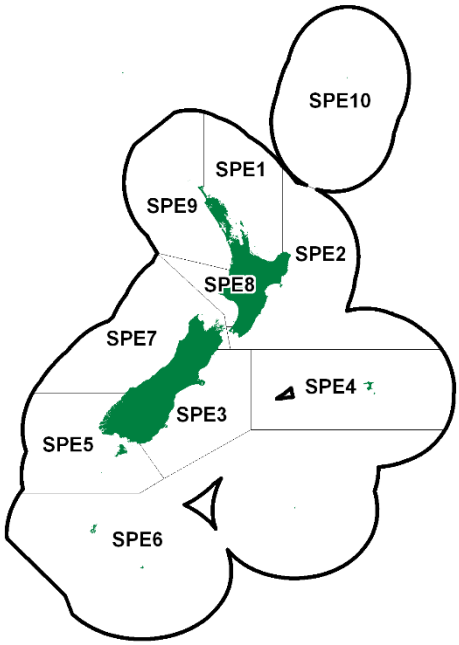
SEA PERCH (SPE)

(*Helicolenus percoides, H. barathri*)
Pōhuiakaroa



1. FISHERY SUMMARY

Sea perch was introduced into the QMS from 1 October 1998. Current TACs, TACCs, and allowances for non-commercial fishers are displayed in Table 1. There are two species of sea perch around New Zealand: *Helicolenus percoides* and *H. barathri* (Roberts et al 2015). *Helicolenus percoides* occur in depths shallower than 250 m with a peak at around 150 m, whereas *H. barathri* occur in about 300–1000 m, with a peak at around 600 m (Bentley et al 2014).

Table 1: Recreational and customary non-commercial allowances (t) and current TACCs (t) and TACs (t), by Fishstock, for sea perch.

	Recreational	Customary non-commercial	Other sources	TACC	TAC
SPE 1	1	1	3	53	58
SPE 2	9	5	0	79	93
SPE 3	11	11	0	1 000	1 022
SPE 4	0	0	46	910	956
SPE 5	1	1	0	36	38
SPE 6	0	0	0	9	9
SPE 7	8	8	0	82	98
SPE 8	4	2	0	15	21
SPE 9	1	1	0	10	8
SPE 10	0	0	0	0	0

1.1 Commercial fisheries

From 1 October 2000 the TACC for SPE 3 was increased from 738 t to 1000 t under the Adaptive Management Programme (AMP). The TACC for SPE 4 was increased from 533 t to 910 t from 1 October 2004 under the low knowledge bycatch framework. The TACC for SPE 1 was increased from 18 t to 33 t from 1 October 2006, and to 53 t from October 2013. TACCs in SPE 2, 5&6, 7, and 8 have remained unchanged since their introduction in 1998.

In SPE 1 landings were above the TACC for a number of years prior to 2006 and 2013; the TACC was consequently increased to the average of the previous 7 years plus an additional 10%. In SPE 2, landings were above the TACC for a number of years from 1999–00 to 2010–11 but landings have since decreased, averaging about 50 t annually from 2012. In SPE 3, landings have been well below the TACC since it was increased in 2001, and in SPE 4 landings have been below the TACC since it was increased in 2004. In SPE 7, landings have been above the TACC in most years since the introduction

of the TACC, but only 47 t were recorded in 2018–19, 57 t in 2019–20, and 62 t in 2020–21. The TACC for SPE 9 was increased from 6 t to 10 t in 2020–21.

Reported landings for 1931 to 1982 are given by sea perch QMAs 1, 2, 3, and 4 in Table 2. Reported landings and TACCs of sea perch by Fishstock are given in Table 3, and Figure 1 shows historical landings and TACC values for the five main sea perch stocks.

Very small quantities of sea perch have been landed for local sale for many years but were largely unreported. Catches have been made by foreign vessels since the 1960s, but were also not recorded (they were most probably included within a "mixed" or "other finfish" category), and most were probably discarded. Despite poor reporting rates, estimated landings are thought to have increased from 400 t in the early 1980s to approximately 1300 t in recent years (Table 3); an unknown quantity has been discarded over this period.

Table 2: Reported landings (t) for the main QMAs from 1931 to 1982.

Year	SPE 1	SPE 2	SPE 3	SPE 4	Year	SPE 1	SPE 2	SPE 3	SPE 4
1931	0	0	0	0	1957	0	0	1	0
1932	0	0	0	0	1958	0	0	1	0
1933	0	0	0	0	1959	0	0	1	0
1934	0	0	0	0	1960	0	0	1	0
1935	0	0	0	0	1961	0	0	1	0
1936	0	0	0	0	1962	0	0	0	0
1937	0	0	0	0	1963	0	0	0	0
1938	0	0	0	0	1964	0	0	1	0
1939	0	0	0	0	1965	0	0	2	0
1940	0	0	0	0	1966	0	0	1	0
1941	0	0	0	0	1967	0	0	1	0
1942	0	0	0	0	1968	1	0	1	0
1943	0	0	0	0	1969	1	0	3	0
1944	0	0	4	0	1970	1	2	7	0
1945	0	0	2	0	1971	6	0	7	0
1946	0	0	2	0	1972	1	1	2	0
1947	0	0	2	0	1973	0	0	0	0
1948	0	0	1	0	1974	0	0	0	0
1949	0	0	2	0	1975	0	0	0	0
1950	0	0	1	0	1976	0	0	0	0
1951	0	0	5	0	1977	0	0	0	0
1952	0	0	2	0	1978	0	0	2	11
1953	0	0	1	0	1979	0	18	92	248
1954	0	0	0	0	1980	0	1	8	100
1955	0	0	1	0	1981	6	0	70	253
1956	0	0	0	0	1982	22	1	176	164
1931	0	0	0	0	1957	0	0	0	0
1932	0	0	0	0	1958	0	0	0	0
1933	0	0	0	0	1959	0	0	0	0
1934	0	0	0	0	1960	0	0	0	0
1935	0	0	0	0	1961	0	0	0	0
1936	0	0	0	0	1962	0	0	0	0
1937	0	0	0	0	1963	0	0	0	0
1938	0	0	0	0	1964	0	0	0	0
1939	0	0	0	0	1965	0	0	0	0
1940	0	0	0	0	1966	0	0	0	0
1941	0	0	0	0	1967	0	0	0	0
1942	0	0	0	0	1968	0	0	0	0
1943	0	0	0	0	1969	0	1	0	0
1944	29	0	0	0	1970	0	13	0	0
1945	0	0	0	0	1971	0	0	0	0
1946	0	0	0	0	1972	0	0	0	0
1947	0	0	0	0	1973	0	0	0	0
1948	0	0	0	0	1974	0	0	0	0
1949	2	0	0	0	1975	0	0	0	0
1950	2	0	0	0	1976	0	0	0	0
1951	1	0	0	0	1977	0	0	0	0
1952	0	0	0	0	1978	13	11	0	0
1953	0	0	0	0	1979	54	14	1	3
1954	0	0	0	0	1980	40	38	0	0
1955	0	0	0	0	1981	32	15	0	1
1956	0	0	0	0	1982	31	17	1	1

