Fisheries and Oceans Canada | Pêches et Océans Canada
Science | Sciences

C S A S | ***S C C S***

Canadian Science Advisory Secretariat | **Secrétariat canadien de consultation scientifique**

Research Document 2009/109 | **Document de recherche 2009/109**

Rockfish Bycatch in the British Columbia Commercial Prawn Trap Fishery

Prises accessoires de sébastes dans les casiers à crevette des pêcheurs commerciaux en Colombie-Britannique

D. T. Rutherford, K. Fong, and H. Nguyen

Fisheries and Oceans Canada
Science Branch
Pacific Biological Station
3190 Hammond Bay Road
Nanaimo, B.C V9T 6N7

ISSN 1499-3848 (Printed / Imprimé)
ISSN 1919-5044 (Online / En ligne)

Canada

Correct citation for this publication:

Rutherford, D.T., Fong, K., and Nguyen, H. 2010. Rockfish Bycatch in the British Columbia Commercial Prawn Trap Fishery. DFO Can. Sci. Advis. Sec. Res. Doc. 2009/109. iii + 25 p.

Abstract

A sampling program to estimate rockfish bycatch in the British Columbia commercial prawn trap fishery was initiated in 2002. The bycatch sampling program utilizes the third party on-ground monitors that have already been established to collect the data necessary for the in-season management of the prawn fishery. For the rockfish bycatch program, on-ground monitors sample a sub-set of traps and record rockfish encounters to the species level. This report documents the methods and analysis, and presents results of the rockfish bycatch monitoring program from 2002 to 2008

Rockfish encounters in the commercial prawn fishery are a rare and random event and follow a Poisson distribution. The observed data was analyzed using maximum likelihood and bootstrap procedures to estimate total rockfish bycatch. Rockfish encounter rates (rockfish per trap) are presented by Pacific Fishery Management Area (PFMA) and year and ranged from a low of 0.000 to 0.045 rockfish/trap. Estimated total annual coastwide rockfish bycatch ranged from a low of 13,867 pieces in 2005 to a high of 19,996 in 2002. The coastwide estimates of rockfish bycatch at the upper 95% CI ranged from 22,792 in 2005 to 40,780 in 2002.

Twenty three species of rockfish and a total of 2088 rockfish were observed during the bycatch monitoring program from 2002 to 2008. Immature quillback rockfish (*Sebastes maliger*) accounted for the greatest proportion of all rockfish sampled, with an average size of 0.233 kilograms and an approximated age of 4 years. However rockfish bycatch, by species, on a coastwide basis could not be estimated due to small sample size and low encounter rates. If species composition is deemed to be an important variable that needs to be quantified with more precision, then sampling rate will have to be significantly increased along with verification of species identification.

Résumé

Un programme d'échantillonnage pour estimer les prises accessoires de sébastes dans les casiers à crevette des pêcheurs commerciaux en Colombie-Britannique a été lancé en 2002. Le programme d'échantillonnage de prises accessoires utilise des appareils de mesure au sol de tierce partie qui ont déjà été mis en place pour recueillir les données nécessaires pour la gestion en saison de la pêche de crevettes. Pour le programme lié aux prises accessoires de sébastes, les appareils de mesure au sol assurent l'échantillonnage d'un sous-ensemble de casiers et enregistrent les repérages de sébastes au niveau de l'espèce. Ce rapport documente les méthodes et l'analyse et présente les résultats du programme de surveillance des prises accessoires de sébastes, et présente les résultats du programme de surveillance des prises accessoires de sébastes de 2002 à 2008.

Les repérages de sébastes dans la pêche commerciale de la crevette représentent un événement rare et aléatoire et suivent une distribution des petites probabilités. Les données observées ont été analysées au moyen de procédures de probabilité maximale et d'auto-amorçage pour estimer le total des prises accessoires de sébastes. Les taux de repérage de sébastes (sébastes par casier) sont présentés par Secteur d’exploitation des pêcheries du Pacifique et par année, et variaient entre 0,000 et 0,045 sébaste/casier. Le total estimé de prises accessoires de sébastes à l'échelle de la côte variait entre 13 867 individus en 2005 et 19 996 en 2002. Les estimations de prises accessoires de sébastes à l'échelle de la côte selon l'indicateur composite avancé supérieur de 95 p. 100 variaient entre 22 792 en 2005 et 40 780 en 2002.

Vingt-trois espèces de sébastes et un total de 2 088 sébastes ont été observés au cours du programme de surveillance des prises accessoires de 2002 à 2008. Les sébastes à dos épineux (Sebastes maliger) immatures représentaient la plus importante proportion de tous les sébastes échantillonnés, avec un poids moyen de 0,233 kg et un âge approximatif de quatre ans. Cependant, les prises accessoires de sébastes, par espèce, à l'échelle de la côte, n'ont pu être estimées en raison de la petite taille de l'échantillon et des faibles taux de repérage. Si la composition taxinomique est perçue en tant que variable importante qui doit être quantifiée de façon plus précise, le taux d'échantillonnage devra donc être nettement accru de pair avec la vérification de l'identification des espèces.

1.0 Introduction

The spot prawn (*Pandalus platyceros)* is the largest of the seven commercially harvested shrimp species (*Pandalus* spp.*)* on Canada's Pacific coast. The British Columbia prawn trap fishery began prior to 1914, but did not reach prominence until the mid 1970's. The fishery experienced a period of growth between 1979 and 1989, with the number of vessels reporting landings increasing from approximately 50 vessels to 305 vessels out of an eligible 900 licences issued in 1989. In 1990, licence limitation was implemented. Currently there are 253 licences eligible for this fishery.

Beginning in 1991, prawn fishers discussed trap limitation as a means to control the annual increases in gear being used on the grounds. More than 80,000 traps were deployed by the fleet in 1994. Trap limits were adopted as a pilot program in 1995, setting a maximum inventory of 78,000 traps for the 260 licences in the fishery at that time. There is a fixed limit of 300 traps per licence with an annual option of combining two trap allotments on a single vessel, referred to as "stacking". When combined, a maximum of 500 traps is permitted on the acquiring vessel. From 2002 to 2008, the annual number of traps fished coastwide averaged approximately 65,000 traps which is less than the allowed maximum due to license stacking, the voluntary use of fewer traps on some vessels, and inactive licenses.

The prawn trap fishery is presently managed using an escapement-based model often referred to as the Spawner Index Model (Boutillier and Bond 2001). This is a standardized catch per unit effort (CPUE) model based on ensuring a minimum number of spawners are available at time of egg hatch, which normally occurs around the end of March. The number of spawners is measured using a spawner escapement index (SI) developed by Boutillier (1994). For all months preceeding egg hatch, minimum monthly indices (MMI), were established through back calculation using an estimated natural mortality rate obtained from research survey studies (Boutillier and Bond 2001; Rutherford et al. 2004a). The harvest control rules (HCR) used for in-season management of this fishery are compliant with the Precautionary Approach (PA). Provisional reference points, based on the SI, are established for this fishery and are documented in Rutherford et al. (2008).

Implementation of this escapement model and monitoring of stock status in relation to the provisional reference points is carried out through an in-season industry funded monitoring program. Third party on-ground monitors are deployed in-season to achieve uniform spatial and temporal coverage throughout the coast during the commercial fishing season. On-ground monitors sample a sub-set of the commercial catch at the time fishing gear is retrieved. Traps in the prawn fishery are set along a ground line referred to as a string, and a string usually consists of 50 traps. Traps within a string are sampled to provide CPUE estimates of the number of prawns per trap by sexual stage. The CPUE is then standardized for trap type and bait type (Rutherford et al. 2004b). The spawner index model uses the standardized CPUE of only those prawns that will contribute to the spawning population in March following the fishing season.

Until recently, bycatch of non-target species has not been of concern in this fishery due to the nature of trap fishing and the minimal diversity of bycatch. The non-target species are easily sorted and quickly returned to the water, resulting in presumed low mortality. However, fishery independent surveys carried out by the Department of

Fisheries and Oceans (DFO) using prawn trap gear have encountered rockfish in traps (Boutillier and Cooke 1976, Favaro et al. 2009). Rockfish brought to the surface by trap gear are assumed not to survive release due to their inability to equilibrate air bladders to rapid changes in depth. The presence of rockfish in prawn traps combined with the decline of some inshore rockfish stocks (Yamanaka and Lacko 2001; Yamanaka et al. 2004) prompted the implementation of a rockfish bycatch monitoring program in the commercial prawn trap fishery. Accordingly, a rockfish bycatch monitoring program was developed and established in 2002 with the objective of estimating total annual rockfish bycatch in the commercial prawn fishery.

