FLATFISH (FLA)

(*Rhombosolea leporina, Rhombosolea plebeia*, *Rhombosolea retiaria*, *Rhombosolea tapirina*, *Pelotretis flavilatus, Peltorhamphus novaezeelandiae*, *Colistium guntheri*, *Colistium nudipinnis*)
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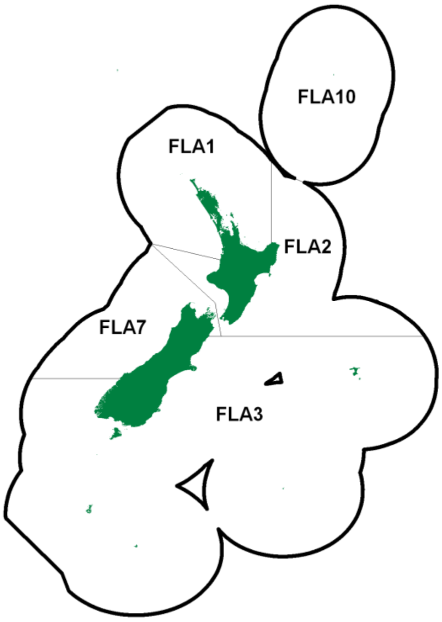
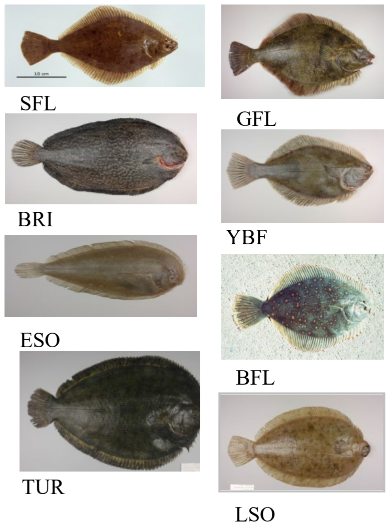




1. FISHERY SUMMARY

Allowances, TACCs, and TACs are shown in Table 1.

Table 1: Recreational and Customary non-commercial allowances, other mortality, TACCs, and TACs (t) for flatfish by Fishstock from 1 October 2024.

Fishstock	Recreational allowance	Customary non-commercial allowance	Other sources of mortality	TACC	TAC
FLA 1	27	50	19	890	986
FLA 2	10	10	8	150	178
FLA 3	150	5	32	1430	1617
FLA 7	10	10	40	524	584
FLA 10*	–	–	–	10	–

* allowances and TAC not set

1.1 Commercial fisheries

Flatfish (FLA) stocks within the QMS comprise a group of eight species: the yellowbelly flounder, *Rhombosolea leporina* (YBF); sand flounder, *Rhombosolea plebeia* (SFL); black flounder, *Rhombosolea retiaria* (BFL); greenback flounder, *Rhombosolea tapirina* (GFL); lemon sole, *Pelotretis flavilatus* (LSO); New Zealand sole, *Peltorhamphus novaezeelandiae* (ESO); brill, *Colistium guntheri* (BRI); and turbot, *Colistium nudipinnis* (TUR). Historically, catch, effort and landings data for flatfish could be reported using the FLA group code or the individual species codes. From 1 September 2021, all commercial flatfish reporting, other than on Monthly Harvest Returns, has been required to use the individual species codes.

Flatfish are generally shallow water species, taken mainly by target inshore trawl and Danish seine fleets around the North Island and the South Island. Setnet and drag net fishing are also important in the northern harbours and the Firth of Thames. Important fishing areas are:

Yellowbelly flounder (YBF)	Firth of Thames, Kaipara, and Manukau harbours;
Sand flounder (SFL)	Hauraki Gulf, Tasman Bay/Golden Bay, Hawke Bay, Canterbury Bight, and Te Wae Wae Bay;
Greenback flounder (GFL)	Tasman Bay/Golden Bay;
Black flounder (BFL)	Canterbury Bight, especially Lake Ellesmere;
Lemon sole (LSO)	Otago, and Southland;

New Zealand sole (ESO)	west coast South Island, Otago, Southland, Canterbury Bight, and Hawke Bay;
Brill (BRI) and turbot (TUR)	west coast South Island.

Greenback flounder are also reported from deeper water around the Auckland Islands.

TACCs for flatfish were originally set at the level of the sum of the provisional ITQs for each fishery. Between 1983–84 and 1992–93 total flatfish landings fluctuated between 2750 t and 5160 t per year; from 1992–93 to 1997–98, landings were relatively consistent, between about 4500 t and 5000 t per year. Landings declined to 2963 t in 1999–00, the lowest recorded since 1986–87, before increasing to a peak of 4051 t for the 2006–07 fishing year. Landings thereafter declined to just 957 t in 2023–24, the lowest total landings recorded since 1936–37. Historical estimated and recent reported flatfish landings and TACCs are shown in Table 2 and Table 3, and Figure 1 shows the historical landings and TACC values for the four FLA QMAs.

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

Year	FLA 1	FLA 2	FLA 3	FLA 7	Year	FLA 1	FLA 2	FLA 3	FLA 7
1931–32	767	290	219	265	1957	308	64	529	183
1932–33	958	219	61	276	1958	362	59	989	321
1933–34	698	277	181	346	1959	362	48	971	382
1934–35	708	203	83	195	1960	410	58	1 257	361
1935–36	686	118	57	209	1961	386	102	665	273
1936–37	438	127	139	139	1962	383	156	584	228
1937–38	570	125	380	123	1963	352	106	627	228
1938–39	717	83	639	94	1964	499	134	879	350
1939–40	721	128	448	83	1965	599	109	917	518
1940–41	1 004	180	494	101	1966	547	222	1 141	496
1941–42	943	139	622	139	1967	646	231	1 273	493
1942–43	591	192	594	154	1968	541	139	973	311
1943–44	669	89	606	172	1969	686	193	936	269
1944	441	104	783	78	1970	557	262	1 027	471
1945	435	104	984	83	1971	407	149	1 028	276
1946	392	168	1 264	146	1972	475	114	548	166
1947	551	99	1 685	198	1973	438	149	717	442
1948	433	93	1 494	214	1974	503	147	637	748
1949	412	76	1 473	202	1975	431	156	598	476
1950	284	31	1 446	176	1976	548	132	802	929
1951	308	62	1 178	135	1977	764	255	916	1 165
1952	349	94	1 117	166	1978	706	202	1 730	1 225
1953	349	149	1 510	197	1979	742	287	1 962	899
1954	376	112	1 184	213	1980	906	219	1 562	459
1955	377	125	913	248	1981	1 082	760	1 369	399
1956	308	106	772	190	1982	934	650	1 214	468

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.

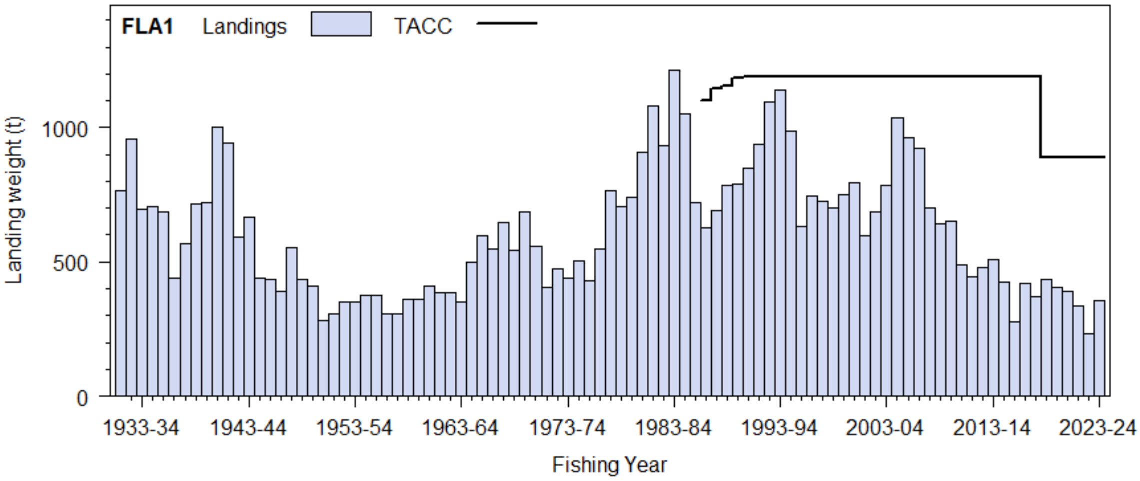
Flatfish were first introduced to the QMS in the fishing year 1986–87. After some minor increases, TACCs remained unchanged for all FLA Fishstocks until 1 October 2007, when a TAC and allowances were set for the first time in FLA 3. The FLA 3 TACC was reduced in that year by 47% to 1430 t and a management procedure (MP) was implemented that recommended an in-season increase in the commercial catch allowance if supported by early CPUE data (see Section 4.1 for a description of this procedure – this MP has been suspended, beginning in 2019–20). All FLA Fishstocks have been listed in Schedule 2 of the Fisheries Act 1996. Schedule 2 allows that, for certain 'highly variable' stocks, the TACC can be increased within a fishing season. Increased commercial catch is provided for through the creation of additional 'in-season' ACE. The base TACC is not changed by this process and the 'in-season' TACC reverts to the original level at the end of each season. The FLA 3 management procedure (Section 4.1) was an implementation of this form of management. Landings have remained well below the TACC for FLA 1, FLA 2, and FLA 7. The TACC for FLA 1 was reduced to 890 t from 2018–19, and to 150 t in FLA 2 from 2021–22. The TACC for FLA 7 was reduced to 524 t from 2024–25.

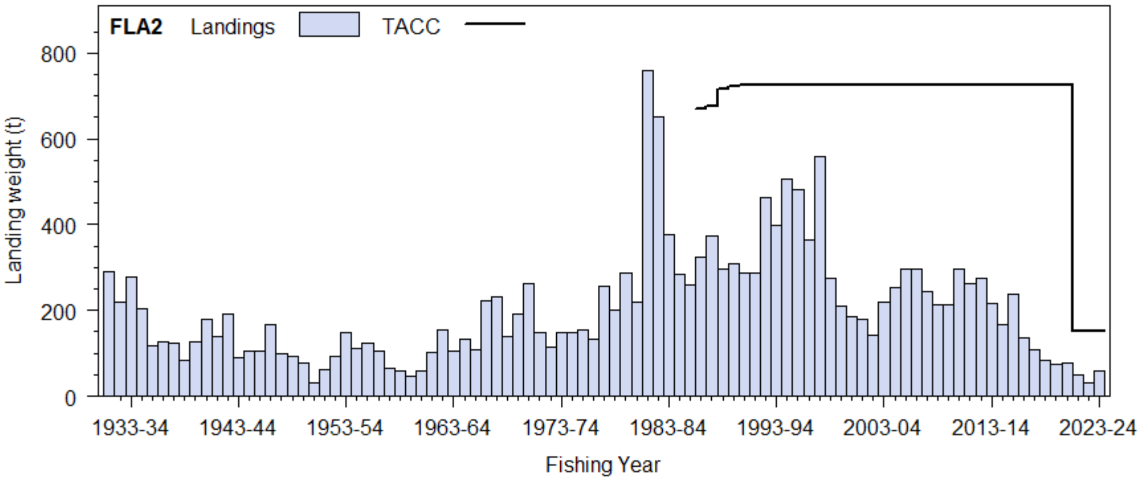
From 1 October 2008, a suite of regulations intended to protect Māui and Hector's dolphins was implemented for all New Zealand by the Minister of Fisheries. Commercial and recreational set netting were banned in most areas to 4 nautical miles offshore of the east coast of the South Island, extending 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 Kaikōura Canyon, and permitting set netting 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. The commercial minimum legal size for sand flounder is 23 cm, and for all other flatfish species is 25 cm.

Table 3: Reported landings (t) of flatfish by Fishstock from 1983–84 to present and actual TACCs (t) from 1986–87 to present. QMS data from 1986–present.

Fishstock	FLA 1		FLA 2		FLA 3		FLA 7		FLA 10			
FMA (s)	1 & 9		2 & 8		3, 4, 5 & 6		7		10		Total	
	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC
1983–84*	1 215	–	378	–	1 564	–	1 486	–	0	–	5 160	–
1984–85*	1 050	–	285	–	1 803	–	951	–	0	–	4 467	–
1985–86*	722	–	261	–	1 537	–	385	–	0	–	‡3 215	–
1986–87	629	1 100	323	670	1 235	2 430	563	1 840	0	10	‡2 750	6 050
1987–88	688	1 145	374	677	2 010	2 535	1 000	1 899	0	10	‡4 072	6 266
1988–89	787	1 153	297	717	2 458	2 552	757	2 045	0	10	4 299	6 477
1989–90	791	1 184	308	723	1 637	2 585	745	2 066	0	10	3 482	6 568
1990–91	849	1 187	292	726	1 340	2 681	502	2 066	0	10	2 983	6 670
1991–92	940	1 187	288	726	1 229	2 681	745	2 066	0	10	3 202	6 670
1992–93	1 106	1 187	460	726	1 954	2 681	1 566	2 066	0	10	5 086	6 670
1993–94	1 136	1 187	435	726	1 926	2 681	1 108	2 066	0	10	4 605	6 670
1994–95	964	1 187	543	726	1 966	2 681	1 107	2 066	0	10	4 580	6 670
1995–96	628	1 187	481	726	2 298	2 681	1 163	2 066	1	10	4 571	6 670
1996–97	741	1 187	363	726	2 573	2 681	1 117	2 066	0	10	4 794	6 670
1997–98	728	1 187	559	726	2 351	2 681	1 020	2 066	0	10	4 657	6 670
1998–99	690	1 187	274	726	1 882	2 681	868	2 066	0	10	3 714	6 670
1999–00	751	1 187	212	726	1 583	2 681	417	2 066	0	10	2 963	6 670
2000–01	792	1 187	186	726	1 702	2 681	447	2 066	0	10	3 127	6 670
2001–02	596	1 187	177	726	1 693	2 681	614	2 066	0	10	3 080	6 670
2002–03	686	1 187	144	726	1 650	2 681	819	2 066	0	10	3 299	6 670
2003–04	784	1 187	218	726	1 286	2 681	918	2 066	0	10	3 206	6 670
2004–05	1 038	1 187	254	726	1 353	2 681	1 231	2 066	0	10	3 876	6 670
2005–06	964	1 187	296	726	1 177	2 681	1 283	2 066	0	10	3 720	6 670
2006–07	922	1 187	296	726	1 429	2 681	1 419	2 066	0	10	4 066	6 670
2007–08	703	1 187	243	726	1 365	1 430	1 313	2 066	0	10	3 624	5 419
2008–09	639	1 187	214	726	1 544	**1 780	1 020	2 066	0	10	3 417	5 419
2009–10	652	1 187	212	726	1 525	**1 763	884	2 066	0	10	3 273	5 835
2010–11	486	1 187	296	726	1 027	1 430	659	2 066	0	10	2 467	5 509
2011–12	445	1 187	262	726	1 507	1 430	646	2 066	0	10	2 861	5 419
2012–13	480	1 187	274	726	1 512	**1 727	526	2 066	0	10	2 792	5 716
2013–14	511	1 187	216	726	1 377	1 430	568	2 066	0	10	2 672	5 419
2014–15	426	1 187	166	726	1 231	1 430	640	2 066	0	10	2 464	5 419
2015–16	277	1 187	238	726	1 622	**1 650	656	2 066	0	10	2 792	5 639
2016–17	421	1 187	136	726	1 421	*#2 065	873	2 066	0	10	2 851	6 054
2017–18	367	1 187	108	726	886	1 430	651	2 066	0	10	2 014	5 419
2018–19	435	890	82	726	968	1 430	454	2 066	0	10	1 940	5 122
2019–20	405	890	74	726	1 002	1 430	430	2 066	0	10	1 911	5 122
2020–21	392	890	78	726	870	1 430	474	2 066	0	10	1 814	5 122
2021–22	336	890	50	150	827	1 430	370	2 066	< 1	10	1 583	4 546
2022–23	233	890	30	150	633	1 430	121	2 066	< 1	10	1 018	4 546
2023–24	356	890	58	150	411	1 430	133	2 066	< 1	10	957	4 546

* FSU data.
‡ Includes 11 t of turbot, area unknown but allocated to QMA 7.
§ Includes landings from unknown areas before 1986–87.
** Commercial catch allowance increased with additional ‘in-season’ ACE provided under S68 of Fisheries Act 1996.
*# The increase in commercial catch under S68 of Fisheries Act 1996 was not approved until late August 2017.