Notes:

1. The 1931–1943 years are April–March but from 1944 onwards are calendar years.
2. Data up to 1985 are from fishing returns; data from 1986 to 1990 are from Quota Management Reports.
3. Data for the period 1931 to 1982 are based on reported landings by harbour and are likely to be underestimated as a result of under-reporting and discarding practices. Data include both foreign and domestic landings. Data were aggregated to FMA using methods and assumptions described by Francis & Paul (2013).

About 75% of New Zealand's landed sea perch is taken as a bycatch in trawl fisheries off the east coast of the South Island, including the Chatham Rise. A small catch is made in some central and southern line fisheries, e.g., for groper. The most important QMAs in most years are QMA 3 (east coast South Island) and QMA 4 (Chatham Rise) (Table 3).

The catch from SPE 3 is spread throughout the fishing year. There is a variable seasonal distribution between years. A higher proportion of the catch is taken during April, May, and September and catches are lower from December to February, and in July. Most of the SPE 3 catch is taken as a bycatch from the red cod (about 30%) and hoki fisheries (15%) and from the sea perch target fishery (21%). The remainder is taken as a bycatch from the target barracouta, flatfish, ling, squid, and tarakihi fisheries. Virtually all the SPE 3 catch is taken by bottom trawling, with a small proportion taken by bottom longline. SPE 3 catch rates are highest in 150–400 m depths.

Table 3: Reported landings (t) of sea perch by Fishstock and fishing year, 1983–84 to present. The data in this table have been updated from that published in previous Plenary Reports by using the data up to 1996–97 in table 38 on p. 278 of the "Review of Sustainability Measures and Other Management Controls for the 1998–99 fishing year - Final Advice Paper" dated 6 August 1998 [Continued on next page].

Fishstock	SPE 1		SPE 2		SPE 3		SPE 4		SPE 5	
FMA	1		2		3		4		5	
	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC
1983–84	14	–	2	–	150	–	58	–	*36	–
1984–85	10	–	2	–	290	–	70	–	*26	–
1985–86	14	–	2	–	213	–	218	–	*28	–
1986–87	19	–	2	–	507	–	71	–	*19	–
1987–88	20	–	1	–	544	–	63	–	*18	–
1988–89	14	–	1	–	262	–	36	–	*18	–
1989–90	2	–	6	–	287	–	177	–	*9	–
1990–91	5	–	9	–	559	–	68	–	*3	–
1991–92	12	–	8	–	791	–	222	–	*36	–
1992–93	15	–	15	–	783	–	317	–	*55	–
1993–94	16	–	26	–	690	–	223	–	*28	–
1994–95	25	–	66	–	626	–	415	–	*18	–
1995–96	23	–	50	–	1 047	–	404	–	*62	–
1996–97	19	–	77	–	655	–	435	–	*45	–
1997–98	24	–	54	–	913	–	656	–	*29	–
1998–99	21	18	79	79	903	738	872	533	26	36
1999–00	27	18	82	79	862	738	821	533	24	36
2000–01	25	18	81	79	798	738	840	533	16	36
2001–02	41	18	89	79	720	1 000	910	533	19	36
2002–03	19	18	78	79	696	1 000	1 685	533	25	36
2003–04	30	18	80	79	440	1 000	1 287	533	23	36
2004–05	27	18	104	79	372	1 000	894	910	23	36
2005–06	40	18	73	79	436	1 000	502	910	24	36
2006–07	30	33	98	79	519	1 000	591	910	29	36
2007–08	38	33	91	79	422	1 000	568	910	15	36
2008–09	27	33	46	79	328	1 000	338	910	10	36
2009–10	47	33	53	79	428	1 000	345	910	20	36
2010–11	53	33	83	79	644	1 000	572	910	22	36
2011–12	50	33	55	79	349	1 000	555	910	13	36
2012–13	40	33	43	79	495	1 000	492	910	27	36
2013–14	47	53	69	79	500	1 000	332	910	19	36
2014–15	32	53	42	79	734	1 000	475	910	13	36
2015–16	38	53	44	79	774	1 000	436	910	34	36
2016–17	44	53	49	79	589	1 000	424	910	15	36
2017–18	52	53	54	79	625	1 000	490	910	12	36
2018–19	53	53	46	79	555	1 000	432	910	18	36
2019–20	42	53	33	79	497	1 000	442	910	15	36
2020–21	41	53	34	79	412	1 000	405	910	17	36
2021–22	35	53	26	79	256	1 000	384	910	20	36
2022–23	32	53	24	79	250	1 000	412	910	15	36

Fishstock	SPE 6		SPE 7		SPE 8		SPE 9		SPE 10	
FMA	6		7		8		9		10	
	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC
1983–84	–	–	16	–	2	–	55	–	0	–
1984–85	–	–	14	–	1	–	2	–	0	–
1985–86	–	–	12	–	2	–	4	–	0	–
1986–87	–	–	11	–	3	–	1	–	0	–
1987–88	–	–	8	–	6	–	0	–	0	–
1988–89	–	–	5	–	2	–	1	–	0	–
1989–90	–	–	14	–	1	–	0	–	0	–
1990–91	–	–	28	–	1	–	0	–	0	–
1991–92	–	–	20	–	2	–	0	–	0	–
1992–93	–	–	71	–	18	–	0	–	2	–

Table 3 [Continued]:

Fishstock	SPE 6		SPE 7		SPE 8		SPE 9		SPE 10	
FMA	6		7		8		9		10	
	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC
1993–94	–	–	52	–	10	–	0	–	0	–
1994–95	–	–	67	–	7	–	0	–	0	–
1995–96	–	–	78	–	7	–	1	–	0	–
1996–97	–	–	64	–	7	–	1	–	< 1	–
1997–98	–	–	118	–	5	–	7	–	< 1	–
1998–99	1	9	109	82	< 1	15	2	6	0	0
1999–00	3	9	80	82	2	15	5	6	0	0
2000–01	3	9	80	82	4	15	3	6	0	0
2001–02	3	9	95	82	6	15	3	6	0	0
2002–03	4	9	103	82	4	15	4	6	0	0
2003–04	5	9	95	82	6	15	3	6	0	0
2004–05	1	9	47	82	5	15	2	6	0	0
2005–06	<1	9	75	82	5	15	2	6	0	0
2006–07	2	9	67	82	2	15	2	6	0	0
2007–08	5	9	103	82	2	15	2	6	0	0
2008–09	3	9	96	82	2	15	4	6	0	0
2009–10	1	9	117	82	4	15	3	6	0	0
2010–11	2	9	124	82	3	15	2	6	0	0
2011–12	3	9	82	82	3	15	3	6	0	0
2012–13	1	9	89	82	4	15	4	6	0	0
2013–14	3	9	100	82	4	15	5	6	0	0
2014–15	2	9	118	82	4	15	7	6	0	0
2015–16	3	9	89	82	4	15	7	6	0	0
2016–17	9	9	90	82	3	15	9	6	0	0
2017–18	2	9	118	82	4	15	11	6	0	0
2018–19	5	9	47	82	3	15	8	6	0	0
2019–20	1	9	57	82	2	15	6	6	0	0
2020–21	5	9	62	82	2	15	5	10	< 1	0
2021–22	5	9	60	82	2	15	8	10	0	0
2022–23	3	9	73	82	2	15	6	10	0	0

Fishstock	Total	
FMA		
	Landings	TACC
1983–84	333	–
1984–85	415	–
1985–86	493	–
1986–87	633	–
1987–88	660	–
1988–89	339	–
1989–90	496	–
1990–91	703	–
1991–92	1 091	–
1992–93	1 276	–
1993–94	1 045	–
1994–95	1 224	–
1995–96	1 672	–
1996–97	1 304	–
1997–98	1 807	–
1998–99	2 014	1 516
1999–00	1 907	1 516
2000–01	1 850	1 778
2001–02	1 886	1 778
2002–03	2 614	1 778
2003–04	1 969	1 778
2004–05	1 475	2 155
2005–06	1 157	2 155
2006–07	1 340	2 170
2007–08	1 246	2 170
2008–09	854	2 170
2009–10	1 018	2 170
2010–11	1 505	2 170
2011–12	1 115	2 170
2012–13	1 197	2 170
2013–14	1 077	2 190
2014–15	1 427	2 190
2015–16	1 428	2 190
2016–17	1 232	2 190
2017–18	1 368	2 190
2018–19	1 166	2 190
2019–20	1 097	2 190
2020−21	984	2 194
2021–22	796	2 194
2022–23	817	2 194

Notes:

* SPE 5 and SPE 6 catch is reported together under SPE 5* from 1983–84 until 1997–98 prior to Sea Perch being introduced into the QMS from 1 October 1998. Catch is split into SPE 5 and SPE 6 from 1998–99 onwards.

The trawl fisheries operating in SPE 4 catch sea perch along the northern and southern edge of the Chatham Rise in the 200–700 m depth range. The majority of the SPE 4 catch is taken as a bycatch of the hoki target fishery (about 59%), with the ling and hake fisheries accounting for around 25% and 10% of the total SPE 4 catch, respectively.

