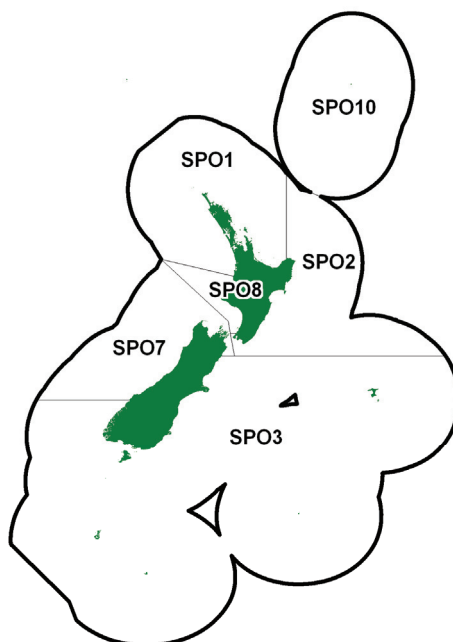


RIG (SPO)

(*Mustelus lenticulatus*)
Pioke, Makoo



1. FISHERIES SUMMARY

1.1 Commercial fisheries

Rig are caught in coastal waters throughout New Zealand. Most of the catch is taken in water less than 50 m deep during spring and summer, when rig aggregate inshore. Before the introduction of the QMS in 1986, 80% of the commercial catch was taken by bottom setnet and most of the remainder by trawl. Total reported landings of rig increased rapidly during the 1970s, and averaged about 3200 t per year during the late 1970s and early 1980s (Table 1). Since then, a larger proportion has been taken by trawlers as bycatch, but the exact split by method is unknown (because method data were available only for a portion of the rig catch in the CELR database). The most important bottom setnet fisheries are at 90-Mile Beach, Kaipara Harbour, Manukau Harbour, South Taranaki Bight – Tasman/Golden Bay, Canterbury Bight, Kaikoura and Hauraki Gulf. Due to a decline in CPUE the TACC for SPO 7 was decreased to 221 t on the 1st October 2006. Figure 1 shows the historical landings and TACC values for the main SPO stocks.

Table 1: Reported total New Zealand landings (t) of rig for the calendar years 1965 to 1985. Sources: MAF and FSU data.

| Year | Landings | Year | Landings | Year | Landings | Year | Landings | Year | Landings |
|------|----------|------|----------|------|----------|------|----------|------|----------|
| 1965 | 723 | 1970 | 930 | 1974 | 2 040 | 1978 | 3 300 | 1982 | 3 425 |
| 1966 | 850 | 1971 | 1 120 | 1975 | 1 841 | 1979 | 2 701 | 1983 | 3 826 |
| 1967 | 737 | 1972 | 1 011 | 1976 | 2 610 | 1980 | 3 000 | 1984 | 3 562 |
| 1968 | 677 | 1973 | – | 1977 | 3 281 | 1981 | 3 006 | 1985 | 3 222 |
| 1969 | 690 | | | | | | | | |

Following the introduction of rig to the QMS in 1986, landings declined to less than half those of the previous decade in response to the TACCs. Since 1986–87, landings have generally increased in response to TACC increases (Table 2). TACCs for all Fishstocks except SPO 10 were increased by 20% for the 1991–92 fishing year under the Adaptive Management Programme (AMP). Another TACC increase (from 454 t to 600 t) was implemented in SPO 3 for the 2000–01 fishing year. The TACCs for SPO 1, SPO 2 and SPO 8 reverted to the pre-AMP levels in the 1997–98 fishing year, when these Fishstocks were removed from the AMP in July 1997. The TACC for SPO 2 was increased from 72 t to 86 t from 1 October 2004 under the low knowledge bycatch framework.

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In October 1992, the conversion factors for headed and gutted, and dressed, rig were both reduced from 2.00 to 1.75. They were each further reduced to 1.55 in 2000-01. Landings prior to 2000-01 have not been adjusted for the changes in the conversion factor.

Commercial landings of rig in SPO 1 have declined consistently since 1991-92. Although changes to the conversion factors mean that landings prior to 2000-01 are overestimated, catches since that time have continued to decline.

The Banks Peninsula Marine Mammal Sanctuary was established in 1988 by the Department of Conservation under the Marine Mammal Protection Act 1978, for the purpose of protecting Hector's dolphins. The sanctuary extends 4 nautical miles from the coast from Sumner Head in the north to the Rakaia River mouth in the south. Prior to 1 October 2008, no setnets were allowed within the sanctuary between 1 November to the end of February. For the remainder of the year, setnets were allowed; but could only be set from an hour after sunrise to an hour before sunset, be no more than 30 metres long, with only one net per boat which was required to remain tied to the net while it was set.

Voluntary setnet closures were implemented by the SEFMC from 1 October 2000 to protect nursery grounds for rig and elephantfish and to reduce interactions between commercial setnets and Hector's dolphins in shallow waters. The closed area extended from the southern most end of the Banks Peninsula Marine Mammal Sanctuary to the northern bank of the mouth of the Waitaki River. This area was closed permanently for a distance of 1 nautical mile offshore and for 4 nautical miles offshore for the period 1 October to 31 January.

From 1 October 2008, a suite of regulations intended to protect Maui's and Hector's dolphins was implemented for all of New Zealand by the Minister of Fisheries.

For SPO 1, there have been two recent changes to the management regulations affecting setnet fisheries which take school shark off the west coast of the North Island. The first was a closure to setnet fishing from Maunganui Bluff to Pariokariwa Point for a distance of 4 nautical miles on 1 October 2003. This closure was extended by the Minister to 7 nautical miles on 1 October 2008. An appeal was made by affected fishers who were granted interim relief by the High Court, allowing setnet fishing beyond 4 nautical miles during daylight hours between 1 October to 24 December.

For SPO 3, commercial and recreational set netting was banned in most areas to 4 nautical miles offshore of the east coast of the South Island, extending from Cape Jackson in the Marlborough Sounds to Slope Point in the Catlins. Some exceptions were allowed, including an exemption for commercial and recreational set netting to only one nautical mile offshore around the Kaikoura Canyon, and permitting setnetting in most harbours, estuaries, river mouths, lagoons and inlets except for the Avon-Heathcote Estuary, Lyttelton Harbour, Akaroa Harbour and Timaru Harbour. In addition, trawl gear within 2 nautical miles of shore was restricted to flatfish nets with defined low headline heights.

For SPO 5, commercial and recreational setnetting was banned in most areas to 4 nautical miles offshore, extending from Slope Point in the Catlins to Sandhill Point east of Fiordland and in all of Te Waewae Bay. An exemption which permitted setnetting in harbours, estuaries and inlets was allowed. In addition, trawl gear within 2 nautical miles of shore was restricted to flatfish nets with defined low headline heights.

For SPO 7, both commercial and recreational setnetting were banned to 2 nautical miles offshore, with the recreational closure effective for the entire year and the commercial closure restricted to the period 1 December to the end of February. The closed area extends from Awarua Point north of Fiordland to the tip of Cape Farewell at the top of the South Island. There is no equivalent closure in SPO 8, with the southern limit of the Maui's dolphin closure beginning north of New Plymouth at Pariokariwa Point. There have been two recent changes to the management regulations affecting setnet fisheries which take school shark off the west coast of the North Island.

Table 2: Reported landings (t) of rig by Fishstock from 1985–86 to 2008–09 and actual TACCs (t) from 1986–87 to 2008–09. QMS data from 1986–present.

| Fishstock FMA (s) | SPO 1 1 & 9 | | SPO 2 2 | | SPO 3 3,4,5, & 6 | | SPO 7 7 | | SPO 8 8 | |
|----------------------|----------------|------|------------|------|---------------------|------|------------|------|------------|------|
| | Landings | TACC | Landings | TACC | Landings | TACC | Landings | TACC | Landings | TACC |
| 1985–86* | 845 | – | 96 | – | 921 | – | 367 | – | 465 | – |
| 1986–87 | 366 | 540 | 55 | 60 | 312 | 330 | 233 | 240 | 125 | 240 |
| 1987–88 | 525 | 614 | 66 | 68 | 355 | 347 | 262 | 269 | 187 | 261 |
| 1988–89 | 687 | 653 | 68 | 70 | 307 | 352 | 239 | 284 | 212 | 295 |
| 1989–90 | 689 | 687 | 61 | 70 | 292 | 359 | 266 | 291 | 206 | 310 |
| 1990–91 | 656 | 688 | 63 | 71 | 284 | 364 | 268 | 294 | 196 | 310 |
| 1991–92 | 878 | 825 | 105 | 85 | 352 | 430 | 290 | 350 | 145 | 370 |
| 1992–93 | 719 | 825 | 90 | 86 | 278 | 432 | 324 | 350 | 239 | 370 |
| 1993–94 | 631 | 829 | 96 | 86 | 327 | 452 | 310 | 350 | 255 | 370 |
| 1994–95 | 666 | 829 | 88 | 86 | 402 | 454 | 341 | 350 | 273 | 370 |
| 1995–96 | 603 | 829 | 107 | 86 | 408 | 454 | 400 | 350 | 330 | 370 |
| 1996–97 | 681 | 829 | 99 | 86 | 434 | 454 | 397 | 350 | 277 | 370 |
| 1997–98 | 621 | 692 | 85 | 72 | 442 | 454 | 325 | 350 | 287 | 310 |
| 1998–99 | 553 | 692 | 86 | 72 | 426 | 454 | 336 | 350 | 235 | 310 |
| 1999–00 | 608 | 692 | 86 | 72 | 427 | 454 | 330 | 350 | 219 | 310 |
| 2000–01 | 554 | 692 | 81 | 72 | 458 | 600 | 338 | 350 | 174 | 310 |
| 2001–02 | 436 | 692 | 86 | 72 | 391 | 600 | 282 | 350 | 216 | 310 |
| 2002–03 | 477 | 692 | 86 | 72 | 417 | 600 | 264 | 350 | 209 | 310 |
| 2003–04 | 481 | 692 | 81 | 72 | 354 | 600 | 293 | 350 | 203 | 310 |
| 2004–05 | 429 | 692 | 108 | 86 | 366 | 600 | 266 | 350 | 208 | 310 |
| 2005–06 | 345 | 692 | 110 | 86 | 389 | 600 | 288 | 350 | 163 | 310 |
| 2006–07 | 400 | 692 | 101 | 86 | 423 | 600 | 265 | 221 | 176 | 310 |
| 2007–08 | 297 | 692 | 104 | 86 | 472 | 600 | 231 | 221 | 220 | 310 |
| 2008–09 | 297 | 692 | 106 | 86 | 328 | 600 | 233 | 221 | 222 | 310 |