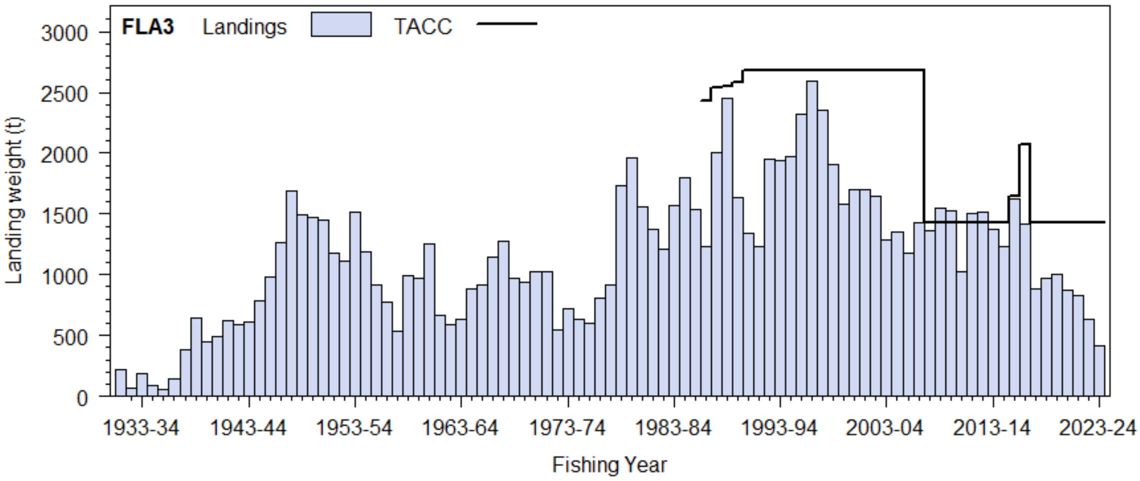


Figure 1: Historical landings and TACC for the four main FLA stocks. FLA 1 (Auckland), FLA 2 (Central) and FLA 3 (South East Coast, South East Chatham Rise, Sub-Antarctic, Southland) [Continued on next page].

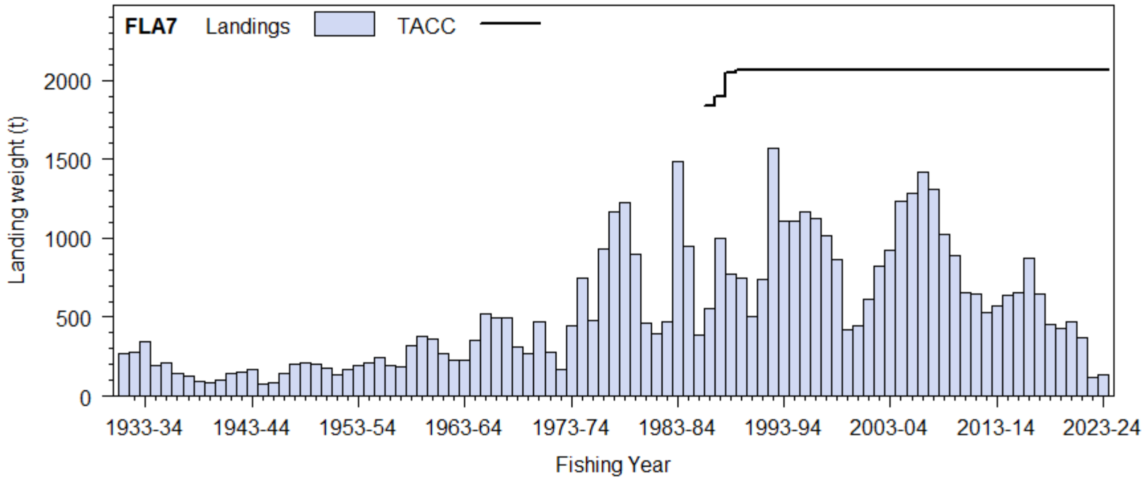


Figure 1 [Continued]: Historical landings and TACC for the four main FLA stocks. FLA 7 (West Coast South Island).

Historically, all reporting that used a Fishstock code (i.e., landings and Monthly Harvest Returns) implied the use of the aggregate FLA code. From September 2021, landings and discards are reported using pseudo-Fishstock codes (for example, YBF 1 rather than FLA 1) and the FLA code is now only used on Monthly Harvest Returns. Fishers have been encouraged to use the specific flatfish species code when reporting estimated catches of flatfish since the 1990–91 fishing year, but this has only been legally required since 1 September 2021.

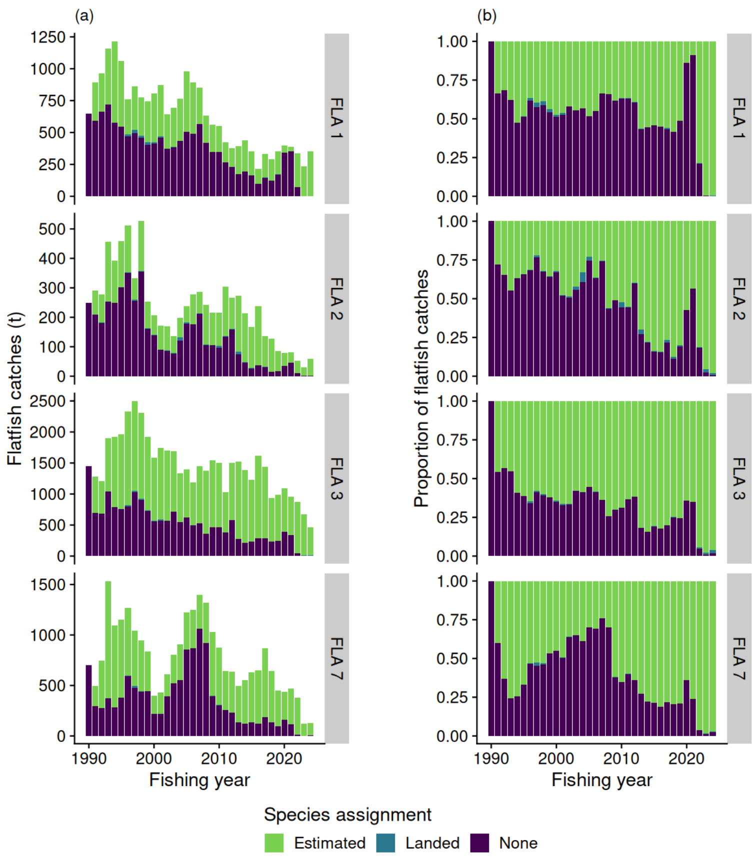


Figure 2: The quantity (a) and proportion (b) of fishing event-level flatfish catches that were assignable to species, by fishstock and year and categorised by assignment method (estimated catch data or landings data; from Starr et al 2025).

Starr et al (2025) found that the proportion of the flatfish catch reported by species had tended to increase over time in FLA 2 and FLA 3, was stable in FLA 1 up to 2019, and had varied over time in FLA 7 (Figure 2). Yellowbelly flounder dominated the catches from FLA 1, New Zealand sole and sand flounder predominate in FLA 2 and FLA 7, while lemon sole and New Zealand sole predominate in FLA 3 (Figure 3).

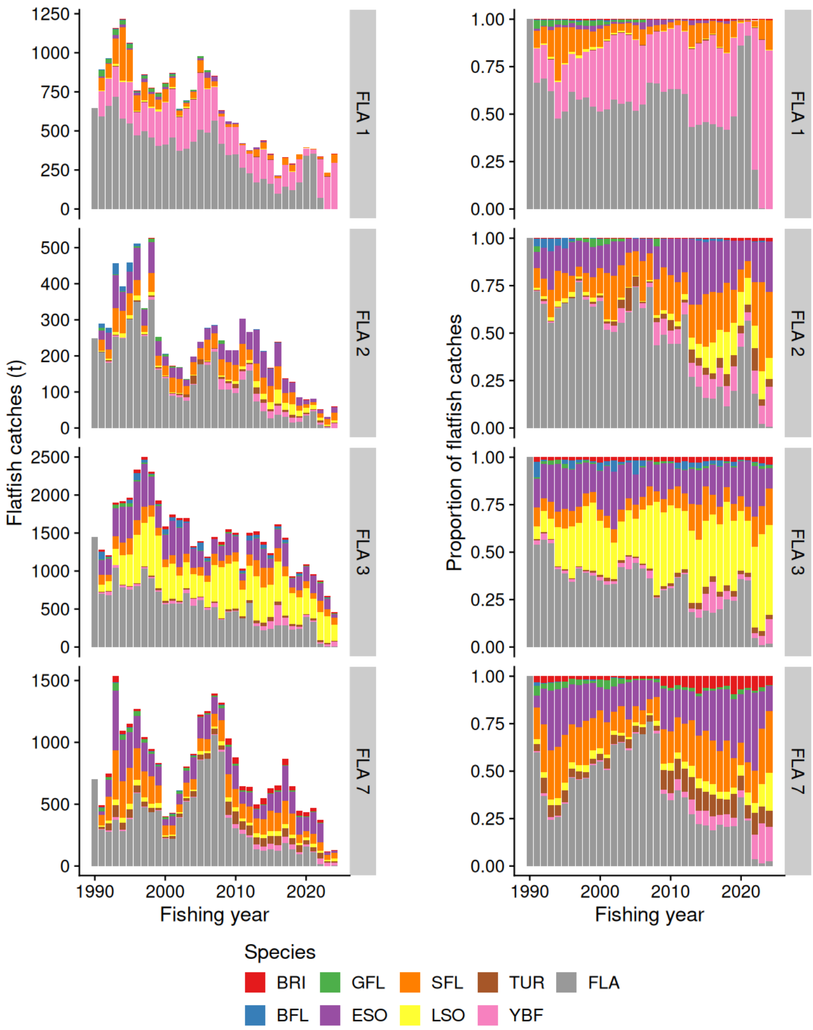


Figure 3: Flatfish catches by Fishstock, split by species where this can be done at the event level; from Starr et al (2025).

1.2 Recreational fisheries

There are important recreational fisheries, mainly for the four flounder species, in most harbours, estuaries, coastal lakes, and coastal inlets throughout New Zealand. The main methods are set netting, drag netting (62.8% combined), and spearing (36.1%) (Wynne-Jones et al 2014). In the northern region, important areas include the west coast harbours, the lower Waikato, the Hauraki Gulf, and the Firth of Thames. In the Bay of Plenty, Ohiwa and Tauranga harbours are important. In the Challenger FMA, there is a moderate fishery in Tasman Bay and Golden Bay and in areas of the Mahau-Kenepuru Sound and in Cloudy Bay. In the South-East and Southland FMAs, flatfish are taken in areas such as Lake Ellesmere, inlets around Banks Peninsula and the Otago Peninsula, the Oreti and Riverton estuaries, Bluff Harbour, and the inlets and lagoons of the Chatham Islands.

1.2.1 Management controls

The main methods used to manage recreational harvests of flatfish are minimum legal sizes (MLS) and daily bag limits. General spatial and method restrictions also apply, particularly to the use of set nets. The flatfish MLS for recreational fishers is the same as that for commercial fishers: 25 cm for all species except sand flounder for which the MLS is 23 cm. Fishers can take up to 20 flatfish as part of their combined daily bag limit in the Auckland, Central, and Challenger Fishery Management Areas.

Fishers can take up to 30 flatfish as part of their combined daily bag limit in the South-East, Kaikōura, Fiordland, and 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. Harvest estimates are provided in Table 4.

The first recreational harvest estimates for flatfish were provided by offsite telephone-diary surveys conducted between 1991 and 2001 (Bradford 1998, Boyd & Reilly 2004). These estimates are no longer considered to be reliable by the Marine Amateur Fishing Working Group (MAFWG), because the method was prone to 'soft refusal' bias during recruitment of potential participants and overstated catches during reporting (Wright et al 2004).

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. 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 2024). Note that the national panel survey estimates reported here exclude recreational harvest taken on charter vessel trips or under s111 general approvals.

Table 4: Estimated number and weight of flatfish, by Fishstock and survey, harvested by recreational fishers (excluding recreational harvest taken on charter vessel trips or reported under s111 general approvals). National panel surveys (Wynne-Jones et al 2014, 2019, Heinemann & Gray 2024) were conducted from 1 October to 30 September and used mean weights for flatfish from boat ramp surveys (Hartill & Davey 2015, Davey et al 2019; 2024).

Fishstock	Survey	Number	CV	Harvest range (t)	Point estimate (t)
2011–12					
FLA 1	Panel	64 919	0.37	–	27.2
FLA 2	Panel	12 773	0.31	–	5.4
FLA 3	Panel	53 079	0.32	–	21.5
FLA 7	Panel	12 259	0.37	–	4.7
2017–18					
FLA 1	Panel	37 045	0.29	–	15.1
FLA 2	Panel	22 161	0.41	–	9.0
FLA 3	Panel	23 316	0.38	–	9.5
FLA 7	Panel	12 930	0.43	–	5.3
2022–23					
FLA 1	Panel	14 115	0.23	–	3.3
FLA 2	Panel	2 615	0.23	–	0.6
FLA 3	Panel	16 218	0.23	–	3.8
FLA 7	Panel	8 679	0.23	–	2.0

1.3 Customary non-commercial fisheries

Quantitative information on the current level of customary non-commercial catch is not available.

1.4 Illegal catch

There is no quantitative information on the current level of illegal catch available.

1.5 Other sources of mortality

The extent of unrecorded fishing mortality is unknown.