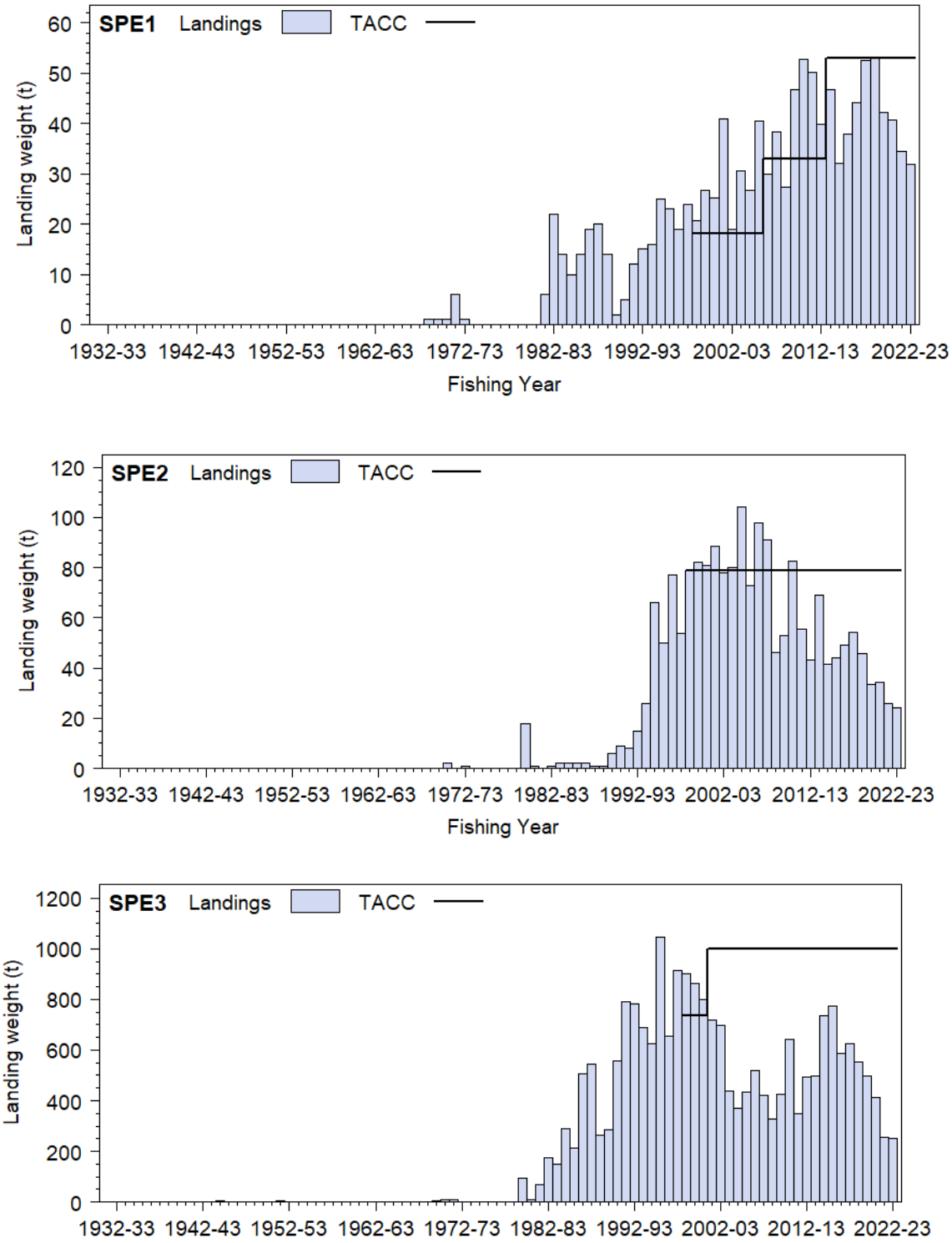


Figure 1: Reported commercial landings and TACC for the five main SPE stocks. SPE 1 (Auckland East), SPE 2 (Central East), and SPE 3 (South East Coast) [Continued on next page]

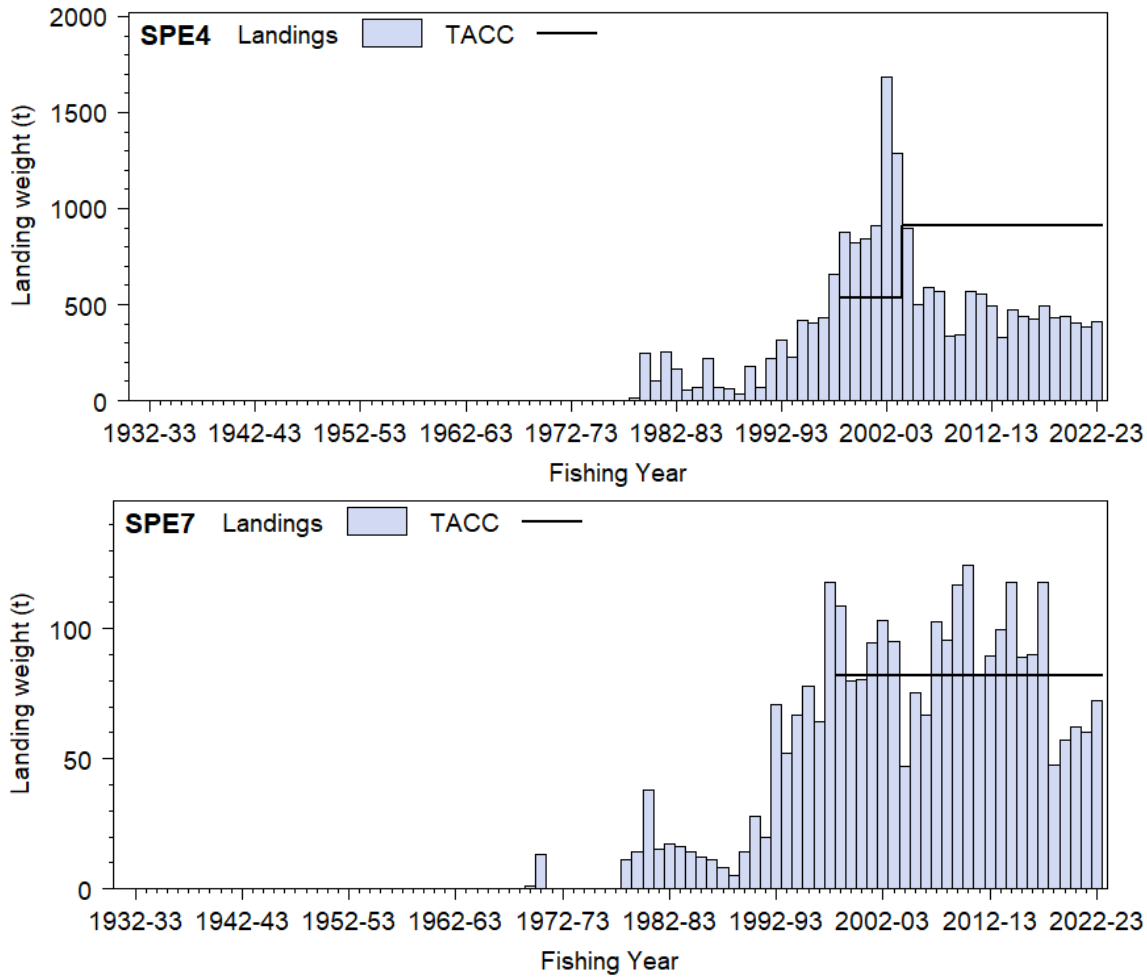


Figure 1 [Continued]: Reported commercial landings and TACC for the five main SPE stocks. SPE 4 (South East Chatham Rise) and SPE 7 (Challenger).

1.2 Recreational fisheries

Sea perch are seldom targeted by recreational fishers but are widely caught in reasonable numbers. Some are used for bait, and many were likely to have been discarded in the past. The quality of sea perch as an eating fish has been increasingly recognised and they are now less likely to be discarded. They are predominantly taken by rod and reel (98.6%) with a small proportion taken by longline (1%). The catch is taken predominantly from boats (93.7%) with a small proportion from land based fishers (3%). The allowances within the TAC for each Fishstock are shown in Table 1.

1.2.1 Management controls

The main method used to manage recreational harvests of sea perch are minimum legal size (MLS) and daily bag limits. General spatial and method restrictions also apply. A sea perch MLS for recreational fishers of 26 cm applies only in the Kaikōura Marine Area. Fishers can take up to 20 sea perch as part of their combined daily bag limit in Kaikōura Marine Area. Fishers can take up to 10 sea perch as part of their combined daily bag limit in the Fiordland Marine Area. No bag limit is currently in place in the Auckland, Central, Challenger, South-East, or Southland Fishery Management Areas.