This report documents the methods and analysis, and presents results of the rockfish bycatch monitoring program from 2002 to 2008. This report has been prepared in response to a verbal request for a report on rockfish bycatch in the prawn trap fishery, made by Fisheries and Aquaculture Management (FAM) at the April 2009 meeting of the Shellfish Working Group.

2.0 Methods

2.1 Data Collection

The third party on-ground monitors that were already established to collect the in-season data necessary for managing the spawner index program were also utilized to collect rockfish bycatch data. For year 2002, the target sampling rate was to observe every third trap on a string as they were retrieved during the commercial fishing operations. Commencing in 2003 the sampling rate was increased to observe all traps on a sampled string for rockfish; however, not all monitors followed this protocol with some still using the 2002 sampling rate. In 2004 a sampling rate of every trap on a string was fully implemented. The distribution of sampling was dictated by the in-season spawner index program so sampling was distributed uniformly, both spatially and temporally. The strings sampled for rockfish were the same as those sampled for the spawner index. Sampling was conducted throughout the duration of the commercial season which ranged from a low of 58 days in 2008 to a high of 72 days in 2003 with an average of 62 days. The spatial distribution of sampling followed the commercial fishing locations throughout the coast. Sample sizes and effort data are presented in Appendix 1.

Data recorded for the rockfish bycatch program included date, location of string when hauled (GPS or chart reference), number of traps on a string observed for rockfish catch, number of rockfish observed for the string, and rockfish species identified to the lowest taxonomic level possible. Rockfish weight was recorded but not length data or age structures.

Rockfish species identification was conducted by on-ground monitors. Monitors were trained annually on rockfish identification. During the season if monitors were unable to identify a rockfish they were instructed to record it as ”unknown species” and, if possible, take a photo and voucher sample and send it to the Pacific Biological Station, Nanaimo, B.C. for identification.

Effort data, by Pacific Fishery Management Area (PFMA; Figure 1), used in the analysis were obtained from commercial fishing logs. Data were extracted from the

PRAWNLOGS database maintained by the Shellfish Data Unit, Marine Ecosystems and Aquaculture Division (MEAD), DFO, Nanaimo, B.C.

2.2 Data Analysis

2.2.1 Encounter Rates

Encounter rates, expressed as rockfish per trap, were calculated for each PFMA by year simply by summing total rockfish observed on all sampled strings and dividing by total number of traps on the sampled strings as follows:

$$E_r\,(\text{rockfish / trap}) = \frac{\sum_i^n Y_i}{n}$$

Where E_r is encounter rate (number of rockfish per trap),
Y_i is number of rockfish observed on string *i*
n is total number of traps sampled.

2.2.2 Rockfish Bycatch Estimation

To estimate total rockfish bycatch, a string was the sampling unit. All rockfish encounters were summed for the string. For each string the number of traps was known and the number of rockfish encountered was known; however, the number of individual rockfish caught in a given trap was not available owing to the string sampling unit.

Rockfish encounters on a string were a rare and random event; accordingly, the number of rockfish observed was assumed to fit a Poisson distribution. This assumption was based on testing the data from the PFMA with the largest sample size in each year for goodness of fit to a Poisson distribution using the Kolmogorov-Smirnov test in SYSTAT (Systat Software Inc. 2004). A total of 7 tests were performed (one in each year) with P> 0.13. Accordingly string rate parameter λ was estimated as follows.

$$\Pr(Y_i = k \mid \text{rate parameter} = \lambda) = \frac{e^{-r}\lambda^k}{k!}$$

Y_i indicates the observed count k of fish on sampled string. The string rate parameter λ is the expected number of fish on observed string. Parameter λ is estimated by method of maximum likelihood from Poisson distribution Pr.

Total rockfish catch for each PFMA was then estimated as follows:

$$C = r_B * S$$

Where *C* is total catch
r_B is mean of bootstrapped string encounter rate
S is total number of standardized strings

Because the number of traps sampled on a string varied between PFMA's and year, strings were standardized for trap number for each PFMA by determining the total number of annual commercial trap sets in a PFMA and dividing by the average number of traps on the sampled strings.

The 95% confidence intervals (CI) of the rate *r* were determined by a bootstrap method applied to the maximum likelihood estimate using PopTools (Hood 2008). One thousand bootstrap iterations were performed for each PFMA. The 95% CI bounds were then empirically derived by identifying the cut off points. In all except one year the lower CI = zero. Because a lower CI of zero provides little useful information, given that rockfish were encountered, only one tailed upper 95% CI's were determined. The upper 95% CI were determined by identifying the cut off points of the top 50 bootstrapped estimates. The rates at these upper cut off points were then multiplied by *S*.

2.2.3 Rockfish Species Composition and Size

Species composition documented in this report is simply the composition of the observed rockfish each year for each PFMA. The only biological measurement recorded for rockfish was weight. Individual rockfish weights were recorded for the majority of samples. Average species specific rockfish weights, pooled across all years of the sampling program were calculated. The average is based on only those samples for which individual weights were available. In the absence of length and age data, species specific average ages were approximated for only the most commonly encountered species using the length-weight relationship parameters and Von Bertalanffy growth curves in Love et al. (2002).

3.0 Results

3.1 Encounter Rates

Mean rockfish encounter rates, by year and PFMA ranged from a low of 0.000 to a high of 0.045 rockfish per trap, with the highest encounter rate observed in PFMA 24 in 2003 (Table 1). When averaged across all years of sampling, the lowest encounter rates (0.001 rockfish per trap) were observed in PFMA 8 and 23. The highest average rates across all years were in PFMA 24 and PFMA 4 and were 0.028 and 0.017, respectively; however, only 2 years of sample data were available for PFMA 24 and 6 years of data for PFMA 4 (Table 1).

Increasing trends in rockfish encounter rates were observed in PFMA 17 and 18. Decreasing trends in rockfish encounter rates were observed in PFMA 4, 13, and 25 (Figure 2). No trends in encounter rates were evident in the other PFMA's (Figure 2).

3.2 Total Rockfish Bycatch

The total estimated coastwide rockfish bycatch by year ranged from a low of 13,867 pieces in 2005 to a high of 19,996 in 2002 (Table 2). The coast-wide estimates at the upper 95% CI ranged from 22,792 in 2005 to 40,780 in 2002 (Table 2).

The highest bycatch estimated for any PFMA across all years was 4,443 rockfish in PFMA 15 in 2006 (Table 3). PFMA 15 also had the highest rockfish bycatch in 3 of the 7 years sampled with the high catches ranging from 2,693 to 4,443 rockfish. PFMA 13 had the highest rockfish bycatch in 2 of the 7 years (2,941 and 3,504 rockfish). PFMA 16 had the highest rockfish bycatch in 2 years with a catch of 1,844 and 3431 rockfish (Table 3).

PFMA 23 had the lowest rockfish bycatch in 4 of the 7 years sampled and in all four of the years the bycatch was estimated to be zero. The highest bycatch estimated for PFMA 23 was 392 rockfish in 2002 (Table 3).

3.3 Rockfish Species Composition and Size

There were 23 species of rockfish and a total of 2088 rockfish recorded when summed across all years of the rockfish bycatch sampling program (Table 4). Quillback rockfish (*Sebastes maliger*) accounted for the greatest proportion (62%, n= 1295) of all rockfish encounters followed by copper rockfish (*S. caurinus*) (14%, n= 293), greenstriped rockfish (*S. elongatus*) (7%, n= 136), yelloweye rockfish (*S. ruberrimus*) (5%, n= 112), and unknown rockfish (*Sebastes sp*.) (3%, n=58) (Table 4, Figure 3). The remaining 19 rockfish species accounted for 1% or less of the total rockfish recorded. Rockfish that could not be identified to species level were recorded as unknown rockfish. Also included in this group were 4 rockfish initially identified as chilipepper (*S. goodei*) and 2 as blackgill (*S. melanostomus*); given the geographic distribution of these two species (Hart 1973; Mecklenberg et al. 2002) it was very unlikely that they would have been encountered; furthermore, no voucher samples or photos were taken.