2. BIOLOGY

Some New Zealand flatfish species are fast-growing and short-lived, generally only surviving to 3–4 years of age, with very few reaching 5–6 years. Others, such as brill and turbot, are longer lived, reaching a maximum age of 21 years and 16 years, respectively (Stevens et al 2001). However, these estimates have yet to be fully validated. Size limits (set at 25 cm for most species) are generally at or above the size at which the fish reach maturity.

Available biological parameters relevant to stock assessment are shown in Table 5. The estimated parameters in sections 1 and 3 are region and species specific — growth patterns are likely to be different for these species in other areas and for other species of flatfish.

Sutton et al (2010) showed that growth is rapid throughout the lifespan of greenback flounder. Females reached a slightly greater maximum length than males, but the difference was not significant at the 95% level. Over 90% of sampled fish were 2 or 3 years of age, with maximum ages of 5 and 10 years obtained for male and female fish, respectively. This difference in maximum age resulted in estimated natural mortalities, using Hoenig's (1983) regression method, of 0.85 for males and 0.42 for females. It is suggested that 0.85 is currently the most appropriate estimate for the species because only 1% of all fish exceeded 5 years. However, it was also noted that a complete sample of the larger fish was not obtained and as a result these estimates are preliminary. Growth rings were not validated.

Flatfish are shallow-water species, generally found in waters less than 50 m depth. Juveniles congregate in sheltered inshore waters, e.g., estuarine areas, shallow mudflats, and sandflats, where they remain for up to two years. Juvenile survival is highly variable. Flatfish move offshore for first spawning at 2–3 years of age during winter and spring. Adult mortality is high, with many flatfish spawning only once and few spawning more than two or three times. However, fecundity is high, e.g., from 0.2 million eggs to over 1 million eggs in sand flounders.

Table 5: Estimates of biological parameters for flatfish.

Fishstock	Estimate	Source
1. Natural mortality (*M*)		
Brill - West coast South Island (FLA 7)	0.20	Stevens et al (2001)
Turbot - West coast South Island (FLA 7)	0.26	Stevens et al (2001)
Sand flounder - Canterbury (FLA 3)	1.1–1.3	Colman (1978)
Lemon sole - West coast South Island (FLA 7)	0.62–0.96	Gowing et al (unpub.)

2. Weight = $a(\text{length})^b$ (Weight in g, length in cm total length).	Females		Males		
	a	*b*	*a*	*b*	
Brill (FLA 7)	0.01443	2.9749	0.02470	2.8080	Hickman & Tait (unpub.)
Turbot (FLA 7)	0.00436	3.3188	0.00571	3.1389	Hickman & Tait (unpub.)
Sand flounder (FLA 1)	0.03846	2.6584	-	-	McGregor et al (unpub.)
Yellowbelly flounder (FLA 1)	0.07189	2.5117	0.00354	3.3268	McGregor et al (unpub.)
New Zealand sole (FLA 3)	0.03578	2.6753	0.007608	3.0728	McGregor et al (unpub.)

3. von Bertalanffy growth parameters	Females			Males			
	L_∞	*k*	t_0	L_∞	*k*	t_0	
Brill							
West coast South Island (FLA 7)	43.8	0.10	–15.87	38.4	0.37	38.4	Stevens et al (2001)
Turbot							
West coast South Island (FLA 7)	57.1	0.39	0.30	49.2	0.34	49.2	Stevens et al (2001)
Sand flounder							
Canterbury (FLA 3)	59.9	0.235	–0.083	37.4	0.781	37.4	Mundy (1968), Colman (1978)
Lemon sole							
West coast South Island (FLA 7)	26.1	1.29	–0.088	25.6	1.85	25.6	Gowing et al (unpub.)
Greenback flounder (FLA 5)	55.82	0.26	–1.06	52.21	0.25	–1.32	Sutton et al (2010)

3. STOCKS AND AREAS

There is evidence of many localised stocks of flatfish. However, the inter-relationships of adjacent populations have not been well studied. The best information is available from studies of the variation in morphological characteristics of sand flounders and from the results of tagging studies, conducted mainly on sand and yellowbelly flounders. Variation in morphological characteristics indicate that sand flounder stocks off the east and south coasts of the South Island are clearly different from stocks in central New Zealand waters and from those off the west coast of the South Island. There also appear to be differences between west coast sand flounders and those in Tasman Bay, and between sand flounders on either side of the Auckland-Northland peninsula. Tagging experiments show that sand flounders, and other species of flounder, can move substantial distances off the east and south coasts of the South Island. However, fish tagged in Tasman Bay or the Hauraki Gulf have never been recaptured very far from their point of release.

Thus, although the sand flounders off the east and south of the South Island appear to be a single, continuous population, fish in enclosed waters may be effectively isolated from neighbouring populations and should be considered as separate stocks. Examples of such stocks are those in Tasman Bay and the Hauraki Gulf and possibly areas such as Hawke Bay and the Bay of Plenty.

There are no new data which would alter the stock boundaries used in previous assessment documents.

4. STOCK ASSESSMENT

4.1 Estimates of fishery parameters and abundance

FLA 1

A standardised CPUE analysis of FLA 1 was conducted in 2022 (Moore et al 2023) following previous analyses in 2019 (Starr & Kendrick 2019b), 2015 (Kendrick & Bentley 2015), 2012 (Kendrick & Bentley 2012), 2009 (Kendrick & Bentley 2011), and 2005 (Beentjes & Coburn 2005). Three standardised CPUE indices were generated using estimated catches as the dependent variable:

1. FLA(TOT) in Manukau Harbour (Statistical Area 043);
2. FLA(TOT) in Kaipara Harbour (Statistical Area 044);
3. FLA(TOT) in Hauraki Gulf (Statistical Areas 005, 006, and 007).

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 (Hauraki Gulf only), net length (summed), and duration of fishing (summed), with the estimated species catch used as the dependent variable. Following the 2019 analysis, the 2022 analyses also examined the use of a procedure (termed 'F2') which scales estimated catches to landings using a 'vessel correction factor'. This procedure multiplies estimated catches with the ratio of landings to estimated catches for a vessel in a fishing year. A comparison of the two series for those records that had both landings and estimated catch data available showed no appreciable difference in output between the two procedures (Figure 4), even though the F2 procedure truncates the data set to avoid excessively large and small ratios. Accordingly, unscaled estimated catches were used in the final CPUE models (i.e., using all estimated catch records, including those without matched landings). Starr & Kendrick (2019b) also summed all flatfish estimated catches for the Manukau Harbour and Kaipara Harbour analyses to create a TOT category, a procedure that was replicated in the 2022 analyses. This was done because estimated catches of other flatfish species are negligible in these harbours (Table 6) and a comparison with 2015 series by Starr & Kendrick (2019b) showed no difference in the overlapping years.

Table 6: Total FLA 1 estimated catches by declared flatfish species, summed over the period 1989–90 to 2020–21. From 2019 until 1 September 2021, after ERS was introduced, species-specific reporting was not accepted by many of the platforms.

	Manukau	Kaipara	Lower Waikato	Northwest	FLA 1 West	East Northland	Hauraki Gulf	Bay of Plenty	FLA 1 East	Total FLA 1
FLA	1 999.0	3 742.6	587.5	555.7	6 884.8	595.1	3 539.9	268.0	4 403.1	11 287.9
YBF	146.2	1 778.1	126.7	164.0	2 215.0	433.3	2669.7	137.7	3240.7	5 455.8
SFL	4.0	45.7	19.9	8.9	78.5	72.6	1271.2	310.0	1653.8	1 732.3
ESO	0.0	0.0	12.2	16.2	28.4	1.1	5.4	210.7	217.2	245.6
GFL	0.0	0.1	7.5	0.2	7.8	0.0	202.6	12.7	215.3	223.1
LSO	0.0	0.0	2.6	2.6	5.2	0.5	1.0	76.7	78.3	83.5
BRI	0.0	0.0	11.8	2.6	14.4	0.1	0.1	20.7	20.9	35.3
BFL	0.0	0.0	0.1	0.2	0.3	0.3	26.3	2.3	28.9	29.2
TUR	0.0	0.0	4.8	4.6	9.4	0.1	0.4	1.3	1.9	11.2
Total	2 149.3	5 566.5	773.1	754.9	9 243.8	1 103.3	7 716.7	1 040.2	9 860.2	19 103.9

Unlike previous analyses, species-specific CPUE indices were not generated for the Hauraki Gulf in 2022. This was because the SFL series of the 2019 analysis was rejected by the Northern Inshore Working Group (NINSWG) because it was noted that the reporting of SFL in the estimated catches fell away in the early to mid-2000s, which was also a period when the SFL CPUE dropped while, at the same time, there was little change in the species-specific reporting of YBF. Moreover, since the introduction of the ERS there has been a lack of species-specific reporting in all FLA 1 areas. These issues in reporting make the associated CPUE series unreliable, resulting in a recommendation from the NINSWG that the species-specific CPUE series for the Hauraki Gulf be replaced with a TOT series (which sums all flatfish species catch).

Less than half of the estimated FLA 1 flatfish catch since 1989–90 has been identified by species (Table 6), but most of the flatfish caught in FLA 1 West were likely to be yellowbelly flounder under the assumption that the flatfish reported using the generic 'FLA' code are YBF. This assumption is supported by the fact that the preferred muddy bottom habitat of yellowbelly flounder dominates the west coast harbours. Over 80% of the west coast catch is taken from Kaipara Harbour and Manukau Harbour (Table 6). Standardised CPUE trends were derived for these two areas using TOT (sum of all flatfish estimated catches). The NINSWG accepted the Manukau FLA(TOT) and Kaipara FLA(TOT) series as reflecting abundance. In spite of fluctuations, both the Manukau and Kaipara series show a long-term declining trend between 1990 and about 2010. Since then, both series have been generally stable and are currently 54% and 67% below the respective peaks in the early to mid-1990s (see Status of the Stocks section). Work in the Manukau Harbour (McKenzie et al 2013) has linked the decrease in local CPUE with an increase in eutrophication, suggesting that there may be factors other than fishing contributing to the decline.

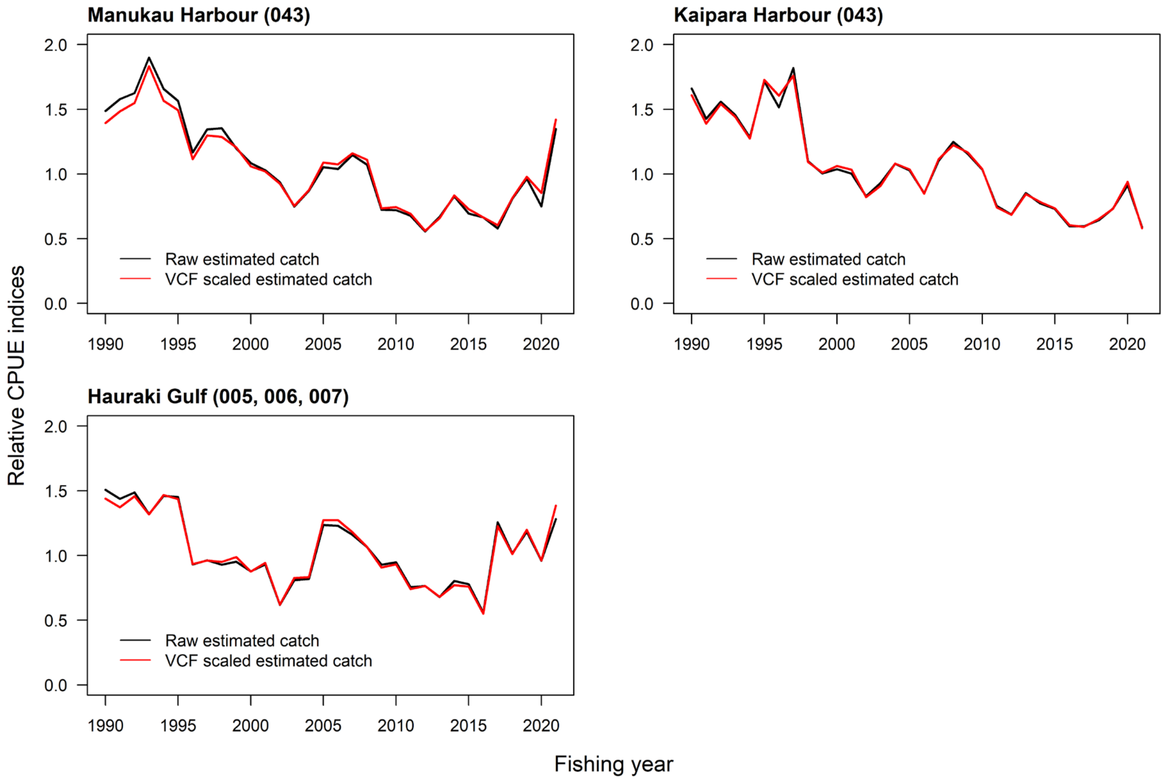


Figure 4: Comparison of standardised CPUE indices for flatfish (all species) from models of catch rate based on raw estimated catches and estimated catches scaled by a 'vessel correction factor' (F2 procedure) for successful set net trips in Manukau Harbour, Kaipara Harbour, and the Hauraki Gulf.

Seventy-eight percent of the flatfish catch from FLA 1 East, including a substantial and variable proportion of sand flounder, is taken in the Hauraki Gulf, particularly from the Firth of Thames (Statistical Area 007). The Hauraki Gulf FLA(TOT) series shows an overall declining trend except for a three-year increase from 2002 to 2005 and a single strong increase in the 2017 fishing year, which brought the series above the long-term average. Since then, the CPUE index has fluctuated around the series mean (see Status of the Stocks section).

FLA 2

In 2017, Schofield et al (2018a) provided standardised CPUE series for the FLA 2 flatfish bottom trawl target fishery in Statistical Areas 013 and 014 (here referred to as Hawke Bay). A combined species (FLA) series was used to provide a partial quantitative stock assessment, while species specific CPUE series were also provided for New Zealand sole and sand flounder, but without setting reference points.

Starr et al (2025) reviewed and updated the CPUE analyses for FLA 2. Target bottom trawl catches in the Hawke Bay fishery had declined substantially after 2015 and most FLA catch after 2022 was taken as by-catch in the gurnard target bottom trawl fishery, severely reducing the reliability of the CPUE series based on target FLA trawling. As a result, a new CPUE series was developed based on bottom trawl effort in Statistical Areas 013 and 014 that targeted either flatfish or gurnard. A combined (binomial/positive with Weibull error distribution) event resolution series, starting in 2008, was selected as the preferred series on the basis that depth was available as a covariate. This series was more variable than the previous series for the flatfish target fishery, potentially due to fact that the inclusion of gurnard effort resulted in a more diverse range of flatfish species in the catch, in particular more lemon sole (Figure 5).

