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# Shelf Rockfish Assessment for 1998 and Recommended Yield Options for 1999

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## ABSTRACT

Interim assessments are provided for silvergray, widow, yellowtail and canary rockfish. Recommendations for all stocks are unchanged from the previous year. The ranges for silvergray rockfish in PMFC Areas 3C+3D (Vancouver Island), 5A+5B (Queen Charlotte Sound), 5C+5D (Hecate Strait) and 5E (West Coast Vancouver Island) are 150-425 t, 350-700 t, 125-400 t, and 175-300 t, respectively. Trawl landings in 1997 for the four stocks were 236, 468, 236, and 208 t respectively. Recommended yield ranges for the canary rockfish stocks of Area 3C+3D and Area 5A+5B are unchanged at 350-525 t, and 200-400 t, respectively. Landings for the two stocks were 387 and 202 t. The recommended coastwide yield range for widow rockfish remains unchanged at 1,100-3,000 t. Landings were 1,137 t in 1997. The yield recommendation for the coastal yellowtail rockfish fishery (Areas 3D-5E) remains 2,000-4,025 t. Landings were 3,199 t in 1997. The yield recommendation for the yellowtail rockfish stock of PMFC Area 3C fishery (south Vancouver Island) is combined with the northern Washington fishery (Areas 3C-US and 3B). The recommendation remains 1,100-2,400 t. Combined landings were 1,517 in 1997.

Stock assessment research in 1998 focussed on acoustic biomass estimation of a mid-winter aggregation of widow rockfish. The mid-winter aggregation near Triangle Island is well known to fishers. They suggested that the aggregation might, if estimated, be large enough to alter Department perceptions of harvest limits. A joint Fisheries and Oceans and Industry survey aboard the C.G.R.S. *W. E. Ricker* and Fishing Vessel *Frosti* was conducted in January-February of 1998. The aggregation was surveyed 20 times with a maximum estimate of approximately 2,000 t of widow rockfish. This biomass observation was not sufficient to alter current yield recommendations.

## RÉSUMÉ

Des évaluations provisoires sont fournies sur le sébaste argenté, le sébaste rocote, le sébaste à queue jaune et le sébaste canari. Les recommandations pour tous les stocks demeurent inchangées par rapport à celles de l'année antérieure. Pour le sébaste argenté dans les zones PMFC 3C+3D (île de Vancouver), 5A+5B (détroit de la Reine-Charlotte), 5C+5D (détroit d'Hecate) et 5E (côte ouest de l'île de Vancouver), elles sont respectivement de 150-425 t, 350-700 t, 125-400 t et 175-300 t. En 1997, les débarquements par chalut pour les quatre stocks étaient respectivement de 236, 468, 236 et 208 t. Les captures recommandées pour les stocks du sébaste canari dans les zones 3C+3D et 5A+5B restent les mêmes, soit de 350 à 525 t et de 200 à 400 t, respectivement. Les débarquements de ces deux stocks ont été de 387 t et 202 t. Le rendement recommandé pour le sébaste rocote pour toute la côte, demeure inchangé entre 1100 et 3 000 t. On en a débarqué 1137 t en 1997. La récolte recommandée pour la pêche côtière du sébaste à queue jaune (zones 3D-5E) demeure inchangée entre 2 000 et 4 025 t. Les débarquements en 1997 ont été de 3 199 t. Dans la zone 3C du PMFC (sud de l'île de Vancouver), la recommandation de récolte du sébaste à queue jaune est intégrée à celle de la zone de pêche au nord de l'État de Washington (3C-US et 3B), et reste entre 1 100 t et 2 400 t. Les débarquements combinés pour 1997 ont été de 1 517 t.

En 1998, la recherche en évaluation des stocks a porté sur l'estimation acoustique de la biomasse de la concentration mi-hivernale du sébaste rocote. En bordure de l'île Triangle, la concentration mi-hivernale est bien connue des pêcheurs. Ceux-ci croyaient d'ailleurs qu'une fois évaluée, cette concentration se révélerait assez importante pour amener le Ministère à revoir sa perception des limites de captures. Tout au long de janvier et de février 1998, Pêches et Océans et l'industrie ont mené un relevé conjoint à bord du C.G.R.S. *W.E. Ricker* et du bateau de pêche *Frosti*. À partir des 20 relevés effectués sur la concentration, on n'a pu estimer la biomasse du sébaste à plus de 2000 t. Ce qui était insuffisant pour modifier des limites actuelles recommandées.

# 1 INTRODUCTION

We report interim assessments for the silvergray, canary, widow and yellowtail rockfish landings. Harvest recommendations are unchanged from the previous year (Table 9.1). We have summarised our recent work on acoustic biomass estimation of widow rockfish. The work failed to show that current recommendations are inappropriate.

We had hoped to conduct preliminary catch-at-age analysis for silvergray rockfish but a review of age composition information indicated that, in the absence of any meaningful tuning index, the analysis would be pointless. However, we have updated the summaries of age composition. We continue to treat silvergray rockfish as four separate stocks, with the south and central stocks being west coast Vancouver Island (PMFC Areas 3C+3D) and Queen Charlotte Sound (Areas 5A+5B, excluding Moresby Gully) respectively. Moresby Gully plus Hecate Strait (Areas 5C+5D) is treated as a third stock. The fishery off the west coast of the Queen Charlotte Islands (Area 5E) is treated as a fourth stock.

Widow rockfish is treated as one coastwide stock. Canary rockfish are treated as two stocks, the west coast of Vancouver Island (Areas 3C+3D) and Queen Charlotte Sound (Areas 5A+5B, excluding Moresby Gully). Yellowtail rockfish are treated as two stocks. The "coastal" stock extends from central Vancouver Island to the Alaska border (3D-5E). The "boundary" stock combines southern Vancouver Island (Area 1 and 3C-Canada) with northern Washington (Areas 3B and 3C-US).

Total Canadian landings for all four species was 7,800 t in 1997, 18% less than 1996, and lower than the average of the last 10 years (Figure 9.1). Total hook-and-line landings for these species was 100 t, down from 165 t in 1996 (Table 9.2). At the time of report preparation, it was not practical to obtain hook-and-line landings by major area. There is also a small proportion of 1997 trawl landings that we cannot currently allocate to area. These are landings that have been validated during unloading but were not observed at sea. Most of these are associated with the domestic hake fishery operating in Area 3C. The amounts of these landings were insignificant for canary and silvergray rockfish. The small amounts of yellowtail and widow rockfish represented by these landings are included in tables of total trawl landings for these two species in Area 3C (Table 9.1, 9.3, 9.6, 9.10 and 9.11).

As discussed in the previous assessment (Stanley and Haist 1997), while we attached significance to trends in CPUE in previous assessments, we remained sceptical over their value owing to the schooling nature of these species and questionable correlation between abundance and CPUE. Our scepticism over the value of these indices has increased in recent years as a highly dynamic management regime has eroded the comparability among years. The most recent impacts have been the introduction of IVQ's and 100% observer coverage. We now attach little or no credibility to the trends in catch rate for any of the shelf rockfish species. We see little point in continuing to struggle with these CPUE data, other than updating the nominal trend. We provide yearly estimates of non-qualified and 25% qualified CPUE, ($\Sigma C/\Sigma E$ and median) based on those tows which contain the species. The references to "rolled-up" CPUE refers to the practice prior to 1991 of recording fishing logs in groups of tows (rolled-up), as opposed to one tow per record (tow-by-tow) in the database. For comparability, we provided a pseudo rolled-up

version for 1991 and years following. We can not provide this estimate for 1996 and 1997 owing to changes in the data system. If the management and economic environment become less volatile, it is possible that catch rates may become more informative starting with the first year of IVQ's. However, we suspect that there will always be new events in the fishery that will act to corrupt catch rate comparability over time.

# 2 Coastwide

## 2.1 Widow rockfish

### 2.1.1 Landings and biological data

Widow rockfish landings were 1,137 t in 1997 (Table 9.3, Figure 9.2). This was down from 1996 landings of 1,702 and the 10-y mean of 2,462 t. The combination of sporadic availability on the grounds and difficult marketing owing to poor keeping qualities implies that landings cannot be assumed to index abundance. Landings from the northwest coast of Vancouver Island and Queen Charlotte Sound (Areas 3D and 5A) continue to dominate. We continue to collect and age specimens but have not conducted any further analysis since age frequency summaries provided in Stanley (1997).

### 2.1.2 Widow rockfish acoustic survey 1998

#### *2.1.2.1 Background*

Industry representatives had commented on a large mid-winter aggregation of widow rockfish that consistently occupied a specific fishing ground, west of Triangle Island in mid-winter. They suggested that, if it could be estimated, it might be large enough by itself to alter F&O perceptions of stock biomass. To address their comment, we conducted an acoustic survey of this aggregation in January - February 1998.

Our options for stock assessment for widow rockfish are limited. The fishery is conducted with mid-water gear thus there is little potential in using fishery dependent CPUE. The fishery is also relatively new (<10 years) so it will be a few more years before catch-at-age information will be meaningful, and even then, there will be no accompanying tuning index. Finally, as pointed out by fishers, the fishery is highly unpredictable in time and space thereby reducing comparability of samples over time.

While a poor candidate for stock dynamics modelling, widow rockfish appear to be a reasonable candidate for acoustic estimation. They adopt a more pelagic behaviour than most other rockfish and spend more of their time far enough off bottom where they should be "visible" to acoustic techniques. The methods, analysis and results of the survey are provided in detail in Stanley *et al.* (in prep). We provide a brief summary below and discuss the implications of the results on our harvest recommendations.

#### *2.1.2.2 Survey Objectives*

The principal objective of the study was to obtain a credible estimate of the biomass of the Triangle Island aggregation. Additional objectives included:

- characterising widow rockfish size composition through sampling the fish catches;
- obtaining target strength estimates for widow rockfish;
- documenting widow rockfish diel behaviour;
- examining the impact of diel behaviour on biomass estimation;
- characterising the physical oceanography of the site;

- testing the acoustic methodology over a larger area.

The study principals also hoped that the program would also serve as a model for developing closer research collaboration between Industry and F&O staff.

### *2.1.2.3 Survey Methods*

The study was conducted aboard the F&O research vessel, the C.G.R.S. *W. E. Ricker* and a commercial trawler, the FV *Frosti,* from late January to early February 1998. Pre-survey reconnaissance and continued acoustic observation by the charter boat indicated that the aggregation was confined to a 6 n. $mi^2$ area at the edge of the continental shelf.

After discussions regarding orientation and placement of transects, the *W. E. Ricker* conducted 20 repeat mini-surveys of a set of 11 parallel transects (300 m spacing) over 50 hours. The charter vessel conducted fishing to confirm species composition and patrolled the perimeter with echosounding to verify that the aggregation was contained within the survey zone during estimation.

Following the first five surveys, industry cooperants questioned whether transect placement was acting to reduce biomass estimates. To accommodate their concern, the set of 11 transects was repeated five times while offsetting the entire set of transects an additional 50 m to the northeast, with each new pass.

To further explore the possibility that transect choice was acting to minimise the biomass estimates, the fisher cooperant aboard the *W. E. Ricker* was given permission to steer the vessel as it returned to the SE start point. During the return leg, the cooperant attempted to maximise the density of fish ensonifed by following the main axis of the aggregation. This track was converted to a biomass estimate by extrapolating to a 300m track width. Following the 20 mini-surveys at Triangle Island, we attempted, without success, to find and conduct biomass estimation of other aggregations.

The conversion of acoustic backscatter to biomass is described in detail in Stanley *et al* (in prep). Typical of acoustic surveys, acoustic backscatter was averaged over 0.1 nm and converted to biomass density per $m^2$ resulting in an "elementary sampling density unit" (ESDU) of 0.1 nm. Each survey resulted in approximately 135 individual estimates of surface density, which were then converted to biomass by using proximal analysis. Transects were evenly spaced and virtually the same length, so the proximal analysis produced estimates indistinguishable from those based on the mean density estimate. We used a target strength (TSw) of –35.24 based on a mean length of 42 cm from set #1 and a literature review of previously published rockfish TSw estimates with length (Robert Kieser, unpublished data).

Variance of each mini-survey estimate was derived in one of three ways. The first treatment simply used the sample variance among the ESDU's corrected for the finite correction factor. The second and third treatments used spatial analysis with EVA2 (Petitgas and La Font 1997). The second method used individualised variograms (omni-directional and bi-directional) for each mini-survey. The third method used a global omnidirectional variogram for all surveys weighted by number of observations. Among survey variance was also estimated empirically from the 20

mini-surveys. Species composition was estimated from five mid-water tows conducted during the surveys.

#### *2.1.2.4 Survey Results*

The 20 micro-surveys provided biomass estimates ranging from 894-2,366 t (Table 9.4). Averaged species composition from five tows indicated the fish were 88% widow rockfish (787-2,082 t). Precision of the density estimates was proportional to biomass. The coefficient of variation (CV) of the mean density estimates, which can be assumed to represent precision of the biomass estimates, ranged from 9-30% based on either simple sample variance of mean density or spatial analysis and a global variogram. Individualised spatial analysis of each micro-survey revealed a CV range of 5-25%. The overall CV among the 20 biomass estimates was 31%. The offset set of transects (micro-surveys) provided total biomass estimates of 1,094-2,312 t. Fisher transects provided estimates of 174-1,540 t.

#### *2.1.2.5 Discussion*

Assuming 88% of the aggregation was widow rockfish and using the maximum biomass estimate of 2,366 t results in a maximum biomass estimate of 2,082 t for the widow rockfish aggregation with a mean of 1,399 t. The echograms indicated that the biomass was often close to bottom. Since there is a zone within 3-4 m of the bottom in which targets are acoustically invisible when the bottom is rough and sloping, we tend to view the biomass estimates as conservative. We view the lower estimates as resulting from a significant proportion of fish being too close to bottom. For purposes of stock assessment discussion, we suggest that the actual biomass of widow rockfish during the survey was probably between the mean and the maximum observed biomass (1,400 – 2,100 t). We assume that at some times of the diel period, most, if not all, the fish were off-bottom and visible acoustically, thus the actual biomass would not have exceeded the maximum observed estimate.

Sources of error or bias, which could act to minimize the biomass estimates, include simple sampling variation, or incorrect target strength. We suggest that the significant sampling error is unlikely. The likelihood that the transects were placed to consistently underestimate biomass, is low. Not only was the observed precision low among and within the mini-surveys, but neither the offset sets of transects nor the fisher transects provided any basis for thinking that transect placement seriously minimized biomass estimates.

The target strength used is consistent with published literature. However, in our preliminary analysis, we used mean length observed in the first tow, 42 cm, and the resulting TSw of –35.24 dB. We are in process of re-analysing biomass using a mean overall length of 44.8 cm from all five tows. This implies a TSw of –35.57. Use of this TSw will result in a maximum biomass estimate about 10% larger, or 2300 t.

It is possible that fish behaviour tended to minimize backscatter density through presenting a sub-maximal aspect to the acoustic beam (severe body tilt). Perhaps, those times of day when most of the fish are acoustically visible may coincide with the time of day when they are minimising their individual backscatter. We have no way of assessing this without either underwater observation or deep-deployment of the acoustic transducer.

The implications of these results on our yield recommendation depend on the assumptions of what percentage of the coastwide stock was represented by the 2,300 t observed at Triangle Island. We have no way of determining this, and our attempts to expand the survey south along the west coast of Vancouver Island did not succeed. However, we note that before and during the survey, fishers and observers had been requested by telex to inform investigators of any observations of widow rockfish along the entire B. C. coast. Only 4 comments were received from fishers. Two reported the actual survey site. The other two indicated the site examined later during the trip, which did not indicate large aggregations although one vessel was successful in conducting a commercial trip at that location. Consequently, during the survey there were no simultaneous reports of widow rockfish aggregations elsewhere on the coast. Furthermore, the revelation of the large aggregation by the study attracted considerable attention from the fleet, almost interfering with the survey. Many fishers were anxious to harvest the Triangle Island aggregation indicating that the lack of a fishery at this time was not due to market conditions.

The primary experimental hypothesis of the survey was to prove that current quota recommendations are too conservative and that the survey would indicate that the Triangle aggregation would be large enough by itself to change current F&O perception of stock abundance. The survey failed to support this hypothesis.

We can calculate the exploitable biomass required to sustain annual harvests of 1,100 – 3,000 t given an estimate of natural mortality (M) and a specific harvest strategy. Hoenig's longevity regression (Hoenig 1983) and maximum age of 58 observed in our samples provides an estimate of 0.07 for M. Simple catch curve analysis of aged samples from B. C. waters for both sexes combined and ages 20-50 indicates an estimate of 0.125. Ralston and Pearson (1997) used an M of 0.15 for the U.S. stock assessments. The implications of a simple F=M strategy are summarised in Table 9.5

It should be noted that an F=M strategy is not considered a conservative strategy for long-lived, slow growing species (Mace 1994). Ralston and Pearson calculated the spawning population per recruit relationship based on growth rates and maturation schedules observed in U.S. stocks for widow rockfish. An $F_{40\%}$ reference point corresponds to an F=0.15, and, therefore, an F=M strategy based on the U. S. estimate of M. From table 9.5, an annual removal of 1,100 - 3,000 requires an exploitable biomass of 7,000- 43,000 t. The maximum observation of 2,300 t in the Triangle Island aggregation without concurrent observations of other large aggregations does not convince us to reject the current harvest recommendation of 1,100- 3,000 t. The Triangle Island site is the approximate centre of the traditional exploitation area of northern Vancouver Island to central Queen Charlotte Sound. It is plausible that a major portion of the exploitable stock would be aggregated near Triangle Island during the mating season and just prior to parturition. Thus, even the low-end exploitable biomass requirement of 7,000, while obviously conservative, still remains plausible as a coastwide stock estimate.

We plan to conduct the survey once more in 1999 to provide a second opportunity to identify a large biomass, but see no point in a larger-scale study. Advisors state that widow rockfish are too unpredictable in time of space, and the most likely outcome of such a survey would be a waste of resources.

The original basis for the 1,100 – 3,000 t recommendation was derived from the exploitation history of the U. S. fishery for widow rockfish. We noted in an earlier document (Stanley 1993) that the U.S. fishery had followed a classic boom-and-bust cycle (Gunderson 1984). Landings of 28,000 t in 1981 were not sustainable and led to implementation of a 10,000 t quota in 1983. A subsequent assessment in 1993 lowered the quota to 7,000 t. In the absence of any Canadian stock assessment information, we suggested that the ratio (25%) of the sustainable estimate versus peak unrestricted landings (7,000/28,000) be applied to the Canadian fishery. As unrestricted fishing from 1990–1992 had provided nominal landings of about 4,000 t/year, an initial harvest quota might be 1,000 t or 25%. We therefore recommended a range which bracketed 1,000 t, 500 – 2,000 t (Stanley 1993). Fishers commented that the distance of the fishing grounds from market and delivery points in B. C. made this logic too conservative. They argued that the markets caused a restriction in landings. In view of their argument, the recommendation was raised the following year to 1,100 – 3,000 t, where it has remained since. We now note that current U. S. stock assessment continues to indicate a steady decline in biomass since the onset of the fishery. The exploitable biomass is now estimated to be 25% of the original biomass (Ralston and Pearson 1997). The assessment points to sustained poor recruitment. The authors state that a harvest of only 5,870 t for 1998 is consistent with a $F_{40\%}$, but authors caution against a fixed F option given the steady decline of biomass and poor recruitment.

### 2.1.3 Yield recommendation

We suggest that the results of the recent biomass estimates from the Triangle Island survey and the exploitation history in the U. S. do not provide any basis for increasing the recommendation. We continue to recommend a range of 1,100-3,000 t.