Species composition of observed rockfish varied by PFMA and year (Table 5). Quillback rockfish were encountered in the greatest number of PFMA's. Copper, yelloweye and greenstriped rockfish were also encountered in a large number of PFMA's.

The average size of rockfish, expressed as weight, ranged from 0.100 kilograms for both ocean pearch (*S. alutus*) and sharpchin (*S. zacentrus*) to 0.370 kg for china (*S. nebulosus*). Quillback (*S. maliger*), the most frequently encountered rockfish, had an average weight of 0.233 kilograms (Table 6).

Age was approximated for the most commonly encountered species and greenstriped (*S. elongates*) were estimated to be the oldest at age 8 followed by quillback (*S. maliger*) and copper (*S. caurinus*) at age 4 and yelloweye (*S. ruberrimus*) at age 1.

4.0 Discussion

Total rockfish catch in 2002 was the highest observed during the seven years of sampling. This result may be partially explained by the fact that 2002 was the first year of program implementation and documentation on whether or not a string was observed for rockfish was occasionally lacking. When interpreting the sampling data from 2002 it was sometimes difficult to distinguish between a zero data point and no data collected. The default interpretation in these cases was no data collected because observers were not required to sample all strings for rockfish by-catch. This interpretation would tend to bias the bycatch results upward due to missed zero data points. Also in 2002 only a subset of traps on a string were observed for rockfish encounters. 2003 was a transition year with the intent of observing all traps on a string, however some monitors were still using the 2002 sampling protocol, it was not until 2004 that every trap on a sampled string was consistently observed for rockfish encounters.

Total rockfish bycatch by species was not estimated by PFMA or coastwide owing to the low number of rockfish encountered (i.e., small sample size). Another issue complicating species specific estimates is the reliability of the species identification. Species such as quillback, copper, yelloweye, greenstriped, rougheye, sharpchin, canary and china are likely identified correctly as specimens of these were present during the training sessions; however, some of the less common records are in question (e.g., chilipepper, blackgill.) Voucher samples were retained and verified for the bocaccio encounters but not for the other less common encounters. If species composition is deemed to be an important variable that needs to be quantified with more precision than presented in this report, then sampling rate will have to be significantly increased along with verification of species identification.

Rockfish encounters in prawn traps are a rare event which is problematic for designing effective sampling programs to estimate total rockfish bycatch; however, the methodology outlined in this report produces bycatch estimates with known precision. The 2002 estimates had wide confidence intervals owing to only sampling a subset of traps on a sample string. Commencing in 2003 the number of traps sampled was increased resulting in greater precision around the point estimate and in 2004 the rate was increased even further. The level of precision required cannot be addressed in this report and is largely a question for fisheries management and assessment staff familiar with rockfish stocks and rockfish population dynamics. This report does provide estimates to evaluate the significance of rockfish encounters. An important point to consider in further evaluation is that the majority of rockfish encountered were likely immature based on the approximated ages for some of the species. Quillback encountered during the bycatch sampling program had an approximate age of 4 years. Love et al. (2002) reports quillback start to mature at age 5 and approximately 50% maturity at age 11.

Rockfish encounter rates in the recreational prawn trap fishery are unknown. The recreational fishery operates on a different temporal and spatial scale than the commercial fishery so encounter rates could be higher, lower or similar to that of the commercial fishery. This also holds true for First Nation food social and ceremonial (FSC) prawn harvest.

A rockfish conservation strategy was first proposed in 1998, and in 2002 measures were implemented to protect inshore rockfish populations. These measures included catch restrictions, fishery monitoring, assessment programs and establishment of areas closed to certain fishing activities throughout the coast of British Columbia, referred to as Rockfish Conservation Areas (RCA's) (Yamanaka and Lacko 2001, DFO 2006). Certain fishing activities are permitted within RCA's including prawn by trap for both recreational and commercial sectors (DFO 2006). Benefits from the conservation strategy in terms of juvenile rockfish recruitment are expected. One may expect, given the nature of the prawn trap fishery that an increase in rockfish recruitment may result in increased rockfish bycatch encounter rates. This has not yet been the case; however the conservation strategy has only been in full implementation since 2007 so rockfish may not yet have recruited to a size that would be encountered in the prawn trap fishery.

5.0 Acknowledgements

The Pacific Prawn Fisherman's Association (PPFA) and prawn fishers strongly

supported the rockfish bycatch program and provided funding for data collection. The on-ground monitors from J. O. Thomas and Associates through the coordination of Doug Tallman were instrumental in the collection of data. Karin Mathias (DFO) and Duncan Peterson (Co-op student Queens University) assisted with data compilation. Stefanie Duff (Vancouver Island University), Wanli Ou (DFO) and Lynne Yamanaka (DFO) provided thorough reviews and comments.

6.0 References

Boutillier, J.A. 1994. Review of experimental prawn fishing in Howe Sound, 1993. In Hand. C.M., and J. Waddell (editors). 1996. Invertebrate working papers reviewed by the Pacific Stock Assessment Review Committee (PSARC) in 1993 and 1994. Can. Tech. Rep. Fish. Aquat. Sci. 2089.

Boutillier, J.A. and K.D. Cooke. 1976. Prawn trap exploration, British Columbia northern and central coast September 1975 to December 1975. Fish Res. Board of Can. Manuscript Report Series 1388.

Boutillier, J.A., and J.A. Bond. 2001. Using a fixed escapement strategy to control recruitment overfishing in the shrimp trap fishery in British Columbia. J. Northw. Atl. Fish. Sci., Vol 27:261-271.

DFO. 2006. Rockfish Conservation Areas: Protecting British Columbia's Rockfish. Fisheries and Oceans Canada, Pacific Region.

Favaro, B., D.T. Rutherford, S.D. Duff, and I.M. Côté. 2009. Bycatch in British Columbia spot prawn traps: Preliminary assessment using research trap data. Fisheries Research, submitted.

Hart, J.L. 1973. Pacific Fishes of Canada. Fisheries Research Board of Canada. Bulletin 180: 740p.

Hood. G.M. 2008. PopTools version 3.0.6 Available on the internet. URL http://www.cse.csiro.au/poptools.

Love, M.S., M. Yoklavich, L. Thorsteinson. 2002. The rockfishes of the northeast Pacific. University of California Press, Berkeley. 405p.

Mecklenburg, C.W., T.A. Mecklenburg, and L.K. Thorsteinson. 2002. Fishes of Alaska. American Fisheries Society, Bethesda, Maryland. 1037p.

Rutherford, D.T., K.H. Fong, and A.R. Kronlund. 2008. Description of the situation for Pacific prawn (biological information, context of the fishery and elements of a potential Precautionary Approach framework). In Proceedings of the Precautionary Approach Workshop on Canadian Shrimp and Prawn Stocks and Fisheries. Fisheries and Oceans Canada, Canadian Science Advisory Secretariat, Proceedings Series 2008/031.

Rutherford, D.T., H. Nguyen, and J. Boutillier. 2004a. Assessment and management of spot prawn *Pandalus platyceros* along the British Columbia coast. Journal of

Shellfish Research 23, 658-659.

Rutherford, D.T., H. Nguyen, and G.E. Gillespie. 2004b. Update on effort standardization for the in-season monitoring of the prawn by trap fishery. Fisheries and Oceans Canada, Canadian Science Advisory Secretariat Research, Document 2004/015. 13p.

Systat Software Inc. 2004. 501, Canal Boulevard, Suite C. Richmond, CA, USA.

Yamanaka, K.L., L.C. Lacko, J.K. Lochead, J. Martin, R. Haigh, C. Grandin, and K. West. 2004. Stock assessment framework for inshore rockfish. Fisheries and Oceans Canada, Canadian Science Advisory Secretariat, Research Document 2004/068. 63pp.

Yamanaka, K. L., and L.C. Lacko. 2001. Inshore rockfish (*Sebastes ruberrimus, S. maliger, S. caurinus, S. melanops, S. nigrocinctus,* and *S. nebulosus*) stock assessment for the West Coast of Canada and recommendations for management. Fisheries and Oceans Canada, Canadian Science Advisory Secretariat, Research Document 2001/139. 101pp.

Table 1. Rockfish encounter rates (rockfish/trap) in the commercial prawn trap fishery, by year and Pacific Fishery Management Area (PFMA), from 2002 to 2008.