| Fishstock FMA (s) | SPO 10 10 | | Total | |
|----------------------|--------------|------|-----------|-------|
| | Landings | TACC | Landings§ | TACC |
| 1985–86* | 0 | – | 2 906 | – |
| 1986–87 | 0 | 10 | 1 091 | 1 420 |
| 1987–88 | 0 | 10 | 1 395 | 1 569 |
| 1988–89 | 0 | 10 | 1 513 | 1 664 |
| 1989–90 | 0 | 10 | 1 514 | 1 727 |
| 1990–91 | 0 | 10 | 1 467 | 1 737 |
| 1991–92 | 0 | 10 | 1 770 | 2 070 |
| 1992–93 | 0 | 10 | 1 650 | 2 072 |
| 1993–94 | 0 | 10 | 1 619 | 2 097 |
| 1994–95 | 0 | 10 | 1 769 | 2 098 |
| 1995–96 | 0 | 10 | 1 848 | 2 098 |
| 1996–97 | 0 | 10 | 1 888 | 2 098 |
| 1997–98 | 0 | 10 | 1 760 | 1 888 |
| 1998–99 | 0 | 10 | 1 635 | 1 888 |
| 1999–00 | 0 | 10 | 1 670 | 1 888 |
| 2000–01 | 0 | 10 | 1 607 | 2 034 |
| 2001–02 | 0 | 10 | 1 411 | 2 034 |
| 2002–03 | 0 | 10 | 1 453 | 2 034 |
| 2003–04 | 0 | 10 | 1 412 | 2 034 |
| 2004–05 | 0 | 10 | 1 377 | 204 8 |
| 2005–06 | 0 | 10 | 1 295 | 2 048 |
| 2006–07 | 0 | 10 | 1 365 | 1 919 |
| 2007–08 | 0 | 10 | 1 324 | 1 919 |
| 2008–09 | 0 | 10 | 1 186 | 1 919 |

*FSU data.

§Includes landings from unknown areas before 1986-87

SPO 7 is managed under a stakeholder led fisheries plan. This fisheries plan was developed by the Challenger Finfisheries Management Company Limited on behalf of quota owners and includes details of rebuild goals and objectives for the rig fishery in quota management area 7 (SPO 7). It represents part of the commitment made by 93% of the rig quota owners towards improving the value of their property rights and ensuring the future utilisation of the fishery for future generations. This plan was submitted to the Minister of Fisheries for approval pursuant to Section 11(a) of the Fisheries Act 1996. The plan seeks to improve the productivity of the SPO 7 fishstock through implementing area closures and catch reductions.

RIG (SPO)

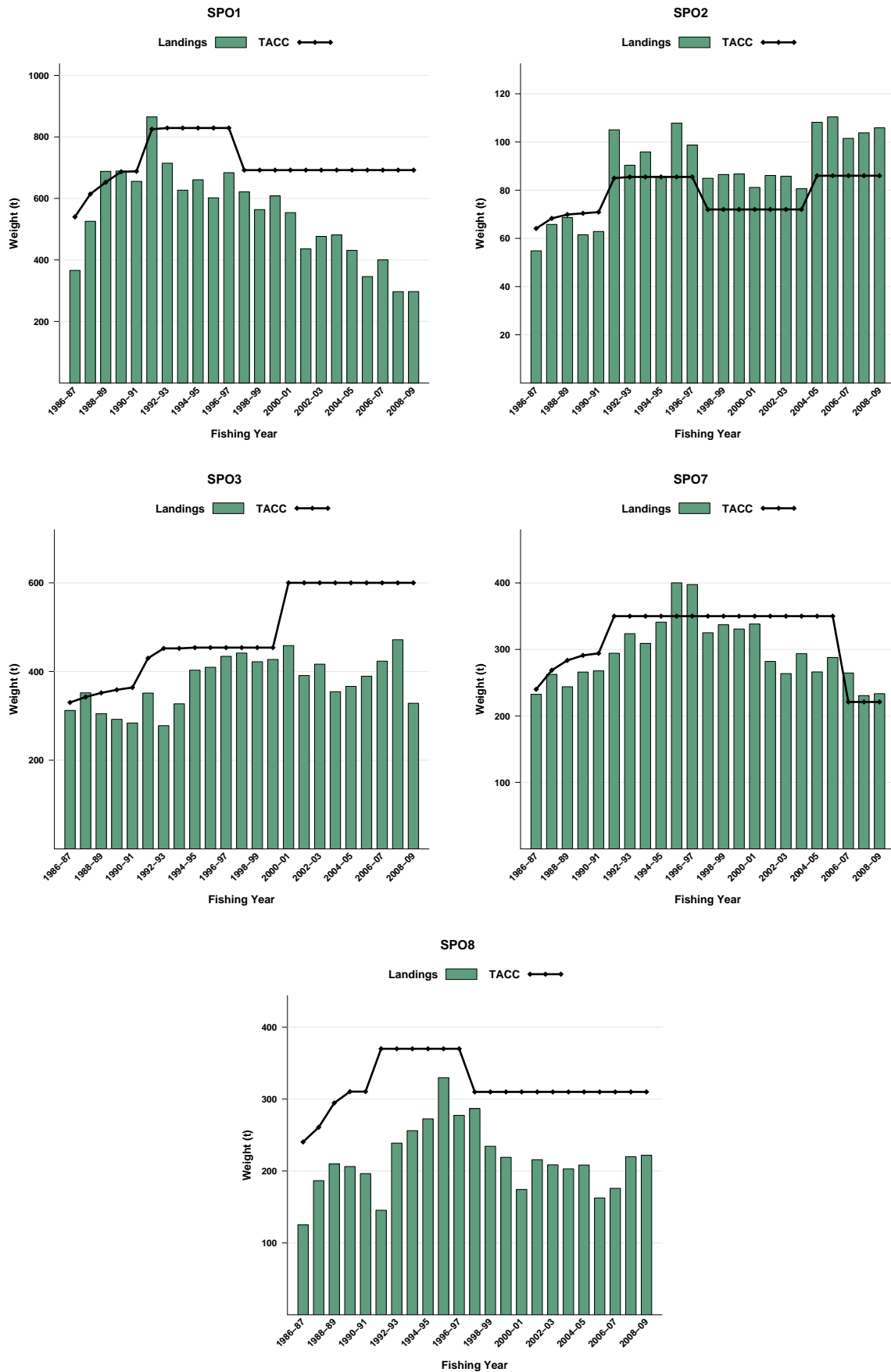


Figure 1: Historical landings and TACC for the five main SPO stocks. From top left: SPO1 (Auckland East), SPO2 (Central East), SPO3 (South East Coast), SPO7 (Challenger), and SPO8 (Central Egmont). Note that these figures do not show data prior to entry into the QMS.

1.2 Recreational fisheries

Rig are caught by recreational fishers throughout New Zealand. Less than 3% of the recaptures of rig tagged around the South Island and Manawatu coasts in 1982–84 were returned by recreational fishers. Estimates of recreational landings obtained from three surveys, 1991–92 to 1993–94, 1996 and 1999–00 are given in Table 3. Recreational landings between 1991 and 1994 comprised only a small proportion (< 15%) of the total rig harvest in all Fishstocks.