## 2.2 Yellowtail rockfish ("Coastal" stock)

### 2.2.1 Landings and biological data

The coastal stock refers to PMFC Areas 3D-5E, from the northwest coast of Vancouver Island to the B. C.-Alaska border. Trawl landings for this stock were 3,199 t in 1997. These were higher than the 31-year average of 2,834 t but lower than the mean of 3,965 t over the last 10 years (Table 9.6 and 9.7, Figures 9.3 and 9.4). We indicate qualified (25%) bottom trawl CPUE ($\Sigma C/\Sigma E$ and median) for all tows with yellowtail rockfish present for both Area 5A+5B and Area 3D (Table 9.7). The values increased from the previous year but we do not know whether this reflects greater availability or variation in fishing patterns or both. We continue to collect and age biological data but this material has not been updated for the current assessment.

### 2.2.2 Yield recommendation

We continue with the same recommendations as the previous year. Depending on the management boundaries, for Areas 5A and 5B only, for 5A to 5E, and for 3D to 5E, we recommend 950-1,900 t, 1,150–2,300 t and 2,000–4,025 t respectively.

# 3 WEST COAST VANCOUVER ISLAND (AREAS 3C+3D)

## 3.1 Silvergray rockfish

### 3.1.1 Landings, biological data and yield recommendations

Total trawl landings of silvergray rockfish were 236 t in 1997 (Table 9.8, Figures 9.5 and 9.6). Landings continue to be down from the 10-y average of 548 t and 31-year average of 534 t. They have been within the recommended range for the last two years after exceeding it for the previous three years. Tow-by-tow and median cpue is without trend in recent years. Silvergray rockfish age composition information has been updated (Table 9.9 and Figure 9.7). The limited age data continues to reflect a more truncated distribution in comparison with 1978 and 1982 samples although the juvenation does not seem to have progressed since the extensive set of samples collected in 1985-1986. We continue to recommend a yield range of 150-425 t.

## 3.2 Yellowtail rockfish ("Boundary" stock, Areas 1, 3B+3C)

### 3.2.1 Landings

This stock is harvested jointly with the U.S. Portions of both nations' harvests are generated as bycatch in the joint-venture and domestic hake fisheries (Table 9.6, 9.10 and 9.11, Figures 9.8 and 9.9). Total harvest in 1997 was 1,517 t, the lowest since 1985 and less than the average combined harvest since 1967 of 2,070 t. Both nations' catches were reduced about the same proportion, as the Canadian percentage remained at about 50%. The decline in catches was consistent across both targeted domestic fisheries and hake bycatch. Canadian harvest has averaged 502 t since 1967, but averaged 1,060 t, over the last 10 years, with half of that as bycatch from the offshore hake fishery. The Canadian TAC in 1997/98 was 1,005 t. The U.S. operates under a coastwide quota. Canadian domestic trawl landings were 506 t in 1997, about equal to the average of the last 10 years. The joint-venture hake fishery in Canadian waters yielded only 206 t of yellowtail rockfish bycatch in 1997. Most of the landings by Canadian domestic trawl results from midwater fishing thus CPUE is meaningless as an index of abundance.

### 3.2.2 Yield recommendations

In previous assessments, we have relied on U. S. assessments for developing yield recommendations (Tagart 1991, 1993; Tagart and Wallace 1996: Tagart *et al* 1997). All available Canadian landings and biological data are included in these assessments and we have participated in the analyses. The U. S. and Canadian assessment staff have then independently used the output from these analyses to frame harvest advice to their respective managers. While both nations continue to collect and age biological samples, no update of this material was conducted in the current year. We continue to recommend a yield range of 1,000 – 2,000 t.

## 3.3 Canary rockfish (Area 3C+3D)

### 3.3.1 Landings and yield recommendations

Trawl landings of canary rockfish from PMFC Areas 3C+3D were 387 t in 1997 (Table 9.12 and Figures 9.10 and 9.11) lower than the 31-y average (1967-1997) of 697 t. Landings exceeded the high-risk yield recommendation 1989-1995 but have been about equal to the minimum recommendation 1996 and 1997. After increasing for four years, tow-by-tow CPUE has declined slightly in 1997. We continue to collect ageing samples but have not updated the information for this interim assessment. We continue to recommend a harvest range of 350-525 t.

# 4 QUEEN CHARLOTTE SOUND (AREA 5A+5B)

## *4.1 Silvergray rockfish*

### 4.1.1 Landings

The trawl landings of 468 t of silvergray rockfish in 1997 were below the long-term mean of 706 t (Table 9.13 and Figures 9.12 and 9.13). The CPUE's show no consistent trend. The 468 t harvest is midway between the harvest recommendations but less than the TAC.

Age composition information is updated to include three samples from both 1996 and 1997 (Table 9.9 and Figure 9.14). The age composition, which, in the early 1990s appeared to be being progressively truncated, indicated a larger component of older fish in 1994 and 1995. The two most recent years appeared similar to 1986-1988 samples. Observations since 1986 indicate fewer old fish than the original 1977-1982 samples but the samples over the last 10 years indicate a stable age composition. These observations provide no evidence that harvests of the last decade (mean=700 t) have further truncated the age composition.

### 4.1.2 Yield recommendations

We continue to recommend that a harvest as high as 700 t may be sustainable. However, an equally plausible explanation is that age composition appears stable in spite of excessive fishing mortality because of poor recruitment over the last 5-10 years. If abundance is decreasing significantly, we should begin to see some symptoms of reduced abundance either through anecdotal comments from industry or reductions in catch rates. If, with two more years of ageing data, we continue to observe a stable age composition with no anecdotal evidence of lower abundance, we will consider raising the conservative yield range of 350 t. For this interim document, we continue to recommend a yield range of 350-700 t.

## 4.2 Canary rockfish

### 4.2.1 Landings and biological data

Total trawl landings equalled 202 t in 1997 (Tables 9.14 and Figures 9.15 and 9.16), less than the long-term or 10-y average of about 350 t. Landings equalled the minimum recommended yield. CPUE indices show no consistent trend. The nominal median CPUE of 1996-1997 is lower than 1991-1995 but this is probably related to change to catch databases through use of observer data and IVQ's. Biological material was not updated for this assessment.

### 4.2.2 Yield recommendations

The previous recommendations of 200-400 t corresponded to 50% and 100% of the historical yield. We see no reason to change from the previous rationale but note that the low landings of the last four years have led to a modest decrease in the mean historical yield. Thus the same proportions of 50% and 100 % now lead to a harvest range of 175-350 (rounded to nearest 50 t). We see no reason to change from the previous recommendation of 200-400 t.

# 5 HECATE STRAIT (AREA 5C+5D)

## *5.1 Silvergray rockfish*

### 5.1.1 Landings and biological data

Total trawl landings equalled 236 t in 1997, down from 315 t in 1996 (Tables 9.15, Figures 9.17 and 9.18). This was less than the mean trawl landings of 553 t over the last 10 years. Nominal CPUE (qualified and non-qualified) appears to have stabilised since the significant decline following 1986. Tow-by-tow CPUE has increased over the last two years.

While 1990s samples indicate fewer old fish than 1977-80 samples, there is little evidence to argue for truncation of the age distribution since the 1983-86 samples. During this period, the fishery has averaged harvests of 600 t. However, a comparison of the 1996-1997 samples with the two years previous, indicates little new recruitment given the absence of specimens less than 15 years of age. It appears that the two recruitment pulses first apparent in the 1992-93 samples are still maintaining the fishery.

### 5.1.2 Yield recommendations

The process of truncation appears to be more gradual that at first observed during the early part of the fishery. While the response in age composition might suggest raising the upper limit to 600 t, we are concerned about the absence of newly recruiting fish. For this interim assessment, we continue to recommend 125-400 t.

### 5.2 Canary rockfish

The canary rockfish fishery in Hecate Strait continues to be minor with total trawl landings of 57 t.

# 6 AREA 5E (WEST COAST OF THE QUEEN CHARLOTTE ISLANDS)

### 6.1 Widow, yellowtail and canary rockfish

The widow, yellowtail, and canary rockfish fisheries off the west coast of the Queen Charlotte Islands continue to be minor. Yield recommendations are not presented for these species. In the previous assessment we noted industry concerns over possible yields that could be removed from this area without affecting populations on the traditional grounds. While we have no objective basis for identifying stock boundaries, we suggest that there is a reasonable likelihood that canary rockfish, off the west coast of the Queen Charlotte Islands, could be separate from the traditional stocks. Canary rockfish age composition in samples taken from a recent survey have a significantly higher frequency of older fish, wish individuals as old as 58 years.

### 6.2 Silvergray rockfish

#### 6.2.1 Landings, biological data and yield recommendations

Combined landings for all minor areas of Area 5E were 208t from the trawl fishery (Table 9.16 and Figures 9.20 and 9.21). In the previous assessment, we recommended a yield range quota of 175-300 t for the combined region. This recommendation was implemented for the 1997-1998 and 1998-1999 fishing year as a quota of 273 t. We have summarised available ageing material (Figure 9.22). We continue to recommend a yield range of 175-300 t which represents 75 and 125% of the mean yield of 218 t over the last 20 years, but note the relatively young age composition in the samples.

# 7 LITERATURE CITED


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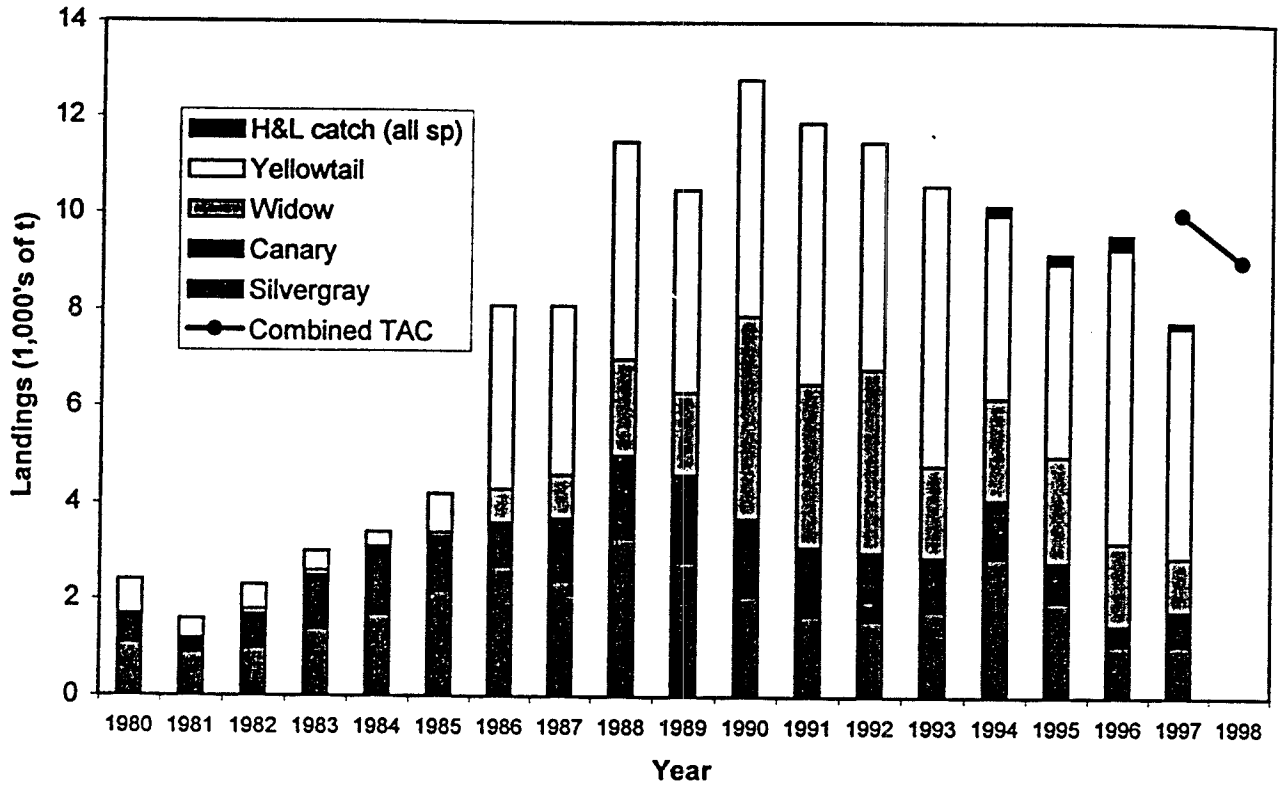
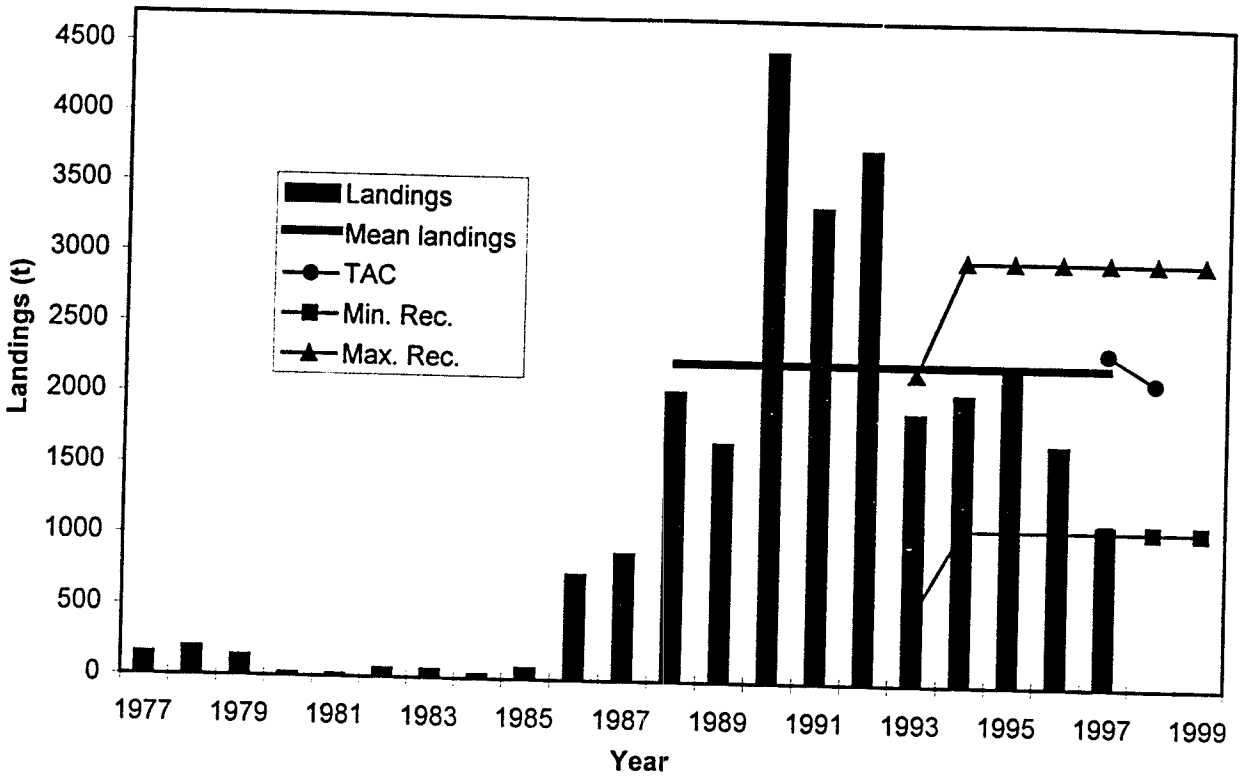



Figure 9.1 TAC and total shelf rockfish landings in B.C waters by species for trawl landings and grouped for hook-and-line (1980-1997)

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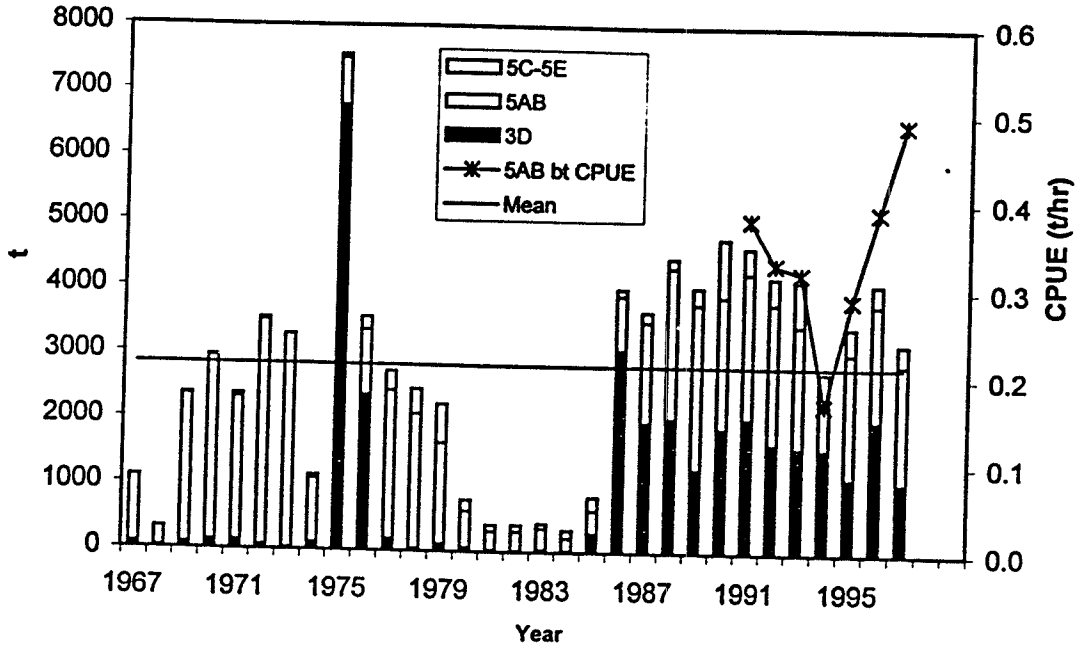



Figure 9.3 Coastal yellowtail rockfish landings history and 5AB bottom trawl qualified CPUE

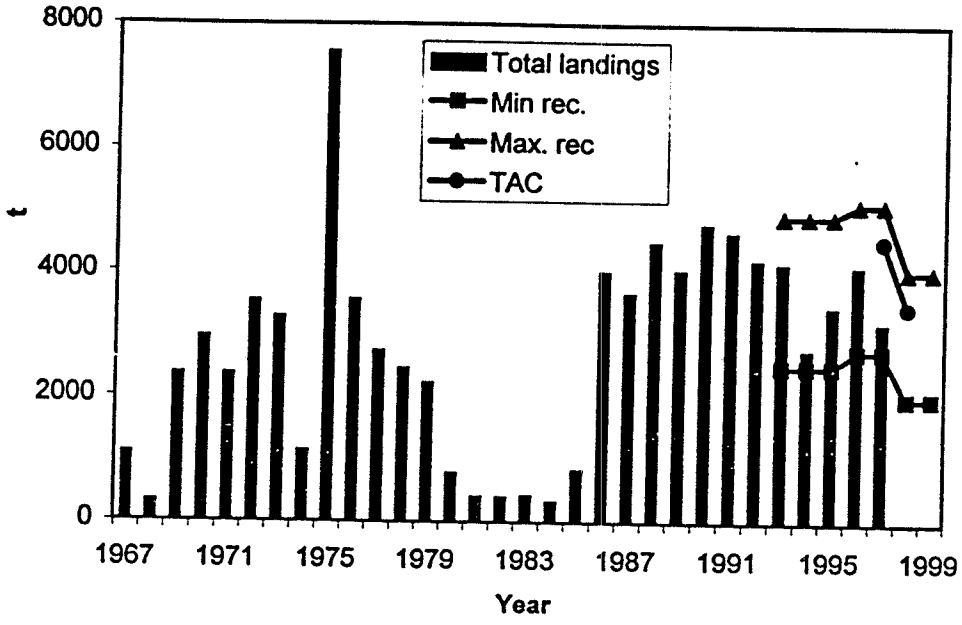



Figure 9.4 Coastal yellowtail rockfish landings history, yield recommendations and TAC