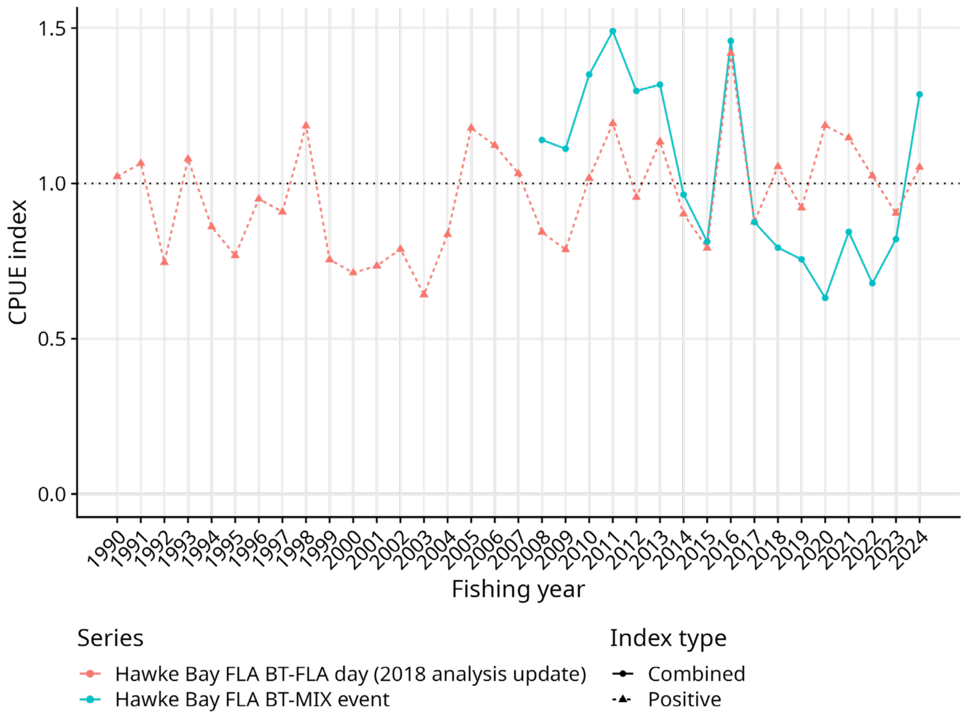


Figure 5: Standardised CPUE indices for combined flatfish in Hawke Bay for BT targeting flatfish using daily resolution data, and targeting flatfish or gurnard using event resolution data (Starr et al 2025).

Species-specific CPUE series, using event resolution data from flatfish and gurnard target effort in Statistical Areas 013 and 014 were also developed for New Zealand sole, sand flounder, yellowbelly flounder, and lemon sole. Only the series for New Zealand sole and sand flounder were considered by the Working Group to be adequately monitoring abundance (Figure 6). Species specific CPUE series were also investigated for sand flounder and lemon sole in the South Taranaki Bight (Statistical Area 038), but catches in this area were sparse and adequate CPUE models could not be fitted.

The sensitivity of the accepted series to splitting vessels that had participated in the fishery for more than 12 years was investigated; but did not result in indices that were notably different from those where vessel effects were constant over time. Trends in CPUE were also compared with various water quality measures using data collected by Hawke's Bay Regional Council; no clear correlations were obvious.

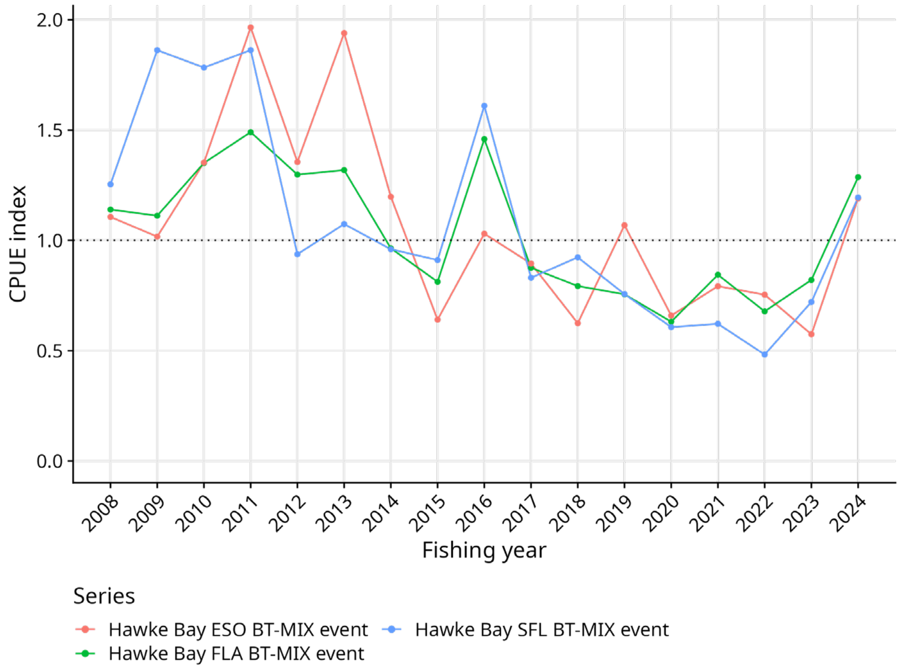


Figure 6: Standardised CPUE indices for combined flatfish, New Zealand sole, and sand flounder in Hawke Bay for BT targeting flatfish or gurnard using event resolution data (Starr et al 2025).

Establishing B_{MSY} compatible reference points

In 2014, the Working Group adopted mean CPUE from the bottom trawl flatfish target series based on the combined species catch in Statistical Areas 013 and 014 (Hawke Bay) for the period 1989–90 to 2012–13 as a B_{MSY}-compatible proxy for FLA 2. In 2025, this target was updated to the geometric mean CPUE from 2007–08 to 2023–24 using the Hawke Bay FLA BT-MIX event series (Figure 6).

B_{MSY}-compatible proxy targets were also set for New Zealand sole (geometric mean CPUE from 2014–15 to 2023–24 in the Hawke Bay ESO BT-MIX event series) and sand flounder (geometric mean CPUE from 2011–12 to 2017–18 in the Hawke Bay SFL BT-MIX event series) in Hawke Bay (Figure 6).

Although the predominant flatfish species monitored by the CPUE series in FLA 2 are highly productive species (for which a management target of 30% B_0 might apply), it was recommended that these targets should be considered as proxies for 40% B_0 targets. A higher target biomass was appropriate because management of flatfish as a species complex creates challenges where individual species are naturally variable, may not vary in synchrony and the interval between assessments may be too long. The Working Group accepted the default Harvest Strategy Standard definitions that the soft and hard limits would be one half and one quarter the target, respectively.

FLA 3

CPUE trends

CPUE trends for the three principal FLA 3 species (New Zealand sole [ESO], sand flounder [SFL], and lemon sole [LSO]) and an aggregated catch landed to FLA [TOT], based on bottom trawl catch and effort data, were updated in 2020 (Starr & Kendrick 2022a). The species-specific catch data were based on 'splitter' trips, defined as trips which landed FLA 3 but which did not use the FLA code in the estimated catch section of the catch and effort form. Alternative definitions of 'splitters' based on vessel performance were investigated in 2015 (Starr & Kendrick 2018), but CPUE trends were found to be similar to those derived from the 'trip splitter' algorithm. The latter was selected because it retained the greatest amount of catch, particular in the early years of the series.
The CPUE data were prepared by matching the FLA landing data for a trip with the effort data from the same trip that had been amalgamated to represent a day of fishing. The procedure assigns the modal statistical area and modal target species (defined as the observation with the greatest effort) to the trip/date record. All estimated catches for the day were summed and the five top species with the

greatest catch were assigned to the date. This ‘daily-effort stratum’ preparation method was followed so that the event-based data forms that are presently being used in these fisheries can be matched as well as possible with the earlier daily forms to create a continuous CPUE series. For this procedure to function correctly, given that there are multiple flatfish species in the estimated catches, the matching procedure with landings is done twice: first by summing all flatfish estimated catches into a single generic ‘flatfish’ category. The ratio of the total FLA landings relative to the sum of the estimated flatfish catches can then be used to scale each of the species-specific estimated catches on the same trip as the second step.

Each analysis was confined to a set of core vessels which had participated consistently in the fishery for a reasonably long period (5 trips for at least 5 years). The explanatory variables offered to each model included fishing year (forced), month, vessel, statistical area, number tows, and duration of fishing, with the scaled estimated species catch used as the dependent variable. The WG agreed to report only the lognormal series for these analyses because zero records only meant that the species had not been reported, rather than being a true zero. The WG also agreed to restrict all analyses to target FLA records and to the following six Statistical Areas: 020, 022, 024, 026, 025, and 030.

The estimated CPUE trends by species were used to evaluate the relative status of the three main species in the FLA 3 fishery. There were similarities among the three species-specific standardised CPUE indices (Figure 5), with all indices increasing in the early 1990s and peaking at some point in the early to mid-1990s. All indices then have a trough in the early- to mid-2000s, followed by an increase for LSO and SFL and a decrease for ESO, with the ESO and SFL indices showing similarity in their fluctuations. The SFL index series gradually increased to a peak in the mid-2010s, after which it levelled out while neither the LSO or ESO series have returned to the levels seen in the 1990s. The LSO series has been without trend since 2008–09 while the ESO series has declined slowly from that year (Figure 5).

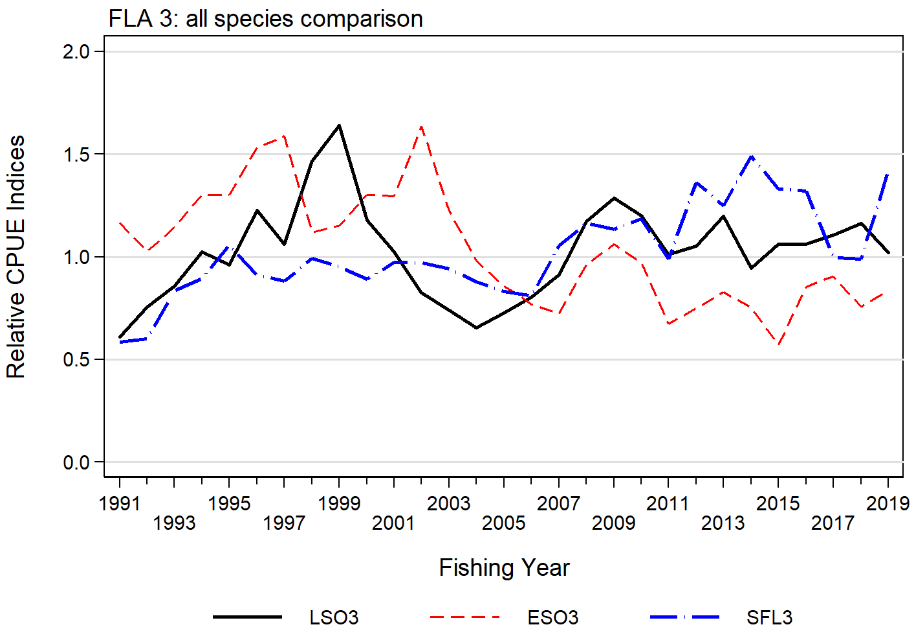


Figure 5: Comparison of standardised bottom trawl lognormal CPUE indices in FLA 3 for LSO (lemon sole), ESO (New Zealand sole), and SFL (sand flounder) (from Starr & Kendrick 2022a).

ECSI trawl survey biomass estimates for LSO, ESO, and SFL

Lemon sole biomass indices in the core strata (30–400 m) from the east coast South Island trawl survey (Table 7) show no trend (Figure 6). Coefficients of variation are moderate to low, ranging from 15 to 33% (mean 23%). The additional biomass captured in the 10–30 m depth range region accounted for 1% to 5% of the biomass in the core plus shallow strata (10–400 m) for the five years with usable biomass estimates in the 10–30 m region, indicating that the existing core strata time series in 30–400 m are more important for this species. A comparison of the LSO CPUE series with the LSO ECSI biomass indices shows that both series fluctuate without trend and show considerable variation (Figure 6). The correspondence between the two sets of indices is weak (rho=-0.342; R^2=12%).

Table 7: Relative biomass indices (t) and coefficients of variation (CV) for lemon sole (LSO). New Zealand sole (ESO), and sand flounder (SFL) from the east coast South Island (ECSI) - winter survey area. Biomass estimates are provided for the core (30–400 m) region and for the shallow (10–30 m) region introduced in 2007. NA: insufficient tows for shallow region.

Species	Year	Trip number	Total Biomass estimate (t)	CV (%)	Total Biomass estimate (t)	CV (%)
			30–400 m (core)		10–30 m	
LSO	1991	KAH9105	92	27	–	–
	1992	KAH9205	57	18	–	–
	1993	KAH9306	121	19	–	–
	1994	KAH9406	77	21	–	–
	1996	KAH9606	49	33	–	–
	2007	KAH0705	74	26	3	38
	2008	KAH0806	116	25	NA	NA
	2009	KAH0905	55	27	NA	NA
	2012	KAH1207	65	18	1	55
	2014	KAH1402	107	27	2	50
	2016	KAH1605	91	15	3	52
	2018	KAH1803	44	20	2	33
ESO	2007	KAH0705	5	51	19	72
	2008	KAH0806	6	38	NA	NA
	2009	KAH0905	2	48	NA	NA
	2012	KAH1207	15	82	17	38
	2014	KAH1402	13	41	22	29
	2016	KAH1605	4	64	23	31
	2018	KAH1803	3	60	32	40
SFL	2007	KAH0705	16	61	31	64
	2008	KAH0806	9	52	NA	NA
	2009	KAH0905	2	74	NA	NA
	2012	KAH1207	43	71	30	27
	2014	KAH1402	55	42	65	21
	2016	KAH1605	2	63	48	33
	2018	KAH1803	5	99	40	14

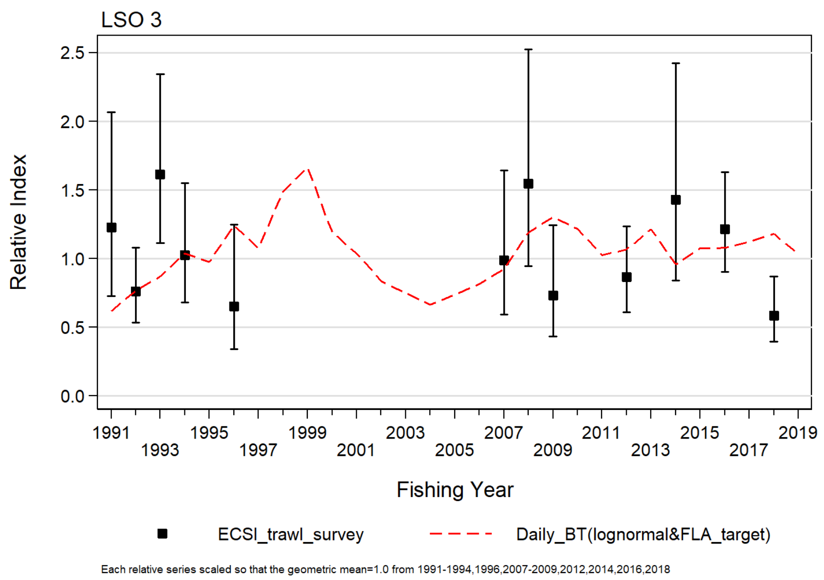


Figure 6: Lemon sole total biomass and 95% confidence intervals for the ECSI winter survey in core strata (30–400 m) plotted against the LSO bottom trawl CPUE series.