Table 3: Estimated number and weight of rig harvested by recreational fishers by Fishstock and survey. Surveys were carried out in different years in the Ministry of Fisheries regions: South in 1991–92, Central in 1992–93, North in 1993–94 (Teirney *et al.* 1997) and nationally in 1996 (Bradford 1998) and 1999–00 (Boyd & Reilly 2002). Survey harvests are presented as a range to reflect the uncertainty in the estimates.

| Fishstock | Survey | Number | CV% | Harvest Range (t) | Point estimate (t) |
|-----------|----------|--------|-----|-------------------|--------------------|
| 1991–92 | | | | | |
| SPO 3 | South | 12 000 | 22 | 15–30 | - |
| 1992–93 | | | | | |
| SPO 2 | Central | 5 000 | - | 5–15 | - |
| SPO 7 | Central | 8 000 | 39 | 10–25 | - |
| SPO 8 | Central | 18 000 | 43 | 20–60 | - |
| 1993–94 | | | | | |
| SPO 1 | North | 11 000 | 21 | 5–25 | - |
| SPO 8 | North | 1 000 | - | 0–5 | - |
| 1996 | | | | | |
| SPO 1 | National | 28 000 | 31 | 25–45 | 35 |
| SPO 2 | National | 4 000 | - | - | - |
| SPO 3 | National | 12 000 | 20 | 10–20 | 15 |
| SPO 7 | National | 19 000 | 20 | 20–30 | 24 |
| SPO 8 | National | 7 000 | - | - | - |
| 1999–00 | | | | | |
| SPO 1 | National | 13 000 | 30 | 12–23 | 17 |
| SPO 2 | National | 16 000 | 58 | 9–33 | 21 |
| SPO 3 | National | 43 000 | 32 | 39–75 | 57 |
| SPO 7 | National | 33 000 | 38 | 21–46 | 33 |
| SPO 8 | National | 7 000 | 48 | 5–13 | 9 |

The Recreational Technical Working Group concluded that the harvest estimates from the diary surveys should be used only with the following qualifications: a) they may be very inaccurate; b) the 1996 and earlier surveys contain a methodological error; and, c) the 2000 and 2001 estimates are implausibly high for many important fisheries.

1.3 Customary non-commercial fisheries

Maori fishers traditionally caught large numbers of "dogfish" during the last century and early this century. Rig was probably an important species, though spiny dogfish and school shark were also taken. The historical practice of having regular annual fishing expeditions, during which thousands of dogfish were sun-dried on wooden frames, is no longer prevalent. However, rig are still caught in small quantities by customary non-commercial fishers in parts of the North Island, especially the harbours of the Auckland region. Quantitative information on the current level of customary non-commercial take is not available.

1.4 Illegal Catch

Quantitative information on the level of illegal catch is not available.

1.5 Other sources of mortality

Unknown quantities of juvenile rig are caught by setnets placed in harbours and shallow bays. Quantitative information on the level of other sources of mortality is not available.

2. BIOLOGY

Rig are born at a total length (TL) of 25–30 cm. On the South Island male and female rig attain maturity at 5–6 yrs (~85cm) and 7–8 yrs (~100 cm), respectively (Francis & O'Maolagain 2000). Rig

RIG (SPO)

in the Hauraki Gulf mature earlier – 4 yrs for males and 5 yrs for females – and at smaller sizes (Francis & Francis 1992). Longevity is not known because few large fish have been aged, however, a male rig that was mature at tagging was recaptured after nearly 14 years of liberty, suggesting a longevity of 20 years or longer. Females reach a maximum length of 151 cm and males 126 cm TL.

Rig give birth to young during spring and summer following a 10–11 month gestation period. Most females begin a new pregnancy immediately after parturition, and therefore breed annually. The number of young produced increases exponentially with the length of the mother, and ranges from 2 to 37 (mean ~ 11). Young are generally born in shallow coastal waters, especially in harbours and estuaries, throughout North and South Islands. They grow rapidly during their first summer, and then disappear as water temperatures drop in autumn-winter. They presumably move into deeper water.

Rig make extensive coastal migrations, with one tagged female moving a least 1160 km. Over half of the tagged rig that were recaptured had moved over 50 km, and over half of the females had moved more than 200 km. Females travel further than males, and mature females travel further than immature females.

Biological parameters relevant to stock assessment are shown in Table 4.

Table 4: Estimates of biological parameters for rig.

| Fishstock | Estimate | | | | | | Source |
|---|-----------------------|-------|-------|-----------------------|------|-------|------------------------------|
| 1. Natural mortality (<i>M</i>) | 0.2–0.3 | | | | | | Francis & Francis (1992a) |
| All | | | | | | | |
| 2. Weight = $a(\text{length})$ (Weight in g, length in cm fork length). | Females | | | Males | | | |
| | a | b | | a | b | | |
| SPO3 | 3.67×10^{-7} | 3.54 | | 1.46×10^{-6} | 3.22 | | Francis (1979) |
| SPO 7&8 | 9.86×10^{-7} | 3.32 | | 3.85×10^{-6} | 3.01 | | Blackwell (unpubl. data) |
| 3. von Bertalanffy growth parameters | Females | | | Males | | | |
| | L_{∞} | k | t_0 | L_{∞} | k | t_0 | |
| SPO 1 | 90.7 | 0.42 | -0.77 | 118.7 | 0.16 | -2.02 | Francis & Francis (1992a) |
| SPO3 | 87.0 | 0.40 | -0.68 | 161.1 | 0.11 | -1.91 | Francis & Francis (1992a) |
| | Both Sexes | | | | | | |
| | L | k | t_0 | | | | |
| SPO 3 & 7 | 147.2 | 0.119 | -2.35 | | | | Francis & Ó Maolagáin (2000) |

3. STOCKS AND AREAS

Information relevant to determining rig stock structure in New Zealand was reviewed in 2009 (Smith 2009, Blackwell & Francis 2010, Francis 2010). These reviews concluded that the existing QMAs are a suitable size for rig management, although the boundaries between biological stocks are poorly defined, especially in the Cook Strait region. Insufficient tagging occurred in SPO 1 to determine whether division of that stock into separate 1E and 1W stocks is warranted.

Genetic, biological, fishery and tagging data were all considered, but the evidence available for the existence and geographical distribution of biological stocks is poor. Some differences were found in CPUE trends at a small spatial scale but stock separation at the indicated spatial scales seems unlikely, and the CPUE differences may have resulted from processes acting below the stock level, such as localised exploitation of different sexes or different size classes of sharks. Genetic and morphological evidence indicate that a separate undescribed species of *Mustelus* occurs at the Kermadec Islands, but it is not known if rig also occurs there.

The most useful source of information was a tagging programme undertaken mainly in 1982–84 (Francis 1988). However, most tag releases were made around the South Island, so little information was available for North Island rig. Male rig rarely moved outside the release QMA, even after more than 5 years at liberty. Female rig were more mobile than male rig, with about 30% of recaptures reported beyond the release QMA boundaries within 2–5 years of release. The proportion reported beyond the release QMA increased steadily with time. However, few females moved more than one

QMA away from the release point. Because males move shorter distances than females, a conservative management approach is to set rig QMAs at a size appropriate for male stock ranges.

4. STOCK ASSESSMENT

There are no new data which would alter the yield estimates given in the 1997 Plenary Report. The yield estimates are based on commercial landings data only.

4.1 Estimates of fishery parameters and abundance

SPO 1 and SPO 8

Standardised CPUE (kg / km net) indices had been calculated for SPO 8 and for five sub-areas in SPO 1 by modelling (GLM) non-zero catches by core vessels targeting rig with setnets between 1989–90 and 2003–04 (Blackwell *et al.* 2006). Catches had been adjusted prior to the analysis to account for changes in conversion factors over this period. In 2008 this analysis was updated using data through to the end of the 2006–07 fishing year (Figure 2).

Considering changes since the previous analysis there have been increases in CPUE for Thames, the Kaipara Harbour, the Manukau Harbour, and the SPO 1 west coastal regions and decreases in CPUE for SPO 1 eastern coastal regions and SPO 8. Apart from the increase in Thames, all recent CPUE was within the range estimated historically.

In considering the decline observed in the Manukau Harbour the Inshore working Group previously noted that “although standardised CPUE in the Manakau harbour declined, rig in this harbour do not comprise a separate population; this observation is therefore more likely to reflect changes in local conditions than a decline in the abundance of the SPO 1 west coast stock”. Since 2003–04, CPUE in this area has increased to around the levels estimated in the mid 1990s.

SPO 2

A standardised CPUE analysis was conducted on SPO 2 in 2009 (Starr and Kendrick 2009). This analysis was based on complete trips which landed SPO 2 using the bottom trawl or setnet methods from 1989–90 to 2007–08, adjusted for changes in conversion factors. The use of complete trips was necessary because of the large proportion of trips which landed SPO 2 but did not report any estimated catch (26% by weight for the dataset). In addition, estimated catches severely underestimated landings (median estimated catch by trip was 2/3 the landed catch). The use of complete trips limited the number of explanatory factors that could be applied in the analysis. However, no difference was found between analyses which adjusted for zone of capture or target species category compared to the analyses which only corrected for year, month and vessel. The indices presented in this report are those corrected for year, month and vessel as they are based on the greatest amount of available data. The bottom trawl index is based on 16,440 trips representing 715 t of landings while the setnet index is based on 4,760 trips representing 273 t of landings.

The SPO 2 series constructed from bottom trawl data shows a gradually increasing trend from 1989–90 to 1996–97 after which the series remains reasonably stable through to 2007–08 with three consecutive high years from 2001–02 to 2003–04 (Figure 3). A series based on setnet data is reasonably similar to the bottom trawl series until the final one or two years (2006–07 and 2007–08) when the setnet series drops below the bottom trawl series. The setnet series is less credible than the bottom trawl series due to fewer available data to perform this analysis.