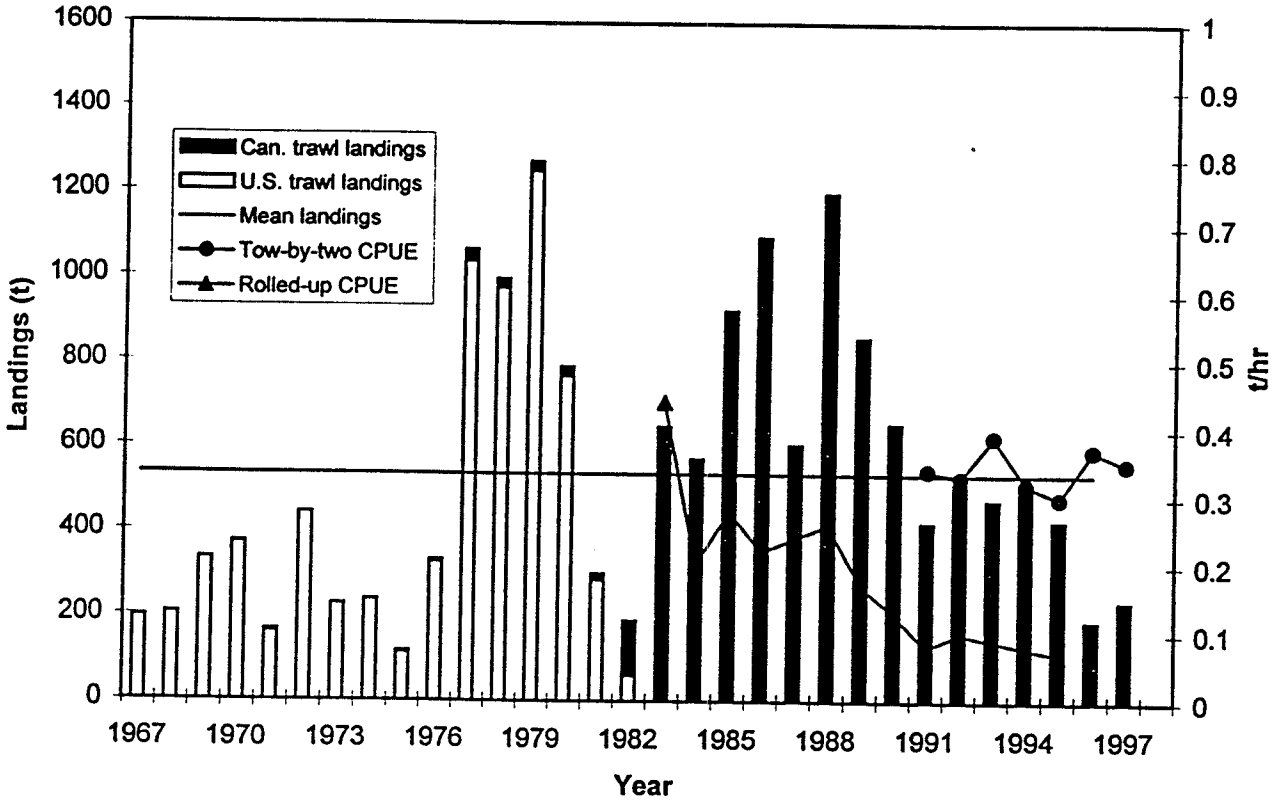



Figure 9.5 Silvergray rockfish landings and bottom trawl CPUE (25% qualified rolled-up and tow-by-tow) for Area 3C+D.

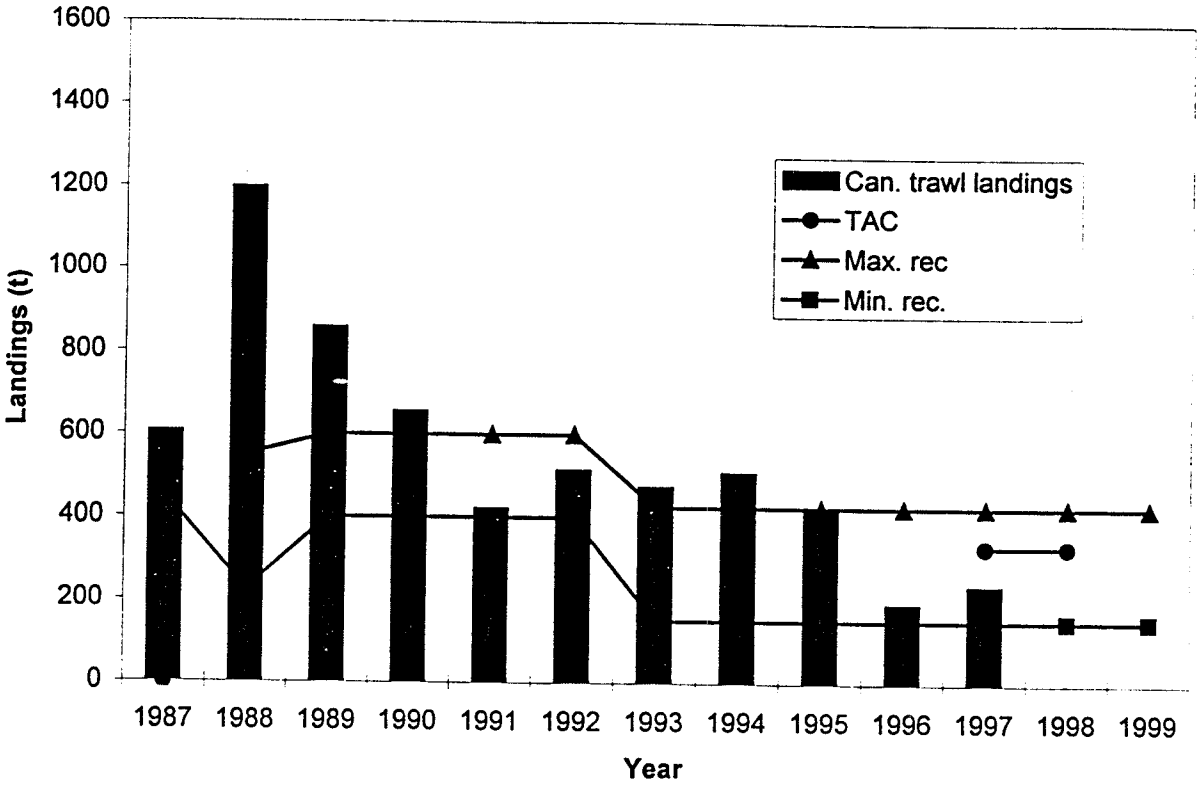



Figure 9.6 Silvergray rockfish landings and recommended yield options for PMFC Area 3C+D.

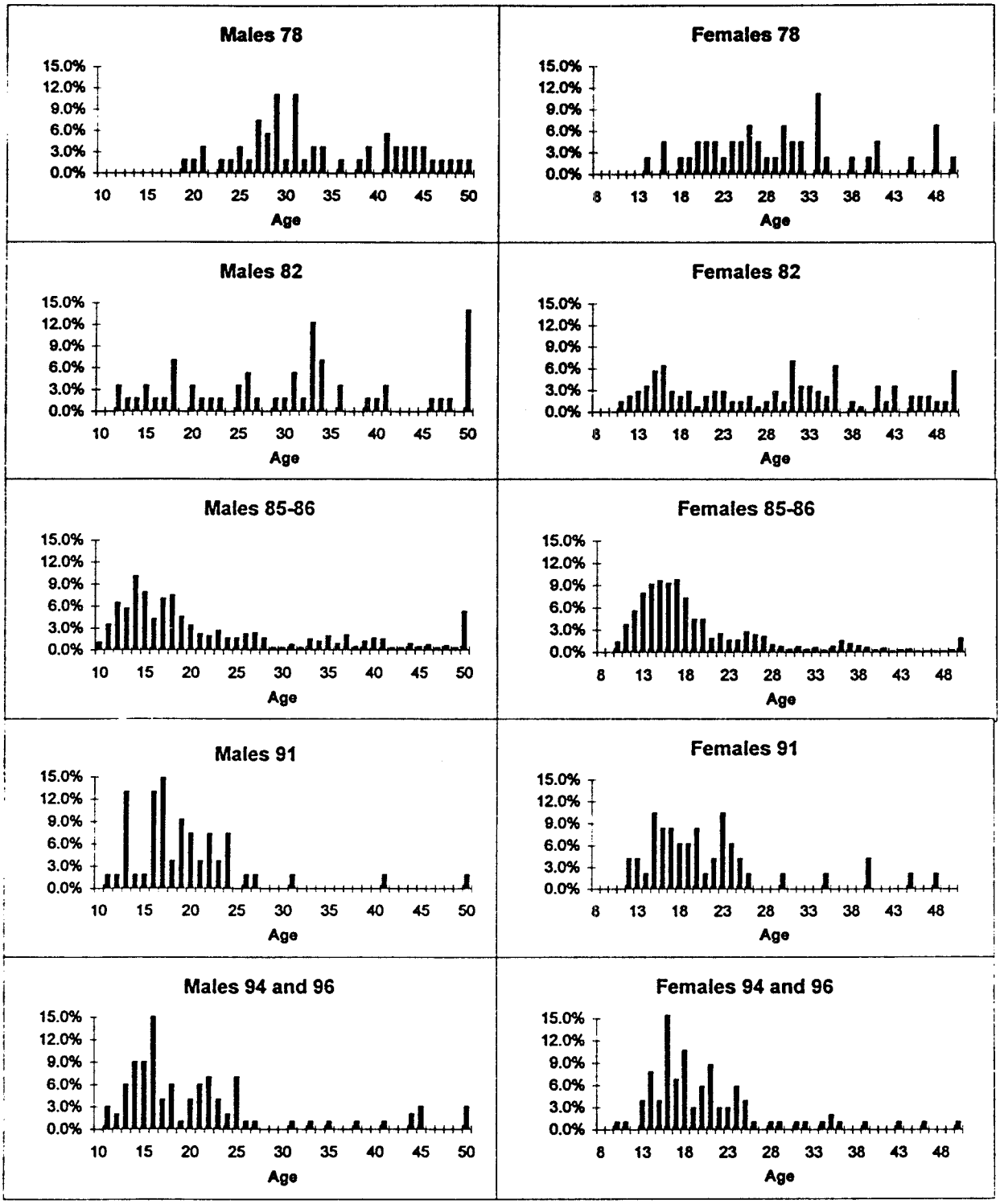



Figure 9.7 Silvergray rockfish age composition for Area 3C and 3D

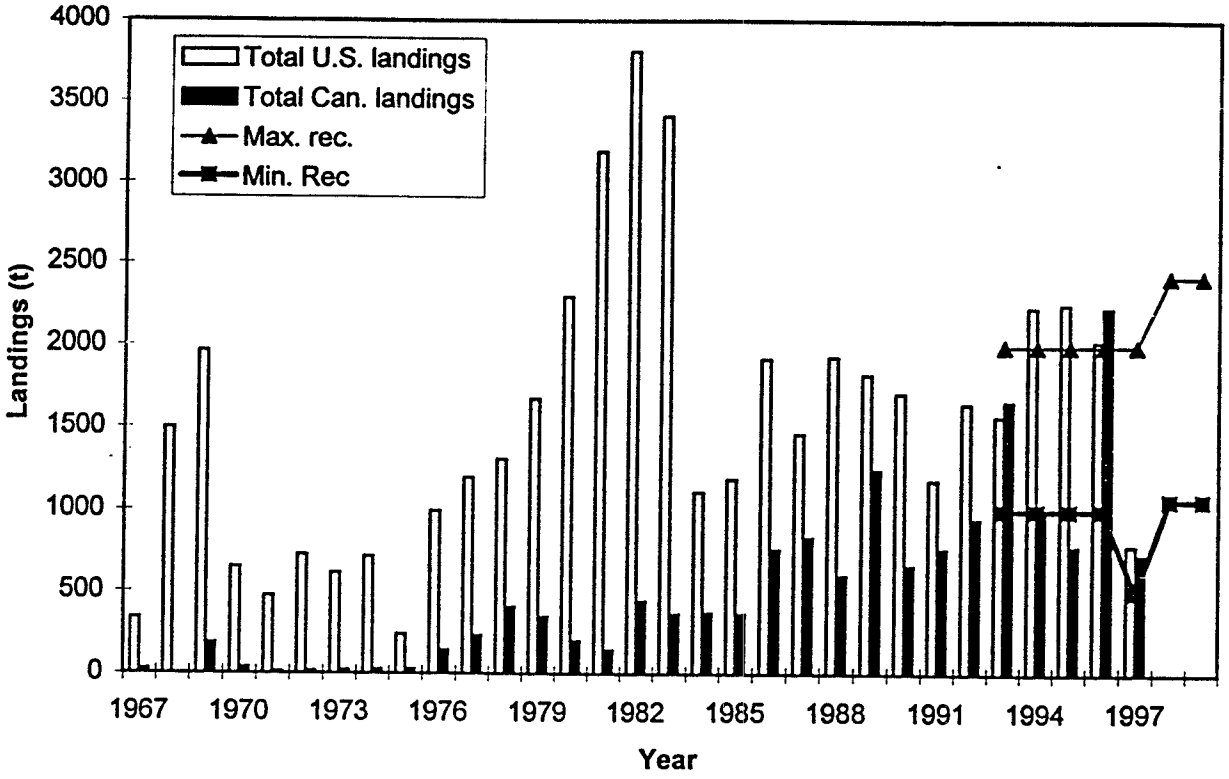
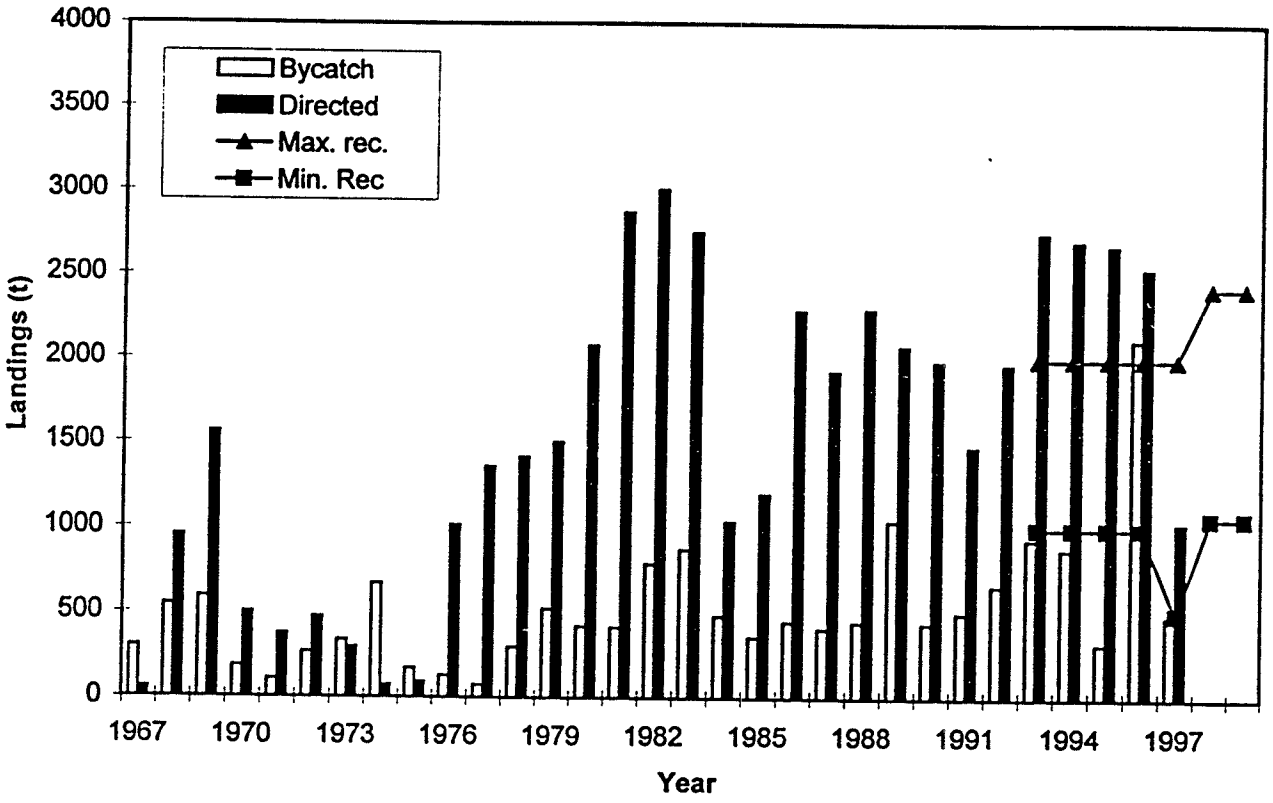



Figure 9.8 Boundary stock total yellowtail rockfish landings by nation Areas 1+3B+3C.