The shallow 10–30 m region holds a substantial fraction of the biomass of the other two important FLA 3 species, ESO and SFL. This fraction ranges from 54% to 90% of the total annual ESO biomass whereas the equivalent range for SFL is 41–96% (Table 7). There is reasonable correspondence between the summed survey biomass estimates and the equivalent commercial CPUE series over the five overlapping years (Figure 7), although the CVs for these estimates are large for both species (Table 7).

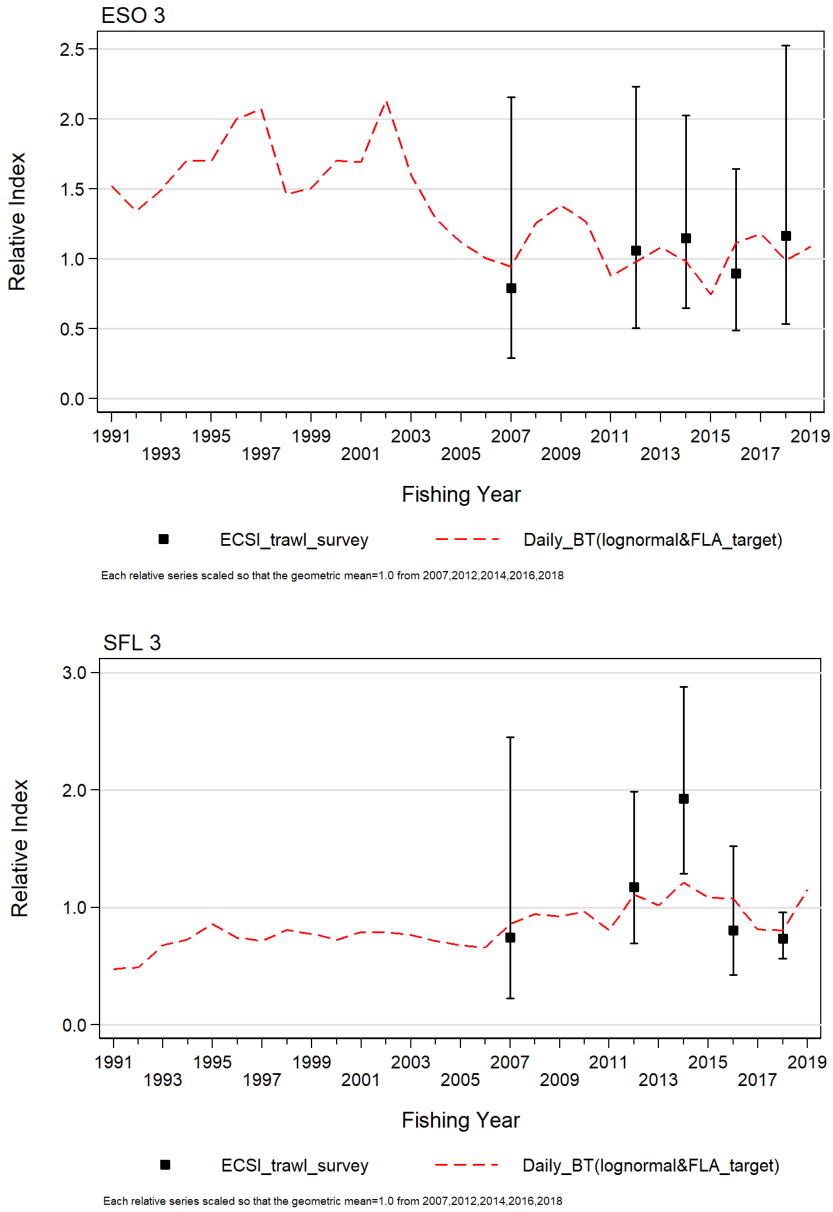


Figure 7: New Zealand sole (ESO, top panel) and sand flounder (SFL, bottom panel) total biomass and 95% confidence intervals for the summed ECSI winter survey core + shallow strata plotted against the respective ESO and SFL bottom trawl CPUE series.

In-season Management Procedure

In 2007 concerns were expressed about the sustainability of FLA 3 catches and the TACC was reduced from 2681 t to 1430 t from 1 October 2007. In the 2008–09 fishing year anecdotal information indicated an increase in abundance of lemon and New Zealand sole in the FLA 3 QMA above a level that fishers were able to utilise within the available TACC. It was considered that there was opportunity for increased utilisation that would not adversely impact on the long-term sustainability of the FLA 3 stock complex and for 2008–09 'in-season' commercial allowances were set at 1780 t based on the 15 year average of commercial FLA 3 catches.

In 2010, an 'in-season' Management Procedure (MP) was developed which has been used to inform in-season adjustments to the FLA 3 TACC since 2010–11 (Bentley 2009, 2010). This MP was updated and revised in 2015 (Starr et al 2018). It used the relationship between annual standardised CPUE for all FLA 3 species and the total annual FLA 3 landings to estimate an average exploitation rate which is then used to recommend a level of full-season catch based on an early estimate of standardised CPUE. Only the period 1989–90 to 2006–07 was used to estimate the average exploitation rate because this was the period before the TACC was reduced which allowed the fishery to operate at an unconstrained level. A partial year in-season estimate of standardised CPUE is used as a proxy for the final annual index, with the recommended catch defined by the slope of the regression line (Figure 8) multiplied by the CPUE proxy estimate (Figure 8 shows the outcome of this procedure for 2019).

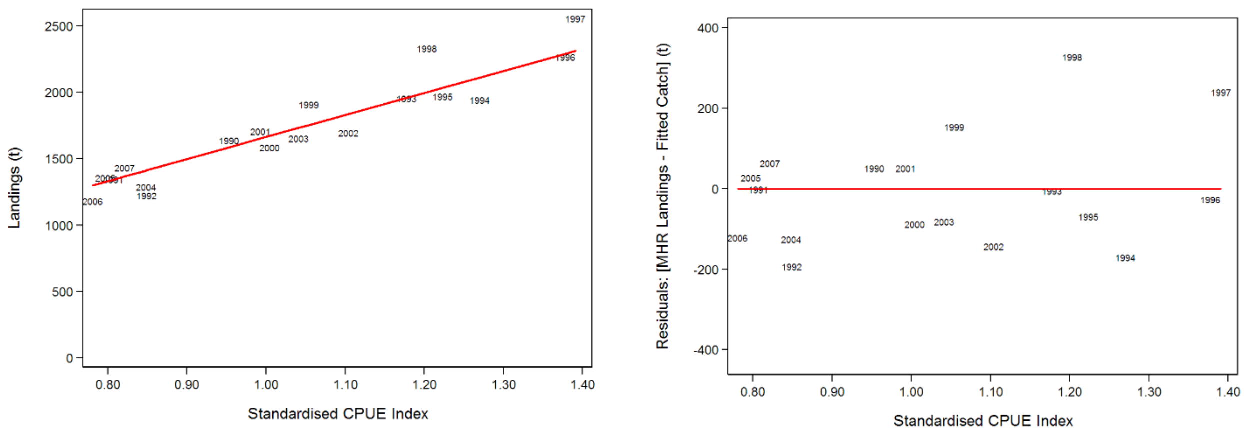


Figure 8: Relationship between annual FLA 3 CPUE and total annual FLA 3 QMR/MHR landings from 1989–90 to 2006–07 (calculated for the 2019 in-season MP, the most recent year of the operation of this MP) [left panel] and residuals from the regression [right panel].

The 2010 FLA 3 MP approximated the standardisation procedure by applying fixed coefficients to a data set specified by a static core vessel definition. This approach deteriorated over time as vessels dropped out of the core vessel fleet, thus reducing the available data set. The 2015 MP was based on a re-estimated standardisation procedure using a data set specified annually by a dynamic core vessel definition, allowing new vessels to enter the data set as they meet the minimum eligibility criteria. The 2015 MP was validated through a retrospective analysis which used the data available up to the end of the previous year and the partial data in the final year to determine how the model performed across years (Figure 9). In most years, the MP performance was satisfactory after only two months of data were accumulated. The poor performance of the model in some years (e.g., 2012) persisted across all four early months, indicating that collecting additional data in those years would not have improved the recommendation (relative to the end of year recommendation).

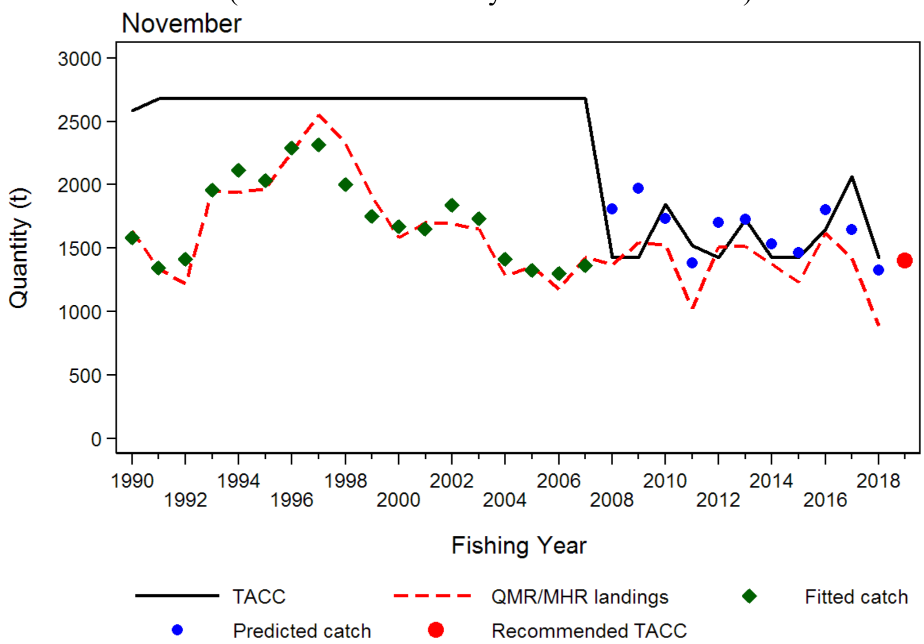


Figure 9: Operation of the 2015 FLA 3 MP in 2019 (the most recent year of operation), showing the relationship of the fitted catch estimates to the observed MHR/QMR landings and the annual recommended catches from 2008 onward based on the estimated standardised CPUE up to the end of November.

Starr & Kendrick (2022a) repeated the 2015 evaluation of the capacity of the FLA 3 MP to estimate the final annual CPUE, given the accumulation of two to five months of data in the final (predictive) year. This evaluation was made retrospectively over 12 years of observations from 2007–08 to 2018–19, using partial year data to estimate the annual CPUE in the final year. They showed that the first two months of data (October, November) had an average absolute prediction error of 11% (range: 4.7% to 23.1%). This statistic dropped by less than 1% with the addition of data from the month of December and by less than another 2% after the addition of the January data. This relative insensitivity to adding additional months of data to the analysis indicates that the MP should be able to provide benefit to the fishery once the implementation difficulties are solved.

Table 8 shows the results of the operation of the FLA 3 in-season MP since the inception of the Schedule 2 programme. Five TACC in-season increases have been recommended since 2010 based on the operation of the MP (2009–10, 2010–11, 2012–13, 2015–16, and 2016–17; Table 8). However approval of the 2016–17 increase was delayed until late August, resulting in limited opportunity to take advantage of the increase in commercial catch allowance. The FLA 3 MP was suspended by Fisheries New Zealand from 2019–20 due to the long delays which are consequent to the consultation requirements attendant to catch limit changes, even if they are temporary. These delays resulted in reduced (or even eliminated) opportunities to catch the additional flatfish.

Table 8: Results of the operation of the FLA 3 MP by prediction year. NA: not available.

Prediction Year	Fishing Year	CPUE Prediction	CPUE Total year[1]	Recom-mended commercial allowance (t)	Approved commercial allowance (t)[2]	Annual catch (t)	Date of Approval[2]	Reference
2010*	2009–10	64.98 (kg/tow)	75.82	1 846	1 763	1 525	18 June 2010	Bentley (2010)
2011*	2010–11	59.83 (kg/tow)	58.76	1 520	1 430	1 027	–	Bentley (2011)
2012	2011–12	58.45 (kg/tow)	57.56	1 495	–	1 507	–	Bentley (2012)
2013*	2012–13	67.97 (kg/tow)	69.70	1 727	1 727	1 512	17 May 2013	Brouwer (2013)
2014	2013–14	NA	54.80	NA	–	1 377	–	NA
2015	2014–15	53.20 (kg/tow)	NA	1 362	1 352	1 231	–	Bentley (2015)
2016*	2015–16	0.984	1.048	1 650	1 650	1 622	15 July 2016	Starr et al (2016)
2017*	2016–17	1.215	0.978	2 065	2 065	1 421	23 Aug 2017	Starr & Kendrick (2017)
2018	2017–18	0.870	0.796	1 461	–	886	–	Starr & Kendrick (2018)
2019	2018–19	0.843	0.803	1 402	1 430	968	–	Starr & Kendrick (2019a)

[1] calculated in the year following.
[2] information provided by MPI.
* MP operation that resulted in a commercial catch allowance increase recommendation.

Establishing B_{MSY} compatible reference points

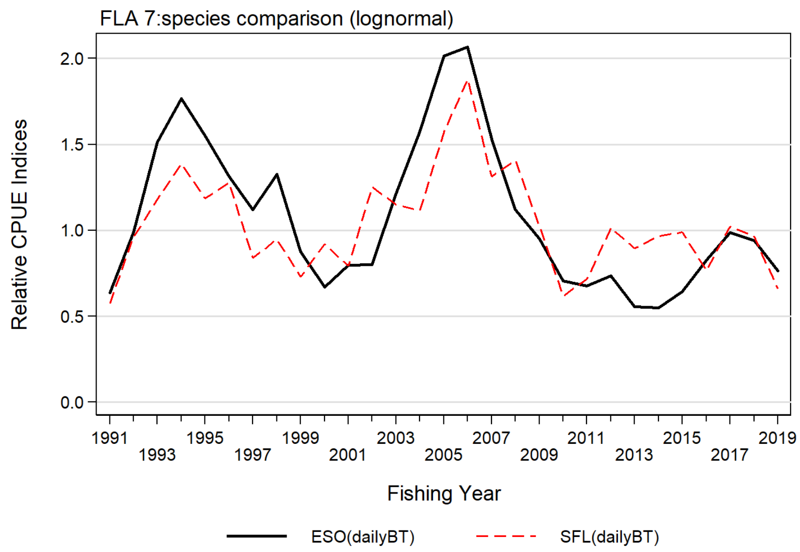
Given the large recruitment driven fluctuations in biomass observed for FLA, a target biomass is not meaningful. In-season adjustments were therefore based on relative fishing mortality for all FLA species combined, with increases made when this drops below the target value. F_{MSY} proxies accepted for FLA 3 were the relative fishing mortality values calculated by dividing the baseline TACCs by the corresponding CPUE values on the landings:CPUE regressions shown in Figure 8.