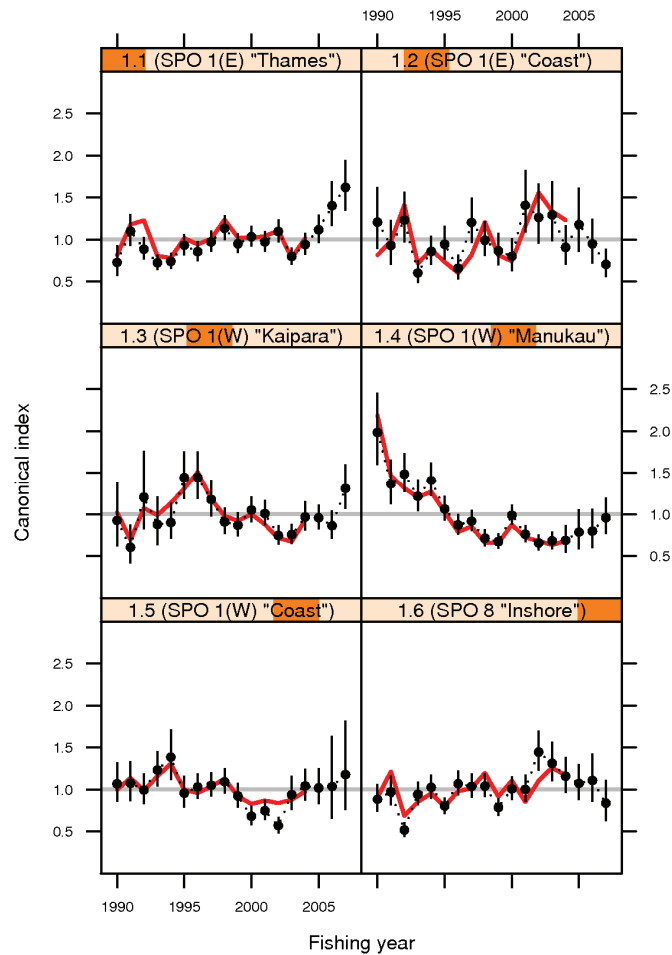
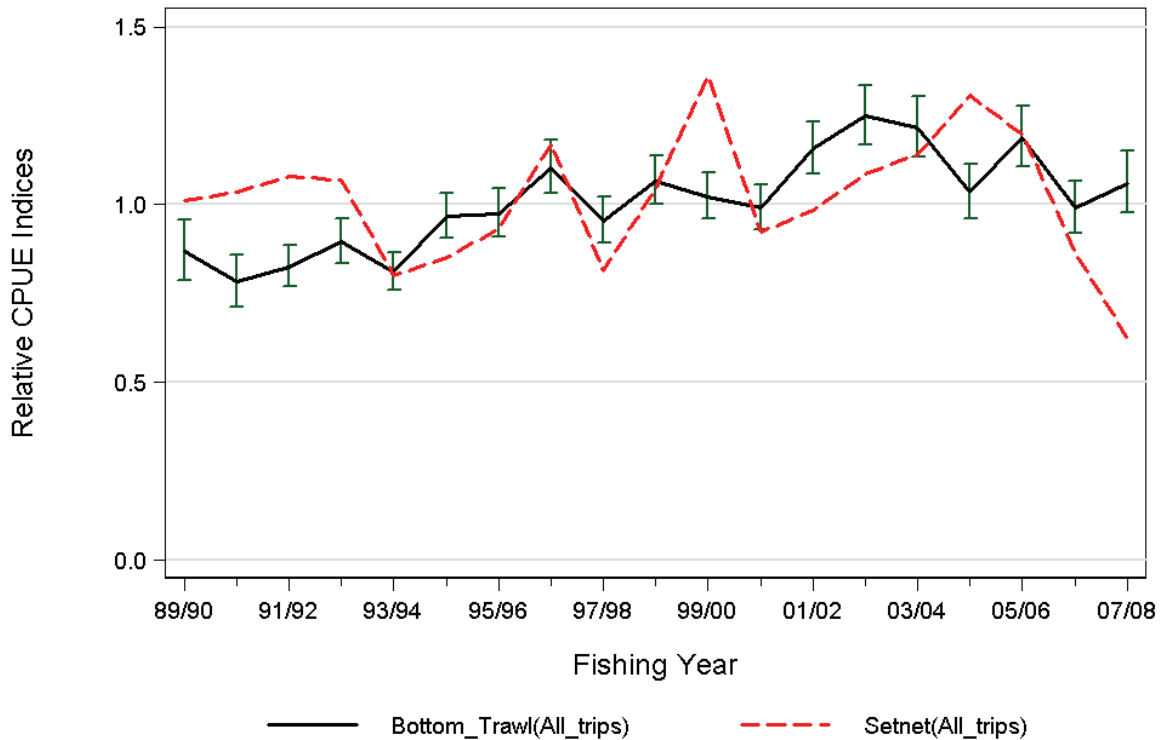


Figure 2: Standardised CPUE indices, based on non-zero, core-vessel setnet catches (calculated green weight) for SPO 1 and 8 (Manning in prep). Error bars represent 95% confidence intervals and the solid line represents the previous indices from Blackwell et al. (2006).



Each series is scaled so that the geometric mean=1

Figure 3: Comparison of two lognormal standardised CPUE series for SPO 2 based on all valid bottom trawl and setnet trips which landed to SPO 2

SPO 7

CPUE analyses using lognormal standardisation of non-zero setnet catches for core vessels were undertaken to assess relative abundance of SPO 7. These analyses were updates of analyses previously accepted by the Working Group in 2006. The 2010 analyses used the same fishery definitions as the previous analysis: 1) setnet fishery in Statistical Areas 032–037 targeting rig, school shark and spiny dogfish [SN(WC)]; 2) setnet fishery in Statistical Area 038 targeting rig, spiny dogfish and school shark [SN(038)]; and 3) bottom trawl fishery in Statistical Areas 016–018, 032–037, 038, and 039 targeting flatfish, red cod and rig [BT(All)].

The analysis of each fishery/area was performed in the same manner (Starr et al. 2010). The effort data were matched with the landing data at the trip level. Each analysis was confined to a set of core vessels which had participated consistently in the fishery for a reasonably long period. The explanatory variables offered to each model included fishing year (forced), month, vessel, statistical area, target species, duration of fishing, and length of net set (for the setnet analysis). The Working Group had previously concluded that the SN(038) index was the most credible index of SPO 7 abundance. Concerns were raised in 2010 about the continued reliability of the SN(WC) index which may have been compromised by fleet behaviour changes in response to setnet closures on the west coast of the South Island designed to protect Hector’s dolphins.

The SN(038) index showed a continuous declining trend from the beginning of the series to a low in the mid-2000s. It is this series which led to the decision to reduce the SPO 7 TACC to 221 t. That index has now increased four years in succession to 2008–09. The BT(All) series mirrored the SN(038) from the late-1990s and it too has shown an increasing trend since the mid-2000s. In 2006, the SN(WC) series was the most optimistic of the three series, showing little trend up to the mid-2000s. However, this index has since declined, although the Working Group thought it was likely that this may be in part be the result of other factors. Examination of the distribution of setnet effort on the west coast of the South Island shows that there has been a substantial decline in the number of vessels operating there since 2005–06.

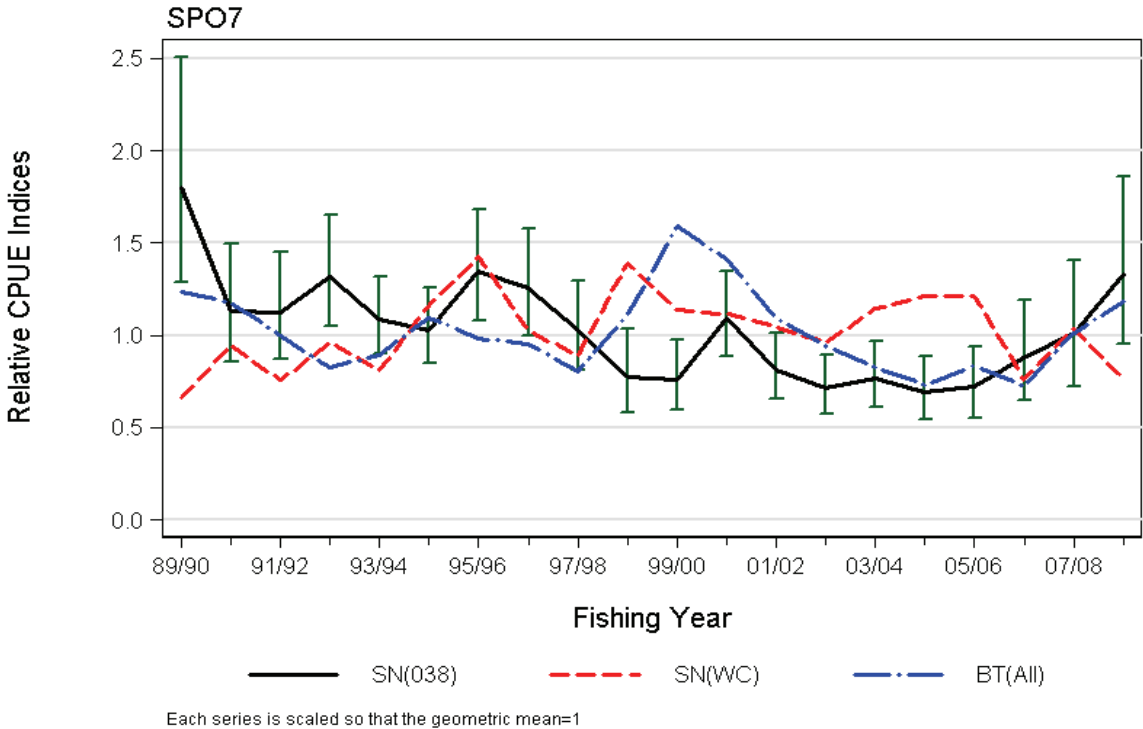


Figure 4: Comparison of three SPO 7 standardised CPUE series: i) setnet fishery (shark target and west coast South Island) [SN(WC)]; ii) setnet fishery (shark target and Tasman/Golden Bays) [SN(038)];iii) bottom trawl fishery (mix target and all SPO 7) [BT(All)].