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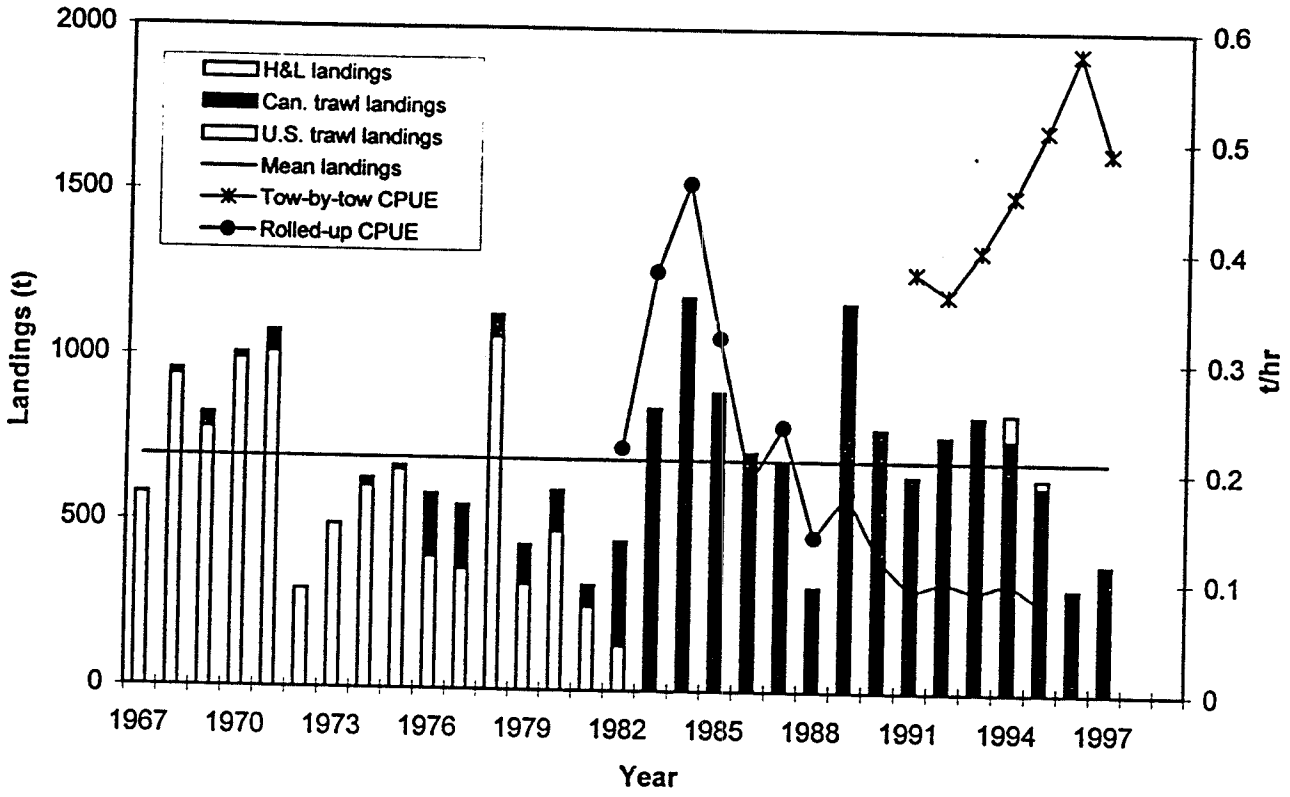
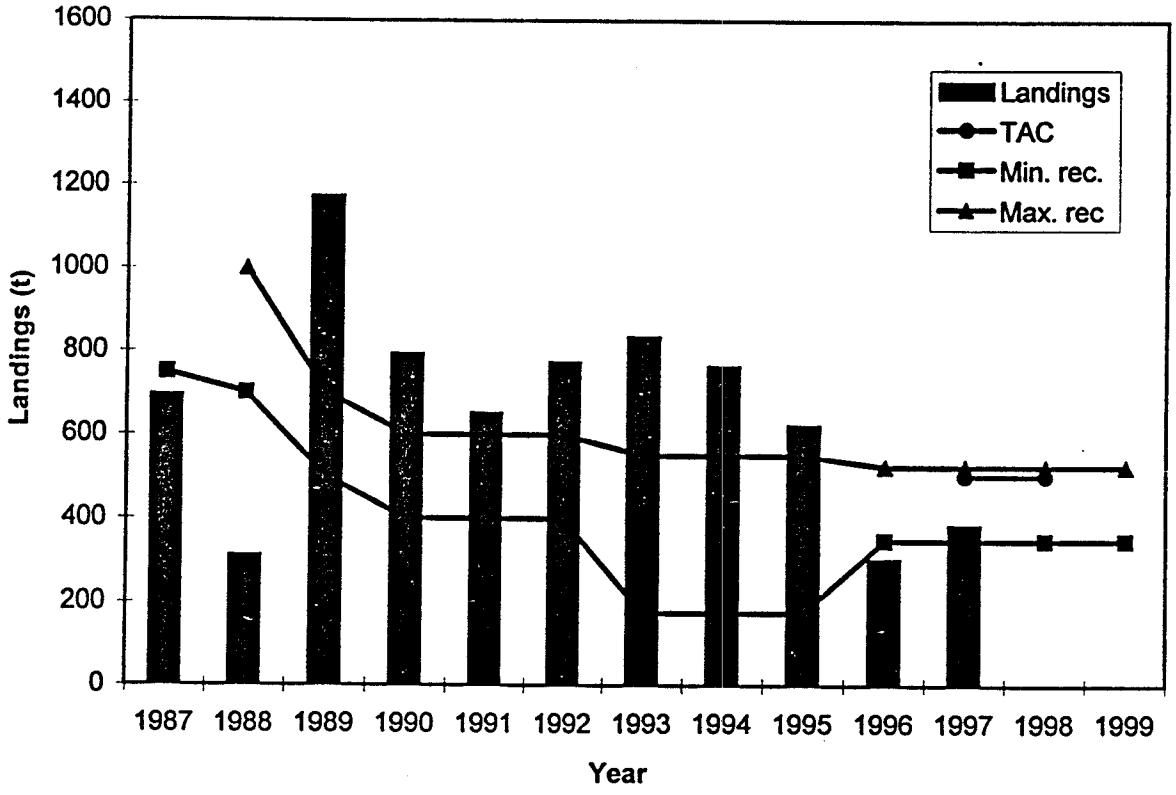



Figure 9.10 Canary rockfish landings and bottom trawl CPUE (rolled-up and tow-by-tow) for Area 3C+3D.

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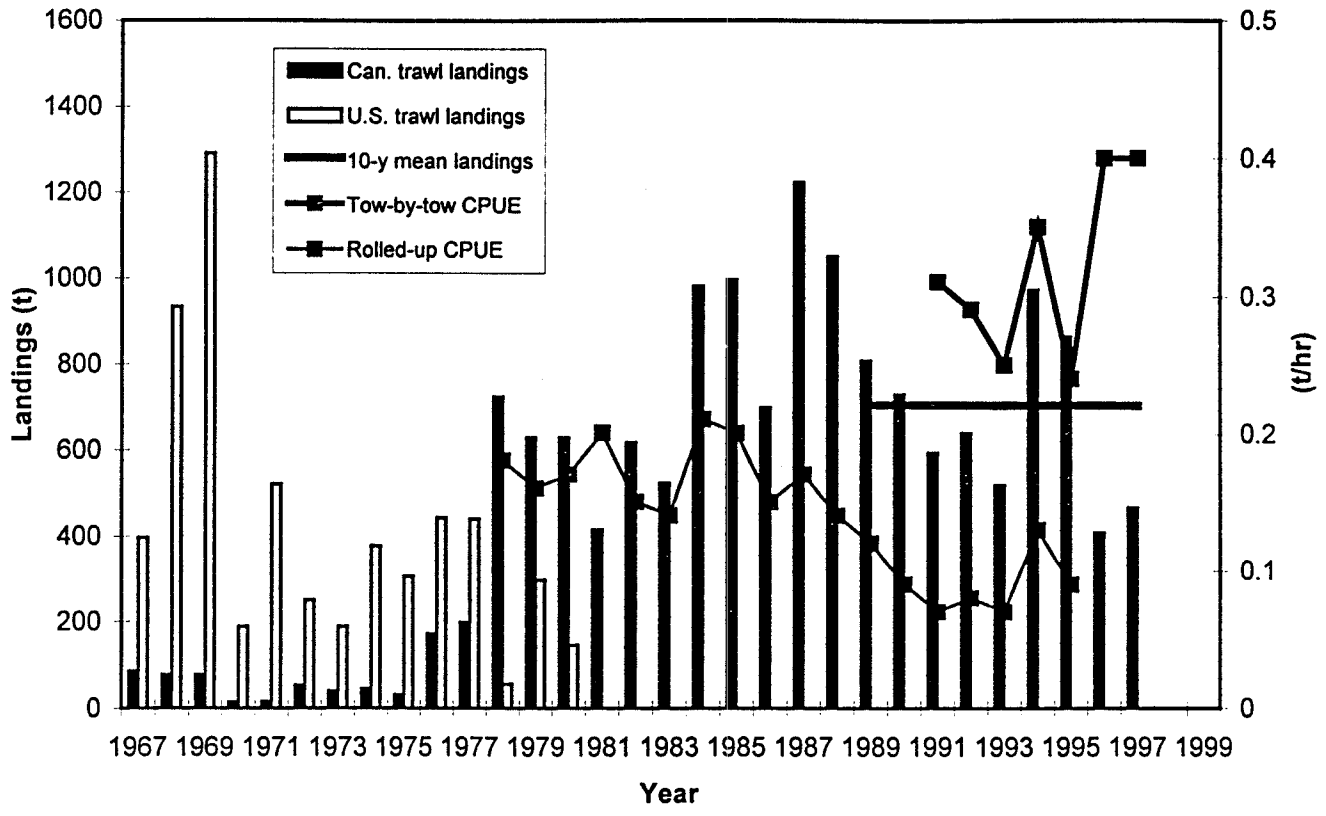


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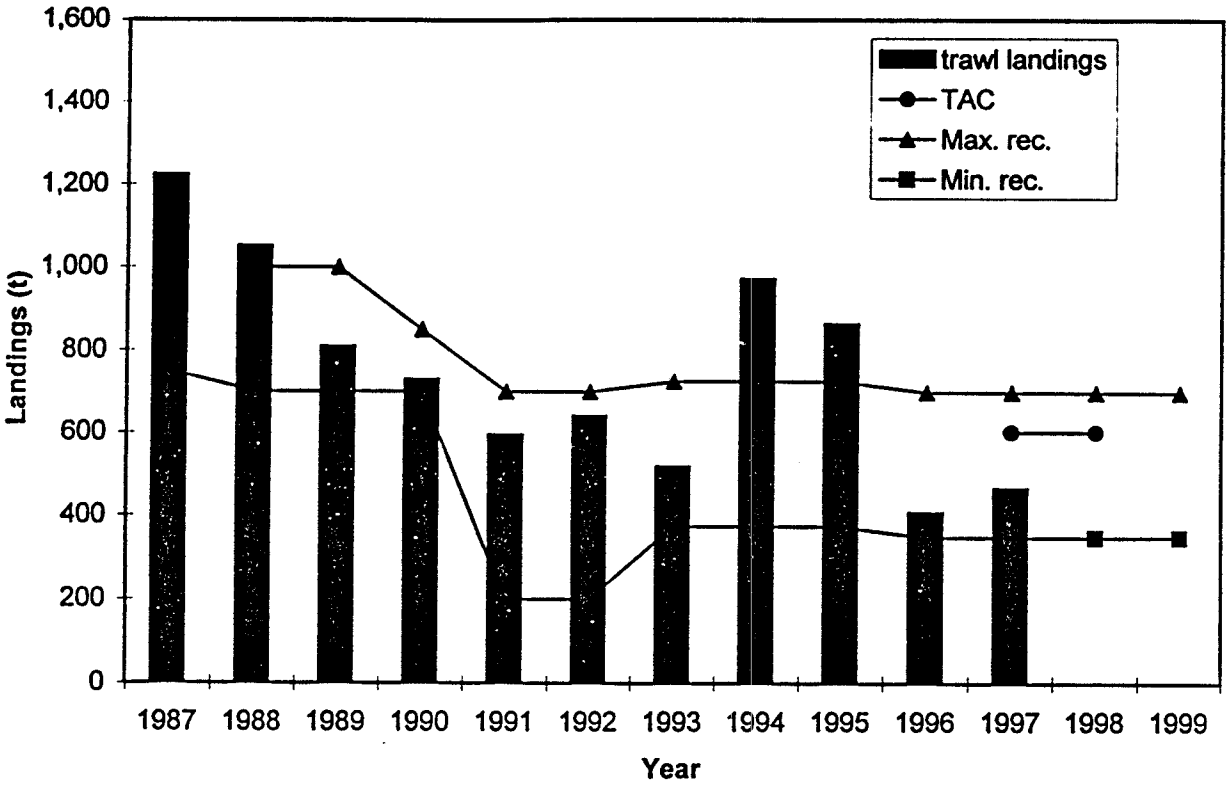



Figure 9.13 Silvergray rockfish landings and recommended yield options for Area 5A+B.

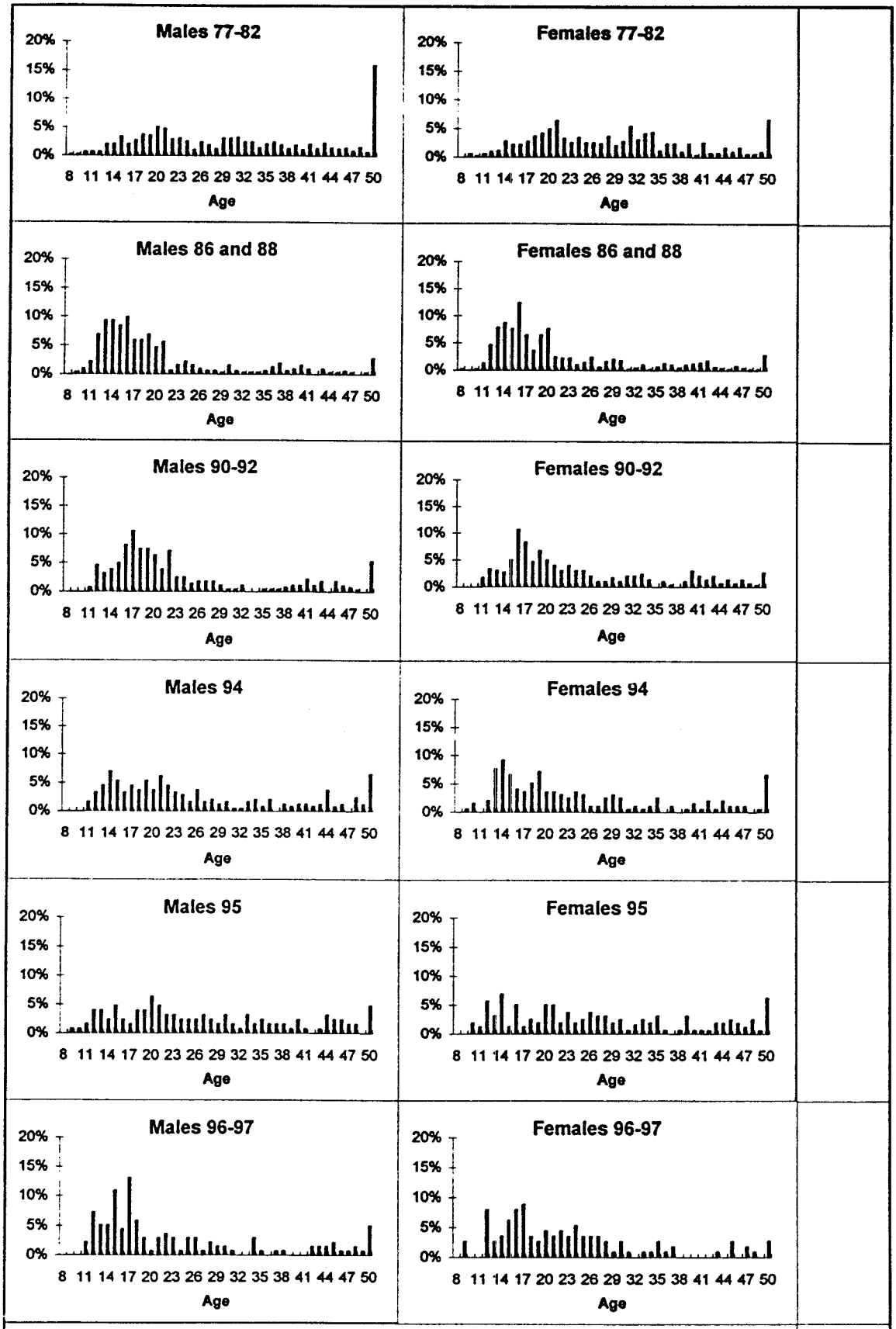



Figure 9.14 Silvergray rockfish age composition for Areas 5A and 5B

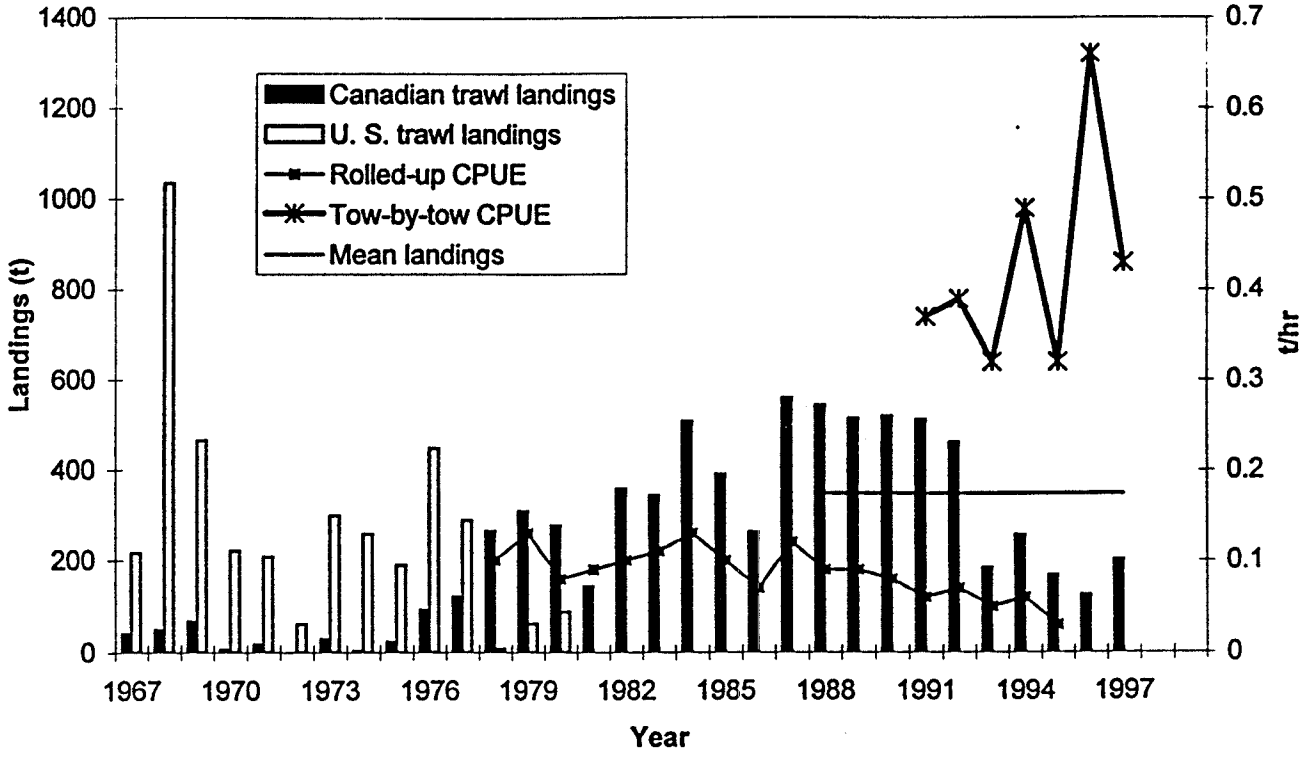
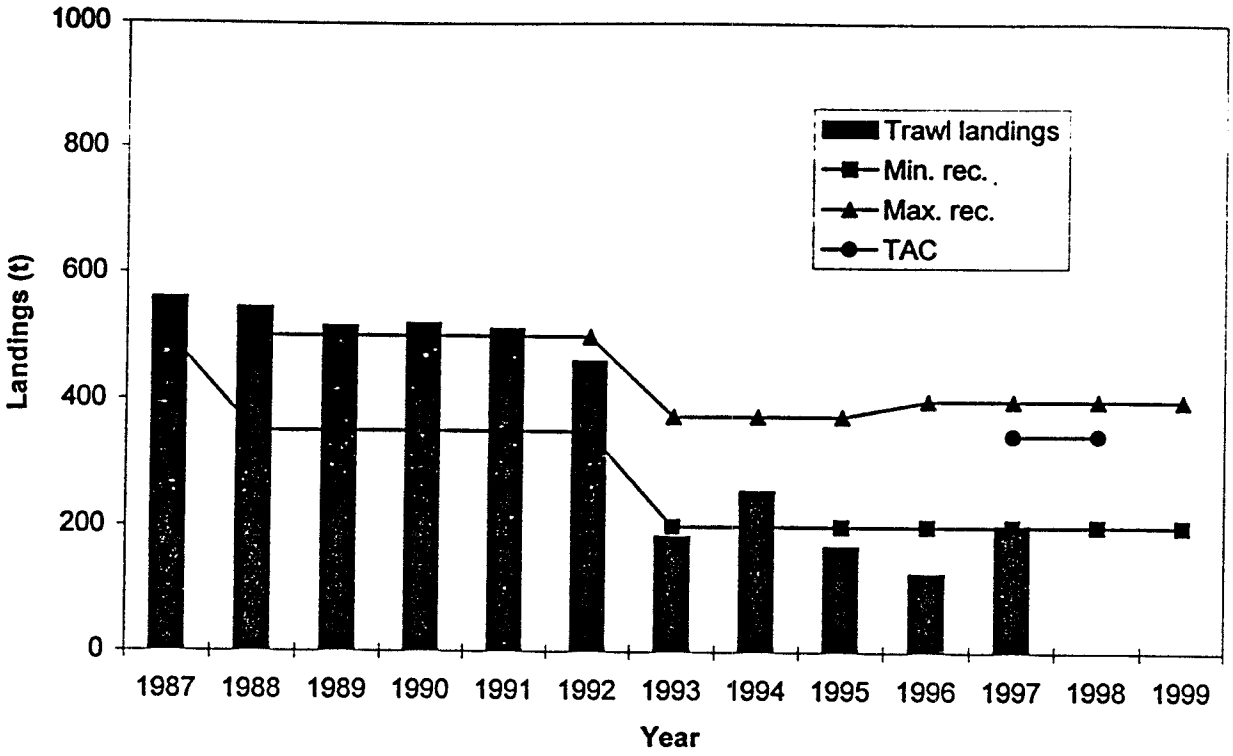



Figure 9.15 Canary rockfish landings and bottom trawl CPUE (25% qualified rolled-up and tow-by-tow) for Areas 5A+5B.