	Rockfish Encounter Rate (rockfish/trap)							
PFMA	2002	2003	2004	2005	2006	2007	2008	Avg (2002-2008)
2	0.000	0.001	0.000	0.003	0.002	0.016	0.004	0.004
3	0.013	0.007	0.005	0.003	0.003	0.005	0.002	0.005
4	0.032	0.044	0.008	0.005	0.005	0.005	n/a	0.017
5	0.004	0.002	0.004	0.002	0.001	0.002	0.002	0.003
6	0.006	0.004	0.002	0.001	0.001	0.004	0.001	0.003
7	0.001	0.003	0.004	0.006	0.004	0.004	0.004	0.004
8	0.000	0.001	0.000	0.002	0.001	0.002	0.001	0.001
9	0.001	0.003	0.003	0.003	0.001	0.002	0.003	0.002
10	0.000	0.000	0.001	0.002	0.005	0.010	0.003	0.003
11	n/a	0.000	0.003	0.005	0.000	0.012	n/a	0.004
12	0.004	0.001	0.005	0.002	0.002	0.005	0.005	0.003
13	0.009	0.005	0.009	0.008	0.006	0.006	0.004	0.007
14	0.008	0.005	0.002	0.002	0.002	0.005	0.002	0.004
15	0.009	0.004	0.007	0.005	0.009	0.006	0.007	0.007
16	0.010	0.006	0.003	0.005	0.008	0.004	0.008	0.006
17	0.002	0.002	0.003	0.002	0.004	0.005	0.008	0.004
18	0.004	0.003	0.003	0.006	0.005	0.015	0.021	0.008
19	0.000	0.004	0.002	0.003	0.001	0.003	0.002	0.002
23	0.004	0.000	0.003	0.000	0.000	0.000	0.000	0.001
24	n/a	0.045	0.012	n/a	n/a	n/a	n/a	0.028
25	0.011	0.005	0.010	0.009	0.005	0.006	0.002	0.007
26	n/a	0.004	0.008	0.005	0.003	0.002	0.005	0.004
27	0.019	0.002	0.005	0.007	0.009	0.005	0.003	0.007
28	0.020	0.003	0.000	0.000	0.002	0.002	0.000	0.004
29	0.002	0.004	0.001	0.003	0.004	0.009	0.004	0.004

n/a = not available, no sampling conducted

Table 2. Total estimated number of rockfish caught, by year, in the commercial prawn trap fishery from 2002 to 2008.

Year	Mean Estimate	Upper 95% CI
2002	19,996	40,780
2003	14,310	28,845
2004	15,734	24,176
2005	13,867	22,792
2006	15,556	25,080
2007	17,715	26,620
2008	15,769	24,181

Table 3. Estimated rockfish bycatch, by Pacific Fishery Management Area (PFMA) and year, in the commercial prawn trap fishery from 2002 to 2008.

	Number of Rockfish 2002		Number of Rockfish 2003		Number of Rockfish 2004		Number of Rockfish 2005		Number of Rockfish 2006		Number of Rockfish 2007		Number of Rockfish 2008	
PFMA	Mean Estimate	Upper 95% CI	Point Estimate	Upper 95% CI	Mean Estimate	Upper 95% CI	Mean Estimate	Upper 95% CI	Mean Estimate	Upper 95% CI	Mean Estimate	Upper 95% CI	Mean Estimate	Upper 95% CI
2	**0**	-	**122**	295	**0**	-	**176**	340	**143**	297	**590**	749	**74**	146
3	**614**	1299	**204**	491	**160**	290	**81**	153	**93**	204	**158**	321	**52**	148
4	**2159**	3652	**1401**	2729	**316**	602	**174**	354	**131**	254	**130**	238	**n/a**	-
5	**206**	464	**92**	216	**132**	304	**77**	156	**94**	204	**86**	160	**73**	142
6	**712**	1360	**308**	610	**159**	371	**83**	196	**83**	199	**408**	681	**71**	152
7	**110**	342	**526**	991	**633**	1094	**748**	1219	**438**	748	**464**	694	**369**	653
8	**0**	0	**121**	328	**0**	0	**113**	217	**53**	160	**111**	229	**36**	86
9	**126**	363	**201**	519	**161**	288	**104**	221	**23**	70	**82**	159	**127**	212
10	**0**	0	**0**	0	**44**	131	**111**	253	**201**	383	**310**	519	**54**	132
11	**n/a**	-	**0**	0	**114**	356	**114**	336	**0**	0	**186**	380	**n/a**	-
12	**2416**	4934	**656**	1563	**1696**	2400	**905**	1419	**582**	1078	**1951**	2354	**1766**	2550
13	**2436**	4580	**1581**	2876	**3504**	4435	**2941**	3989	**2216**	3134	**2123**	2982	**1152**	1762
14	**1318**	3238	**1165**	2362	**494**	980	**581**	1195	**601**	1344	**1308**	2493	**299**	741
15	**2862**	6713	**1767**	3794	**3307**	4456	**2389**	3364	**4443**	6548	**2693**	3790	**2754**	5138
16	**2783**	5442	**1844**	3332	**850**	1373	**1730**	2389	**3002**	4145	**1880**	2614	**3431**	4521
17	**551**	1053	**553**	1009	**885**	1439	**269**	582	**990**	1465	**1527**	2118	**2296**	3167
18	**454**	804	**272**	464	**246**	488	**451**	746	**508**	962	**1219**	1843	**2113**	2380
19	**0**	0	**590**	959	**222**	453	**281**	563	**108**	264	**318**	576	**209**	372
23	**392**	1047	**0**	0	**141**	287	**18**	57	**0**	0	**0**	0	**0**	0
24	**n/a**	-	**1266**	2588	**281**	562	**n/a**	-	**n/a**	-	**n/a**	-	**n/a**	-
25	**1149**	1966	**731**	1591	**1515**	2055	**1153**	1720	**543**	843	**472**	750	**158**	339
26	**n/a**	-	**136**	318	**322**	487	**217**	468	**49**	117	**77**	184	**87**	246
27	**397**	992	**87**	276	**469**	1111	**821**	1983	**578**	1147	**267**	515	**123**	274
28	**1186**	2233	**282**	584	**28**	85	**0**	0	**106**	241	**144**	294	**39**	120
29	**125**	298	**405**	950	**55**	129	**330**	872	**571**	1273	**1211**	1977	**486**	900
Total	**19,996**	40,780	**14,310**	28,845	**15,734**	24,176	**13,867**	22,792	**15,556**	25,080	**17,715**	26,620	**15,769**	24,181

n/a = not available, no sampling conducted

Table 4. Total observed rockfish catch by species summed across all years of the rockfish bycatch sampling program, 2002 to 2008.

Common name	Latin name	N	Proportion
Quillback	*Sebastes maliger*	1295	0.62
Copper	*Sebastes caurinus*	293	0.14
Greenstriped	*Sebastes elongatus*	136	0.07
Yelloweye	*Sebastes ruberrimus*	112	0.05
Unknown	*Sebastes* sp.	58	0.03
Canary	*Sebastes pinniger*	25	0.01
Rougheye	*Sebastes aleutianus*	25	0.01
Harlequin	*Sebastes variegatus*	15	0.01
Yellowtail	*Sebastes flavidus*	14	0.01
Redstripe	*Sebastes proriger*	12	0.01
Tiger	*Sebastes nigrocinctus*	12	0.01
Redbanded	*Sebastes babcocki*	11	0.01
Sharpchin	*Sebastes zacentrus*	11	0.01
China	*Sebastes nebulosus*	10	0.00
Darkblotched	*Sebastes crameri*	10	0.00
Black	*Sebastes melanops*	9	0.00
Bocaccio	*Sebastes paucispinis*	9	0.00
Widow	*Sebastes entomelas*	8	0.00
Splitnose	*Sebastes diploproa*	7	0.00
Rosethorn	*Sebastes helvomaculatus*	6	0.00
Silverygray	*Sebastes brevispinis*	4	0.00
Ocean perch	*Sebastes alutus*	3	0.00
Vermilion	*Sebastes miniatus*	2	0.00
Yellowmouth	*Sebastes reedi*	1	0.00

Table 5a. Species composition, and numbers in parentheses, of rockfish observed during the sampling program in 2002.