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Although large rig are not effectively targeted with bottom trawl gear, the WCSI trawl survey is believed to provide reliable indices of the relative biomass of males and younger females in SPO 7. Relative biomass indices declined by more than 50% between 1995 and 2005 but have since increased toward the long-term mean (Figure 5).

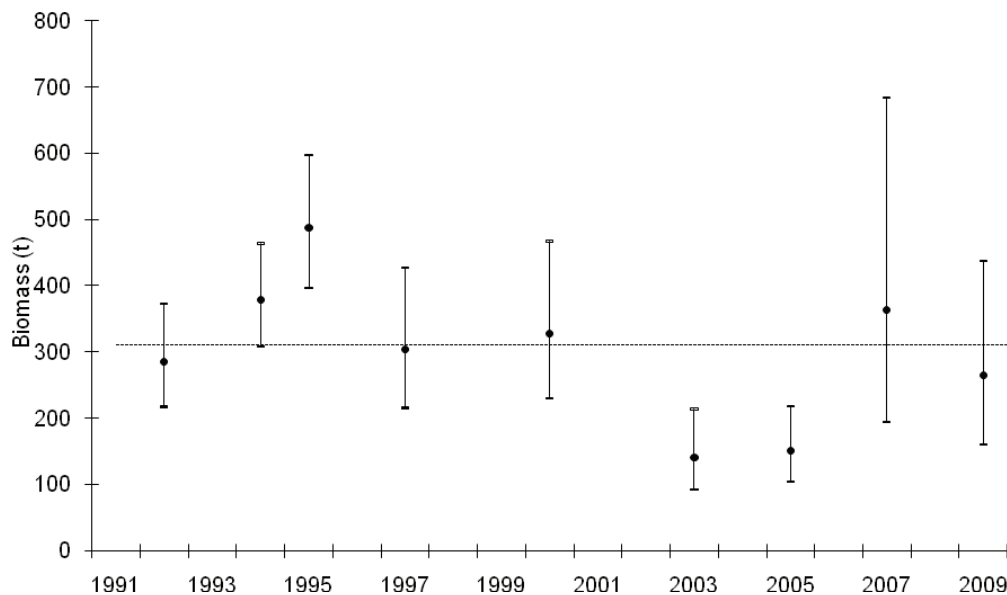


Figure 5: Plots of biomass estimates (t) for rig from the west coast South Island trawl survey by year. Error bars are approximated from the CVs assuming a lognormal distribution dashed line is the series mean.

SPO 7 Stock Assessment

A stock assessment for SPO 7 was presented to the AMP Working Group in 2006 (AMP-WG-06/24, AMP-WG-06/25). This assessment was an age-structured model fitted to setnet CPUE indices from two areas: Tasman/Golden Bays (Statistical Area 038) and the west coast South Island (Figure), biomass indices from the WCSI survey (Figure 5), commercial length frequency data (setnet and trawl fisheries), length frequency data from the WCSI survey, and age-length data (for estimating the growth model). Historical catches were reconstructed back to 1965, which was assumed to be the beginning of the model, starting with an unfished biomass at equilibrium. The model had two sexes, with growth models for each sex estimated in the model and a plus group at age 23 to accommodate the largest females in the length frequency data. Sex-specific commercial and survey selectivities were estimated. Descending right-hand limbs were allowed in the commercial trawl and survey selectivity functions to account for an assumed reduction in catchability associated with large rig by trawl nets. Natural mortality (M) was fixed at 0.25 and steepness (h) at 0.5 (Francis & Francis 1992). This latter value was consistent with values used for low productivity shark species. Bayesian methods were used to estimate uncertainty.

The Working Group noted that this assessment was the first stock assessment completed within an AMP programme and was also the first chondrichthyan assessment completed in New Zealand. The Working Group accepted the methods, including data preparation steps and model structure and considered the results satisfactory.

The Working Group made the following conclusions based on this stock assessment:

- The SPO 7 stock was almost certainly below B_{msy} . There was however some uncertainty as to where the stock was in relation to B_0 . It was therefore not possible to produce reliable stock projections necessary to derive an assessment based TACC.
- Based on declining indices of abundance, current catches and the TACC (which has been substantially under caught for the last five years) were not sustainable.

The Working Group requested that the stock assessment should be repeated in 2008. The next assessment should include the following:

- sensitivity runs based on larger historical catches prior 1975 to account for probable dumping by trawlers;
- additional length-age data, particularly for large females; more rig would therefore need to be aged;
- new length composition data from the commercial catch (trawl and setnet);
- appropriate stock recruit relationships for sharks;
- 5-year stock projections;
- an understanding of the relationship of rig stocks between areas: what is the appropriate relationship of sub-areas within SPO 7 or with SPO 3 or SPO 8? The Working Group agreed that there was uncertainty in this issue and that information should be collected to address this problem.

4.2 Biomass estimates

Absolute estimates of current biomass are not available for any rig stocks. Relative biomass estimates are available for the West and East Coast South Island, however, the Working Group does not consider that these surveys monitor the full size range of these populations.

4.3 Estimation of Maximum Constant Yield (MCY)

No estimates of MCY are available for these stocks. This conclusion has not changed since the 2008 Plenary Report.

4.4 Estimation of Current Annual Yield (CAY)

CAY cannot be determined with available data.

Yield estimates are summarised in Table 5.

Table 5: Yield estimates (t) of rig by stock.

| Parameter | Fishstock | Estimates |
|-----------|----------------------|----------------------|
| MCY | SPO 1 (WCNI + NECNI) | 630* |
| | SPO 2 (SECNI) | < 70 |
| | SPO 3 (ECSI) | Cannot be determined |
| | SPO 7 (WCSI) | Cannot be determined |
| | SPO 8 (WCNI) | 270* |
| | SPO 10 | Cannot be determined |
| CAY | All | Cannot be determined |

* MCY estimate for the WCNI stock was apportioned pro-rata between SPO 1 and SPO 8 Fishstocks on the basis of historical catches.

4.5 Other factors

Stock mixing occurs in the South Taranaki Bight to the Cook Strait and South Westland regions, and probably elsewhere. Some regional fisheries therefore exploit more than one stock. Also, biological stock boundaries do not always coincide with Fishstock boundaries. Consequently, management by quota within Fishstocks is likely to be sub optimal for individual stocks.

The use of small mesh commercial setnets (125 mm) in the Auckland FMA probably results in a large proportion of the rig catch being immature fish. Elsewhere, the minimum size is 150 mm.

There have been several changes to the rig conversion factors over the period that SPO has been managed within the QMS. The trend has been towards lower conversion factors. While researchers correct catches for these changes in undertaking CPUE analyses, this has not been done for total landings reported in this Working Group Report. These changes have the effect of reducing the effect of catches in recent years compared to early years, e.g. if actual catch had been constant it would appear to be declining. This has implication for historically set TACCs and any yield estimates (e.g. MCY).

5. ANALYSIS OF ADAPTIVE MANAGEMENT PROGRAMMES (AMP)

The Ministry of Fisheries revised the AMP framework in December 2000. The AMP framework is intended to apply to all proposals for a TAC or TACC increase, with the exception of fisheries for

RIG (SPO)

which there is a robust stock assessment. In March 2002, the first meeting of the new AMP Working Group was held. Two changes to the AMP were adopted:

- a new checklist was implemented with more attention being made to the environmental impacts of any new proposal;
- the annual review process was replaced with an annual review of the monitoring requirements only. Full analysis of information is required a minimum of twice during the 5 year AMP.

SPO 3

The SPO3 AMP was extended for one year in 2004/05 and again in 2005/06, and was fully reviewed in 2007. However, a request was made in 2006 for a full stock assessment to be done. This was not done in 2007, and SPO 3 was placed on the 2008 AMP agenda for review and a stock assessment in 2008. A stock assessment was requested for SPO 3 in response to concerns raised by fishers and regional managers in FMA 3, mainly related to the fact that the TACC has been substantially under-caught since the AMP TACC increase in 2000–01, and anecdotal reports of declining mean size, or decline in the proportion of large females, in catches in recent years.