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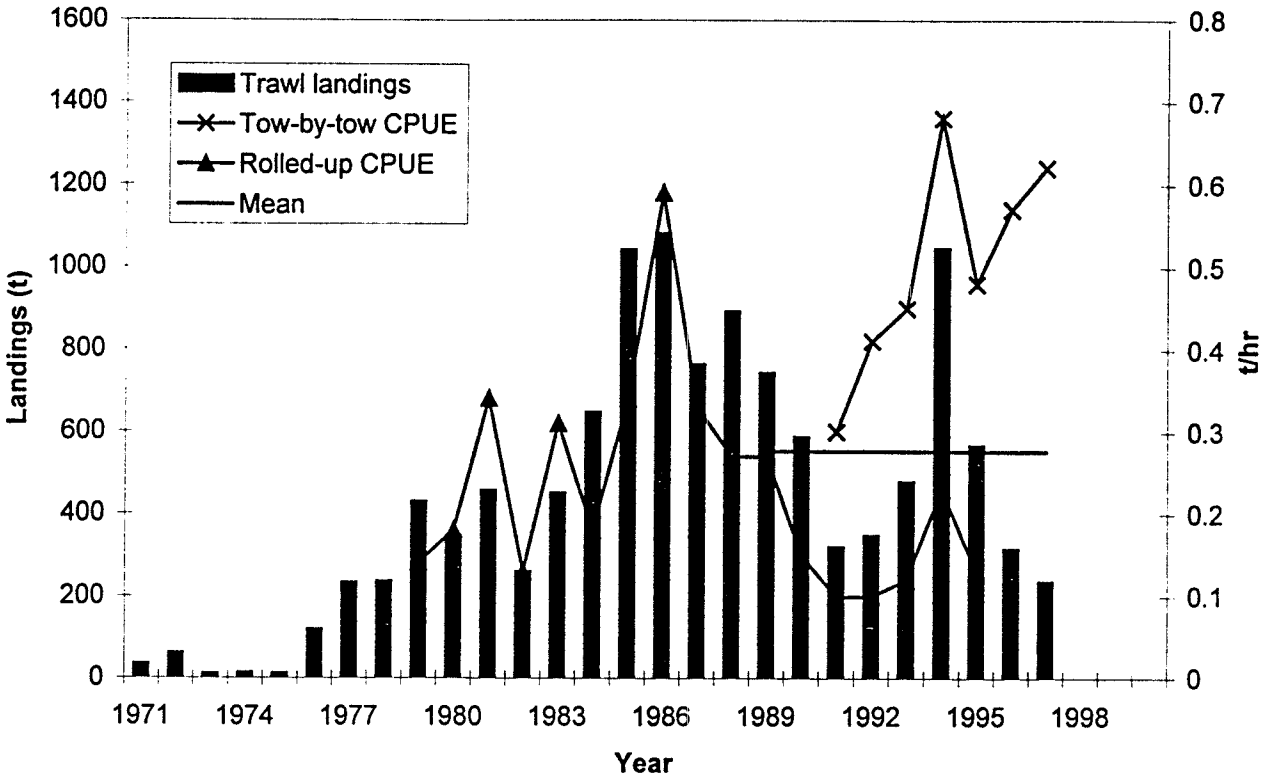


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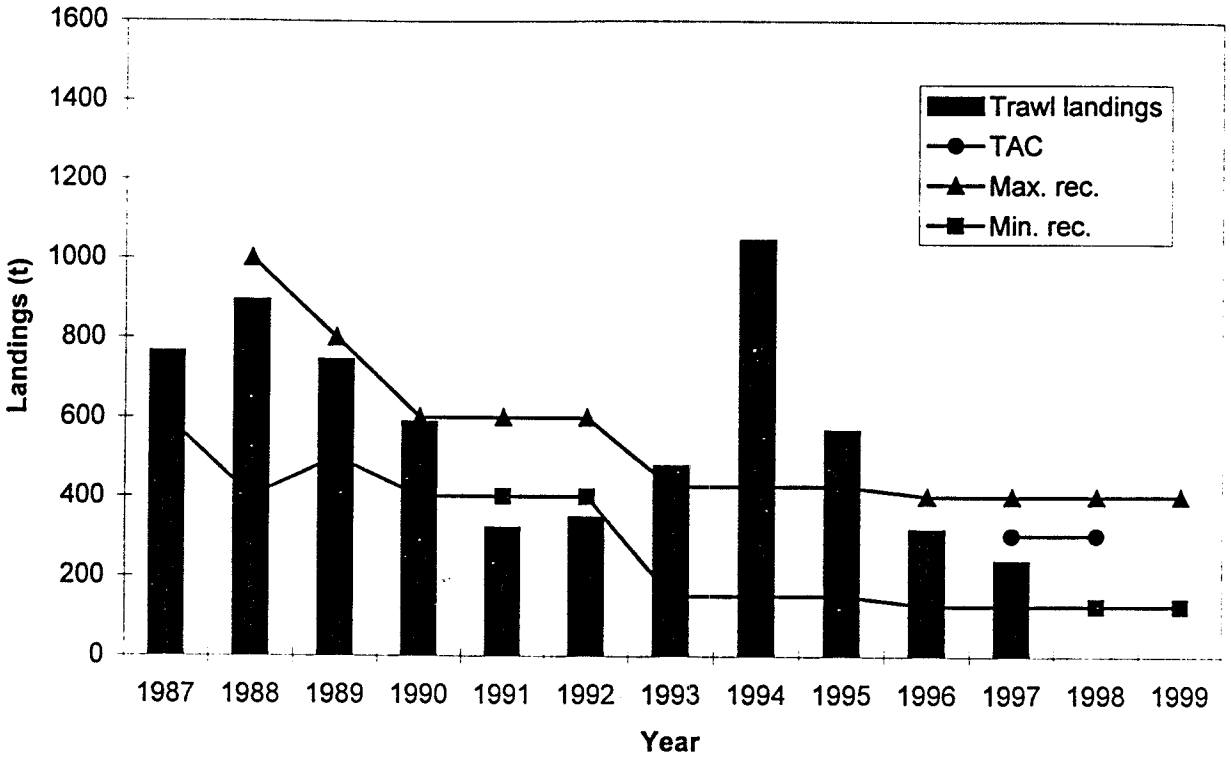


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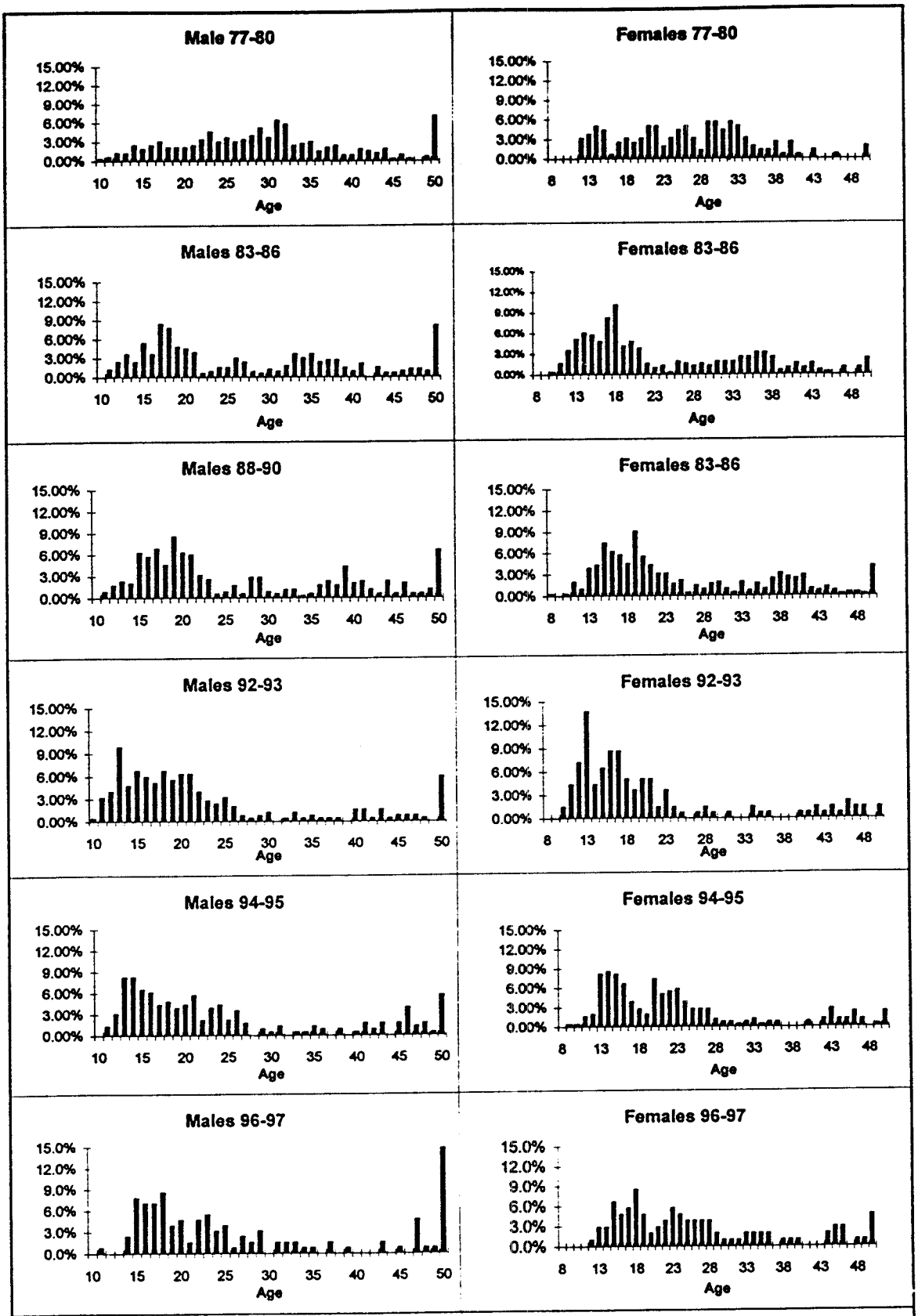


Figure 9.19 Silvergray rockfish age composition for Area 5C+5D

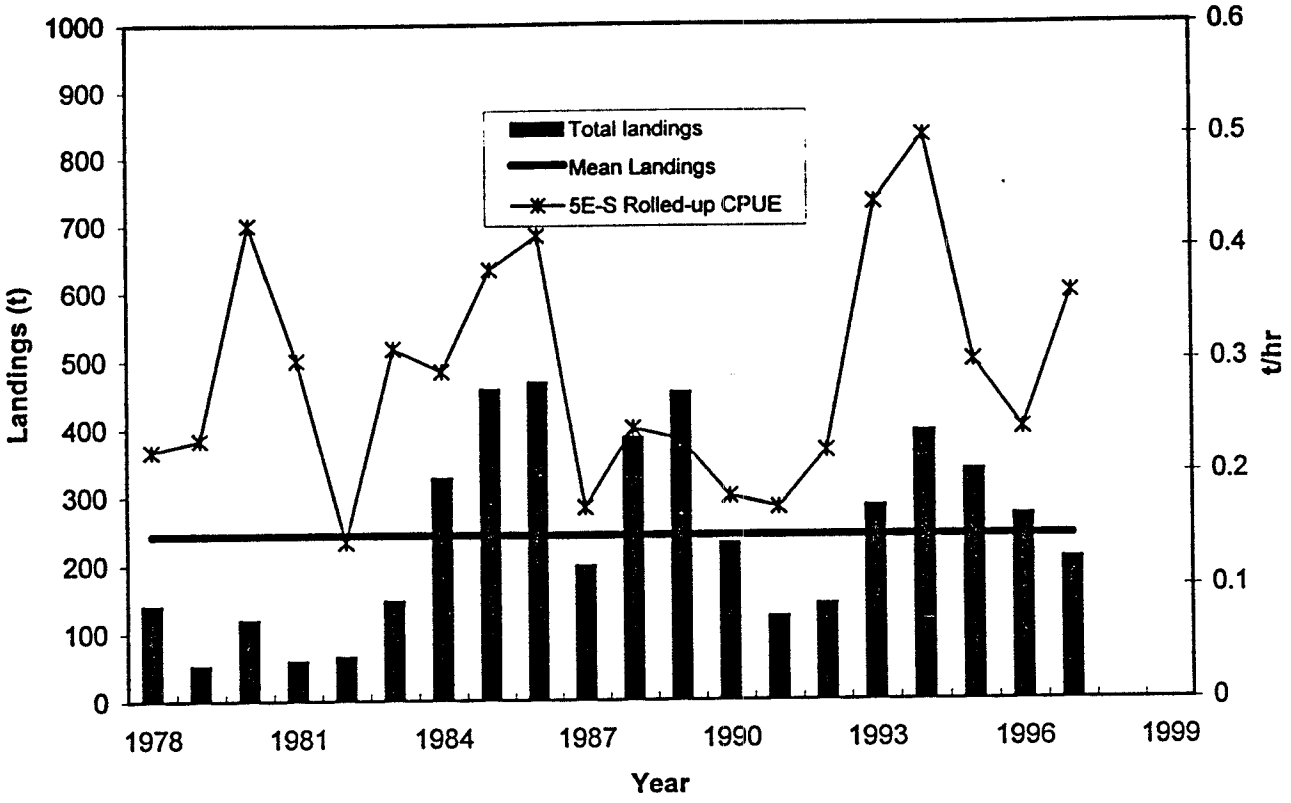


Figure 9.20 Silvergray rockfish landings for PMFC Area 5E and bottom trawl CPUE for PMFC Area 5E-South.

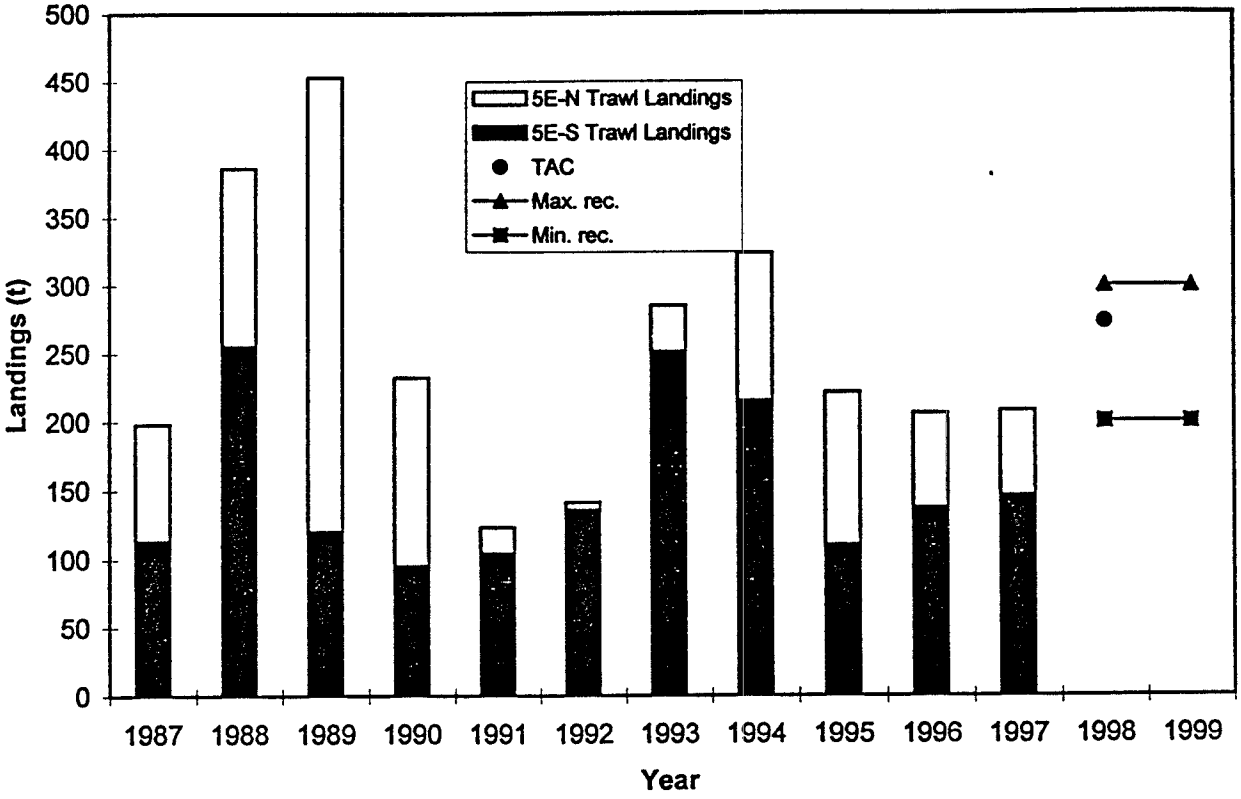


Figure 9.21 Silvergray rockfish landings for PMFC Area 5E by fishery and minor area.