	Species Composition (number in parentheses)								
PFMA	Quillback	Copper	Widow	China	Yellowtail	Canary	Silvergray	Tiger	Unknown
2									
3									1.00(7)
4									1.00(12)
5									1.00(2)
6									1.00(4)
7	0.50(1)	0.50(1)							
8									
9									1.00(1)
10									
11									
12	0.20(2)	0.60(6)					0.10(1)	0.10(1)	
13	0.76(13)	0.24(4)							
14	0.60(6)	0.20(2)							0.20(2)
15	0.78(7)	0.11(1)							0.11(1)
16	0.64(7)			0.18(2)					0.18(2)
17		0.66(4)	0.17(1)			0.17(1)			
18		1.00(6)							
19									
23	0.75(3)				0.25(1)				
24									
25	0.65(9)	0.14(2)	0.07(1)		0.14(2)				
26									
27	0.40(2)		0.60(3)						
28	0.83(15)			0.17(3)					
29	1.00(2)								

Table 5b. Species composition, and numbers in parentheses, of rockfish observed during the sampling program in 2003.

	Species Composition (number in parentheses)											
PFMA	Quillback	Copper	Greenstriped	Tiger	Yelloweye	Black	Canary	China	Redstripe	Silvergray	Splitnose	Unknown
2	1.00(1)											
3	1.00(3)											
4	0.85(11)			0.15(2)								
5		1.00(1)										
6	0.22(2)										0.56(5)	0.22(2)
7	0.80(4)	0.20(1)										
8					1.00(1)							
9	1.00(1)											
10												
11												
12	0.50(2)	0.25(1)				0.25(1)						
13	0.80(8)							0.20(2)				
14	0.80(4)	0.20(1)										
15	0.40(2)			0.20(1)			0.40(2)					
16	0.74(6)		0.13(1)		0.13(1)							
17	0.25(2)	0.75(6)										
18	0.13(1)	0.25(2)							0.62(5)			
19	0.44(4)	0.44(4)	0.12(1)									
23												
24	0.50(6)	0.50(6)										
25	0.57(4)	0.29(2)								0.14(1)		
26	1.00(2)											
27	1.00(1)											
28	1.00(4)											
29	0.50(3)		0.50(3)									

Table 5c. Species composition, and numbers in parentheses, of rockfish observed during the sampling program in 2004.

	Species composition (number in parentheses)															
PFMA	Quillback	Copper	Yelloweye	Greenstriped	Rougheye	Harlequin	Sharpchin	Canary	China	Redbanded	Silvergray	Tiger	Vermilion	Yellowmouth	Yellowtail	Unknown
2																
3	0.38(3)		0.13(1)		0.25(2)								0.25(2)			
4	0.44(4)		0.11(1)		0.33(3)									0.11(1)		
5					0.83(5)	0.17(1)										
6	0.20(1)				0.60(3)		0.20(1)									
7	0.37(5)		0.07(1)	0.07(1)		0.14(2)	0.21(3)		0.07(1)							0.07(1)
8																
9	0.60(3)				0.20(1)		0.20(1)									
10	1.00(1)															
11	1.00(1)															
12	0.60(18)	0.17(5)	0.03(1)	0.17(5)						0.03(1)						
13	0.85(50)		0.07(4)	0.08(5)												
14	0.89(8)			0.11(1)												
15	0.69(25)	0.03(1)	0.11(4)	0.16(6)								0.03(1)				
16	0.93(14)							0.07(1)								
17	0.42(8)	0.26(5)	0.11(2)	0.11(2)												0.10(2)
18		1.00(5)														
19		0.80(4)														0.20(2)
23	0.88(7)	0.13(1)														
24	0.56(5)	0.44(4)														
25	0.69(39)	0.19(11)	0.02(1)					0.02(1)		0.02(1)	0.02(1)				0.04(2)	
26	0.36(5)	0.64(9)														
27	0.72(10)	0.07(1)				0.21(3)										
28									1.00(1)							
29		0.50(1)		0.50(1)												

Table 5d. Species composition, and numbers in parentheses, of rockfish observed during the sampling program in 2005.

	Species Composition (number in parentheses)												
PFMA	Quillback	Yelloweye	Greenstriped	Copper	Rougheye	Darkblotched	Tiger	Black	Widow	Ocean Perch	Redstripe	Sharpchin	Unknown
2	0.43(6)			0.57(8)									
3	0.50(2)	0.25(1)								0.25(1)			
4		0.14(1)	0.29(2)		0.57(4)								
5	0.67(4)				0.33(2)								
6					0.33(1)	0.67(2)							
7	0.40(9)	0.13(3)	0.04(1)		0.04(1)	0.04(1)					0.13(3)	0.22(5)	
8	0.17(1)		0.50(3)				0.33(2)						
9	0.57(4)					0.29(2)	0.14(1)						
10	0.80(4)	0.20(1)											
11	1.00(3)												
12	0.69(13)		0.05(1)	0.16(3)			0.05(1)						0.05(1)
13	0.75(44)	0.03(2)	0.20(12)										0.02(1)
14	0.42(3)	0.29(2)	0.29(2)										
15	0.72(23)	0.13(4)	0.15(5)										
16	0.85(29)	0.09(3)	0.06(2)										
17	0.74(6)	0.13(1)		0.13(1)									
18	0.08(1)	0.17(2)		0.67(8)					0.08(1)				
19	0.20(1)			0.80(4)									
23	1.00(1)												
24													
25	0.97(38)							0.03(1)					
26	1.00(6)												
27	0.83(25)	0.03(1)	0.07(2)					0.07(2)					
28													
29	0.38(3)	0.25(2)	0.25(2)						0.12(1)				

Table 5e. Species composition, and numbers in parentheses, of rockfish observed during the sampling program in 2006.

	Species composition (number in parentheses)														
PFMA	Quillback	Copper	Yelloweye	Greenstriped	Yellowtail	Black	Canary	Darkblotched	Harlequin	Redbanded	Redstripe	Rosethorn	Silvergray	Tiger	Widow	Unknown
2	0.70(7)	0.30(3)														
3	0.75(3)	0.25(1)														
4		1.00(3)														
5	0.50(2)	0.25(1)		0.25(1)												
6		0.50(2)							0.50(2)							
7	0.27(4)	0.20(3)						0.13(2)		0.20(3)		0.13(2)				0.07(1)
8				1.00(2)												
9				1.00(1)												
10	0.84(10)	0.08(1)														0.08(1)
11																
12	0.07(1)	0.79(11)	0.07(1)											0.07(1)		
13	0.83(24)		0.10(3)	0.07(2)												
14	0.57(4)	0.14(1)	0.14(1)	0.14(1)												
15	0.79(45)		0.09(5)	0.12(7)												
16	0.92(59)		0.08(5)													
17	0.41(11)	0.22(6)	0.04(1)		0.18(5)	0.04(1)	0.11(3)									
18	0.11(1)	0.67(6)	0.11(1)												0.11(1)	
19	0.67(2)										0.33(1)					
23																
25	0.86(18)	0.14(3)														
26	1.00(2)															
27	0.60(17)	0.32(9)	0.04(1)										0.04(1)			
28	1.00(5)															
29	0.45(4)		0.33(3)		0.22(2)											

Table 5f. Species composition, and numbers in parentheses, of rockfish observed during the sampling program in 2007.

	Species Composition (number of rockfish in parenthesis)																		
PFMA	Quillback	Greenstriped	Yelloweye	Copper	Redbanded	Darkblotched	Harlequin	Rosethorn	Bocaccio	Canary	Ocean Perch	Redstripe	Splitnose	Tiger	Black	China	Rougheye	Sharpchin	Yellowtail	Unknown
2	0.58(40)	0.01(1)		0.25(17)	0.01(1)	0.01(1)		0.03(2)	0.01(1)	0.06(4)				0.01(1)	0.03(2)					
3	0.66(4)		0.17(1)				0.17(1)													
4	0.76(6)						0.12(1)										0.12(1)			
5	0.50(2)																			0.50(2)
6	0.39(6)				0.13(2)		0.27(4)	0.07(1)			0.07(1)		0.07(1)							
7	0.48(12)	0.24(6)	0.04(1)		0.04(1)					0.04(1)	0.04(1)	0.04(1)	0.04(1)							0.04(1)
8	0.20(1)					0.20(1)		0.20(1)												0.40(2)
9	0.50(2)	0.25(1)																		0.25(1)
10	1.00(25)																			
11	1.00(6)																			
12	0.77(37)	0.06(3)		0.13(6)	0.02(1)													0.02(1)		
13	0.94(44)	0.04(2)												0.02(1)						
14	0.73(8)	0.09(1)	0.18(2)																	
15	0.71(22)	0.10(3)	0.16(5)		0.03(1)															
16	0.82(23)		0.14(4)													0.04(1)				
17	0.21(7)		0.09(3)	0.61(20)																0.09(3)
18	0.37(11)		0.03(1)	0.50(15)															0.07(2)	0.03(1)
19	0.50(4)			0.50(4)																
23																				
25	0.48(13)			0.29(8)		0.04(1)			0.15(4)											0.04(1)
26																				1.00(1)
27	0.62(8)	0.23(3)										0.15(2)								
28	1.00(5)																			
29	0.80(12)		0.13(2)	0.07(1)																

Table 5g. Species composition, and numbers in parentheses, of rockfish observed during the sampling program in 2008.

