
16	13-Jul-04	48 98.07	126 63.33	49 01.52	126 63.33	168	406	287	5:00 AM	10:44 AM	12:50 PM
17	13-Jul-04	49 01.92	126 38.32	48 98.05	126 38.33	134	141	137	6:31 AM	1:52 PM	3:36 PM
18	13-Jul-04	49 01.95	126 13.33	48 98.30	126 13.33	66	75	70	8:09 AM	4:42 PM	6:25 PM
19	15-Jul-04	49 48.12	127 14.98	49 51.62	127 15.00	141	146	143	5:05 AM	10:06 AM	11:53 AM
20	15-Jul-04	49 68.55	127 15.00	49 64.77	127 15.00	108	117	112	6:39 AM	1:13 PM	3:00 PM
21	15-Jul-04	49 68.60	127 39.98	49 64.48	127 40.00	137	415	276	8:12 AM	4:04 PM	6:07 PM
22	16-Jul-04	49 35.30	127 15.00	49 31.20	127 15.00	170	203	186	5:00 AM	10:25 AM	12:38 PM
23	16-Jul-04	49 35.25	126 88.33	49 31.08	126 88.33	132	141	136	6:46 AM	1:48 PM	3:35 PM
24	16-Jul-04	49 18.62	126 88.35	49 14.48	126 88.33	163	183	173	8:03 AM	4:28 PM	6:26 PM
25	17-Jul-04	49 14.75	126 63.33	49 18.32	126 63.33	119	124	121	5:20 AM	10:21 AM	12:20 PM
26	17-Jul-04	49 14.83	126 38.37	49 18.78	126 38.33	77	91	84	6:53 AM	1:34 PM	3:08 PM
27	17-Jul-04	49 31.67	126 38.33	49 35.72	126 38.33	33	40	36	8:07 AM	3:58 PM	5:43 PM
28	18-Jul-04	49 35.23	126 63.33	49 31.18	126 63.33	37	95	66	5:15 AM	10:17 AM	12:17 PM
29	18-Jul-04	49 48.07	126 88.35	49 51.77	126 88.33	80	97	88	7:10 AM	1:51 PM	3:39 PM
30	18-Jul-04	49 51.98	126 63.33	49 47.97	126 63.33	38	42	40	8:36 AM	4:50 PM	6:36 PM
31	19-Jul-04	49 85.25	127 40.00	49 81.35	127 40.00	79	82	80	5:22 AM	1:35 PM	3:23 PM
32	19-Jul-04	49 85.15	127 66.70	49 81.52	127 66.68	161	351	256	7:22 AM	4:46 PM	6:49 PM
33	19-Jul-04	49 98.05	127 66.67	50 02.22	127 66.67	73	90	81	9:00 AM	8:13 PM	9:59 PM
34	20-Jul-04	50 35.28	128 18.33	50 31.43	128 18.33	154	165	159	5:10 AM	1:19 PM	3:28 PM
35	20-Jul-04	50 51.90	128 45.02	50 48.20	128 45.02	177	187	182	7:24 AM	5:00 PM	7:01 PM
36	20-Jul-04	50 68.63	128 73.33	50 64.82	128 73.33	161	201	181	9:45 AM	8:29 PM	10:25 PM
37	23-Jul-04	51 31.40	128 18.33	51 35.12	128 18.33	57	115	86	5:01 AM	10:05 AM	11:45 AM
38	23-Jul-04	51 51.95	128 18.33	51 48.07	128 18.33	69	90	79	6:38 AM	12:40 PM	2:30 PM
39	23-Jul-04	51 35.23	127 91.68	51 31.23	127 91.67	124	141	132	8:30 AM	4:17 PM	6:08 PM
40	24-Jul-04	51 66.67	128 40.23	51 66.67	128 46.33	130	144	137	5:10 AM	10:29 AM	12:10 PM
41	24-Jul-04	51 83.32	128 73.07	51 83.33	128 66.75	79	141	110	7:10 AM	1:52 PM	3:37 PM
42	24-Jul-04	51 85.28	128 43.33	51 81.25	128 43.33	97	166	131	9:00 AM	5:08 PM	6:50 PM

Star Wars II set specifications continued on next page.