1.2.2 Estimates of recreational harvest

There are two broad approaches to estimating recreational fisheries harvest: the use of onsite or access point methods where fishers are surveyed or counted at the point of fishing or access to their fishing activity; and offsite methods where some form of post-event interview and/or diary are used to collect data from fishers.

The first estimates of recreational harvest for sea perch were calculated using offsite telephone-diary surveys between 1991 and 2000 (Table 4, from Teirney et al 1997, Bradford 1998, Boyd & Reilly

2004). The harvest estimates provided by these telephone-diary surveys are no longer considered reliable for various reasons. A Recreational Technical Working Group concluded that these harvest estimates 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.

Table 4: Estimated number and weight of sea perch recreational harvest by Fishstock and survey. Regional surveys were carried out in different years in the MAF Fisheries regions: South in 1991–92, Central in 1992–93, North in 1993–94 (Teirney et al 1997), and national surveys took place in 1996 (Bradford 1998) and 1999–00 (Boyd & Reilly 2004). National panel surveys were conducted in 2011–12, 2017–18 and 2022–23 (Wynne-Jones et al 2014, 2019, Heinemann & Gray, in prep) using mean weights from boat ramp surveys (Hartill & Davey 2015, Davey et al 2019, Davey et al in prep).

Fishstock	Survey	Number	Harvest (t)	CV%
1991–92				
SPE 3	South	110 000		25
SPE 5	South	18 000		35
SPE 7	South	16 000		–
1992–93				
SPE 2	Central	27 000		–
SPE 3	Central	< 500		–
SPE 5	Central	< 500		–
SPE 7	Central	65 000		40
SPE 8	Central	11 000		–
1993–94				
SPE 1 + 9	North	< 500		–
SPE 2	North	< 500		–
SPE 8	North	< 500		–
1996				
SPE 1 + 9	National	2000		37
SPE 2	National	23 000		–
SPE 3	National	28 000		17
SPE 5	National	3000		–
SPE 7	National	20 000		17
SPE 8	National	11 000		–
1999–00				
SPE 2	National	10 000		94
SPE 2	National	16 000		64
SPE 3	National	154 000		38
SPE 5	National	10 000		58
SPE 7	National	63 000		46
SPE 8	National	< 500		101
2011–12				
SPE 1	Panel	1 070	0.5	45
SPE 2	Panel	7 395	3.9	34
SPE 3	Panel	97 356	48.3	29
SPE 5	Panel	4 237	1.9	60
SPE 7	Panel	28 530	12.5	40
SPE 8	Panel	3 699	1.7	48
2017–18				
SPE 1	Panel	478	0.2	87
SPE 2	Panel	3 287	1.6	40
SPE 3	Panel	55 336	33.1	28
SPE 5	Panel	27 993	13.2	89
SPE 7	Panel	13 486	5.3	30
SPE 8	Panel	3 573	1.7	69
2022–23				
SPE 1	Panel	225	0.1	70
SPE 2	Panel	764	0.4	72
SPE 3	Panel	37 604	18.8	29
SPE 5	Panel	1 822	0.9	63
SPE 7	Panel	10 349	5.7	55
SPE 8	Panel	239	0.1	73

In response to these problems and the cost and scale challenges associated with onsite methods, a national panel survey was conducted for the first time throughout the 2011–12 fishing year. The panel survey used face-to-face interviews of a random sample of 30 390 New Zealand households to recruit a panel of fishers and non-fishers for a full year (Wynne-Jones et al 2014). The panel members were contacted regularly about their fishing activities and harvest information in standardised phone interviews. The national panel survey was repeated during the 2017–18 and 2022–23 fishing years using very similar methods to produce directly comparable results (Wynne-Jones et al 2019; Heinemann & Gray, in prep). Recreational catch estimates from the three national panel surveys are given in Table 4. Note that national panel survey estimates do not include recreational harvest taken on charter vessel trips or under s111 general approvals.

1.3 Customary non-commercial fisheries

The customary non-commercial take has not been quantified.

1.4 Illegal catch

There is no quantitative information on illegal fishing activity or catch, and given the low commercial value of sea perch, such activity is unlikely.

1.5 Other sources of mortality

No quantitative estimates are available about the impact of other sources of mortality on sea perch stocks. However, they are commonly caught as bycatch and a moderate quantity, particularly of small fish, is undoubtedly discarded.

2. BIOLOGY

Sea perch are widely distributed around most of New Zealand, but are rare on the Campbell Plateau. They inhabit waters ranging from the shoreline to 1200 m and are most common between 150 and 500 m. *Helicolenus percoides* occur in depths shallower than 250 m, with a peak at around 150 m, whereas *H. barathri* occur in about 300–1000 m, with a peak at around 600 m (Bentley et al 2014).

Sea perch are viviparous, extruding small larvae in floating jelly masses during an extended spawning season. Sex ratios observed in trawl survey samples show more males, generally in the range 1:0.7 to 1:0.8. Sea perch are opportunistic feeders and prey on a variety of animals on or close to the seafloor.

For both species, growth is relatively slow throughout life. After about age 5 years, male *H. percoides* grow faster than females. Males mature at 19–25 cm, about 5–7 years, whereas females mature at between 15 and 20 cm, around 5 years (Paul & Francis 2002). Male and female *H. barathri* appear to grow at similar rates. Maximum observed ages estimated for sea perch from the east coast South Island (*H. percoides*) and Chatham Rise (*H. barathri*) were 35 and 59 years, respectively. The natural mortality estimates derived from these are 0.12 and 0.07 (using the Hoenig method) (Paul & Horn 2009). The maximum size for sea perch is about 56 cm.

Biological parameters relevant to stock assessment are shown in Table 5.

Table 5: Estimates of biological parameters for sea perch. ECSI = east coast South Island, CR = Chatham Rise. Sea perch from SPE 3 are predominantly *H. percoides* and those from the SPE4 are predominantly *H. barathri*. Ageing material was collected from the Chatham Rise (SPE 4) and east coast South Island inshore trawl survey.