CPUE characterization

Effects of conversion factors

- The conversion factors used for raising DRE and HGU weight to greenweight for SPO3 have changed twice in the past, from 2 (60 to 1991–92), to 1.75 (1992–93 to 1999–00) to 1.55 (2000–01 to present). This has required that reported catch estimates be adjusted for these conversion factor changes, before conducting further analyses. Correcting past catch estimates using the current conversion factors has resulted in a significant reduction in estimates of past catch for SPO across the time series.

AMP history

- SPO 3 was one of the first stocks to enter an AMP with a TACC increase from 364t to 430t for 1991–92. The TACC was raised again to 600t in October 2000, following the 2000 AMP review. After full-term review in 2005, the AMP was extended for two more years under existing conditions until 2006–07. SPO 3 now remains in an AMP until this is replaced by a fisheries plan.
- After correction of past estimated catches using the latest conversion factors for dressed weight to green weight, estimated catches have been well below the TACC levels throughout the history of the fishery. Adjusted landings increased after the first TACC increase from around 250t (QMR reported landings 300t) to over 350t by 1994–95 (QMR reported landings around 400t). Catches then fluctuated between 350t and 400t (QMR 400t–450t) until the next TACC increase in 1999–00.
- Reported landings after 1999–00 are not affected by conversion factor adjustments. SPO 3 landings reached their highest level of 458t in 2000–01, approximately the previous TACC level, but well below the increased TACC of 600t. Catches have since declined, averaging only 390t over 2001–02 to 2006–07, although reaching 423t in 2006–07.

Fishery characterization

- A historic catch series has been reconstructed for SPO 3, in preparation for conducting a stock assessment (Figure 6). Adjusted total landings increased steadily from around 200t in 1968 to a peak of almost 1200t by 1984. Over this same period, the proportion of SPO 3 taken by setnet increased from 10% to over 80%. Adjusted reported landings then declined sharply to only about 250t by the time of entry into the QMS in 1986–87. The proportion of total SPO 3 catch taken by setnets has since remained over 70%.
- SPO 3 is by far the most important of the SPO stocks, contributing, 96% of the adjusted total reported catch of 6975t for all SPO stocks over the period 1989–90 to 2006–07. Small catches are reported for SPO 7 and 8, and negligible amounts for SPO 1 and 2.
- Over this period, SN accounted for 73% of SPO 3 catch, 25% by bottom trawl (BT) and the remainder in Danish-seine (since 2002–03), bottom long line (BLL) and mid-water trawl (MWT).

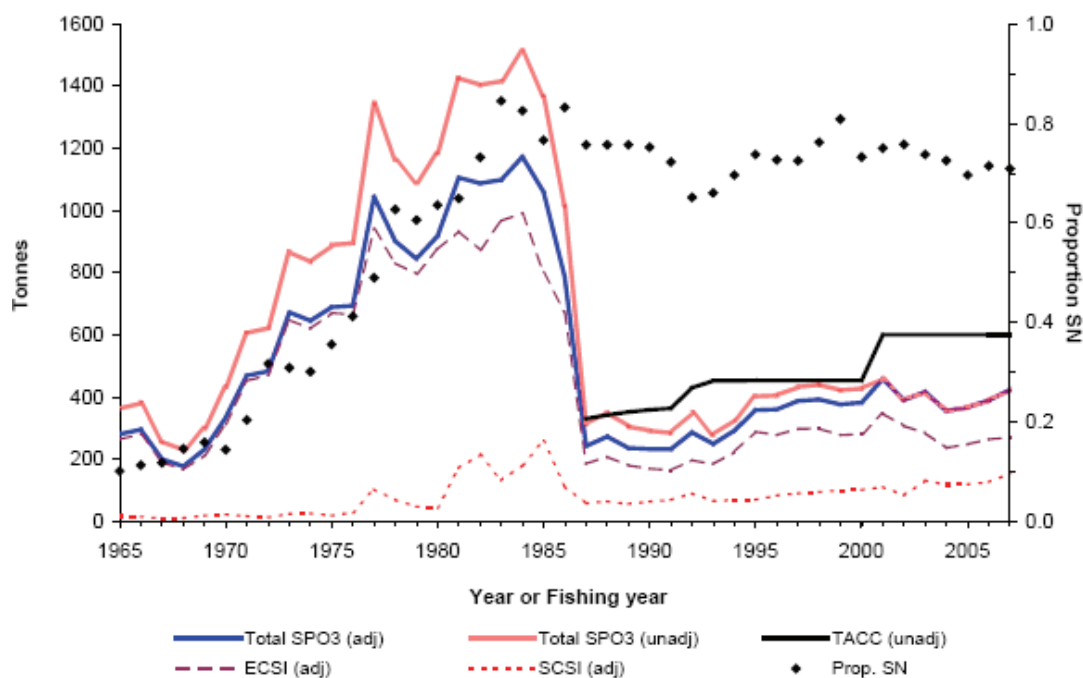


Figure 6: Summary of historical catch data for SPO 3 prepared as described in Starr (in prep.). Total landings (adjusted and unadjusted for conversion factor changes) are shown, as is the unadjusted TACC. The proportion of the total New Zealand rig catch attributed to setnet is also shown. ECSI: east coast South Island; SCSI: south coast South Island; SN: setnet.

- Approximately 70% of the setnet and the bottom trawl landings of SPO 3 have historically come from the four East Coast South Island statistical areas: areas 018 to 024: Kaikoura to Timaru, with peak landings coming from Area 022: Canterbury Bight. The remainder of the bottom trawl and setnet landings for SPO 3 are taken in Foveaux Strait and Fiordland (Areas 025 to 032).
- Setnet effort has always been high in Area 018, reflecting the target TAR setnet fishery, but there has been a drop in effort in the most recent four years. Areas 020 and 022 are now the main areas for setnet and bottom trawl landings of SPO 3, although there has been a drop in setnet effort in Area 020 in the most recent four years as well. Rig are a bycatch species in bottom trawl fisheries which target species such as red cod, barracouta and hoki, and the distribution of SPO 3 bottom trawl landings by statistical area have remained relatively consistent.
- Setnet catches are strongly seasonal, mainly taken in the spring and summer, with about 80% of the rig landings taken by the end of January. The setnet fishery in the Area 022 appears to last into February and March, somewhat later than the fisheries further north in Areas 018 and 020. The SPO 3 bottom trawl season extends longer than the setnet fishery, with about 80% of the total landings recorded by the end of April.
- The seasonal pattern of bottom trawl landings reflects the timing of the dominant red cod fishery, which usually tapers off in May. The seasonal distribution of the bottom trawl landings of rig in the lower end of the South Island differs, with more sporadic landings in the eastern end of Foveaux Strait and a more extended period for western Foveaux Strait and Fiordland.
- Over 90% of the setnet catches SPO 3 are taken by a shark species target fishery (rig, school shark, elephantfish and spiny dogfish) with the SPO being the dominant target species. Bottom trawl landings of rig are taken by fisheries directed at inshore species including flatfish, red cod and stargazer. Few rig are taken by target rig bottom trawls, although some are taken in conjunction with target fishing for elephantfish. There appears to be an increasing trend to target rig and a corresponding drop in the proportion taken as bycatch in the target school shark setnet fishery, coinciding with the increased AMP TACC and decline in Annual Catch Entitlement (ACE) values in 2000–01.

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- Rig are mainly taken between 15 m and 270 m depth (median 60 m). The distribution of tows which caught or targeted rig differs with declared target species, with red cod and barracouta target tows being slightly shallower than the target stargazer tows.

CPUE analysis

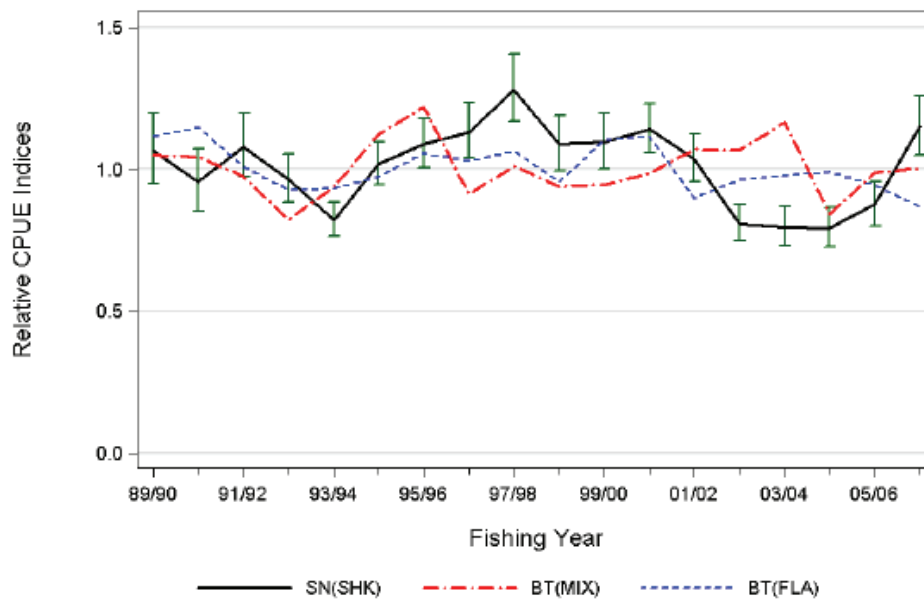


Figure 7: Comparison of the lognormal indices from the three CPUE series for SPO 3: a) SN[SHK]: target shark species setnet fishery; b) BT[MIX]: mixed target species bottom trawl fishery; c) BT[FLA]: target flatfish bottom trawl fishery. (Each series is scaled so the geometric mean = 1.)