	Species Composition (number in parentheses)									
PFMA	Quillback	Greenstriped	Copper	Yelloweye	Canary	Bocaccio	Rougheye	Black	Harlequin	Unknown
2	0.57(8)		0.29(4)					0.14(2)	`	
3	0.33(1)									0.67(2)
4										
5	0.66(4)	0.17(1)				0.17(1)				
6		0.50(2)							0.25(1)	0.25(1)
7	0.11(2)	0.68(13)		0.16(3)			0.05(1)			
8		1.00(2)								
9	1.00(10)									
10	0.33(1)	0.33(1)					0.33(1)			
11										
12	0.80(32)	0.10(4)	0.02(1)	0.08(3)						
13	0.87(24)	0.03(1)	0.07(2)	0.03(1)						
14	1.00(3)									
15	0.54(19)	0.31(11)	0.06(2)	0.06(2)						0.03(1)
16	0.71(40)	0.02(1)		0.27(15)						
17	0.40(16)	0.02(1)	0.33(13)	0.02(1)	0.23(9)					
18	0.50(32)	0.10(6)	0.24(15)	0.13(8)	0.03(2)					
19	0.45(4)	0.10(1)	0.45(4)							
23										
25			0.57(4)			0.43(3)				
26			1.00(3)							
27	0.86(6)		0.14(1)							
28	1.00(1)									
29	0.57(4)		0.29(2)		0.14(1)					

Table 6. Mean weight and approximated age of rockfish, by species, pooled across all years of the rockfish bycatch sampling program, 2002 to 2008.

Common name	Latin name	N	Mean weight (kg)	Standard Deviation	Aproximated Age[1]
Quillback	*Sebastes maliger*	897	0.233	0.140	4
Copper	*Sebastes caurinus*	216	0.254	0.147	4
Greenstriped	*Sebastes elongatus*	89	0.174	0.114	8
Yelloweye	*Sebastes ruberrimus*	85	0.251	0.146	1
Canary	*Sebastes pinniger*	23	0.198	0.119	
Rougheye	*Sebastes aleutianus*	19	0.132	0.048	
Harlequin	*Sebastes variegatus*	11	0.136	0.050	
Yellowtail	*Sebastes flavidus*	11	0.197	0.100	
Redstripe	*Sebastes proriger*	10	0.250	0.127	
Tiger	*Sebastes nigrocinctus*	11	0.164	0.067	
Redbanded	*Sebastes babcocki*	8	0.231	0.139	
Sharpchin	*Sebastes zacentrus*	10	0.100	0.000	
China	*Sebastes nebulosus*	5	0.370	0.140	
Darkblotched	*Sebastes crameri*	10	0.142	0.079	
Black	*Sebastes melanops*	6	0.267	0.103	
Bocaccio	*Sebastes paucispinis*	2	0.150	0.071	
Widow	*Sebastes entomelas*	7	0.221	0.186	
Rosethorn	*Sebastes helvomaculatus*	5	0.260	0.152	
Silvergray	*Sebastes brevispinis*	3	0.233	0.115	
Ocean perch	*Sebastes alutus*	2	0.100	0.000	

[1] Age approximated for the most commonly encountered species only.

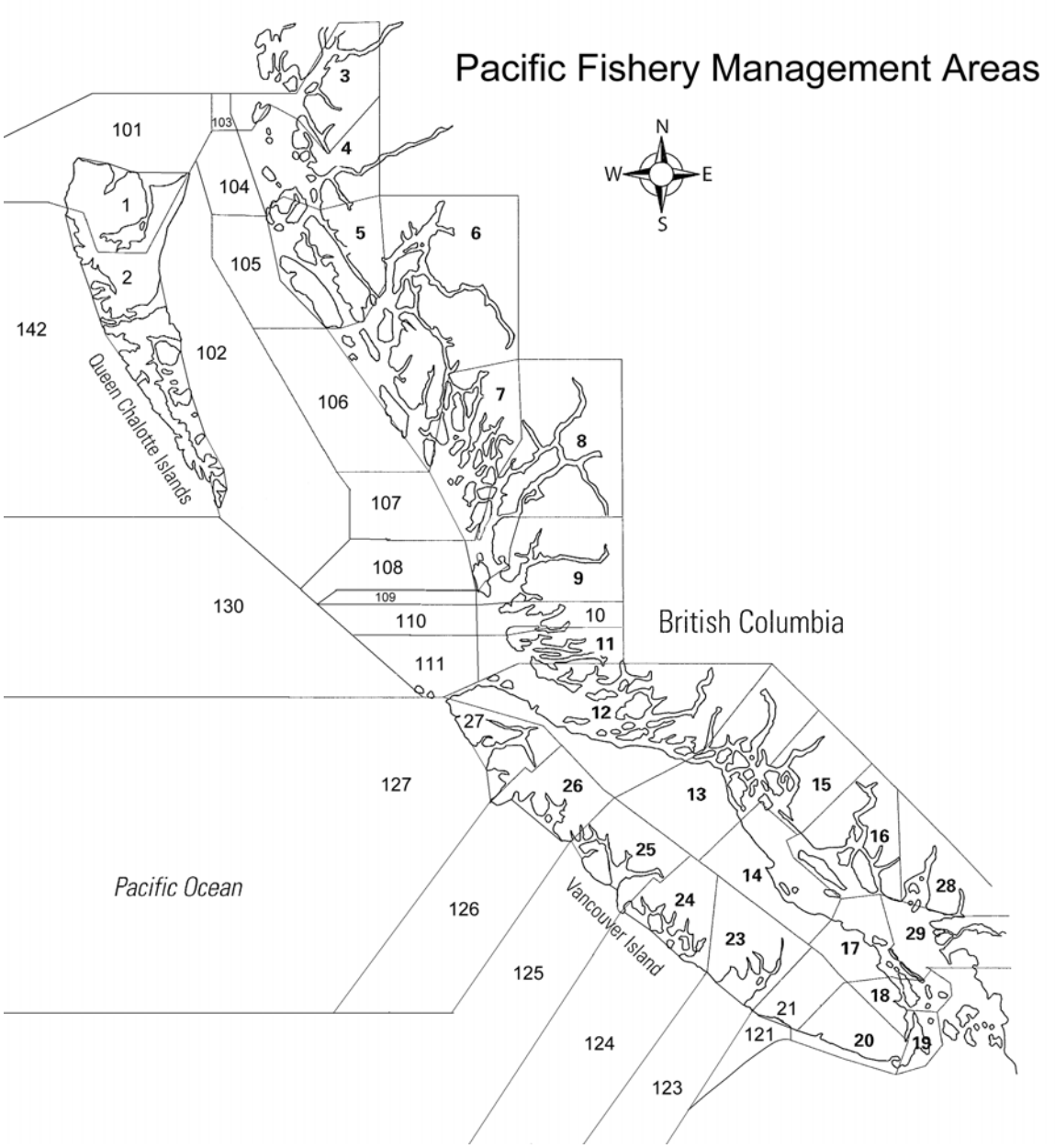

Figure 1. Map of the British Columbia coast and the Pacific Fishery Management Areas.