Fishstock	Estimate	Source
1. Natural mortality (M)		
SPE 3 (ECSI)	0.12 (Hoenig method)	Paul & Horn (2009)
SPE 4 (CR)	0.07 (Hoenig method)	Paul & Horn (2009)

2. Weight = a (length)^b (Weight in g, length in cm fork length)

	Both sexes		
	a	b	
SPE 3	0.007767	3.219132	Schofield & Livingston (1996)

3. von Bertalanffy growth parameters

	Females			Males			
	K	t_0	L_∞	K	t_0	L_∞	
SPE 3 (ECSI)	0.123	-1.05	38.7	0.119	-0.79	42.13	Paul & Horn (2009)
SPE 4 (CR)	0.062	-3.93	46.34	0.074	-2.51	45.5	Paul & Horn (2009)

3. STOCKS AND AREAS

There are no data relevant to stock boundaries. However, regional variation in colouration suggests that separate populations could exist.

4. STOCK ASSESSMENT

4.1 Estimates of fishery parameters and abundance

4.1.1 Biomass estimates

Indices of relative biomass are available from recent *Tangaroa* and *Kaharoa* trawl surveys of the inshore west coast South Island (WCSI), Chatham Rise, and east coast South Island (ECSI) (Table 6, Figures 2–4).

West coast South Island inshore trawl survey

Although the depth range of *H. percoides* is appropriately covered by the WCSI inshore time series, the survey is not optimised for them and they are not a target species. The depth range for this survey is 30–400 m off the west coast of the South Island and >10 m in Tasman Bay and Golden Bay (MacGibbon & Stevenson 2013). Nearly all the sea perch caught during the WCSI winter time series are likely to have been *H. percoides* because only small numbers of *H. barathri* were caught in 2021, and these were in depths over 330 m. No distinction has been made between *H. percoides* and *H. barathri* on previous surveys. Biomass estimates increased from 1991 to 1995, declined to well below the series average by 2003, increased to a second peak in 2011, and then dropped 10-fold from then until 2021 (Figure 2).

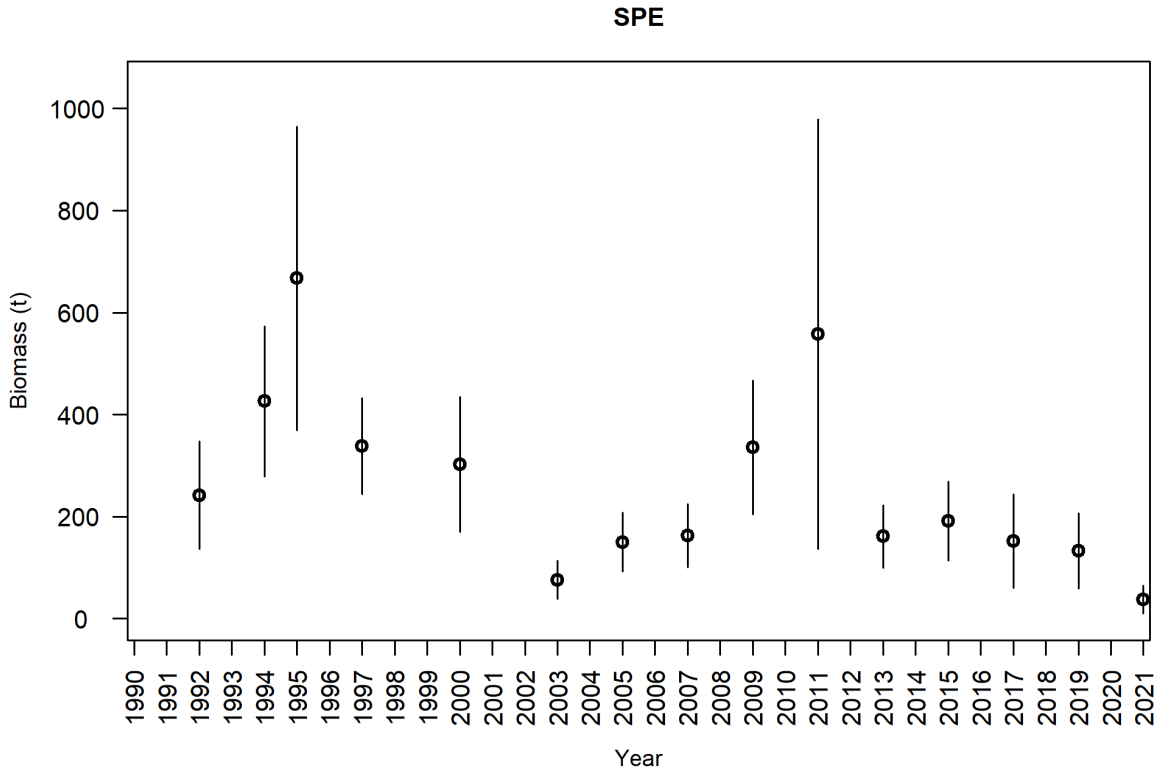


Figure 2: Biomass estimates from the west coast South Island inshore trawl survey. Error bars are ±2 standard errors.

Chatham Rise trawl survey

The Chatham Rise trawl survey was designed primarily for hoki and covers the core depth range 200–800 m. It therefore excludes a small portion of sea perch habitat around the Mernoo Bank in less than 200 m. *Helicolenus barathri* comprised 89% of the 2020 and 97% of 2022 sea perch biomass estimates. No distinction has been made between *H. percoides* and *H. barathri* on previous surveys. The survey biomass estimates for sea perch have fluctuated without trend since 1999 (Figure 3). The size

composition of sea perch caught by the Chatham Rise survey includes a substantial proportion of fish in the 30–45 cm total length range.