- Three CPUE analyses were performed. The primary index is setnet catch effort data in a fishery targeted at a range of shark species (SN(SHK) - rig, school shark, elephantfish, and spiny dogfish) is a repeat of the analyses presented to the AMP Working Group from 2002 to 2007 (Starr *et al.* 2007). Two additional series based on the bycatch of SPO 3 in two bottom trawl fisheries were evaluated: the bottom trawl fishery targeted at a mixed range of species (BT(MIX) - barracouta, red cod, tarakihi and stargazer); and bottom trawl fishery targeted at flatfish species (BT(FLA)). These two fisheries operate at different depth ranges and probably select a different size range of rig.
- The lognormal model for the setnet target shark fishery indicates that the fishery has operated at two levels: one from the beginning of the series to about 1997–98, operating just above the long-term average catch rate; followed by a lower level about 70%–80% of the long-term average (Figure 7). This lower catch rate persisted for 3 years from 2002–03 to 2004–05, but has risen over the past two fishing years to a level in 2006–07 which is slightly higher than the series average. The two bottom trawl series do not show any apparent trend (Figure 7).
- All three models show persistent declining trends in the proportion of records with zero rig landings over the entire series, indicating a steady increase in successful targeting on rig.
- Some of the observed CPUE trends may be caused by changing fishing practices, particularly in the BT(MIX) and BT(FLA) fisheries. However, recent increases may also be caused by a general improvement in the availability of this species. The three lognormal series show relatively little contrast when superimposed, particularly given the upturn in the shark setnet index in 2005–06 and 2006–07 (Figure 7).

Trawl survey abundance indices

- The East Coast South Island winter trawl surveys series was resumed in May 2007 (Figure 5). The results of the 2007 survey are comparable to the five previous indices, but biomass estimates are low, CVs are high and it is uncertain whether these surveys provide a useful index of rig abundance. The distribution of positive catches is variable between surveys, and generally less than one-third of the tows catch rig. Some rig were also caught in the shallow

stratum (10–30 m) only added to the 2007 survey. These survey indices must therefore be interpreted with caution.

- Survey length frequency data show consistency between the male and female distributions on each survey, but variation between surveys. Variability in length frequencies between surveys indicates that surveys may not be representatively sampling the SPO population. Specifically, very few rig greater than 100 cm are caught in surveys, while this size class is common in the commercial setnet fishery. The Southern Inshore FAWG concluded that the ECSI trawl survey was probably providing an accurate index of pre-recruit rig biomass.

Logbook programme

- An industry setnet logbook programme was introduced into QMA 3 in 1994–95, targeted at rig, school shark, and elephantfish. The programme has collected data from inshore setnet fisheries off the eastern and southern coast of the South Island from 1994–95 to 2006–07, and a small number of sets have also been recorded from the Challenger FMA. 85% of the logbook records were collected from the Pegasus Bay / South Canterbury Bight fishery which primarily targets rig, and a few target rig sets have been recorded off Oamaru. Most of the logbook sets occurring in Southland (QMA 5) targeted school shark.
- The setnet logbook programme has obtained reasonable coverage of the SPO 3 fishery over 1995–96 to 2005–06, with the exception of 1997–98 and 2006–07. The number of sets reported per year has ranged from 52 (2006–07) to 463 (2000–01), representing six to 101 t of estimated catch. Coverage levels by catch weight for these years have ranged from 2% to 29%.
- Interest in this programme has varied over the years, declining considerably by 1997–98. Coverage improved after 1997–98, with 12 to 14 vessels participating in the programme for several years. The number of vessels participating in the programme dropped in 2002–03 to 10 vessels, with less than 10 participating in 2004–05 and 2005–06. The programme practically collapsed in 2006–07, with only 3 vessels participating, 52 sets observed and only 60 fish measured.
- The programme has been targeted at the rig fishery in Canterbury Bight, tending to oversample Area 022, and has never obtained good coverage of the small target rig fishery in Area 018. Logbooks did capture the shift to Area 020 from Area 018 which occurred in 2001–02, but coverage of Area 020 appears to have been lost in 2003–04, 2005–06 and 2006–07.
- The logbook programme has been more successful in achieving good seasonal representation, with the distribution by month being adequately representative of the fishery in all years except 1994–95, 2005–06 and 2006–07.
- Length-frequency distributions of sampled rig show no apparent trends up to about 2003–04. Males have been smaller than females, but with no apparent change in male modal length throughout the series, including 2006–07. The cumulative distributions of female rig appear to be more variable between fishing years and have shown a noticeable shift towards smaller fish in 2004–05 and 2005–06.
- The potential effect of the voluntary 4 nautical mile closure in the Canterbury Bight on mean size of rig caught was evaluated by comparing length-frequencies inside and outside the closed area. Seasonal effects appear to be stronger than inshore/offshore effects. Male rig show no size difference inside and outside of the line in either season, but autumn-winter females tend to be larger than spring-summer females. These observations do not support the contention that female rig tend to be larger inside of the 4 nm line during the fishing season.

Effects of fishing

- 73% of the QMA 3 rig catch is taken in nearshore setnets, and the main environmental concern relates to possible mortalities of the endangered Hector's dolphins, which usually occur within 4nm of the shore. Hector's dolphin abundance in the coastal zone on the east coast South Island to 4 nautical miles offshore was calculated at 1880 individuals (CV=15.7%, lognormal 95% CI=1384–2554) during line transect surveys using a catamaran in the late 1990s (Dawson *et al.* 2004).

RIG (SPO)

- In the 2005–06 fishing year coverage was undertaken in Southland (FMA 5) and the Nelson/Marlborough region (FMA 7) to monitor interactions with Hector's dolphins and seabirds. During the 2005–06 fishing year, 3 fur seals and 3 shags were recorded caught. Setnet fisheries were observed in the 2006/07 fishing year in Kaikoura (FMA 3), the west coast of the South Island (FMA 7) and in Southland (FMA 5). One dusky dolphin, one Hector's dolphin and two yellow-eyed penguins were caught.
- For the current observer year (2007–08), DOC CSP coverage of 258 inshore trawl observer days includes Statistical Areas 018, 022, 024, 025, 026 and 030 to monitor interactions with Hector's dolphins and seabirds (penguins, shearwaters, and shags). Two hundred fifty inshore trawl observer days are planned for 2008–09.
- Diving seabirds (penguins, shearwaters, shags and gannets) are also occasionally caught in setnets. The rig 3 fishery overlaps with distributions of the vulnerable yellow-eyed penguin and the white flippered penguin. These birds are particularly vulnerable to setnetting near breeding colonies. Darby and Dawson (2000) estimated that 72 yellow eyed penguins had been captured in commercial setnets between 1979 and 1997. There is insufficient information available to assess the fisheries induced mortality of white flippered penguin, Fiordland crested penguin or Stewart Island shag.
- Incidental mortality of Hector's dolphin from trawling appears to be relatively rare. One capture of a Hector's dolphin was reported by a fisherman in the red cod trawl fishery in QMA 3 in the 1997-1998 fishing year (Starr and Langley 2000). Three Hector's dolphins were self reported to be caught by a trawler in Cloudy Bay in 2006, just outside SPO 3.
- Fur seals are also occasionally caught in setnets. Fur seal interactions with trawl fisheries are relatively rare on the east coast of the South Island. However, these fisheries have too little observer coverage or too few observed captures to estimate total interactions.
- Increased TACCs under the AMP have not resulted in any increases or significant changes in trawl fishing areas or effort.
- The Working Group noted that there has been a 94% uptake of the new NCELR forms in the setnet fishery. These are designed to provide information on protected species interaction, although increased observer coverage rates will be required to validate reporting rates.

Conclusions

- Total landings of rig on the east coast of the South Island exceeding 1000 t per year over 1976 to 1986 likely caused a drop in stock abundance, reflected in declining CPUE at the time (Francis and Smith 1988), and resulting in TACC reductions when this stock was introduced into the QMS. CPUE is considered to provide a reasonable indication of abundance of this stock as long as a significant proportion of the total catch is taken in the target rig setnet fishery (Annala *et al.* 2001). Catches and CPUE gradually increased from the early 1990s to the late 1990s.
- Standardised CPUE analysis based on the target shark setnet fishery conducted since 2002 remained stable up to 1997–98, after which this index dropped to a lower level which has gradually risen since 2004–05. After correction for the change in conversion factors over time, two additional CPUE series based on the bottom trawl fishery show almost no change since 1989–90.
- The shift in the setnet fishery towards area 018 in the late 1990s and early 2000s, as well as the shift in catch away from area 022 and towards area 020 in 2001–02 and 2002–03, have probably reversed. The three year decline in landings that was discussed in the 2005 report has also since reversed, with total SPO 3 landings increasing in each year since 2003–04.
- The low stock size observed in the 1980s possibly recovered in response to reduced catches after this stock entered the QMS. Stock abundance appears to have stabilised.