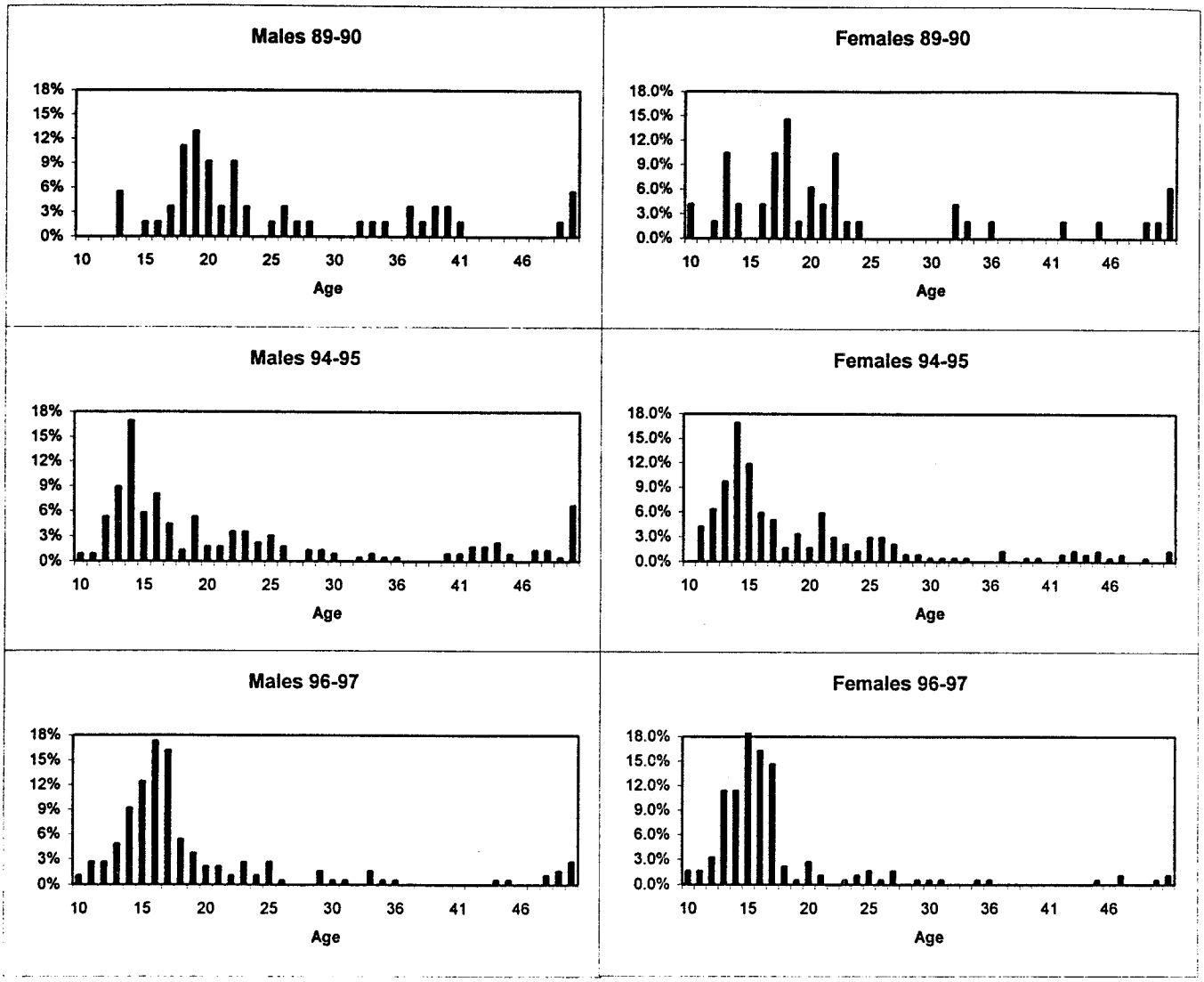


Figure 9.22 Age composition of 5E Silvergray rockfish

| Table 9.1 Mean annual landings and recommended yield ranges for the principal stocks of silvergray, widow, yellowtail and canary rockfish in B. C. waters | | | | | |
|---|---|---|---|---|---|
| PMFCAreas | Species | 10-year Mean Harvest(t) | 1997 Landings (t) | 1998/99 Rec. range (t) | 1999/2000 Rec. range (t) |
| | | | | | |
| 1, 3B-3C[a] | yellowtail | 2,894 | 1,517 | 1,100-2,400 | 1,100-2,400 |
| 3D-5E | yellowtail | 3,965 | 3,199 | 2,000-4,025 | 2,000-4,025 |
| 1,3C-5E | widow | 2,462 | 1,137 | 1,100-3,000 | 1,100-3,000 |
| 3C+3D | silvergray | 548 | 236 | 150-425 | 150-425 |
| 3C+3D | canary | 662 | 387 | 350-525 | 350-525 |
| 5A+5B | silvergray | 706 | 468 | 350-700 | 350-700 |
| 5A+5B | canary | 361 | 202 | 200-400 | 200-400 |
| 5C+5D | silvergray | 553 | 236 | 125-400 | 125-400 |
| 5E | silvergray | 258 | 208 | 175-300 | 175-300 |
| [a] *U.S. and Canada combined* | | | | | |

| Table 9.2 Hook-and-line landings (t) of shelf rockfish, 1994-1997 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Species | Year | | Major Area | | | | Total |
| | | 4B | 3CD | 5AB | 5CD | 5E | |
| | | | | | | | |
| Silvergray | 1994 | 0 | 48 | 2 | 3 | 51 | 104 |
| | 1995 | 0 | 29 | 3 | 18 | 99 | 149 |
| | 1996 | 1 | 9 | 2 | 28 | 66 | 106 |
| | 1997 | n/a | n/a | n/a | n/a | n/a | 46 |
| Total | | | | | | | 405 |
| Mean | | | | | | | 101 |
| | | | | | | | |
| Yellowtail | 1994 | 2 | 1 | 1 | 2 | 1 | 7 |
| | 1995 | 3 | 36 | 0 | 2 | 1 | 42 |
| | 1996 | 4 | 1 | 1 | 1 | 0 | 7 |
| | 1997 | n/a | n/a | n/a | n/a | n/a | 11 |
| Total | | | | | | | 67 |
| Mean | | | | | | | 17 |
| | | | | | | | |
| Canary | 1994 | 1 | 78 | 6 | 5 | 19 | 109 |
| | 1995 | 0 | 23 | 3 | 9 | 17 | 52 |
| | 1996 | 0 | 6 | 6 | 28 | 12 | 52 |
| | 1997 | n/a | n/a | n/a | n/a | n/a | 43 |
| Total | | | | | | | 256 |
| Mean | | | | | | | 64 |
| | | | | | | | |
| Total | 1994 | 3 | 127 | 9 | 10 | 71 | 220 |
| | 1995 | 3 | 88 | 6 | 29 | 117 | 243 |
| | 1996 | 5 | 16 | 9 | 57 | 78 | 165 |
| | 1997 | n/a | n/a | n/a | n/a | n/a | 100 |
| Grand total | | | | | | | 628 |
| Grand mean | | | | | | | 157 |

Table 9.3 Annual landings (t) of widow rockfish from B. C. waters.

| Year | 4B-3C | 3D | 5A | 5B | 5C | 5D | 5E | Total |
|---|---|---|---|---|---|---|---|---|
| 1973 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 1974 | 2 | 0 | 0 | 3 | 0 | 0 | 0 | 5 |
| 1975 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1976 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| 1977 | 52 | 0 | 11 | 76 | 0 | 4 | 12 | 154 |
| 1978 | 0 | 2 | 1 | 142 | 0 | 0 | 57 | 202 |
| 1979 | 1 | 0 | 0 | 129 | 0 | 0 | 10 | 140 |
| 1980 | 0 | 5 | 0 | 10 | 0 | 0 | 5 | 20 |
| 1981 | 12 | 0 | 0 | 1 | 0 | 0 | 4 | 16 |
| 1982 | 0 | 2 | 0 | 6 | 0 | 3 | 51 | 63 |
| 1983 | 12 | 3 | 9 | 6 | 1 | 0 | 29 | 60 |
| 1984 | 4 | 5 | 0 | 18 | 0 | 0 | 4 | 32 |
| 1985 | 0 | 19 | 3 | 13 | 14 | 7 | 25 | 80 |
| 1986 | 41 | 607 | 21 | 18 | 6 | 0 | 51 | 744 |
| 1987 | 11 | 607 | 86 | 119 | 19 | 0 | 54 | 897 |
| 1988 | 27 | 626 | 48 | 1,287 | 8 | 24 | 27 | 2,047 |
| 1989 | 98 | 293 | 53 | 1,176 | 57 | 0 | 9 | 1,686 |
| 1990 | 52 | 1,759 | 1,196 | 1,292 | 60 | 58 | 58 | 4,476 |
| 1991 | 446 | 1,614 | 526 | 652 | 15 | 48 | 64 | 3,364 |
| 1992 | 373 | 909 | 1,995 | 374 | 11 | 38 | 79 | 3,779 |
| 1993 | 120 | 750 | 603 | 356 | 3 | 41 | 42 | 1,914 |
| 1994 | 23 | 441 | 1,574 | 28 | 22 | 2 | 12 | 2,101 |
| 1995 | 88 | 946 | 1033 | 318 | 13 | 11 | 7 | 2,416 |
| 1996 | 267 | 755 | 430 | 229 | 2 | 1 | 18 | 1,702 |
| 1997 | 317 | 399 | 430 | 163 | 6 | 1 | 11 | 1,137 |
| | | | | | | | | |
| Total | 27,040 | | | | | | | |
| Mean | 2,253 | (1986-1997 | | | | | | |
| Last 10y | 2,462 | | | | | | | |
| Last 5y | 1,854 | | | | | | | |

| Table 9.4 Biomass estimates per micro-survey during 1998 widow rockfish cruise | | | | | |
|---|---|---|---|---|---|
| Pass | Date | Time | Offset | Survey biomass (t) | Fisher transect biomass (t) |
| | | | | | |
| SE-1 | 29-Jan | 1:31 | n | 1,501 | n/a |
| SE-2 | " | 3:08 | n | 1,375 | n/a |
| SE-3 | " | 4:49 | n | 2,064 | n/a |
| SE-4 | " | 6:34 | n | 1,709 | n/a |
| SW-1 | 2-Feb | 20:10 | n | 2,110 | 1,492 |
| SW-2 | " | 23:33 | n | 1,780 | 385 |
| SW-3 | 3-Feb | 1:53 | n | 1,203 | 275 |
| SW-4 | " | 4:53 | n | 1,709 | 556 |
| SW-5 | " | 7:34 | n | 1,730 | 327 |
| SW-6 | " | 10:25 | n | 894 | 181 |
| SW-7 | " | 13:05 | n | 914 | 260 |
| SW-8 | " | 16:21 | n | 1,565 | n/a |
| SW-9 | " | 20:21 | n | 852 | 286 |
| SW-10 | " | 23:00 | n | 968 | 418 |
| SW-11 | 4-Feb | 1:44 | y | 1,094 | 308 |
| SW-12 | " | 4:27 | y | 1,372 | 295 |
| SW-13 | " | 6:47 | y | 1,799 | 308 |
| SW-14 | " | 9:28 | n | 2,333 | 472 |
| SW-15 | " | 12:09 | y | 2,163 | 174 |
| SW-16 | " | 15:00 | y | 2,312 | 346 |
| SW-17 | " | 17:51 | n | 2,065 | 1,540 |
| SW-18 | " | 20:40 | n | 2,366 | 1,067 |
| SW-19 | " | 23:27 | n | 1,795 | 327 |
| SW-20 | 5-Feb | 3:20 | n | 1,740 | n/a |

Table 9.5 Widow rockfish exploitable biomass required to support 1,110-3,000 harvests given F=M strategy and varying estimates of M

| | Quota (t) | |
|---|---|---|
| M | ***1,100*** | ***3,000*** |
| 0.07 | 15,700 | 42,900 |
| 0.15 | 7,300 | 20,000 |

Table 9.6 Annual trawl landings (t) of yellowtail rockfish from B. C. waters.

| Year | | 4B and | 3C-Can | | | Area 3D | | | | 5A and 5B[a] | | | 5C-5E | | Unknown | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | U.S. | Can. | Can. | JV hake | Can. | Can. | U.S. | Pol/JV hake | Can | Can. | U.S. | Can. | Can. | | |
| | (BT) | (BT) | (MW) | (MW | (BT) | (MW) | (BT) | (MW) | (BT) | (MW) | (BT | (BT | (MW) | | |
| 1967 | 23 | 1 | | | 2 | | 80 | | 19 | 0 | 996 | 1 | | | 1,122 |
| 1968 | 0 | 0 | | | 0 | | 23 | | 23 | 0 | 278 | 0 | | | 324 |
| 1969 | 144 | 43 | | | 1 | | 90 | | 86 | 0 | 2,174 | 15 | | | 2,553 |
| 1970 | 19 | 18 | | | 1 | | 135 | | 160 | 14 | 2,629 | 17 | | | 2,993 |
| 1971 | 1 | 10 | | | 5 | | 127 | | 225 | 0 | 1,955 | 51 | | | 2,374 |
| 1972 | 5 | 11 | | | 0 | | 71 | | 692 | 3 | 2,735 | 29 | | | 3,546 |
| 1973 | 0 | 22 | | | 0 | | 23 | | 516 | 5 | 2,735 | 1 | | | 3,302 |
| 1974 | 8 | 17 | | | 0 | | 109 | | 150 | 14 | 809 | 47 | 1 | | 1,155 |
| 1975 | 16 | 11 | | | 1 | | 73 | 6,700 | 317 | 97 | 303 | 57 | 0 | | 7,575 |
| 1976 | 68 | 59 | | | 26 | | 4 | 2,339 | 590 | 38 | 363 | 164 | 31 | | 3,682 |
| 1977 | 126 | 69 | 5 | | 8 | | 174 | | 762 | 251 | 1,242 | 301 | 2 | | 2,940 |
| 1978 | 169 | 58 | 0 | 120 | 24 | 13 | 0 | | 1,445 | 201 | 397 | 273 | 111 | | 2,811 |
| 1979 | 24 | 57 | 65 | 187 | 8 | 0 | 108 | | 1,312 | 23 | 192 | 469 | 122 | | 2,567 |
| 1980 | 1 | 48 | 1 | 142 | 12 | 8 | 44 | | 471 | 0 | 81 | 124 | 42 | | 972 |
| 1981 | 0 | 25 | 0 | 120 | 17 | 0 | 10 | | 281 | 0 | 0 | 86 | 12 | | 555 |
| 1982 | | 121 | 1 | 320 | 13 | 0 | | | 280 | 13 | | 87 | 12 | | 847 |
| 1983 | | 8 | 9 | 347 | 36 | 0 | | | 308 | 15 | | 58 | 14 | | 795 |
| 1984 | | 23 | 0 | 350 | 19 | 0 | | | 177 | 18 | | 86 | 30 | | 703 |
| 1985 | | 65 | 38 | 264 | 288 | 0 | | | 341 | 0 | | 80 | 129 | | 1,205 |
| 1986 | | 238 | 212 | 311 | 941 | 2,142 | | | 822 | 0 | | 92 | 12 | | 4,770 |
| 1987 | | 197 | 308 | 330 | 835 | 1,143 | | | 1,431 | 101 | | 150 | 1 | | 4,496 |
| 1988 | | 226 | 41 | 334 | 954 | 1,083 | | | 1,307 | 986 | | 127 | 22 | | 5,100 |
| 1989 | | 162 | 98 | 985 | 472 | 798 | | | 1,454 | 1,058 | | 247 | 7 | | 5,281 |
| 1990 | | 215 | 49 | 398 | 735 | 1,153 | | | 1,143 | 864 | | 521 | 360 | | 5,438 |
| 1991 | | 293 | 57 | 414 | 983 | 1,061 | | | 1,895 | 317 | | 374 | 15 | | 5,409 |
| 1992 | | 388 | 124 | 436 | 836 | 820 | | | 1,418 | 721 | | 369 | 36 | | 5,148 |
| 1993 | | 717 | 116 | 829 | 836 | 767 | | | 1,493 | 372 | | 567 | 111 | | 5,808 |
| 1994 | | 173 | 155 | 682 | 321 | 884 | | 374 | 437 | 232 | | 368 | 145 | | 3,771 |
| 1995 | | 287 | 339 | 159 | 349 | 796 | | | 1,170 | 735 | | 250 | 152 | | 4,237 |
| 1996 | | 370 | 610 | 980 | 123 | 1895 | | | 629 | 1139 | | 171 | 149 | 14 | 6,080 |
| 1997 | | 403 | 123 | 206 | 172 | 911 | | | 1298 | 503 | | 259 | 56 | 191 | 4,122 |
| | | | | | | | | | | | | | | | |
| Totals | 604 | 4,335 | 2,351 | 7,914 | 8,018 | 13,474 | 1,071 | | 22,652 | 7,720 | 16,889 | 5,441 | 1,572 | | 101,681 |
| Mean | | 140 | 112 | 406 | 262 | 661 | | | 731 | 249 | | 176 | 66 | | 3,280 |
| Last 10 y | | 323 | 190 | 555 | 644 | 1,017 | | | 1,224 | 693 | | 325 | 105 | | 5,039 |
| Last 5 y | | 390 | 269 | 617 | 493 | 1,051 | | | 1,005 | 596 | | 323 | 123 | | 4,804 |

[a]Excludes Moresby Gully

Table 9.7 Total domestic trawl landings (t) (3D-5E) and CPUE (t/hr) (25% qualified) for bottom trawl for landings in Queen Charlotte Sound (5A+5B) or Area 3D stock of yellowtail rockfish.

| Year | Total Ldgs (t) (3D-5E) | Areas 5A+5B (excluding Moresby Gully) Qual. Ldgs | Rolled-up CPUE | No. Ldgs | Tow by tow CPUE | Median Catch | Area 3D Qual. Ldgs | Rolled-up CPUE | # Ldgs. | Tow by tow CPUE | Median Catch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1966 | 324 | | | | | | | | | | |
| 1969 | 2,366 | 60 | | | | | | | | | |
| 1970 | 2,956 | 135 | 0.5 | 24 | | | | | | | |
| 1971 | 2,363 | 212 | 0.28 | 39 | | | | | | | |
| 1972 | 3,530 | 579 | 0.45 | 47 | | | | | | | |
| 1973 | 3,280 | 491 | 0.46 | 50 | | | | | | | |
| 1974 | 1,130 | 93 | 0.29 | 18 | | | | | | | |
| 1975 | 7,548 | 264 | 0.28 | 39 | | | | | | | |
| 1976 | 3,555 | 392 | 0.28 | 49 | | | | | | | |
| 1977 | 2,745 | 615 | 0.23 | 94 | | | | | | | |
| 1978 | 2,464 | 1,282 | 0.45 | 109 | | | | | | | |
| 1979 | 2,234 | 1,191 | 0.56 | 92 | | | | | | | |
| 1980 | 780 | 387 | 0.31 | 64 | | | | | | | |
| 1981 | 410 | 191 | 0.31 | 41 | | | | | | | |
| 1982 | 405 | 180 | 0.27 | 39 | | | | | | | |
| 1983 | 431 | 188 | 0.42 | 31 | | | | | | | |
| 1984 | 330 | 106 | 0.24 | 26 | | | | | | | |
| 1985 | 838 | 249 | 0.44 | 36 | | | 240 | | | | |
| 1986 | 4,009 | 621 | 0.44 | 66 | | | 441 | 0.62 | 41 | | |
| 1987 | 3,661 | 774 | 0.38 | 112 | | | 405 | 0.68 | 35 | | |
| 1988 | 4,499 | 893 | 0.37 | 127 | | | 701 | 0.80 | 64 | | |
| 1989 | 4,036 | 1,201 | 0.42 | 150 | | | 331 | 0.55 | 51 | | |
| 1990 | 4,776 | 668 | 0.35 | 139 | | | 551 | 0.44 | 104 | | |
| 1991 | 4,645 | 1,548 | 0.41 | 140 | 0.38 | | 834 | 0.63 | 125 | 0.61 | |
| 1992 | 4,200 | 1,032 | 0.39 | 130 | 0.33 | | 650 | 0.53 | 160 | 0.50 | |
| 1993 | 4,146 | 1,136 | 0.31 | 182 | 0.32 | | 652 | 0.46 | 260 | 0.43 | |
| 1994 | 2,247 | 270 | 0.37 | 40 | 0.17 | | 175 | 0.30 | 105 | 0.28 | |
| 1995 | 3,782 | 940 | 0.41 | 105 | 0.29 | | 230 | 0.28 | 120 | 0.28 | |
| 1996 | 4,120 | 531 | n/a | n/a | 0.39 | 162 | 4 | n/a | n/a | 0.27 | 120 |
| 1997 | 3,199 | 1,136 | n/a | n/a | 0.49 | 500 | 125 | n/a | n/a | 0.48 | 300 |
| Total | 85,009 | | | | | | | | | | |
| Mean | 2,834 | | | | | | | | | | |
| Last 10 y | 3,965 | | | | | | | | | | |
| Last 5 y | 3,499 | | | | | | | | | | |

Table 9.8 Area 3C+3D trawl landings (t), effort (hr) and CPUE (t/hr) for silvergray rockfish.