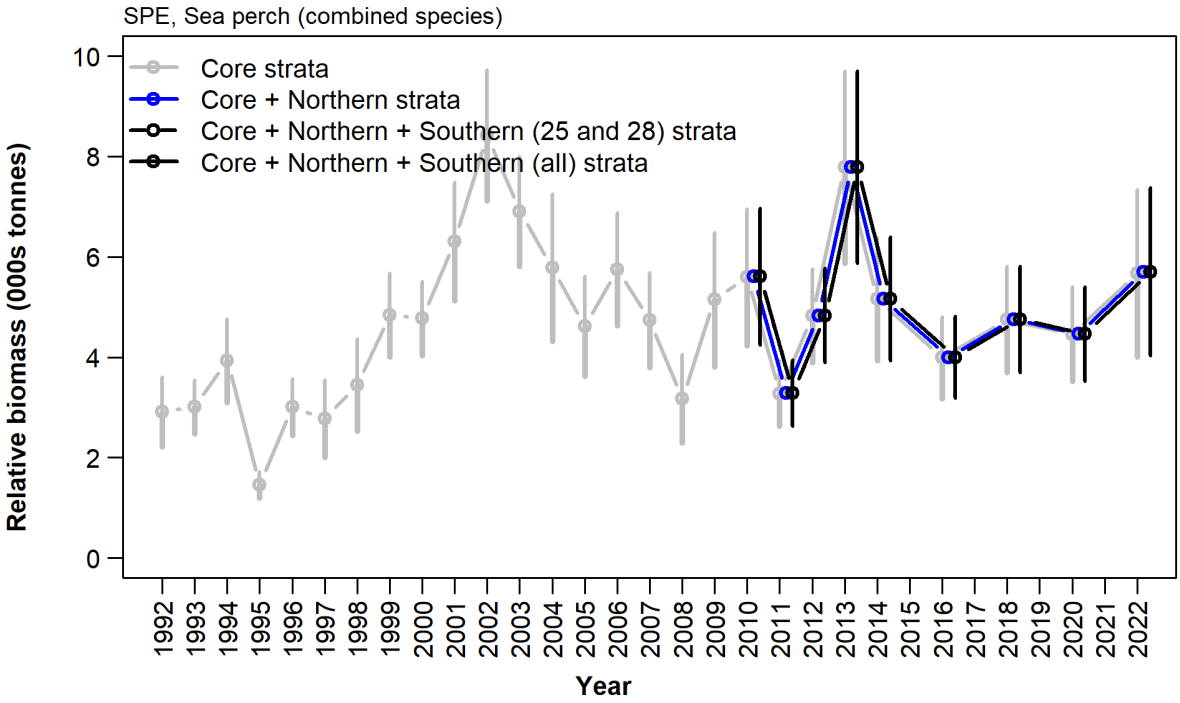


Figure 3: Biomass estimates from the Chatham Rise survey. Error bars are ± 2 standard errors. Core strata are 200–800 m. The other estimates include deeper strata (800–1300 m), where few sea perch are caught.

East coast South Island trawl survey

The ECSI winter surveys from 1991 to 1996 (depth range 30–400 m) were replaced by summer trawl surveys (1996–97 to 2000–01) which also included the 10–30 m depth range, but these were discontinued after the fifth in the annual time series because of the extreme fluctuations in catchability between surveys (Francis et al 2001). The winter surveys were reinstated in 2007, and this time included strata in the 10–30 m depth range to monitor elephantfish and red gurnard which were officially included in the list of target species in 2012. The 2007 survey and all surveys from 2012 onwards provide full coverage of the 10–30 m depth range. Sea perch are, however, not caught in the shallow strata.

Nearly all the sea perch caught during the ECSI winter time series are likely to have been *H. percoides* (species code HPC and previously SPE) because only small numbers of *H. barathri* (species code HBA) were caught in 2021 and 2022, and these were in depths greater than 330 m and 340 m, respectively. No distinction was made between *H. percoides* and *H. barathri* on surveys before 2021.

Sea perch biomass shows no trend over the core strata time series although biomass fluctuates with strong peaks and troughs (see Table 6, Figure 4) (Beentjes et al in press). The 2022 biomass of 2164 t was close to the time series average of 2054 t. Pre-recruit biomass has remained a small and reasonably constant component of the total biomass estimate on all surveys (3–8% of total core strata biomass) and in 2022 it was 4, just below the average of 5%. The juvenile to adult biomass ratio (based on length-at-50% maturity) was relatively constant over the time series at 15–36% juvenile, and, in 2022, it was 20%, just below the average of 27%. There was no sea perch catch in the 10–30 m strata and hence the addition of the shallow strata is of no value for monitoring sea perch.

The spatial distribution of sea perch hot spots within the survey area varies, but overall this species is consistently well represented over the entire survey area, most commonly from about 70 to 300 m. The size distributions of sea perch on each of the fourteen ECSI winter surveys were similar and generally unimodal with a right-hand tail reflecting the large number of age classes (Beentjes et al in press).

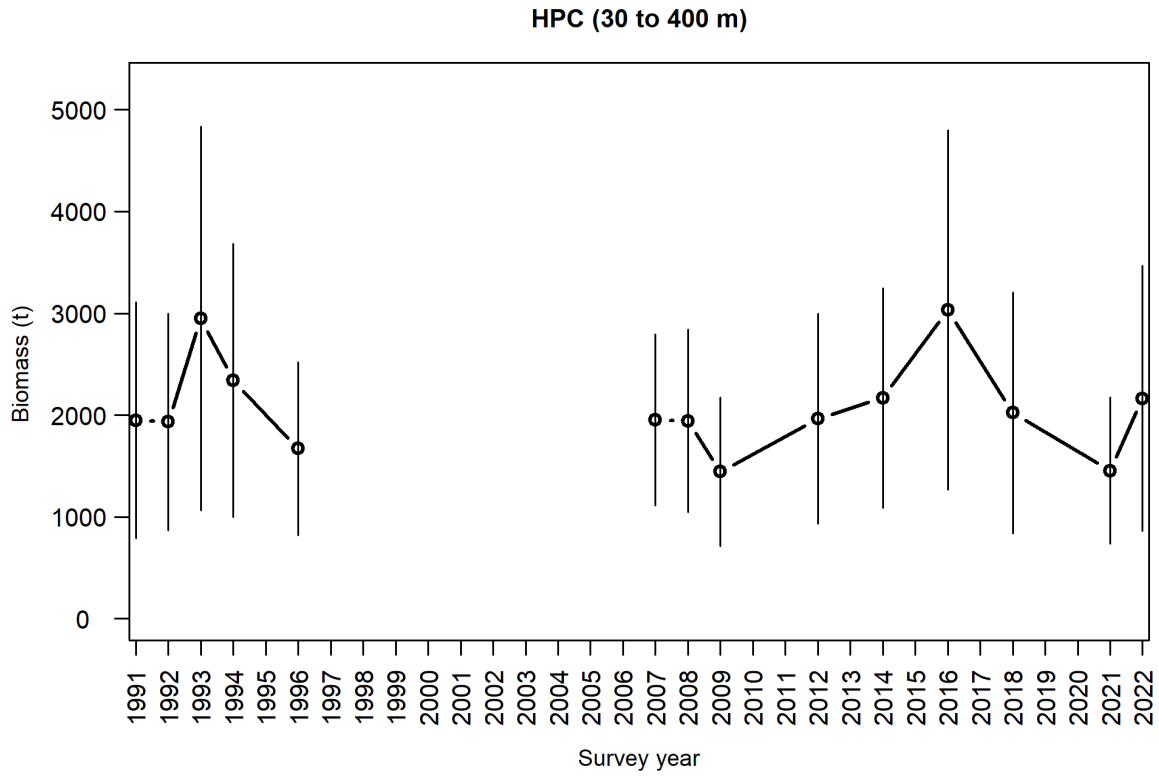


Figure 4: Sea perch total biomass for ECSI winter surveys in core strata (30–400 m). Error bars are ± 2 standard errors. The scientific species code for sea perch (*Helicolenus percoides*) has been changed from SPE to HPC.