FLA 7

CPUE trends

CPUE trends for four principal FLA 7 species (New Zealand sole [ESO], sand flounder [SFL], brill [BRI], and turbot [TUR]), based on bottom trawl catch and effort data, were estimated in 2020 (Starr & Kendrick 2022b). The data preparation description given for FLA 3 [above] also applies to FLA 7, including the use of 'splitter' trips to estimate the time sequences of catch by species, the 'daily effort' amalgamation procedure, and scaling all species-specific catches to the total FLA landings in a trip. The same criteria were used to select core vessels (5 trips for at least 5 years) to screen data used in the analysis which consisted of offering six explanatory variables to each model, including fishing year (forced), month, vessel, statistical area, number of tows, and duration of fishing, using the scaled estimated species catch for the dependent variable. The WG agreed to report only the lognormal series for these species-specific analyses because zero records only meant that the species had not been reported, rather than being a true zero. The WG also agreed to restrict the analyses to target FLA records and to the following spatial restrictions: [SFL] Tasman Bay/Golden Bay (Statistical Area 038); [ESO, BRI, TUR] west coast South Island (Statistical Areas 032, 033, 034 and 035).

The estimated CPUE trends by species were used to evaluate the relative status of the four main species in the FLA 7 fishery. There are similarities in the fluctuations in the standardised CPUE series for ESO and SFL (Figure 10 [top panel]), with each species showing approximate decadal periodicity. They peak three times in the early- to mid-1990s, in the mid-2000s, and finally at the end of the 2010s. The final 'peak' is low relative to the two previous peaks, indicating that both these species are likely to be at below average levels at the end of the 2010–2019 decade (Figure 10 [top panel]). The more long-lived brill and turbot (Figure 10 [bottom panel]) show a nadir in the late-1990s to early 2000s, followed by an increasing trend and subsequent levelling of the series. Brill appear to be more ascendant at the end of the series when they had the highest indices in the series, whereas turbot appear to be declining at the end of the 2010–2019 decade (Figure 10 [bottom panel]).



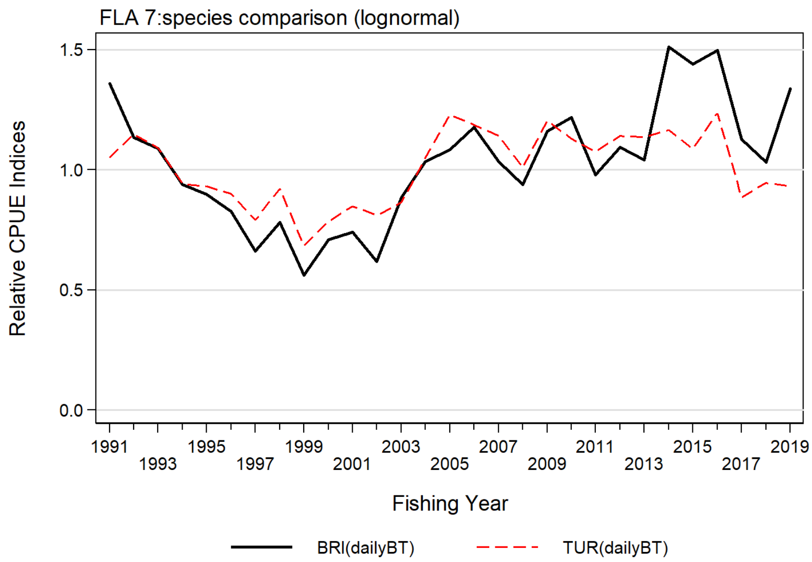


Figure 10: Comparison of FLA 7 standardised bottom trawl lognormal CPUE indices in FLA 7 for [top panel] SFL (sand flounder), ESO (New Zealand sole) [bottom panel] BRI (brill), TUR (turbot) (from Starr & Kendrick 2022b).

Establishing B_{MSY} compatible reference points

The WG discussed establishing B_{MSY} proxy reference points for the four FLA 7 species with CPUE index series. Given that there appeared to be about three decadal cycles in the ESO/SFL series (see Figure 10 [top panel]), the WG agreed to use the average over the entire series as the target. The same conclusion was made for turbot (Figure 10 [bottom panel]), given that this series appeared to be relatively stable across the 30 years of the time series, making the average of the series the B_{MSY} reference level. The B_{MSY} proxy for brill was based on mean standardised CPUE from 1990–91 to 2018–19 (Figure 10 [bottom panel]), which corresponded with a stable period of high abundance and catch.

4.2 Other Factors

The flatfish complex is comprised of eight QMS species although typically only a few are dominant in any one QMA and some are not found in all areas. For management purposes all species are combined to form a unit fishery. The proportion that each species contributes to the catch is expected to vary annually. It is not possible to estimate *MCY* for each species and stock individually.

Because the adult populations of most species generally consist of only one or two year classes at any time, the size of the populations depends heavily on the strength of the recruiting year class and is therefore thought to be highly variable. Brill and turbot are notable exceptions with the adult population consisting of a number of year classes. Early work revealed that although yellowbelly flounder are short-lived, inter-annual abundance in FLA 1 was not highly variable, suggesting that some factor, e.g., size of estuarine nursery area, could be smoothing the impact of random environmental effects on egg and larval survival.

Flatfish TACCs were originally set at high levels so as to provide fishers with the flexibility to take advantage of the perceived variability associated with annual flatfish abundance. This approach was modified with an in-season increase procedure for FLA 3 that operated up to the 2019–20 fishing year.

4.3. Future Research Considerations

FLA 2

- Explore the potential of multi discrete species level CPUE model (in particular to allow common vessel effects).
- Exclude effort allocated landed catch.
- Continue examining environmental covariates and oceanographic drivers.

5. STATUS OF THE STOCKS

Estimates of current and reference biomass are not available.

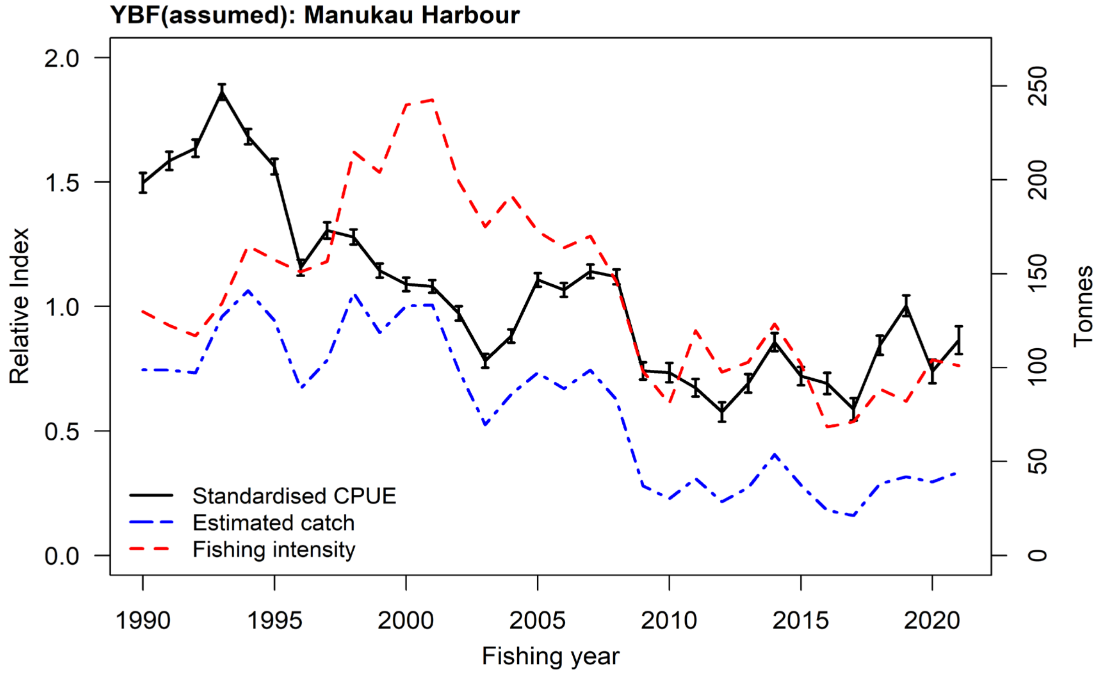
- **Yellowbelly flounder in FLA 1**

Stock Structure Assumptions
Based on tagging studies, yellowbelly flounder appear to comprise localised populations, especially in enclosed areas such as harbours and bays.

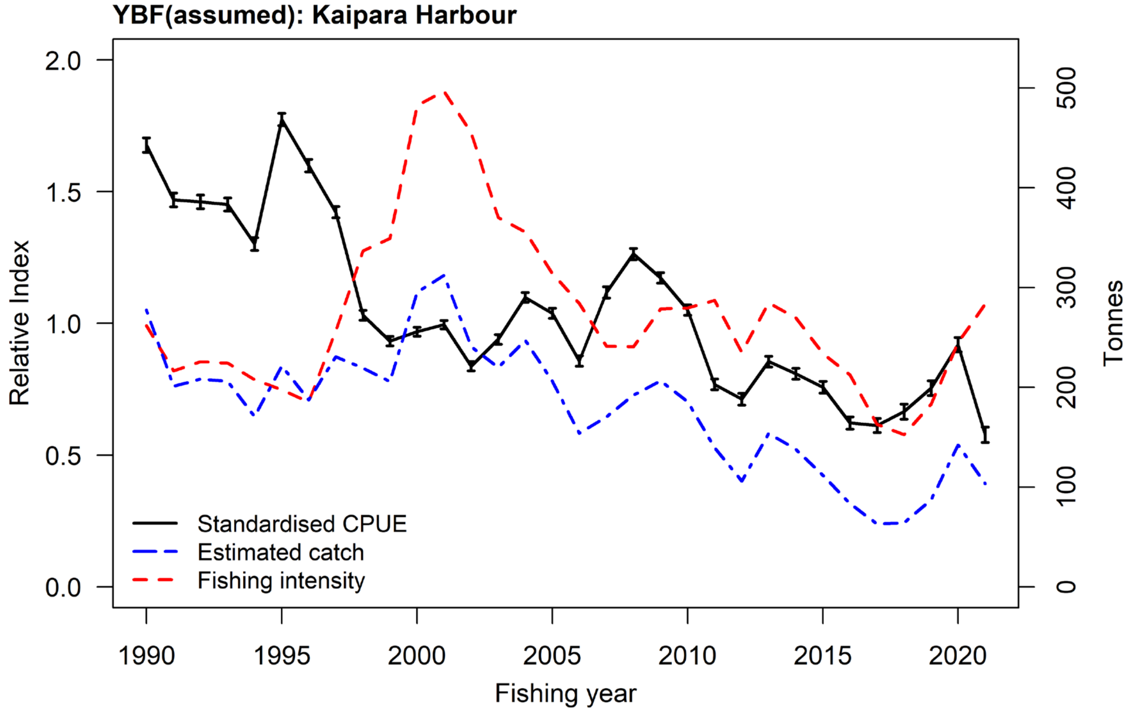
Stock Status		
Most Recent Assessment Plenary Publication Year	2022	
Intrinsic Productivity Level	High	
Catch in most recent year of assessment	Year: 2020–21	Catch: 144 t
Assessment Runs Presented	CPUE in Manukau and Kaipara harbours	
Reference Points	Target: Not established but B_{MSY} assumed Soft Limit: 20% B_0 Hard Limit: 10% B_0 Overfishing Threshold: F_{MSY}	

Status in relation to Target	Manukau: Unknown Kaipara: Unknown
Status in relation to Limits	Unknown
Status in relation to Overfishing	Unknown

Historical Stock Status Trajectory and Current Status



CPUE (± standard error) and total annual estimated catches for YBF (assumed) in Manukau Harbour. Also shown is the fishing intensity (catch/CPUE), standardised relative to the geometric mean. Fishing year designated by second year of the pair.



CPUE (± standard error) and total annual estimated catches for YBF (assumed) in Kaipara Harbour. Also shown is the fishing intensity (catch/CPUE), standardised relative to the geometric mean. Fishing year designated by second year of the pair.

Fishery and Stock Trends	
Recent Trend in Biomass or Proxy	In spite of fluctuations, both the Manukau and Kaipara series show a long-term declining trend, but have been stable since about 2010.
Recent Trend in Fishing Intensity or Proxy	Recent fishing intensity is relatively low in both of the west coast harbours.
Other Abundance Indices	-
Trends in Other Relevant Indicators or Variables	-

Projections and Prognosis	
Stock Projections or Prognosis	Unknown
Probability of Current Catch or TACC causing Biomass to remain below or to decline below Limits	Soft Limit: Unknown Hard Limit: Unknown
Probability of Current Catch or TACC causing Overfishing to continue or to commence	Unknown

Assessment Methodology and Evaluation		
Assessment Type	Level 2 - Partial Quantitative Stock Assessment	
Assessment Method	Standardised CPUE based on positive catches	
Assessment Dates	Latest assessment Plenary publication year: 2022	Next assessment: 2025
Overall assessment quality rank	1 – High Quality	
Main data inputs (rank)	- Catch and effort data	1 – High Quality
Data not used (rank)	N/A	
Changes to Model Structure and Assumptions	-	
Major Sources of Uncertainty	- Lack of species-specific reporting until 2021. All FLA reported catch from Manukau and Kaipara harbours is assumed to be YBF.	

Qualifying Comments
The FLA catch in both the Kaipara and Manukau harbours is predominantly YBF. The lack of species-specific reporting for FLA stocks is limiting the ability to assess these stocks, as is the possible reduction in carrying capacity for Manukau Harbour and Kaipara Harbour.

Fishery Interactions
FLA 1 species are mostly targeted with set nets in harbours. Main QMS bycatch species in west coast harbours are rig, kahawai, parore, and grey mullet.

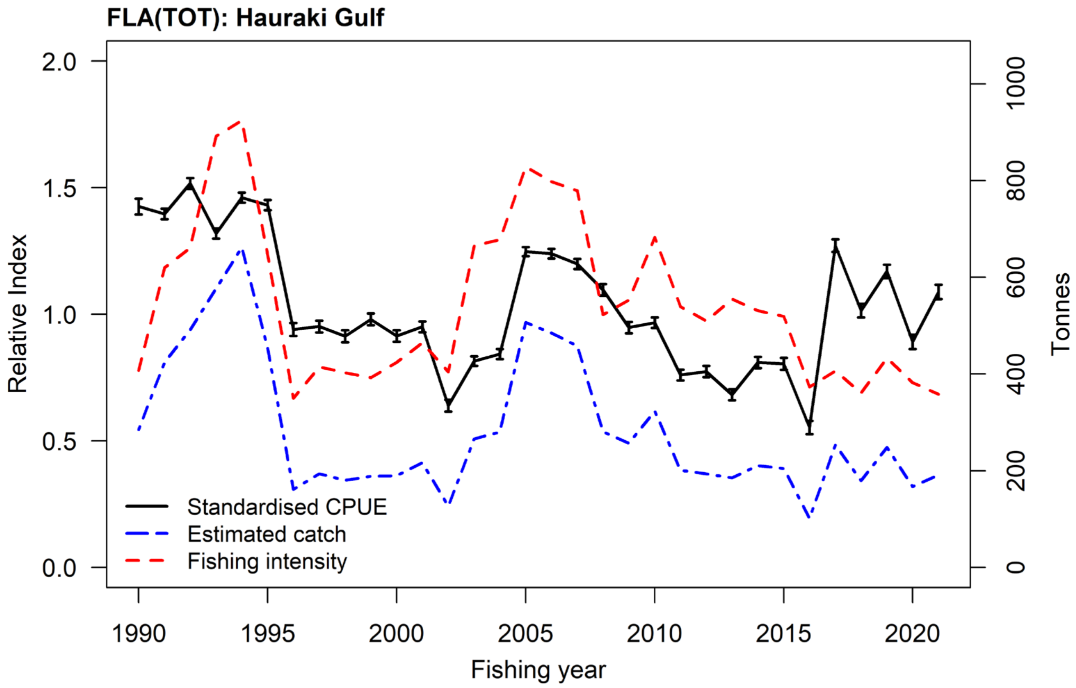
- **Total FLA 1 in Hauraki Gulf**

Due to a reduction in species-level reporting with the introduction of the ERS, species-specific assessments were not generated for the Hauraki Gulf during the 2022 analysis. Rather, a total FLA CPUE analysis is substituted, which will predominantly comprise mixed sand flounder and yellowbelly flounder.