| Year | Nat. | Total trawl | Interviewed landings (bt) | | | | 25% Qualified (bt) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | landings | landings | effort | Nominal CPUE | Median CPUE | landings | effort | CPUE | Nominal CPUE | Tow-by tow CPUE | Median |
| 1967 | USA | 196 | 195 | 4,471 | 0.04 | | - | - | - | | | |
| 1968 | USA | 205 | 200 | 2,928 | 0.07 | | - | - | - | | | |
| 1969 | USA | 334 | 334 | 3,647 | 0.09 | | - | - | - | | | |
| 1970 | CAN | 2 | 2 | 119 | 0.02 | | 1 | 1 | 1 | | | |
| | USA | 371 | 358 | 4,785 | 0.07 | | - | - | - | | | |
| 1971 | CAN | 5 | 5 | 48 | 0.10 | | 2 | 2 | 1 | | | |
| | USA | 161 | 161 | 3,009 | 0.05 | | - | - | - | | | |
| 1972 | USA | 442 | 442 | 2,969 | 0.15 | | - | - | - | | | |
| 1973 | USA | 227 | 227 | 2,619 | 0.09 | | - | - | - | | | |
| 1974 | CAN | 1 | 1 | 12 | 0.08 | | - | - | - | | | |
| | USA | 236 | 235 | 2,666 | 0.09 | | - | - | - | | | |
| 1975 | CAN | 4 | 4 | 44 | 0.09 | | 0 | 0 | - | | | |
| | USA | 113 | 113 | 2,938 | 0.04 | | - | - | - | | | |
| 1976 | CAN | 5 | 5 | 9 | 0.55 | | 0 | 0 | - | | | |
| | USA | 326 | 326 | 3,945 | 0.08 | | - | - | - | | | |
| 1977 | CAN | 28 | 28 | 516 | 0.05 | | 17 | 28 | 0.61 | | | |
| | USA | 1,035 | 1,035 | 5,427 | 0.19 | | - | - | - | | | |
| 1978 | CAN | 22 | 22 | 284 | 0.08 | | 1 | 8 | 0.13 | | | |
| | USA | 972 | 972 | 6,244 | 0.16 | | - | - | - | | | |
| 1979 | CAN | 22 | 22 | 131 | 0.17 | | 13 | | | | | |
| | USA | 1,248 | 1,248 | 4,812 | 0.26 | | - | - | - | | | |
| 1980 | CAN | 23 | 23 | 214 | 0.11 | | 9 | 15 | 0.6 | | | |
| | USA | 764 | 764 | 3,848 | 0.20 | | - | - | - | | | |
| 1981 | CAN | 15 | 15 | 77 | 0.19 | | 9 | 24 | 0.38 | | | |
| | USA | 284 | 284 | 5,424 | 0.05 | | - | - | - | | | |
| 1982 | CAN | 129 | 129 | 388 | 0.33 | | 124 | 126 | 0.99 | | | |
| | USA | 60 | 60 | 11,819 | 0.01 | | - | - | - | | | |
| 1983 | CAN | 646 | 646 | 1,455 | 0.44 | | 390 | 837 | 0.47 | 0.39 | | |
| 1984 | CAN | 570 | 335 | 1,644 | 0.20 | | 237 | 658 | 0.36 | 0.3 | | |
| 1985 | CAN | 921 | 349 | 1,242 | 0.28 | | 273 | 521 | 0.52 | 0.45 | | |
| 1986 | CAN | 1,093 | 690 | 3,135 | 0.22 | | 474 | 906 | 0.52 | 0.44 | | |
| 1987 | CAN | 604 | 516 | 2,199 | 0.24 | | 323 | 458 | 0.72 | 0.54 | | |
| 1988 | CAN | 1,197 | 1,007 | 3,878 | 0.26 | | 644 | 1,217 | 0.53 | 0.45 | | |
| 1989 | CAN | 857 | 845 | 5,001 | 0.17 | | 540 | 1,177 | 0.46 | 0.39 | | |
| 1990 | CAN | 654 | 607 | 4,727 | 0.13 | | 315 | 928 | 0.34 | 0.31 | | |
| 1991 | CAN | 421 | 403 | 4,870 | 0.08 | 120 | 153 | 556 | 0.28 | 0.25 | 0.34 | |
| 1992 | CAN | 514 | 506 | 5,297 | 0.10 | 132 | 223 | 783 | 0.28 | 0.25 | 0.33 | |
| 1993 | CAN | 474 | 426 | 4,886 | 0.09 | 120 | 217 | 731 | 0.30 | 0.29 | 0.39 | |
| 1994 | CAN | 509 | 496 | 6020 | 0.08 | 140 | 245 | 948 | 0.26 | 0.25 | 0.32 | |
| 1995 | CAN | 426 | 401 | 5455 | 0.07 | 125 | 208 | 819 | 0.25 | 0.25 | 0.30 | |
| 1996 | CAN | 190 | 179 | 2643 | 0.07 | 100 | 64 | 173 | n/a | n/a | 0.37 | |
| 1997 | CAN | 236 | 200 | 2468 | 0.08 | 90 | 93 | 271 | n/a | n/a | 0.35 | 551 |
| Total | | 16,542 | | | | | | | | | | |
| Mean | | 534 | | | | | | | | | | |
| Last 10 y | | 548 | | | | | | | | | | |
| Last 5 y | | 367 | | | | | | | | | | |

Notes:

U.S. Total Landings equals Washington and Oregon combined.

U.S. Interviewed landings from Washington only (Tagart and Kimura 1982).

Median catch in lbs/tow. 1991-1995 based onfisher logs, 1996-97 based on observer logs.

1997 total landings incudes 24 t from non-observed trips

Table 9.9 Number of samples and number of aged silvergray rockfish by area

| | 3CD | | 5AB | | 5CD | | 5E | | |
|---|---|---|---|---|---|---|---|---|---|
| year | Samples | Aged fish | Samples | Aged fish | Samples | Aged fish | Samples | Aged fish | Grand Total |
| 1977 | 0 | 0 | 2 | 166 | 3 | 259 | 0 | 0 | 5 |
| 1978 | 1 | 99 | 3 | 295 | 3 | 286 | 0 | 0 | 7 |
| 1979 | 0 | 0 | 4 | 365 | 1 | 99 | 0 | 0 | 5 |
| 1980 | 0 | 0 | 2 | 198 | 2 | 200 | 0 | 0 | 4 |
| 1981 | 0 | 0 | 6 | 220 | 0 | 0 | 0 | 0 | 6 |
| 1982 | 1 | 199 | 1 | 25 | 0 | 0 | 0 | 0 | 2 |
| 1983 | 0 | 0 | 1 | 25 | 1 | 25 | 1 | 25 | 3 |
| 1984 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1985 | 15 | 875 | 0 | 0 | 2 | 339 | 0 | 0 | 17 |
| 1986 | 8 | 623 | 4 | 102 | 2 | 288 | 0 | 0 | 14 |
| 1987 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1988 | 0 | 0 | 11 | 869 | 2 | 532 | 0 | 0 | 13 |
| 1989 | 0 | 0 | 0 | 0 | 3 | 75 | 1 | 25 | 4 |
| 1990 | 0 | 0 | 6 | 192 | 10 | 342 | 3 | 77 | 19 |
| 1991 | 2 | 102 | 4 | 220 | 0 | 0 | 0 | 0 | 6 |
| 1992 | 0 | 0 | 4 | 223 | 4 | 249 | 0 | 0 | 8 |
| 1993 | 0 | 0 | 0 | 0 | 7 | 410 | 0 | 0 | 7 |
| 1994 | 1 | 48 | 8 | 444 | 11 | 629 | 3 | 191 | 23 |
| 1995 | 0 | 0 | 5 | 286 | 6 | 353 | 4 | 269 | 15 |
| 1996 | 2 | 113 | 3 | 144 | 2 | 109 | 5 | 297 | 12 |
| 1997 | 0 | 0 | 3 | 163 | 2 | 126 | 1 | 72 | 7 |
| Total | 30 | 2059 | 67 | 3937 | 61 | 4321 | 18 | 956 | 177 |

Table 9.10 Estimated yellowtail rockfish landings (t) by trawl fishery from PMFC Areas 1, 3C, and 3B (1967-1997)

| | | Domest. trawl | | Shrimp trawl | | Hake | Fishery | Total landings | | Total | %Can |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | US | US discard | Can | US | Can | US | Can | US | Can | | |
| 1967 | 35 | 0 | 25 | 0 | 0 | 302 | 0 | 337 | 25 | 362 | 6.9% |
| 1968 | 952 | 0 | 0 | 0 | 0 | 544 | 0 | 1,496 | 0 | 1,496 | 0.0% |
| 1969 | 1,373 | 0 | 187 | 4 | 0 | 587 | 0 | 1,964 | 187 | 2,151 | 8.7% |
| 1970 | 465 | 0 | 37 | 0 | 0 | 185 | 0 | 650 | 37 | 687 | 5.4% |
| 1971 | 365 | 0 | 11 | 0 | 0 | 107 | 0 | 472 | 11 | 483 | 2.3% |
| 1972 | 457 | 0 | 16 | 0 | 0 | 268 | 0 | 725 | 16 | 741 | 2.2% |
| 1973 | 276 | 0 | 22 | 5 | 0 | 332 | 0 | 613 | 22 | 635 | 3.5% |
| 1974 | 50 | 0 | 25 | 37 | 0 | 629 | 0 | 716 | 25 | 741 | 3.4% |
| 1975 | 66 | 0 | 27 | 38 | 0 | 135 | 0 | 239 | 27 | 266 | 10.2% |
| 1976 | 883 | 0 | 127 | 55 | 17 | 55 | 0 | 993 | 144 | 1,137 | 12.7% |
| 1977 | 1,155 | 0 | 200 | 40 | 34 | 0 | 0 | 1,195 | 234 | 1,429 | 16.4% |
| 1978 | 1,212 | 0 | 202 | 95 | 84 | 0 | 120 | 1,307 | 406 | 1,713 | 23.7% |
| 1979 | 1,357 | 0 | 146 | 317 | 16 | 0 | 187 | 1,674 | 349 | 2,023 | 17.3% |
| 1980 | 2,028 | 0 | 50 | 230 | 10 | 38 | 142 | 2,296 | 202 | 2,498 | 8.1% |
| 1981 | 2,847 | 0 | 25 | 237 | 1 | 57 | 120 | 3,141 | 146 | 3,287 | 4.4% |
| 1982 | 2,887 | 0 | 122 | 85 | 1 | 381 | 320 | 3,353 | 443 | 3,796 | 11.7% |
| 1983 | 2,736 | 0 | 17 | 256 | 0 | 268 | 347 | 3,260 | 364 | 3,624 | 10.0% |
| 1984 | 1,013 | 0 | 23 | 60 | 0 | 70 | 350 | 1,143 | 373 | 1,516 | 24.6% |
| 1985 | 942 | 180 | 103 | 46 | 0 | 49 | 264 | 1,217 | 367 | 1,584 | 23.2% |
| 1986 | 1,544 | 294 | 450 | 43 | 0 | 95 | 311 | 1,976 | 761 | 2,737 | 27.8% |
| 1987 | 1,193 | 227 | 505 | 17 | 0 | 61 | 330 | 1,498 | 835 | 2,333 | 35.8% |
| 1988 | 1,705 | 325 | 267 | 16 | 0 | 97 | 334 | 2,143 | 601 | 2,744 | 21.9% |
| 1989 | 1,527 | 291 | 260 | 5 | 0 | 49 | 985 | 1,872 | 1,245 | 3,117 | 39.9% |
| 1990 | 1,447 | 276 | 264 | 3 | 0 | 39 | 398 | 1,765 | 662 | 2,427 | 27.3% |
| 1991 | 945 | 180 | 350 | 42 | 0 | 43 | 414 | 1,210 | 764 | 1,974 | 38.7% |
| 1992 | 1,223 | 233 | 512 | 15 | 0 | 209 | 436 | 1,680 | 948 | 2,628 | 36.1% |
| 1993 | 1,612 | 307 | 833 | 93 | 0 | 14 | 829 | 2,026 | 1,662 | 3,688 | 45.1% |
| 1994 | 2,003 | 381 | 321 | 18 | 0 | 178 | 682 | 2,580 | 1,003 | 3,583 | 28.0% |
| 1995 | 1,757 | 335 | 586 | 25 | 0 | 137 | 159 | 2,253 | 745 | 2,998 | 24.8% |
| 1996 | 1,288 | 245 | 1,254 | 61 | 0 | 434 | 980 | 2,028 | 2,234 | 4,262 | 52.4% |
| 1997 | 506 | 96 | 526 | 2 | 0 | 181 | 206 | 785 | 732 | 1,517 | 48.3% |
| Total | 37,849 | 3,370 | 7,493 | 1,845 | 163 | 5,544 | 7,914 | 48,607 | 15,570 | 64,177 | 32.0% |
| Mean | 1,221 | 109 | 242 | 60 | 5 | 179 | 255 | 1,568 | 502 | 2,070 | 32.0% |
| Last 10 y | 1,401 | 267 | 517 | 28 | 0 | 138 | 542 | 1,834 | 1,060 | 2,894 | 36.6% |
| Last 5 y | 1,389 | 264 | 672 | 27 | 0 | 233 | 507 | 1,912 | 1,179 | 3,090 | 38.1% |
| Note: | US estimated discards in the US domestic fishery as 16% annually from 1985 to present | | | | | | | | | | |

| Table 9.11 Landings of yellowtail rockfish from Areas 3B+3C and 3D. | | | | |
|---|---|---|---|---|
| Year | 3D | 3B-3C | Total | % 3D |
| 1967 | 82 | 2,049 | 2,131 | 4% |
| 1968 | 23 | 1,991 | 2,014 | 1% |
| 1969 | 91 | 2,060 | 2,151 | 4% |
| 1970 | 136 | 2,106 | 2,242 | 6% |
| 1971 | 132 | 2,103 | 2,235 | 6% |
| 1972 | 71 | 2,043 | 2,114 | 3% |
| 1973 | 23 | 1,996 | 2,019 | 1% |
| 1974 | 109 | 2,083 | 2,192 | 5% |
| 1975 | 6,774 | 8,749 | 15,523 | 44% |
| 1976 | 2,369 | 4,345 | 6,714 | 35% |
| 1977 | 182 | 2,159 | 2,341 | 8% |
| 1978 | 37 | 2,015 | 2,052 | 2% |
| 1979 | 116 | 2,095 | 2,211 | 5% |
| 1980 | 64 | 2,044 | 2,108 | 3% |
| 1981 | 27 | 2,008 | 2,035 | 1% |
| 1982 | 13 | 1,995 | 2,008 | 1% |
| 1983 | 36 | 2,019 | 2,055 | 2% |
| 1984 | 19 | 2,003 | 2,022 | 1% |
| 1985 | 288 | 2,273 | 2,561 | 11% |
| 1986 | 3,083 | 5,069 | 8,152 | 38% |
| 1987 | 1,978 | 3,965 | 5,943 | 33% |
| 1988 | 2,037 | 4,025 | 6,062 | 34% |
| 1989 | 1,270 | 3,259 | 4,529 | 28% |
| 1990 | 1,888 | 3,878 | 5,766 | 33% |
| 1991 | 2,044 | 4,035 | 6,079 | 34% |
| 1992 | 1,656 | 3,648 | 5,304 | 31% |
| 1993 | 1,603 | 3,596 | 5,199 | 31% |
| 1994 | 1,579 | 3,573 | 5,152 | 31% |
| 1995 | 1,145 | 3,140 | 4,285 | 27% |
| 1996 | 2,018 | 4,262 | 6,280 | 32% |
| 1997 | 1,083 | 1,517 | 2,600 | 42% |
| | | | | |
| Totals | 31,976 | 92,103 | 124,079 | 26% |
| Mean | 1,031 | 2,971 | 4,003 | 26% |
| 10-year mean | 1,632 | 3,493 | 5,126 | 32% |
| 5-year mean | 1,486 | 3,218 | 4,703 | 32% |

Table 9.12 Area 3C+3D trawl landings (t), effort (hr) and CPUE (t/hr) for canary rockfish

| Year | Nat. | Total trawl landings | Interviewed landings | | | | 25% qualified landings | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | landings | effort | Nominal CPUE | Median CPUE | landings | effort | Rolled-up Nominal CPUE | Tow-by-tow Nominal CPUE | Median CPUE |
| 1967 | USA | 578 | 575 | 4,471 | 0.13 | | - | - | - | | |
| | Can | 4 | 4 | 41 | 0.10 | | 1 | 8 | 0.12 | | |
| 1968 | USA | 938 | 902 | 2,838 | 0.32 | | 0 | 0 | - | | |
| | Can | 19 | 19 | 157 | 0.12 | | 10 | 12 | 0.83 | | |
| 1969 | USA | 779 | 746 | 3,647 | 0.20 | | - | - | - | | |
| | Can | 46 | 46 | 266 | 0.17 | | 42 | 127 | 0.33 | | |
| 1970 | USA | 990 | 938 | 4,785 | 0.20 | | - | - | - | | |
| | Can | 18 | 18 | 96 | 0.19 | | 17 | 89 | 0.19 | | |
| 1971 | USA | 1,011 | 962 | 3,009 | 0.32 | | - | - | - | | |
| | Can | 66 | 66 | 533 | 0.12 | | 52 | 235 | 0.22 | | |
| 1972 | USA | 294 | 292 | 2,969 | 0.10 | | - | - | - | | |
| 1973 | USA | 493 | 490 | 2,619 | 0.19 | | - | - | - | | |
| 1974 | Can | 26 | 26 | 461 | 0.06 | | 15 | 26 | 0.58 | | |
| | USA | 607 | 605 | 2,666 | 0.23 | | - | - | - | | |
| 1975 | Can | 14 | 14 | 186 | 0.08 | | 9 | 10 | 0.9 | | |
| | USA | 658 | 658 | 2,938 | 0.22 | | - | - | - | | |
| 1976 | Can | 193 | 193 | 822 | 0.23 | | 157 | 207 | 0.76 | | |
| | USA | 395 | 395 | 3,945 | 0.10 | | - | - | - | | |
| 1977 | Can | 196 | 196 | 1,808 | 0.12 | | 109 | 147 | 0.74 | | |
| | USA | 358 | 358 | 5,427 | 0.07 | | - | - | - | | |
| 1978 | Can | 68 | 68 | 434 | 0.16 | | 40 | 56 | 0.71 | | |
| | USA | 1,063 | 1,063 | 6,244 | 0.17 | | - | - | - | | |
| 1979 | Can | 122 | 114 | 680 | 0.17 | | 94 | 175 | 0.54 | | |
| | USA | 315 | 315 | 4,812 | 0.07 | | - | - | - | | |
| 1980 | Can | 126 | 126 | 1,058 | 0.12 | | 109 | 204 | 0.53 | | |
| | USA | 477 | 477 | 3,848 | 0.12 | | - | - | - | | |
| 1981 | Can | 66 | 66 | 929 | 0.07 | | 42 | 84 | 0.5 | | |
| | USA | 249 | 249 | 5,424 | 0.05 | | - | - | - | | |
| 1982 | Can | 316 | 316 | 1,415 | 0.22 | | 286 | 309 | 0.93 | | |
| | USA | 133 | 133 | 11,819 | 0.01 | | - | - | - | | |
| 1983 | Can | 853 | 647 | 1,723 | 0.38 | | 593 | 1,049 | 0.57 | | |
| 1984 | Can | 1,189 | 947 | 1,079 | 0.46 | | 916 | 1,170 | 0.78 | | |
| 1985 | Can | 903 | 611 | 1,897 | 0.32 | | 557 | 779 | 0.72 | | |
| 1986 | Can | 722 | 529 | 2,841 | 0.19 | | 344 | 651 | 0.53 | | |
| 1987 | Can | 695 | 600 | 2,535 | 0.24 | | 462 | 670 | 0.69 | | |
| 1988 | Can | 313 | 291 | 2,085 | 0.14 | | 176 | 516 | 0.34 | | |
| 1989 | Can | 1,173 | 1,154 | 6,520 | 0.18 | | 854 | 1,862 | 0.46 | | |
| 1990 | Can | 794 | 731 | 6,009 | 0.12 | | 384 | 1,180 | 0.33 | | |
| 1991 | Can | 652 | 632 | 7,287 | 0.09 | 120 | 302 | 1,061 | 0.28 | 0.38 | |
| 1992 | Can | 774 | 763 | 7,810 | 0.10 | 120 | 421 | 1,484 | 0.28 | 0.36 | |
| 1993 | Can | 835 | 817 | 8,342 | 0.09 | 120 | 502 | 1,347 | 0.37 | 0.40 | |
| 1994 | Can | 765 | 747 | 7,564 | 0.10 | 135 | 508 | 1,315 | 0.39 | 0.45 | |
| 1995 | Can | 623 | 603 | 7,146 | 0.08 | 124 | 421 | 900 | 0.47 | 0.51 | |
| 1996 | Can | 306 | 264 | 3,262 | 0.08 | 73 | 168 | 290 | n/a | 0.58 | |
| 1997 | Can | 387 | 308 | 2,530 | 0.12 | 79 | 225 | 460 | n/a | 0.49 | 690 |
| Total | | 21,602 | | | | | | | | | |
| Mean | | 697 | | | | | | | | | |
| last 10 y | | 662 | | | | | | | | | |
| last 5 y | | 583 | | | | | | | | | |