Table 6: Relative biomass indices (t) and coefficients of variation (CV) for sea perch for east coast South Island (ECSI) summer and winter, west coast South Island (WCSI), the Stewart-Snares islands survey areas, and the Chatham Rise*. Biomass estimates for ECSI in 1991 have been adjusted to allow for non-sampled strata (7 & 9 equivalent to current strata 13, 16, and 17). The sum of pre-recruit and recruited biomass values do not always match the total biomass for the earlier surveys because at several stations length frequencies were not measured, affecting the biomass calculations for length intervals. –, not measured; NA, not applicable. Recruited is defined as the size-at-recruitment to the fishery (20 cm). [Continued on next page]

Region	Fishstock	Year	Trip number	Biomass estimate	CV (%)	Pre-recruit	CV (%)	Recruited	CV (%)
					30–400 m		30–400 m		30–400 m
ECSI(winter)	SPE 3	1991	KAH9105	1 716	30	70	44	1 483	30
		1992	KAH9205	1 934	28	51	28	1 441	28
		1993	KAH9306	2 948	32	178	76	2 770	30
		1994	KAH9406	2 342	29	78	24	2 264	29
		1996	KAH9606	1 671	26	58	45	1 613	25
		2007	KAH0705	1 954	22	74	18	1 880	22
		2008	KAH0806	1 944	23	144	20	1 800	24
		2009	KAH0905	1 444	25	82	18	1 363	26
		2012	KAH1207	1 964	26	66	25	1 898	27
		2014	KAH1402	2 168	25	182	29	1 986	26
		2016	KAH1605	3 032	29	109	25	2 923	30
		2018	KAH1803	2 023	29	64	19	1 959	30
		2021	KAH2104	1 453	25	120	28	1 333	26
		2022	KAH2204	2 164	30	96	27	2 069	31
ECSI(summer)	SPE 3	1996–97	KAH9618	4 041	47	–	–	–	–
		1997–98	KAH9704	1 638	25	–	–	–	–
		1998–99	KAH9809	3 889	41	–	–	–	–
		1999–00	KAH9917	2 203	27	–	–	–	–
		2000–01	KAH0014	1 792	20	–	–	–	–
WCSI	SPE 7	1992	KAH9204	293	24	–	–	–	–
		1994	KAH9404	510	18	–	–	–	–
		1995	KAH9504	667	23	–	–	–	–
		1997	KAH9701	338	14	–	–	–	–
		2000	KAH0004	302	22	–	–	–	–
		2003	KAH0304	76	25	–	–	–	–

Table 6 [Continued]:

Region	Fishstock	Year	Trip number	Biomass estimate	CV (%)	Pre-recruit	CV (%)	Recruited	CV (%)
					30–400 m		30–400 m		30–400 m
WCSI	SPE 7	2005	KAH0503	150	20	–	–	–	–
		2007	KAH0704	163	19	–	–	–	–
		2009	KAH0904	336	20	–	–	–	–
		2010	KAH1004	558	39	–	–	–	–
		2013	KAH1305	161	20	–	–	–	–
Stewart-Snares	SPE 5	1993	TAN9301	469	33	–	–	–	–
		1994	TAN9402	443	26	–	–	–	–
		1995	TAN9502	450	27	–	–	–	–
		1996	TAN9604	480	29	–	–	–	–
Chatham Rise	SPE 4	1991	TAN9106	3 050	12	–	–	–	–
		1992	TAN9212	3 110	9	–	–	–	–
		1994	TAN9401	3 914	11	–	–	–	–
		1995	TAN9501	1 490	9	–	–	–	–
		1996	TAN9601	3 006	10	–	–	–	–
		1997	TAN9701	2 713	14	–	–	–	–
		1998	TAN9801	3 448	14	–	–	–	–
		1999	TAN9901	4 842	9	–	–	–	–
		2000	TAN0001	4 776	8	–	–	–	–
		2001	TAN0101	6 310	10	–	–	–	–
		2002	TAN0201	8 417	8	–	–	–	–
		2003	TAN0301	6 904	8	–	–	–	–
		2004	TAN0401	5 786	13	–	–	–	–
		2005	TAN0501	4 615	11	–	–	–	–
		2006	TAN0601	5 752	10	–	–	–	–
		2007	TAN0701	4 737	10	–	–	–	–
		2008	TAN0801	3 081	14	–	–	–	–
		2009	TAN0901	5 149	13	–	–	–	–
		2010	TAN1001	5 594	12	–	–	–	–
		2011	TAN1101	3 278	10	–	–	–	–
		2012	TAN1201	4 827	10	–	–	–	–
		2013	TAN1301	7 785	13	–	–	–	–
		2014	TAN1401	5 158	12	–	–	–	–
		2016	TAN1601	3 989	10	–	–	–	–
		2018	TAN1801	4 749	11	–	–	–	–
		2020	TAN2001	4 460	11	–	–	–	–
		2022	TAN2201	5 671	15	–	–	–	–

4.2 Yield estimates and projections

Factors influencing yield estimates (species identification, catch history, biomass estimates, longevity/mortality, and natural fluctuations in population size) are poorly known for sea perch and preclude any reliable yield estimates at present.

5. FUTURE RESEARCH CONSIDERATIONS

- Investigate methods for apportioning historical survey catch by species for the ECSI, WCSI, and Chatham Rise surveys.
- Develop reference points and undertake partial quantitative stock assessments for *H. percoides* in SPE 3 and SPE 7 and *H. barathri* in SPE 4.

6. STATUS OF THE STOCKS

For all Fishstocks there is insufficient information to estimate current stock status.

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