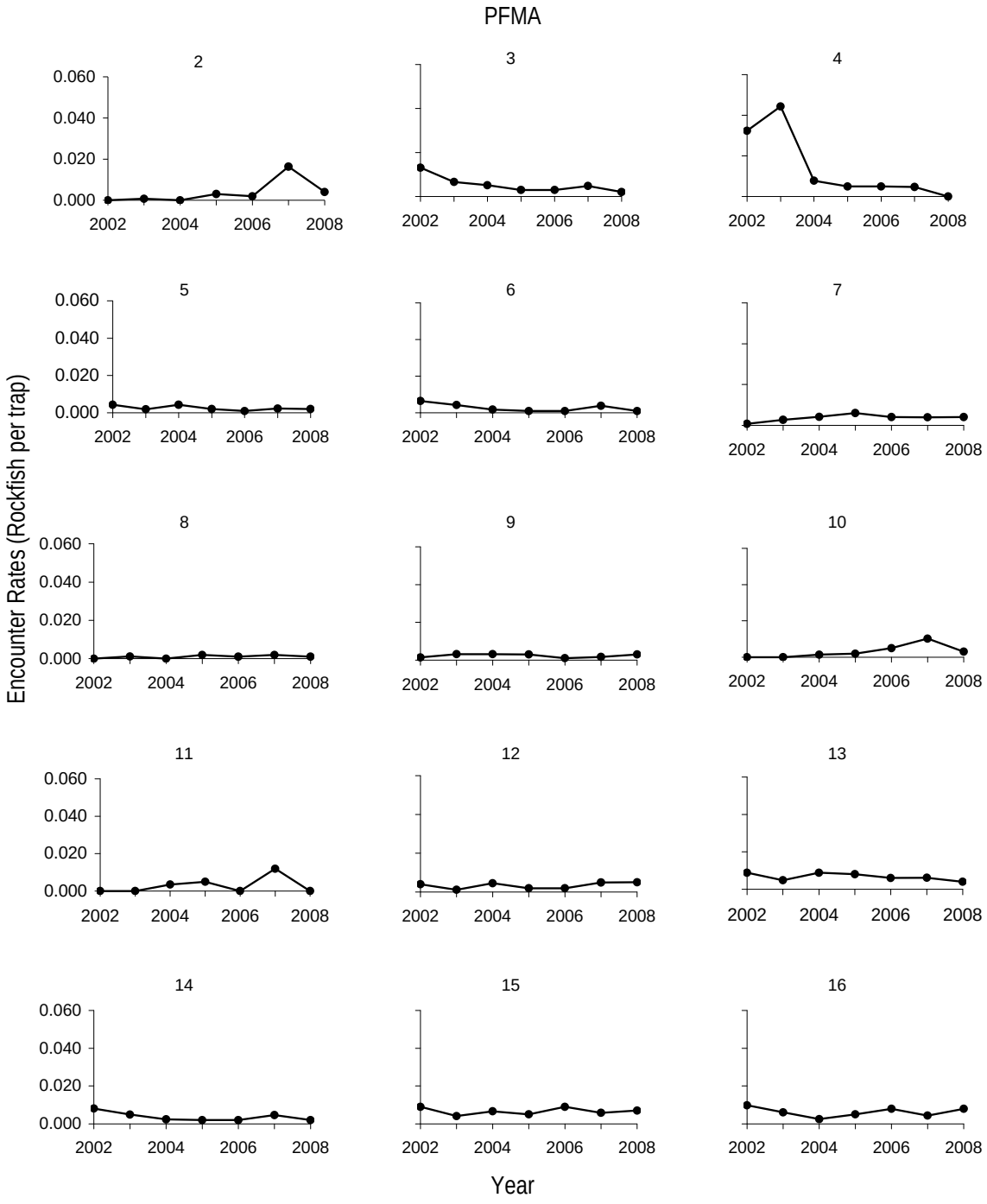

Figure 2. Trend in rockfish encounter rates (rockfish per trap) for each Pacific Fishery Management Area (PFMA) in the commercial prawn trap fishery for years 2002-2008.

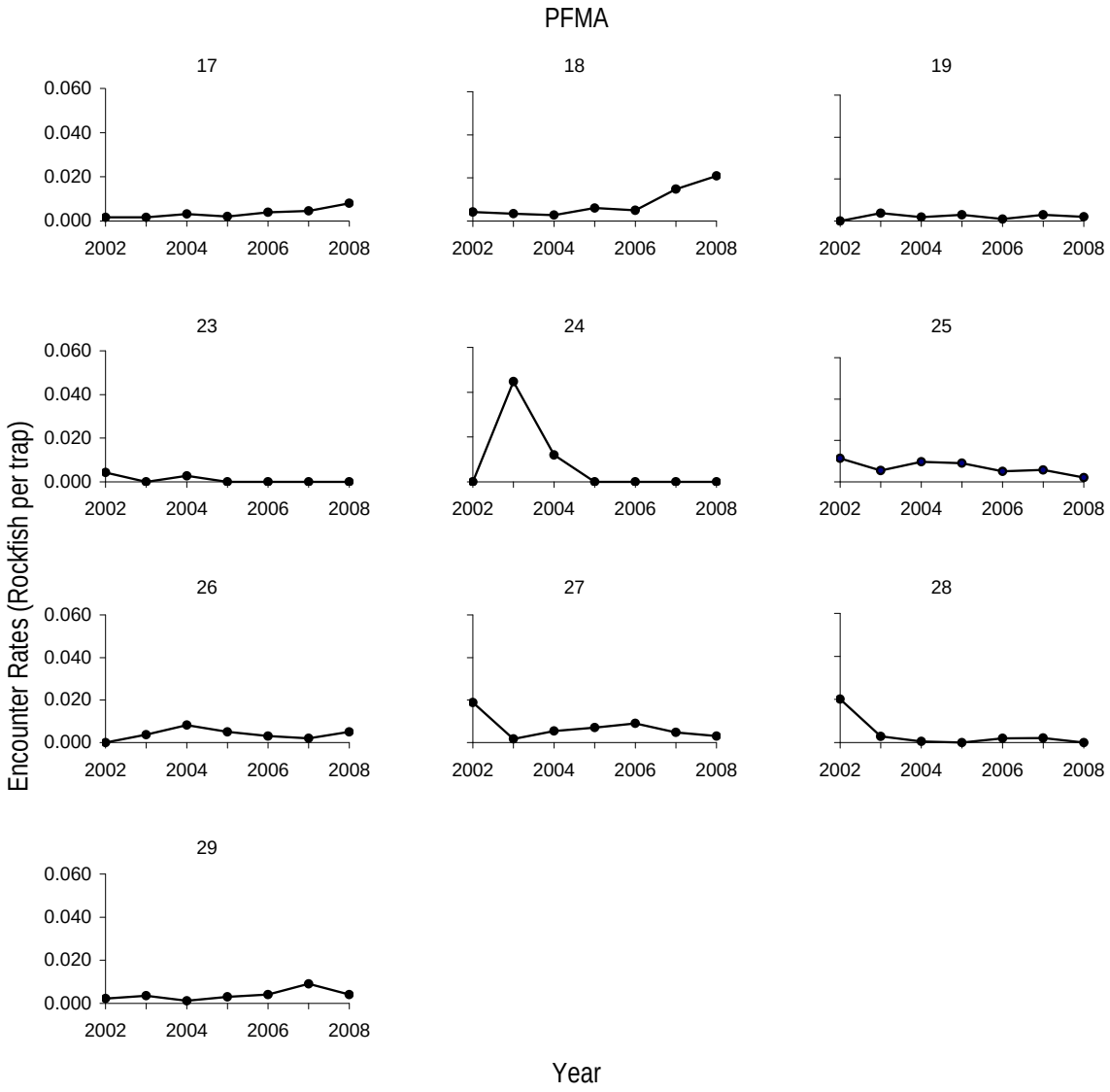

Figure 2. (cont'd) Trend in rockfish encounter rates (rockfish per trap) for each Pacific Fishery Management Area (PFMA) in the commercial prawn trap fishery for years 2002-2008.