Stock Status		
Most Recent Assessment Plenary Publication Year	2022	
Intrinsic Productivity Level	High	
Catch in most recent year of assessment	Year: 2020–21	Catch: 192 t

Assessment Runs Presented	Standardised CPUE for Hauraki Gulf
Reference Points	Target(s): Not established but B_{MSY} assumed Soft Limit: 20% B_0 Hard Limit: 10% B_0 Overfishing threshold: Not established
Status in relation to Target	Unknown
Status in relation to Limits	Unknown
Status in relation to Overfishing	Unknown

Historical Stock Status Trajectory and Current Status



CPUE (± standard error) and total annual estimated catches for FLA(TOT) in the Hauraki Gulf. Also shown is the fishing intensity (catch/CPUE), standardised relative to the geometric mean. Fishing year designated by second year of the pair.

Fishery and Stock Trends	
Recent Trend in Biomass or Proxy	The Hauraki Gulf FLA(TOT) series shows an overall declining trend except for a three-year increase from 2002 to 2005 and a single strong increase in the 2017 fishing year, which brought the series above the long-term average. Since then, the CPUE index has fluctuated around the series mean.
Recent Trend in Fishing Intensity or Proxy	Fishing intensity appears to be dropping after peaking in 2005.
Other Abundance Indices	-
Trends in Other Relevant Indicators or Variables	-

Projections and Prognosis	
Stock Projections or Prognosis	Unknown
Probability of Current Catch or TACC causing Biomass to remain below or to decline below Limits	Soft Limit: Unknown Hard Limit: Unknown
Probability of Current Catch or TACC causing Overfishing to continue or to commence	Unknown

Assessment Methodology		
Assessment Type	Level 2 - Partial Quantitative Stock Assessment	
Assessment Method	Standardised CPUE based on positive catches	
Assessment Dates	Latest assessment Plenary publication year: 2022	Next assessment: 2025
Overall assessment quality rank	1 – High Quality	
Main data inputs (rank)	Catch and effort data	1 – High Quality
Data not used (rank)	-	
Changes to Model Structure and Assumptions	-	
Major Sources of Uncertainty	- Uncertainty in the stock structure and proportion of catch by species.	

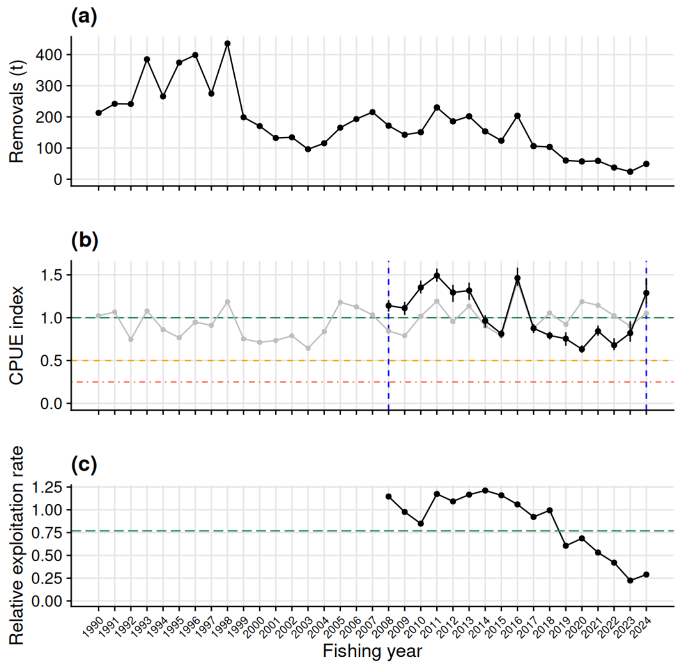
Qualifying Comments
The lack of species-specific reporting for FLA stocks limits the ability to assess these stocks. FLA in the Hauraki Gulf includes variable proportions of YBF and SFL.

Fishery Interactions
Main QMS bycatch species are kahawai, snapper, and rig.

- **FLA 2 (combined species in Hawke Bay)**

Stock Structure Assumptions
Sand flounder off the East Coast (FMA 2) of North Island appear to be a single continuous population.

Stock Status		
Most Recent Assessment Plenary Publication Year	2025	
Intrinsic Productivity Level	High	
Catch in most recent year of assessment	Year: 2023–24	Catch: 49 t
Assessment Runs Presented	Standardised event resolution CPUE for all flatfish combined in Hawke Bay (Statistical Areas 013 and 014) using fishing events targeting flatfish or gurnard	
Reference Points	Target: B_{MSY}-compatible proxy based on the geometric mean CPUE from 2007–08 to 2023–24 Soft Limit: 50% of target Hard Limit: 25% of target Overfishing threshold: F_{MSY}	
Status in relation to Target	About as Likely as Not (40–60%) to be at or above the target	
Status in relation to Limits	Soft Limit: Unlikely (< 40%) to be below Hard Limit: Very Unlikely (< 10%) to be below	
Status in relation to Overfishing	Overfishing is Very Unlikely (< 10%) to be occurring	

Historical Stock Status Trajectory and Current Status

(a) Annual removals for FLA 2 in Statistical Areas 013 and 014; (b) the standardised event resolution catch per unit effort (CPUE) index (BT- MIX event index), relative to the agreed reference points, for combined flatfish in Hawke Bay from trawling targeting flatfish or gurnard, and (c) relative exploitation rate . The reference period is indicated by blue vertical dashed lines. In (b) the grey line shows an update of the previous daily resolution index for bottom trawl effort targeting flatfish.

Fishery and Stock Trends	
Recent Trend in Biomass or Proxy	Relative abundance has varied cyclically since 2007–08 and has been increasing since 2021–22.
Recent Trend in Fishing Intensity or Proxy	Fishing intensity has trended down since the mid-2000s and has been below the reference period average since 2018–19.
Other Abundance Indices	-
Trends in Other Relevant Indicators or Variables	-

Projections and Prognosis	
Stock Projections or Prognosis	Unknown
Probability of Current Catch or TACC causing Biomass to remain below or to decline below Limits	Soft Limit: Unknown for TACC; Unlikely (< 40%) for current catch Hard Limit: Unknown for TACC; Unlikely (< 40%) for current catch
Probability of Current Catch or TACC causing Overfishing to continue or to commence	Unknown for TACC; Unlikely (< 40%) for current catch

Assessment Methodology		
Assessment Type	Level 2 - Partial Quantitative Stock Assessment	
Assessment Method	Standardised CPUE based on positive catches	
Assessment Dates	Latest assessment Plenary publication year: 2025	Next assessment: 2028
Overall assessment quality rank	1 – High Quality	
Main data inputs (rank)	- Catch and effort data	1 – High Quality
Data not used (rank)	N/A	
Changes to Model Structure and	- A new monitoring series was adopted as a result of reduced	

Assumptions	flatfish target effort in Hawke Bay. The updated series used an event resolution hurdle model using data targeting flatfish or gurnard.
Major Sources of Uncertainty	-

Qualifying Comments
-

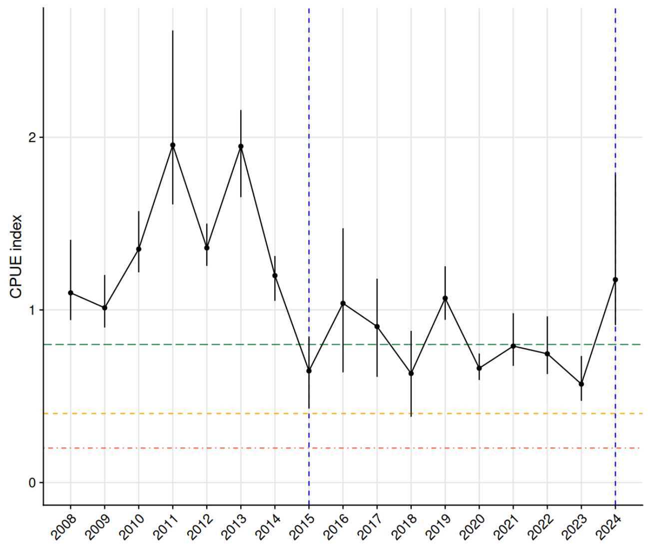
Fishery Interactions
The fishery is mainly confined to the inshore bottom trawl fleet targeting flatfish, or catching flatfish as bycatch in gurnard target fishing. The main bycatch species in the flatfish target trawl fishery have been red cod and gurnard.

- **FLA 2 (New Zealand sole (ESO) in Hawke Bay)**

Stock Structure Assumptions

The stock structure of New Zealand sole (ESO) is unknown, but it is assumed ESO in Hawke Bay are a separate population.

Stock Status		
Most Recent Assessment Plenary Publication Year	2025	
Intrinsic Productivity Level	High	
Catch in most recent year of assessment	Year: 2023–24	Catch: 15 t
Assessment Runs Presented	Standardised event resolution CPUE for New Zealand sole in Hawke Bay (Statistical Areas 013 and 014) using fishing events targeting flatfish or gurnard	
Reference Points	Target: B_{MSY}-compatible proxy based on the geometric mean CPUE from 2014–15 to 2023–24 Soft Limit: 50% of target Hard Limit: 25% of target Overfishing threshold: F_{MSY}	
Status in relation to Target	About as Likely as Not (40–60%) to be at or above the target	
Status in relation to Limits	Soft Limit: Unlikely (< 40%) to be below Hard Limit: Very Unlikely (< 10%) to be below	
Status in relation to Overfishing	Unknown	

Historical Stock Status Trajectory and Current Status

The standardised event resolution catch per unit effort (CPUE) index (BT- MIX event index), relative to the agreed reference points, for New Zealand sole in Hawke Bay from trawling targeting flatfish or gurnard. The reference period is indicated by blue vertical dashed lines.

Fishery and Stock Trends	
Recent Trend in Biomass or Proxy	Relative abundance has fluctuated without trend since 2014–15.
Recent Trend in Fishing Intensity or Proxy	Unknown
Other Abundance Indices	-
Trends in Other Relevant Indicators or Variables	-

Projections and Prognosis	
Stock Projections or Prognosis	Unknown
Probability of Current Catch or TACC causing Biomass to remain below or to decline below Limits	Soft Limit: Unknown for TACC; Unlikely (< 40%) for current catch Hard Limit: Unknown for TACC; Unlikely (< 40%) for current catch
Probability of Current Catch or TACC causing Overfishing to continue or to commence	Unknown

Assessment Methodology		
Assessment Type	Level 2 - Partial Quantitative Stock Assessment	
Assessment Method	Standardised CPUE based on positive catches	
Assessment Dates	Latest assessment Plenary publication year: 2025	Next assessment: 2028
Overall assessment quality rank	1 – High Quality	
Main data inputs (rank)	- Catch and effort data	1 – High Quality
Data not used (rank)	N/A	
Changes to Model Structure and Assumptions	- A new monitoring series was adopted as a result of reduced flatfish target effort in Hawke Bay. The updated series uses event resolution data targeting flatfish or gurnard.	
Major Sources of Uncertainty	-	

Qualifying Comments
Relative exploitation rate cannot be estimated because the total annual catch of New Zealand sole in Hawke Bay is only known for the period 2021–22 to 2023–24 and not for the full reference period.

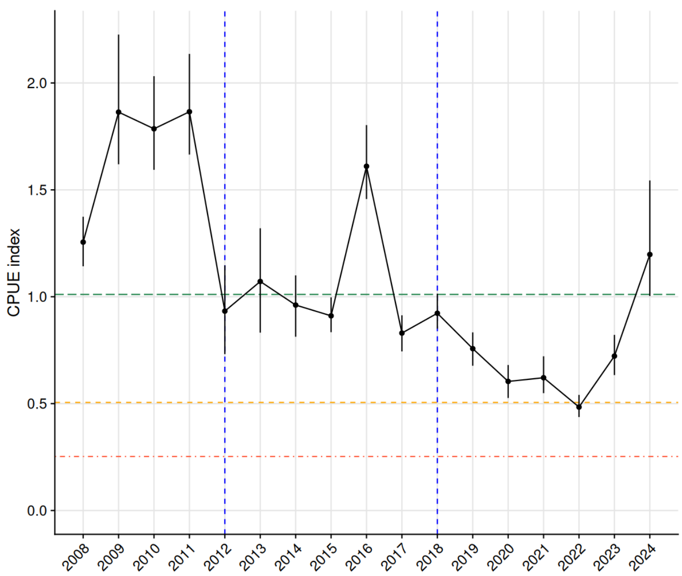
Fishery Interactions
The fishery is mainly confined to the inshore bottom trawl fleet targeting flatfish, or catching flatfish as bycatch in gurnard target fishing. The main bycatch species in the flatfish target trawl fishery have been red cod and gurnard.

- **FLA 2 (sand flounder (SFL) in Hawke Bay)**

Stock Structure Assumptions
Sand flounder off the East Coast (FMA 2) of North Island appear to be a single continuous population.

Stock Status		
Most Recent Assessment Plenary Publication Year	2025	
Intrinsic Productivity Level	High	
Catch in most recent year of assessment	Year: 2023–24	Catch: 18 t
Assessment Runs Presented	Standardised event resolution CPUE for sand flounder in Hawke Bay (Statistical Areas 013 and 014) using fishing events targeting flatfish or gurnard	
Reference Points	Target: B_{MSY}-compatible proxy based on the geometric mean CPUE from 2011–12 to 2017–18 Soft Limit: 50% of target Hard Limit: 25% of target Overfishing threshold: F_{MSY}	
Status in relation to Target	About as Likely as Not (40–60%) to be at or above the target	
Status in relation to Limits	Soft Limit: Unlikely (< 40%) to be below Hard Limit: Very Unlikely (< 10%) to be below	
Status in relation to Overfishing	Unknown	

Historical Stock Status Trajectory and Current Status



The standardised event resolution catch per unit effort (CPUE) index (BT- MIX event index), relative to the agreed reference points, for sand flounder in Hawke Bay from trawling targeting flatfish or gurnard. The reference period is indicated by blue vertical dashed lines.