Notes
U.S. total landings equals Washington and Oregon combined.
U.S. interviewed landings from Washington only (Tagart and Kimura 1982).
Median CPUE in lbs/tow. 1991-1995 based on fisher logs, 1996 - 1997 based on observer data

Table 9.13 Area 5A and 5B trawl landings (excluding Moresby Gully) (t), effort (hr), and CPUE (t/hr) for silvergray rockfish

| Year | Nat. | Total landings | landings | Int. ldgs effort | nominal CPUE | median CPUE | landings | effort | 25% Qualified nominal CPUE | Rolled-up CPUE | Tow-by-tow CPUE | median CPUE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1967 | Can | 87 | 89 | 539 | 0.17 | | 63 | 200 | 0.32 | | | |
| | USA | 397 | 396 | 9,431 | 0.04 | | - | - | - | | | |
| 1968 | Can | 78 | 78 | 644 | 0.12 | | 37 | 109 | 0.34 | | | |
| | USA | 933 | 822 | 8,488 | 0.10 | | - | - | - | | | |
| 1969 | Can | 78 | 78 | 1188 | 0.07 | | 28 | 152 | 0.18 | | | |
| | USA | 1,291 | 1,276 | 13,557 | 0.09 | | - | - | - | | | |
| 1970 | Can | 14 | 14 | 287 | 0.05 | | 6 | 29 | 0.21 | | | |
| | USA | 189 | 189 | 9,264 | 0.02 | | - | - | - | | | |
| 1971 | Can | 16 | 16 | 331 | 0.05 | | 6 | 66 | 0.09 | | | |
| | USA | 521 | 512 | 7,137 | 0.07 | | - | - | - | | | |
| 1972 | Can | 54 | 54 | 654 | 0.08 | | 21 | 108 | 0.19 | | | |
| | USA | 251 | 251 | 9,224 | 0.03 | | - | - | - | | | |
| 1973 | Can | 40 | 40 | 328 | 0.12 | | 33 | 70 | 0.47 | | | |
| | USA | 189 | 189 | 9,625 | 0.02 | | - | - | - | | | |
| 1974 | Can | 45 | 45 | 412 | 0.11 | | 9 | 12 | 0.75 | | | |
| | USA | 377 | 377 | 8,797 | 0.04 | | - | - | - | | | |
| 1975 | Can | 31 | 31 | 479 | 0.06 | | 19 | 61 | 0.31 | | | |
| | USA | 306 | 306 | 5,179 | 0.06 | | - | - | - | | | |
| 1976 | Can | 172 | 172 | 1,914 | 0.09 | | 82 | 224 | 0.37 | | | |
| | USA | 443 | 443 | 4,620 | 0.10 | | - | - | - | | | |
| 1977 | Can | 198 | 198 | 2,462 | 0.08 | | 123 | 320 | 0.38 | | | |
| | USA | 440 | 440 | 5,165 | 0.09 | | - | - | - | | | |
| 1978 | Can | 723 | 723 | 4,049 | 0.18 | | 468 | 1,069 | 0.44 | 0.36 | | |
| | USA | 57 | 57 | 909 | 0.06 | | - | - | - | | | |
| 1979 | Can | 629 | 629 | 3,885 | 0.16 | | 429 | 1,225 | 0.35 | 0.29 | | |
| | USA | 298 | 298 | 1,696 | 0.18 | | - | - | - | | | |
| 1980 | Can | 629 | 625 | 3,681 | 0.17 | | 495 | 1,538 | 0.32 | 0.29 | | |
| | USA | 147 | 147 | 1,146 | 0.13 | | - | - | - | | | |
| 1981 | Can | 415 | 415 | 2,120 | 0.20 | | 340 | 808 | 0.42 | 0.4 | | |
| 1982 | Can | 618 | 597 | 4,099 | 0.15 | | 430 | 1,208 | 0.36 | 0.33 | | |
| 1983 | Can | 524 | 477 | 3,348 | 0.14 | | 323 | 1,073 | 0.3 | 0.29 | | |
| 1984 | Can | 982 | 718 | 3,481 | 0.21 | | 642 | 1,948 | 0.33 | 0.31 | | |
| 1985 | Can | 997 | 724 | 3,555 | 0.20 | | 611 | 1,860 | 0.33 | 0.32 | | |
| 1986 | Can | 700 | 564 | 3,812 | 0.15 | | 388 | 1,314 | 0.3 | 0.27 | | |
| 1987 | Can | 1,224 | 1,083 | 6,509 | 0.17 | | 641 | 1,596 | 0.4 | 0.41 | | |
| 1988 | Can | 1,051 | 1,016 | 7,232 | 0.14 | | 596 | 1,554 | 0.38 | 0.35 | | |
| 1989 | Can | 809 | 779 | 6,625 | 0.12 | | 425 | 1,359 | 0.31 | 0.32 | | |
| 1990 | Can | 730 | 697 | 7,420 | 0.09 | | 347 | 1,116 | 0.31 | 0.29 | | |
| 1991 | Can | 595 | 580 | 8,590 | 0.07 | 150 | 213 | 704 | 0.3 | 0.29 | 0.31 | |
| 1992 | Can | 641 | 624 | 7,786 | 0.08 | 150 | 201 | 822 | 0.24 | 0.24 | 0.29 | |
| 1993 | Can | 520 | 471 | 6,351 | 0.07 | 150 | 197 | 924 | 0.21 | 0.22 | 0.25 | |
| 1994 | Can | 974 | 964 | 7,335 | 0.13 | 180 | 685 | 2,351 | 0.29 | 0.31 | 0.35 | |
| 1995 | Can | 866 | 808 | 8,726 | 0.09 | 150 | 536 | 2,677 | 0.2 | 0.2 | 0.24 | |
| 1996 | Can | 409 | 397 | 4575 | 0.09 | 100 | 243 | 610 | n/a | n/a | 0.40 | |
| 1997 | Can | 468 | 463 | 5653 | 0.08 | 100 | 269 | 676 | n/a | n/a | 0.40 | 750 |
| | | | | | | | | | | | | |
| Total | 21156 | | | | | | | | | | | |
| Mean | 706 | | (includes 738 t captured by foreign vessels in the 1970's) | | | | | | | | | |
| last 10 y | 706 | | | | | | | | | | | |
| last 5 y | 647 | | | | | | | | | | | |

Notes:

U.S. total landings equals Washington and Oregon combined.

U.S. interviewed landings from Washington only (Tagart and Kimura 1982).

Median CPUE in lbs/tow. 1991-1995 based on fisher logs, 1996 based on observer logs

Table 9.14 Area 5A+5B trawl landings (t), effort (hr) and CPUE of canary rockfish

| Year | Nat. | Total landings | | Interviewed landings | | | | 25% Qualified landings | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | landings | effort | nominal CPUE | median Catch | | landings | effort | nominal CPUE | tow-by-tow CPUE | Median Catch |
| 1967 | Can | 41 | 41 | 535 | 0.08 | | | 13 | 32 | 0.41 | | |
| | USA | 216 | 215 | 9,431 | 0.02 | | | - | - | - | | |
| 1968 | Can | 49 | 49 | 576 | 0.09 | | | 31 | 78 | 0.40 | | |
| | USA | 1,034 | 937 | 8,488 | 0.11 | | | - | - | - | | |
| 1969 | Can | 67 | 67 | 733 | 0.09 | | | 37 | 110 | 0.34 | | |
| | USA | 464 | 418 | 13,557 | 0.03 | | | - | - | - | | |
| 1970 | Can | 6 | 6 | 80 | 0.08 | | | 4 | 12 | 0.33 | | |
| | USA | 220 | 220 | 9,264 | 0.02 | | | - | - | - | | |
| 1971 | Can | 18 | 18 | 329 | 0.05 | | | 6 | 8 | 0.75 | | |
| | USA | 207 | 183 | 7,137 | 0.03 | | | - | - | - | | |
| 1972 | USA | 61 | 61 | 9,224 | 0.01 | | | - | - | - | | |
| 1973 | Can | 29 | 29 | 119 | 0.24 | | | 23 | 80 | 0.29 | | |
| | USA | 298 | 298 | 9,625 | 0.03 | | | - | - | - | | |
| 1974 | Can | 3 | 3 | 81 | 0.04 | | | 1 | 7 | 0.14 | | |
| | USA | 257 | 257 | 8,797 | 0.03 | | | - | - | - | | |
| 1975 | Can | 23 | 23 | 403 | 0.06 | | | 15 | 17 | 0.88 | | |
| | USA | 189 | 189 | 5,179 | 0.04 | | | - | - | - | | |
| 1976 | Can | 92 | 92 | 1,558 | 0.06 | | | 16 | 49 | 0.33 | | |
| | USA | 447 | 447 | 4,620 | 0.10 | | | - | - | - | | |
| 1977 | Can | 121 | 121 | 2,356 | 0.05 | | | 53 | 192 | 0.28 | | |
| | USA | 288 | 288 | 5,165 | 0.06 | | | - | - | - | | |
| 1978 | Can | 263 | 263 | 2,692 | 0.10 | | | 101 | 242 | 0.42 | | |
| | USA | 8 | 8 | 909 | 0.01 | | | - | - | - | | |
| 1979 | Can | 308 | 308 | 3,070 | 0.10 | | | 211 | 582 | 0.36 | | |
| | USA | 62 | 62 | 1,696 | 0.04 | | | - | - | - | | |
| 1980 | Can | 276 | 276 | 2,157 | 0.13 | | | 198 | 451 | 0.44 | | |
| | USA | 88 | 88 | 1,146 | 0.08 | | | - | - | - | | |
| 1981 | Can | 144 | 144 | 1,636 | 0.09 | | | 69 | 201 | 0.35 | | |
| 1982 | Can | 358 | 330 | 3,203 | 0.10 | | | 210 | 706 | 0.30 | | |
| 1983 | Can | 343 | 299 | 2,851 | 0.11 | | | 152 | 454 | 0.33 | | |
| 1984 | Can | 507 | 321 | 2,506 | 0.13 | | | 228 | 686 | 0.33 | | |
| 1985 | Can | 391 | 281 | 2,823 | 0.10 | | | 162 | 553 | 0.29 | | |
| 1986 | Can | 262 | 211 | 2,931 | 0.07 | | | 64 | 253 | 0.25 | | |
| 1987 | Can | 560 | 510 | 4,248 | 0.12 | | | 245 | 572 | 0.43 | | |
| 1988 | Can | 544 | 529 | 5,792 | 0.09 | | | 195 | 652 | 0.30 | | |
| 1989 | Can | 514 | 501 | 5,419 | 0.09 | | | 238 | 611 | 0.39 | | |
| 1990 | Can | 519 | 498 | 6,526 | 0.08 | | | 149 | 577 | 0.26 | | |
| 1991 | Can | 511 | 499 | 8,356 | 0.06 | 150 | | 161 | 637 | 0.25 | 0.37 | |
| 1992 | Can | 461 | 449 | 6,241 | 0.07 | 150 | | 185 | 588 | 0.32 | 0.39 | |
| 1993 | Can | 184 | 169 | 3,582 | 0.05 | 150 | | 59 | 224 | 0.26 | 0.32 | |
| 1994 | Can | 256 | 247 | 4,413 | 0.06 | 150 | | 89 | 211 | 0.42 | 0.49 | |
| 1995 | Can | 168 | 146 | 4,572 | 0.03 | 150 | | 55 | 213 | 0.26 | 0.32 | |
| 1996 | Can | 125 | 117 | 2832 | 0.04 | 29 | | 60 | 91 | n/a | 0.66 | |
| 1997 | Can | 202 | 200 | 3793 | 0.05 | 40 | | 109 | 255 | n/a | 0.43 | 1000 |
| Total | | 11,184 | | | | | | | | | | |
| Mean | | 361 | | | | | | | | | | |
| last 10 y | | 348 | | | | | | | | | | |
| last 5 y | | 187 | | | | | | | | | | |

U.S. total landings equals Washington and Oregon combined.
U.S. interviewed landings form Washington only (Tagart and Kimura 1982).

Table 9.15 Area 5C and 5D trawl landings and CPUE of silvergray rockfish

| Year | Total | | Interviewed landings | | | | 25% qualified landings | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | landings | landings | effort | nominal CPUE | median Catch | | landings | effort | nominal CPUE | tow-by-tow CPUE | Median catch |
| 1971 | 34 | 34 | 229 | 0.15 | | | 24 | 121 | 0.20 | | |
| 1972 | 61 | 61 | 232 | 0.26 | | | 44 | 54 | 0.81 | | |
| 1973 | 10 | 10 | 147 | 0.07 | | | - | - | - | | |
| 1974 | 13 | 13 | 64 | 0.20 | | | 11 | 34 | 0.33 | | |
| 1975 | 11 | 11 | 190 | 0.06 | | | 4 | 5 | 0.79 | | |
| 1976 | 118 | 118 | 1,440 | 0.08 | | | 55 | 414 | 0.13 | | |
| 1977 | 232 | 232 | 2,019 | 0.12 | | | 142 | 468 | 0.30 | | |
| 1978 | 235 | 235 | 1,413 | 0.17 | | | 177 | 301 | 0.59 | | |
| 1979 | 429 | 429 | 3,029 | 0.14 | | | 285 | 701 | 0.41 | | |
| 1980 | 346 | 344 | 1,938 | 0.18 | | | 186 | 396 | 0.47 | | |
| 1981 | 456 | 415 | 1,762 | 0.24 | | | 343 | 311 | 1.10 | | |
| 1982 | 259 | 238 | 1,799 | 0.13 | | | 149 | 212 | 0.70 | | |
| 1983 | 451 | 348 | 1,108 | 0.31 | | | 289 | 337 | 0.86 | | |
| 1984 | 647 | 383 | 2,081 | 0.18 | | | 315 | 710 | 0.44 | | |
| 1985 | 1,043 | 729 | 2,133 | 0.34 | | | 578 | 458 | 1.26 | | |
| 1986 | 1,082 | 1,056 | 1,796 | 0.59 | | | 1,024 | 927 | 1.10 | | |
| 1987 | 763 | 632 | 1,928 | 0.33 | | | 531 | 592 | 0.90 | | |
| 1988 | 893 | 881 | 3,270 | 0.27 | | | 625 | 1,064 | 0.59 | | |
| 1989 | 743 | 741 | 2,731 | 0.27 | | | 538 | 1,063 | 0.51 | | |
| 1990 | 587 | 568 | 3,689 | 0.15 | | | 360 | 861 | 0.42 | | |
| 1991 | 320 | 319 | 3,286 | 0.10 | 120 | | 193 | 470 | 0.41 | 0.50 | |
| 1992 | 347 | 344 | 3,534 | 0.10 | 120 | | 189 | 510 | 0.37 | 0.41 | |
| 1993 | 478 | 469 | 3,916 | 0.12 | 120 | | 295 | 774 | 0.38 | 0.45 | |
| 1994 | 1,046 | 1,046 | 4,468 | 0.23 | 125 | | 950 | 1,501 | 0.63 | 0.68 | |
| 1995 | 567 | 564 | 4,439 | 0.13 | 120 | | 451 | 1,037 | 0.44 | 0.48 | |
| 1996 | 315 | 311 | 3,954 | 0.08 | 56 | | 215 | 376 | n/a | 0.57 | |
| 1997 | 236 | 232 | 2,552 | 0.09 | 50 | | 166 | 267 | n/a | 0.62 | 1450 |
| Total | 11,722 | | | | | | | | | | |
| Mean | 434 | | | | | | | | | | |
| last 10 y | 553 | | | | | | | | | | |
| last 5 y | 528 | | | | | | | | | | |
| Notes: | | | | | | | | | | | |
| | Used rolled-up landings data | | | | | | | | | | |

Table 9.16 Area 5E-N and 5E-S trawl landings (t), effort (hr) and CPUE (t/h) of silvergray rockfish

| Year | Region | Interviewed | | | 25% Qualified | |
|---|---|---|---|---|---|---|
| | | Total landings | Effort | CPUE | Total Landings | Effort |
| 1977 | 5E-N | 0 | 0 | | 0 | 0 |
| 1978 | 5E-N | 16 | 91 | | 16 | 21 |
| 1979 | 5E-N | 8 | 95 | | 0 | 0 |
| 1980 | 5E-N | 15 | 17 | | 15 | 17 |
| 1981 | 5E-N | 2 | 10 | | 0 | 0 |
| 1982 | 5E-N | 38 | 56 | | 27 | 9 |
| 1983 | 5E-N | 16 | 108 | | 1 | 1 |
| 1984 | 5E-N | 248 | 731 | | 61 | 33 |
| 1985 | 5E-N | 245 | 1,258 | | 158 | 219 |
| 1986 | 5E-N | 172 | 1,772 | | 35 | 39 |
| 1987 | 5E-N | 85 | 1,004 | | 6 | 21 |
| 1988 | 5E-N | 131 | 1,521 | | 40 | 76 |
| 1989 | 5E-N | 333 | 1,555 | | 188 | 361 |
| 1990 | 5E-N | 137 | 1,208 | | 65 | 133 |
| 1991 | 5E-N | 19 | 64 | | 16 | 28 |
| 1992 | 5E-N | 5 | 17 | | 5 | 16 |
| 1993 | 5E-N | 34 | 79 | | 30 | 31 |
| 1994 | 5E-N | 109 | 239 | | 109 | 113 |
| 1995 | 5E-N | 111 | 195 | | 111 | 106 |
| 1996 | 5E-N | 69 | 162 | | 65 | 38 |
| 1997 | 5E-N | 62 | 110 | | 58 | 44 |
| Total | | 1,855 | | | | |
| Mean | | 88 | | | | |
| last 10 years | | 101 | | | | |
| last 5 years | | 77 | | | | |
| 1977 | 5E-S | 20 | 136 | 0.15 | 0 | 0 |
| 1978 | 5E-S | 124 | 572 | 0.22 | 56 | 105 |
| 1979 | 5E-S | 44 | 189 | 0.23 | 30 | 19 |
| 1980 | 5E-S | 104 | 246 | 0.42 | 81 | 97 |
| 1981 | 5E-S | 57 | 74 | 0.30 | 12 | 12 |
| 1982 | 5E-S | 27 | 152 | 0.14 | 7 | 4 |
| 1983 | 5E-S | 130 | 414 | 0.31 | 44 | 58 |
| 1984 | 5E-S | 78 | 246 | 0.29 | 47 | 104 |
| 1985 | 5E-S | 212 | 466 | 0.38 | 85 | 142 |
| 1986 | 5E-S | 295 | 601 | 0.41 | 112 | 154 |
| 1987 | 5E-S | 113 | 586 | 0.17 | 30 | 53 |
| 1988 | 5E-S | 255 | 1,001 | 0.24 | 108 | 96 |
| 1989 | 5E-S | 120 | 522 | 0.23 | 50 | 71 |
| 1990 | 5E-S | 95 | 530 | 0.18 | 32 | 22 |
| 1991 | 5E-S | 104 | 624 | 0.17 | 26 | 41 |
| 1992 | 5E-S | 136 | 605 | 0.22 | 72 | 190 |
| 1993 | 5E-S | 251 | 541 | 0.44 | 160 | 205 |
| 1994 | 5E-S | 215 | 433 | 0.50 | 172 | 212 |
| 1995 | 5E-S | 110 | 370 | 0.30 | 81 | 119 |
| 1996 | 5E-S | 137 | 562 | 0.24 | 106 | 141 |
| 1997 | 5E-S | 146 | 402 | 0.36 | 124 | 135 |
| Total | | 2773 | | | | |
| Mean | | 132 | | | | |
| last 10 y | | 157 | | | | |
| last 5 y | | 172 | | | | |