AMP review checklist

The AMP checklist questions were not addressed, pending discussion of the requested SPO 3 stock assessment by the AMP Working Group. However, the Working Group made the following requests for additional analyses, and recommendations regarding the stock assessment:

- Additional tables of catch, effort and unstandardised CPUE by statistical area were requested, and supplied to the Working Group.
- Target species, particularly targeting on SPD, should be included as a categorical variable in CPUE standardisation, to evaluate the effect of changes in SPO reporting before and after establishment of the ACE system. Initial evaluations presented to the Working Group suggested that this did not have a major effect on standardisation.
- The historic SPO catch and effort series presented in Francis & Smith (1988) should be included in the planned SPO 3 assessment, at least as a sensitivity test. The various assumptions used to generate the historic catch series to be used in the assessment (such as under-reporting rates in certain years, extrapolation of catches from adjacent years) should also be investigated to determine whether alternate catch series should be used.

6. STATUS OF THE STOCKS

No estimates of current and reference biomass are available.

SPO 1

For SPO 1, reported landings have consistently declined since 1991–92.

Patterns in relative abundance suggest that recent catch levels are probably sustainable in the short term and CPUE in the Manukau Harbour has increased to levels last estimated for the mid-1990s from the low point estimated for 2002–03. However, it is unknown whether the current TACC is sustainable.

SPO 2

For SPO 2, reported landings have exceeded the TACC every year since 1991–92. A bottom trawl CPUE index shows long-term stability since the mid 1990's despite increasing catches. A setnet series that was based on fewer data, showed similar trends but with a sharp drop below the trawl index in the final one or two years. As these indices are stable and have been for 14 years, the current TACC is thought to be sustainable. However, it is unknown whether the current catch, which is on average (past 4 years) 23% over the TACC, is sustainable.

SPO 3

SPO 3 is being managed within an AMP (the TACC was increased for the second time to 600 t in 2000–01). Recent catch levels are thought to be sustainable in the short-term, but it is not known if the TACC is sustainable because catches have averaged about 1/3 below the TACC since 2000–01.

SPO 7**Stock Structure Assumptions**

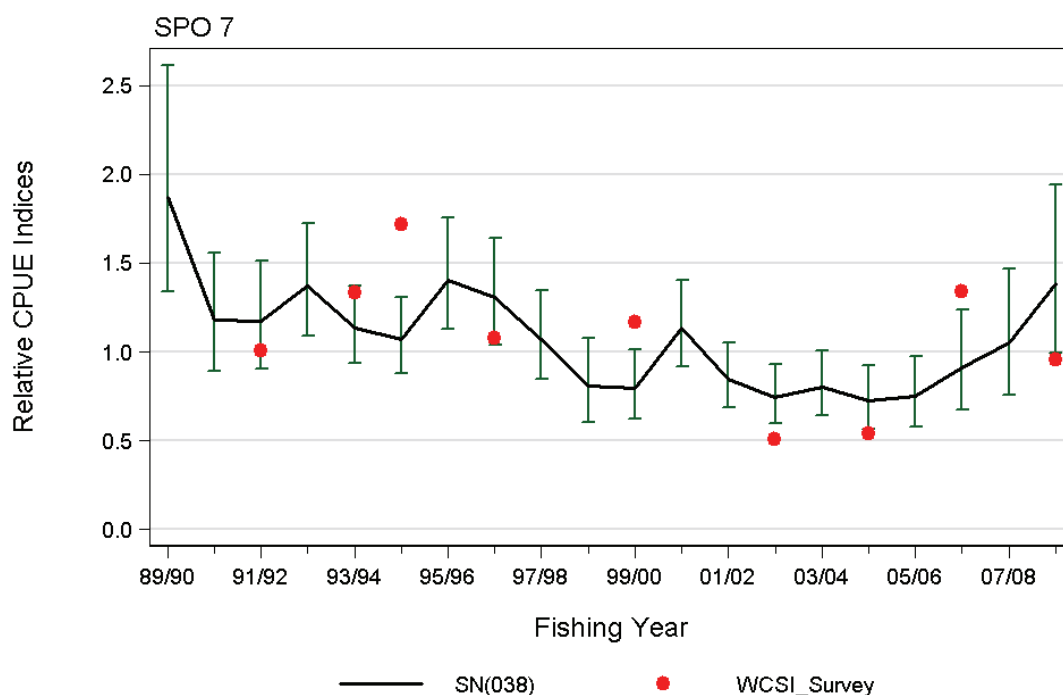
Recent reviews in 2009 conclude that the existing QMAs are a suitable size for rig management, although the boundaries between biological stocks are poorly defined, especially in the Cook Strait region. For the purposes of this summary SPO7 is treated as a discrete stock.

| Stock Status | |
|--------------------------------|---|
| Year of Most Recent Assessment | 2010 |
| Reference Points | Target(s): Not established but B_{MSY} assumed Soft Limit: 20% B_0 Hard Limit: 10% B_0 |
| Status in relation to Target | The SPO 7 stock was assessed in 2006 to be Very Likely (> 90%) to be below B_{MSY} but has since increased. |

RIG (SPO)

| | |
|------------------------------|--|
| Status in relation to Limits | Soft limit: Unknown Hard limit: Likely (> 60%) to be above. |
|------------------------------|--|

Historical Stock Status Trajectory and Current Status



Comparison of SPO 7 CPUE index series with the west coast South Island Kaharoa trawl survey. The survey index has been assigned to the final calendar year of the fishing year pair.

Fishery and Stock Trends

| | |
|--|---|
| Recent Trend in Biomass or Proxy | Available indices suggest an increase in recent years from a low point in 2004/05, to levels possibly near the long-term average. |
| Recent Trend in Fishing Mortality or Proxy | Reduced landings and evidence of increased recruitment suggest reduced levels of fishing mortality in recent years. |

Projections and Prognosis

| | |
|---|--|
| Stock Projections or Prognosis | The increasing trends in abundance and evidence of improved recruitment suggest that the stock is Likely (> 60%) to increase under current catch and TACC. |
| Probability of Current Catch or TACC causing decline below Limits | Soft Limit: Unknown Hard Limit: Unlikely (< 40%) |

Assessment Methodology

| | |
|-------------------|--|
| Assessment Type | Level 1: 2006 Quantitative stock assessment Level 2: 2010 Standardised CPUE abundance index and West Coast South Island trawl survey index and length frequency analysis. |
| Assessment Method | 2006: Bayesian statistical catch-at-age model 2010: Evaluation of agreed standardised CPUE indices, and length frequency analysis. |

| | | |
|--|---|-----------------------|
| Main data inputs | 2006: <ul style="list-style-type: none"> West Coast South Island trawl survey index Setnet CPUE from area 38 and the west coast Length data from SN (38), SN(WC) and bottom trawl(WC) Age/length data 2010: <ul style="list-style-type: none"> Catch and effort data derived from the Ministry of Fisheries catch reporting. Length frequency data summarised from logbooks compiled under the industry Adaptive Management Programme. Abundance indices derived from the West Coast South Island trawl surveys. | |
| Period of Assessment | Latest assessment: 2010 | Next assessment: 2013 |
| Changes to Model Structure and Assumptions | In 2006: SPO 7 stock status was evaluated using an age-structured model fitted to setnet CPUE indices, biomass indices from the WCSI survey, length frequency data and age-length data. In 2010, updated CPUE standardisations were conducted, including on the two series used in the 2006 assessment, and using similar standardisation models to those used previously. | |
| Major Sources of Uncertainty | | |

Qualifying Comments

Fishery Interactions

SPO 7 are mainly caught in a targeted setnet fishery (61%), which also targets school shark and spiny dogfish. This fishery has historically been particularly focussed in statistical area 038 (Tasman and Golden Bays). The remaining catch is taken by a bottom trawl fishery targeting flatfish, barracouta, red cod and tarakihi.

SPO 8

For SPO 8, landings have been relatively stable fluctuating around 200t annually since 1998-99. All recorded landings have been less than the TACC. Recent catch levels are probably sustainable in the short-term. However, it is unknown whether the current TACC is sustainable.

Yield estimates, TACCs and reported landings of rig are summarised in Table 6.

Table 6: Summary of yield estimates (t), TACCs (t) and reported landings (t) of rig for the most recent fishing year.

| Fishstock | | FMA | MCY | 2008–09 Actual TACC | 2008–09 Reported landings |
|-----------|---|-------------|------|---------------------------|---------------------------------|
| SPO 1 | Auckland (East) (West) | 1 & 9 | 630 | 692 | 297 |
| SPO 2 | Central (East) | 2 | < 70 | 86 | 106 |
| SPO 3 | South-East (Coast) (Chatham), Southland and Sub-Antarctic | 3, 4, 5 & 6 | – | 600 | 328 |
| SPO 7 | Challenger | 7 | – | 221 | 233 |
| SPO 8 | Central (West) | 8 | 270 | 310 | 222 |
| SPO 10 | Kermadec | 10 | – | 10 | 0 |
| Total | | | | 2 048 | 1 186 |

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