Appendix C continued

Star Wars II

Set	Date	Start Lat	Start Long	End Lat	End Long	Min Depth (m)	Max Depth (m)	Average Depth (m)	Begin Deploy Time	Begin Retrieve Time	End Retrieve Time
43	25-Jul-04	52 00.00	128 93.55	52 00.00	128 99.83	112	155	133	5:26 AM	10:42 AM	12:35 PM
44	25-Jul-04	51 99.98	128 73.02	52 00.00	128 66.77	161	166	163	7:04 AM	1:53 PM	3:42 PM
45	25-Jul-04	52 14.77	128 68.33	52 18.55	128 68.33	205	251	228	8:35 AM	4:49 PM	6:48 PM
46	26-Jul-04	52 02.02	129 23.33	51 97.97	129 23.33	174	177	175	5:15 AM	11:14 AM	1:05 PM
47	26-Jul-04	51 83.33	129 21.60	51 83.33	129 26.45	121	123	122	6:49 AM	2:43 PM	4:55 PM
48	26-Jul-04	51 85.18	129 51.67	51 81.13	129 51.67	243	254	248	8:47 AM	6:37 PM	8:38 PM
49	27-Jul-04	50 98.07	128 21.68	51 01.85	128 21.67	75	126	100	6:55 AM	12:11 PM	2:02 PM
50	27-Jul-04	50 98.13	127 95.00	51 01.95	127 95.00	27	135	81	8:37 AM	3:33 PM	5:17 PM
51	27-Jul-04	51 18.55	127 93.35	51 14.42	127 93.33	119	134	126	10:15 AM	6:14 PM	8:09 PM
52	28-Jul-04	51 33.33	128 48.20	51 33.33	128 42.02	143	154	148	5:05 AM	10:17 AM	12:12 PM
53	28-Jul-04	51 16.67	128 49.80	51 16.67	128 43.70	185	192	188	6:44 AM	1:15 PM	3:04 PM
54	28-Jul-04	51 16.68	128 23.13	51 16.67	128 16.52	93	113	103	8:05 AM	4:29 PM	6:18 PM
55	1-Aug-04	51 35.27	128 68.95	51 31.08	128 69.05	185	208	196	5:17 AM	11:15 AM	1:18 PM
56	1-Aug-04	51 50.00	128 74.72	51 50.00	128 68.77	42	123	82	7:41 AM	2:33 PM	4:34 PM
57	1-Aug-04	51 51.93	128 45.00	51 48.02	128 45.00	183	188	185	9:14 AM	5:52 PM	7:50 PM
58	2-Aug-04	51 85.25	128 96.70	51 81.22	128 96.67	80	86	83	5:30 AM	11:17 AM	1:13 PM
59	2-Aug-04	51 68.58	128 98.33	51 64.53	128 98.33	48	68	58	6:45 AM	2:18 PM	4:03 PM
60	2-Aug-04	51 68.57	129 25.00	51 65.00	129 25.00	51	60	55	8:19 AM	5:36 PM	7:28 PM
61	3-Aug-04	51 68.50	129 78.33	51 64.17	129 78.33	196	302	249	5:38 AM	10:40 AM	1:23 PM
62	3-Aug-04	51 51.90	129 78.35	51 47.85	129 78.33	161	177	169	6:52 AM	2:33 PM	4:54 PM
63	3-Aug-04	51 50.00	130 01.92	51 50.00	130 08.32	254	358	306	8:21 AM	6:04 PM	8:27 PM
64	4-Aug-04	51 68.57	129 51.67	51 64.47	129 51.67	95	101	98	5:25 AM	10:34 AM	12:25 PM
65	4-Aug-04	51 51.92	129 51.67	51 47.78	129 51.67	91	115	103	6:39 AM	1:30 PM	3:48 PM
66	4-Aug-04	51 51.93	129 25.00	51 48.02	129 25.00	48	51	49	8:25 AM	5:00 PM	6:55 PM
67	5-Aug-04	51 51.97	128 98.33	51 47.78	128 98.33	48	59	53	5:21 AM	10:41 AM	12:32 PM
68	5-Aug-04	51 35.23	128 98.33	51 31.30	128 98.33	234	247	240	6:38 AM	2:35 PM	3:34 PM
69	5-Aug-04	51 35.28	129 25.00	51 31.47	129 25.00	192	256	224	8:17 AM	4:49 PM	6:51 PM
70	6-Aug-04	51 14.72	129 00.00	51 18.78	129 00.00	128	137	132	5:18 AM	10:52 AM	12:43 PM
71	6-Aug-04	51 16.67	128 76.48	51 16.67	128 70.53	97	113	105	7:32 AM	1:45 PM	3:19 PM
72	6-Aug-04	51 01.95	128 73.35	50 97.90	128 73.33	66	73	69	8:54 AM	4:33 PM	6:19 PM
73	9-Aug-04	51 35.33	129 78.33	51 31.57	129 78.35	230	254	242	5:36 AM	10:42 AM	12:52 PM
74	9-Aug-04	51 35.23	129 51.67	51 31.65	129 51.67	170	216	193	7:17 AM	2:05 PM	4:17 PM
75	9-Aug-04	51 18.63	129 53.33	51 14.97	129 53.33	280	283	281	8:32 AM	5:26 PM	7:50 PM
76	10-Aug-04	50 98.08	129 53.33	51 01.77	129 53.33	232	262	247	5:30 AM	10:38 AM	1:10 PM
77	10-Aug-04	50 98.10	129 26.65	51 02.27	129 26.67	155	163	159	7:10 AM	2:23 PM	4:19 PM
78	10-Aug-04	51 14.78	129 26.68	51 18.65	129 26.67	219	300	259	8:27 AM	5:34 PM	7:48 PM
79	11-Aug-04	50 81.37	129 26.68	50 85.52	129 26.67	113	132	122	5:32 AM	10:36 AM	12:56 PM
80	11-Aug-04	50 81.37	129 00.00	50 85.52	129 00.00	59	99	79	7:17 AM	2:20 PM	4:35 PM
81	11-Aug-04	50 98.07	128 99.98	51 01.83	129 00.00	79	86	82	8:28 AM	5:30 PM	7:26 PM
82	12-Aug-04	50 64.70	128 46.67	50 68.45	128 46.67	77	99	88	5:33 AM	10:37 AM	12:40 PM
83	12-Aug-04	50 81.43	128 46.67	50 85.53	128 46.67	51	71	61	6:45 AM	1:53 PM	4:02 PM
84	12-Aug-04	50 98.03	128 46.65	51 02.17	128 46.67	93	97	95	7:58 AM	4:55 PM	6:45 PM