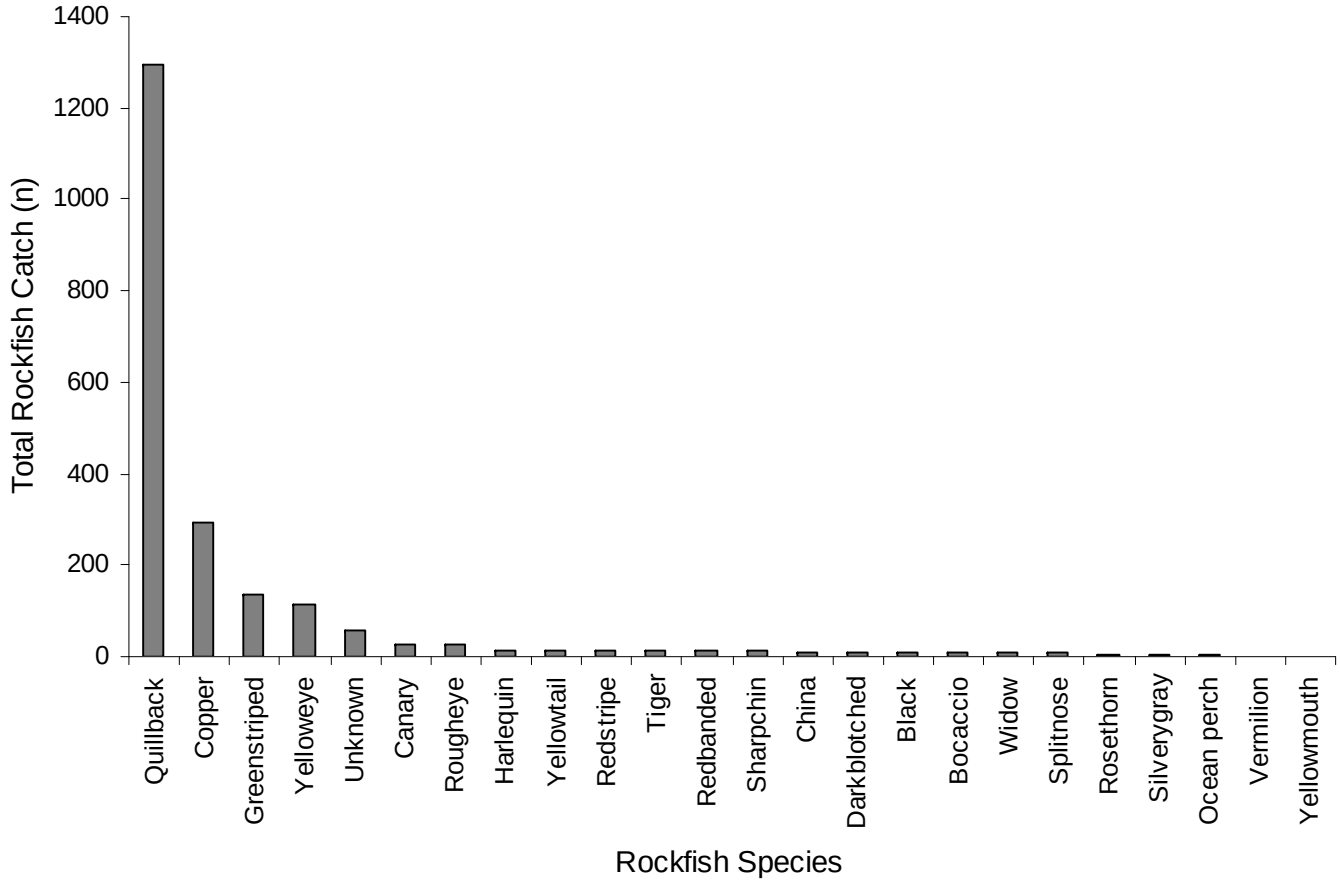

Figure 3. Total observed rockfish catch, by species, pooled across all PFMA's and years of the rockfish bycatch sampling program, 2002 to 2008.

Appendix 1. Total fishing effort (number of trap sets) and sample sizes.

	2002				2003				2004				2005				2006				2007				2008			
PFMA	# trap sets	# traps sampled	# strings sampled	# rockfish observed	# trap sets	# traps sampled	# strings sampled	# rockfish observed	# trap sets	# traps sampled	# strings sampled	# rockfish observed	# trap sets	# traps sampled	# strings sampled	# rockfish observed	# trap sets	# traps sampled	# strings sampled	# rockfish observed	# trap sets	# traps sampled	# strings sampled	# rockfish observed	# trap sets	# traps sampled	# strings sampled	# rockfish observed
2	53139	648	53	0	122427	1414	101	1	118157	4761	95	0	77788	5265	104	14	61305	4541	91	10	37351	4292	86	70	35770	3742	72	14
3	57692	533	39	7	20800	451	34	3	34989	1570	30	8	30500	1400	28	4	37932	1490	26	4	40150	1250	25	6	29680	1400	28	3
4	75263	371	22	12	16910	293	16	13	46495	1160	21	9	38370	1300	26	7	26692	1050	21	5	31550	1720	34	8	19369	128	2	0
5	53380	460	29	2	36760	544	39	1	34950	1380	22	6	44652	2860	55	6	71925	2821	54	4	41127	1800	36	4	45002	3174	56	6
6	121437	625	38	4	74241	2148	52	9	107510	2900	55	5	74595	2280	43	3	78925	3180	62	4	117151	3956	78	15	72594	3816	76	4
7	143775	1263	29	2	188792	1811	70	5	173914	3340	66	14	135443	3887	77	23	135437	4166	83	15	127759	6445	127	25	93536	4299	87	19
8	100626	960	49	0	95140	856	53	1	81589	1650	32	0	65182	3005	58	6	76570	2866	57	2	64749	2550	50	5	71621	3327	65	2
9	82935	686	36	1	24422	314	18	1	55687	1547	30	5	38558	2095	42	7	38323	1648	33	1	54690	2409	48	4	50028	3535	71	10
10	31429	201	10	0	18250	95	6	0	30595	700	14	1	53239	2105	41	5	48997	2583	52	12	35147	2440	48	25	26331	1200	24	3
11	31743	0	0	0	38639	173	10	0	34689	292	6	1	22381	600	12	3	26988	547	11	0	19135	504	10	6	10760	0	0	0
12	692026	2525	150	10	510952	3277	208	4	361718	6565	131	30	444222	8449	132	19	383556	7823	156	14	375479	9564	192	48	383108	8263	163	40
13	327706	1932	124	17	361720	2086	133	10	397976	6650	133	59	356741	6979	140	59	373148	5341	107	29	359030	7591	152	47	319535	7078	142	28
14	200248	1237	85	10	247515	1021	79	5	245681	3762	75	9	299894	3014	60	7	319742	3094	62	7	310853	2367	47	11	250500	2027	40	3
15	351541	955	73	9	318166	1201	92	5	515341	5551	112	37	521330	6667	133	32	561222	6600	132	57	485336	5250	105	31	477784	5253	106	35
16	306045	1125	84	11	294807	1303	107	8	372555	5971	120	15	344320	6490	130	34	388294	7869	158	64	445847	6379	128	28	430112	6797	137	56
17	384502	3652	83	6	321950	4944	141	8	305796	5952	119	19	187734	4834	96	8	272374	6875	139	27	346952	7209	145	33	290312	4838	99	40
18	126063	1411	28	6	82934	2314	52	8	86415	2187	44	6	84425	2036	41	12	117770	1885	37	9	91038	2026	41	30	122090	3075	60	64
19	172810	1848	37	0	177895	2418	60	9	129983	2583	51	5	113180	1810	36	5	123324	2798	56	3	127310	3044	61	8	153674	5772	116	9
23	97650	933	56	4	57872	683	41	0	61101	2985	60	8	44577	2347	47	1	46717	2248	45	0	53403	2992	61	0	57331	2700	53	0
24	24556	0	0	0	29600	268	16	12	30100	750	15	9	23300	0	0	0	2400	0	0	0	5750	0	0	0	11500	300	6	0
25	115739	1236	75	14	118170	1298	79	7	163039	5790	117	56	137764	4327	87	39	118642	4250	85	21	87295	4545	91	27	108985	3857	77	7
26	8850	0	0	0	33935	537	32	2	43557	1700	34	14	46800	1100	22	6	17597	600	12	2	27570	500	10	1	22850	650	13	3
27	24000	266	16	5	42400	564	34	1	107091	2602	49	14	133141	4003	79	30	72082	3002	60	28	63225	2700	54	13	57861	2746	55	7
28	66238	890	61	18	72967	1361	95	4	59078	2086	42	1	70793	3086	62	0	74755	2794	56	5	85060	2397	48	5	103719	2541	52	1
29	66430	893	29	2	119680	1684	56	6	56330	1749	35	2	151386	3074	62	8	157245	2098	42	9	167279	1898	38	15	134804	1646	33	7