Fishery and Stock Trends	
Recent Trend in Biomass or Proxy	Relative abundance had a decreasing trend from 2010–11 to 2021–22 and has increased to the target since.
Recent Trend in Fishing Intensity or Proxy	Unknown
Other Abundance Indices	-
Trends in Other Relevant Indicators or Variables	-

Projections and Prognosis	
Stock Projections or Prognosis	Unknown
Probability of Current Catch or TACC causing Biomass to remain below or to decline below Limits	Soft Limit: Unknown for TACC; Unlikely (< 40%) for current catch Hard Limit: Unknown for TACC; Unlikely (< 40%) for current catch
Probability of Current Catch or TACC causing Overfishing to continue or to commence	Unknown

Assessment Methodology		
Assessment Type	Level 2 - Partial Quantitative Stock Assessment	
Assessment Method	Standardised CPUE based on positive catches	
Assessment Dates	Latest assessment Plenary publication year: 2025	Next assessment: 2028
Overall assessment quality rank	1 – High Quality	
Main data inputs (rank)	- Catch and effort data	1 – High Quality
Data not used (rank)	N/A	
Changes to Model Structure and Assumptions	- A new monitoring series was adopted as a result of reduced flatfish target effort in Hawke Bay. The updated series uses event resolution data targeting flatfish or gurnard.	
Major Sources of Uncertainty	-	

Qualifying Comments
Relative exploitation rate cannot be estimated because the total annual catch of sand flounder in Hawke Bay is only known for the period 2021–22 to 2023–24 which is not part of the reference period.

Fishery Interactions
The fishery is mainly confined to the inshore bottom trawl fleet targeting flatfish, or catching flatfish as bycatch in gurnard target fishing. The main bycatch species in the flatfish target trawl fishery have been red cod and gurnard.

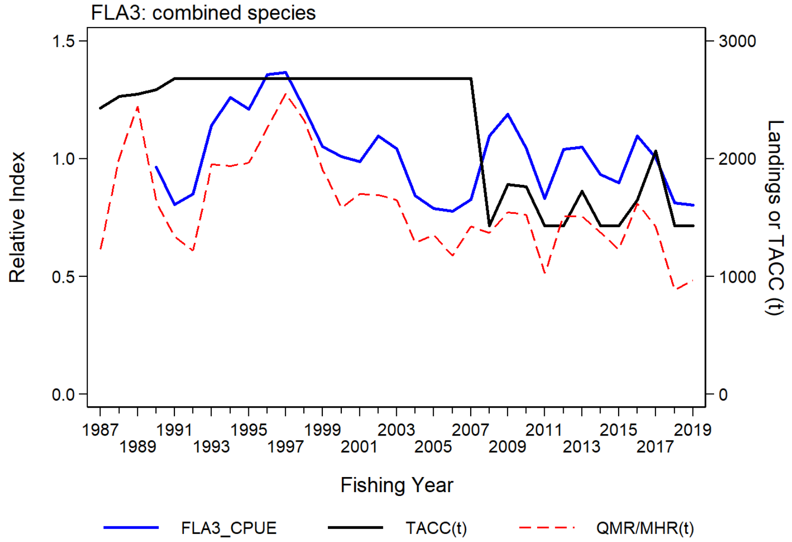
- **FLA 3 (all species combined)**

Stock Structure Assumptions
New Zealand sole and lemon sole appear to be a continuous population extending from Canterbury Bight to Foveaux Strait. Sand flounder off the east and south coasts of the South Island show localised concentrations that roughly correspond to the existing statistical areas. The stock relationships among these localised concentrations are unknown.

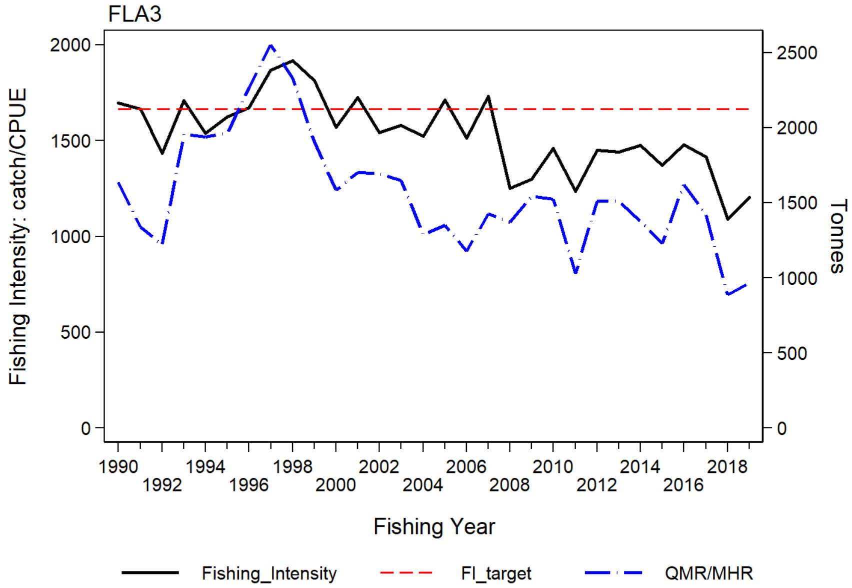
Stock Status		
Most Recent Assessment Plenary Publication Year	2020	
Intrinsic Productivity Level	High	
Catch in most recent year of assessment	Year: 2018–19	Catch: 636 t
Assessment Runs Presented	Standardised lognormal bottom trawl CPUE for all flatfish	

	combined in FLA 3
Reference Points	Target: F_{MSY} proxy Soft Limit: to be determined Hard Limit: to be determined Overfishing threshold: F_{MSY} proxy
Status in relation to Target	Fishing mortality is Likely (> 60%) to be at or below the target
Status in relation to Limits	Soft limit: Not determined Hard Limit: Not determined
Status in relation to Overfishing	Unlikely (< 40%) that overfishing is occurring

Historical Stock Status Trajectory and Current Status



Standardised CPUE indices based on positive catches for all flatfish species combined (Starr & Kendrick 2022a). Also shown are the QMR/MHR declared FLA 3 landings and the annual FLA 3 commercial catch allowance. Fishing year designated by second year of the pair.



Fishing intensity (catch/CPUE) and a target fishing intensity calculated by dividing the base FLA 3 TACC by the CPUE associated with the base FLA 3 TACC from the catch/CPUE regression (left panel of Figure 8). Also plotted are the annual FLA 3 QMR/MHR landings. Fishing year designated by second year of the pair.

Fishery and Stock Trends	
Recent Trend in Biomass or Proxy	CPUE has fluctuated over the long-term near the 30-year mean.
Recent Trend in Fishing Intensity or	Fishing intensity has dropped since the reduction of the

Proxy	TACC in 2007–08 and the introduction of in-season variation to commercial catch allowance and remains below the F_{MSY} proxy.
Other Abundance Indices	-
Trends in Other Relevant Indicators or Variables	-

Projections and Prognosis	
Stock Projections or Prognosis	Stock expected to vary in abundance around the long-term mean
Probability of Current Catch or TACC causing Biomass to remain below or to decline below Limits	Soft Limit: Unknown Hard Limit: Unknown
Probability of Current Catch or TACC causing Overfishing to continue or to commence	Unlikely (< 40%) to cause overfishing

Assessment Methodology		
Assessment Type	Level 2 - Partial Quantitative Stock Assessment	
Assessment Method	Standardised CPUE based on positive catches	
Assessment Dates	Latest assessment Plenary publication year: 2020	Next assessment: 2025
Overall assessment quality rank	1 – High Quality	
Main data inputs (rank)	- Catch and effort data	1 – High Quality
Data not used (rank)	N/A	
Changes to Model Structure and Assumptions	-	
Major Sources of Uncertainty	- Mixed species complex managed without explicitly considering each species - Uncertainty in stock structure assumptions	

Qualifying Comments
-

Fishery Interactions
The fishery is mainly confined to the inshore domestic trawl fleet except for a small incidental bycatch of soles, brill, and turbot by offshore trawlers. The main target species landing flatfish as bycatch in FLA 3 are red cod, barracouta, stargazer, gurnard, tarakihi, and elephantfish.

- **FLA 3: New Zealand (ESO) sole**

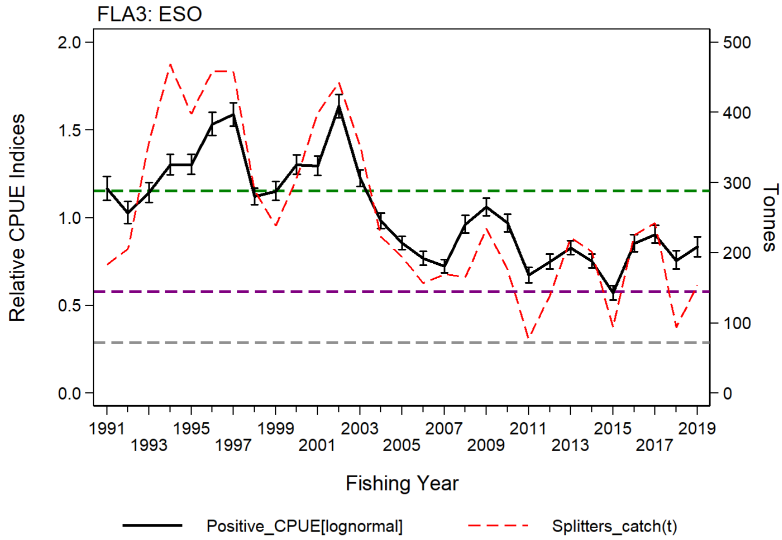
Stock Structure Assumptions

New Zealand sole appear to be a continuous population extending from Canterbury Bight to Foveaux Strait.

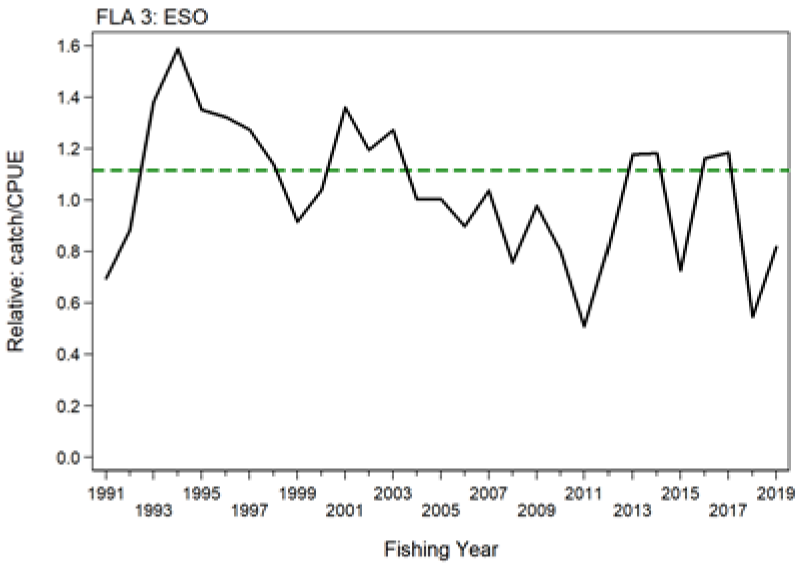
Stock Status		
Most Recent Assessment Plenary Publication Year	2020 – now considered out of date	
Intrinsic Productivity Level	High	
Catch in most recent year of assessment	Year: 2018–19	Catch: 153 t
Assessment Runs Presented	Standardised lognormal bottom trawl CPUE for ESO in FLA 3, based on trips which landed FLA 3 but which did not use the FLA species code	
Reference Points	Interim Target: B_{MSY} proxy based on mean standardised CPUE from 1990–91 to 2006–07 (the final year of unconstrained catches)	

	Soft Limit: 50% B_{MSY} proxy Hard Limit: 25% B_{MSY} proxy Overfishing threshold: F_{MSY} proxy based on mean relative exploitation rate for the period 1990–91 to 2006–07
Status in relation to Target	Unlikely (< 40%) to be at or above target
Status in relation to Limits	Soft Limit: Unlikely (< 40%) to be below Hard Limit: Very Unlikely (< 10%) to be below
Status in relation to Overfishing	Unlikely (< 40%) that overfishing is occurring

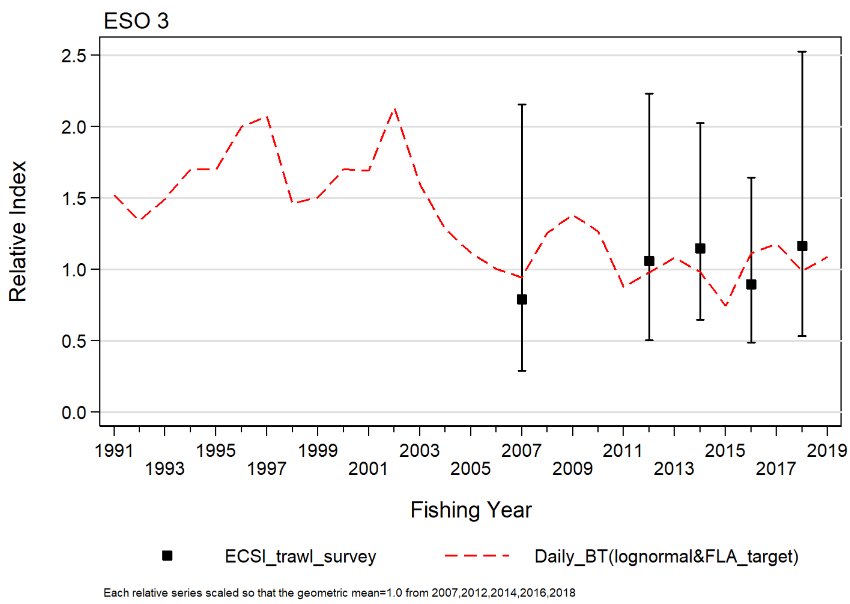
Historical Stock Status Trajectory and Current Status



Standardised CPUE indices based on lognormal CPUE series for New Zealand sole (ESO), showing the agreed B_{MSY} proxy (green dashed line: average 1990–91 to 2006–07 CPUE index) and the associated Soft (purple dashed line) and Hard (grey dashed line) Limits (Starr & Kendrick 2022a). Also shown is the ESO estimated catch by trips that landed FLA 3 but which did not use the FLA code. Fishing year designated by second year of the pair.



Relative fishing intensity for ESO in FLA 3, based on the ESO 'splitter' catch and the standardised lognormal ESO CPUE series. The horizontal dashed green line corresponds to the mean fishing intensity for the period 1991–2007.



Standardised indices based on the lognormal CPUE series for New Zealand sole (ESO), shown with the 5 total (core+shallow strata) trawl survey ESO biomass indices from the *Kaharoa* ECSI winter trawl survey.

Fishery and Stock Trends	
Recent Trend in Biomass or Proxy	CPUE has declined from a peak reached in 2001–02 but has remained above the Soft Limit since 2007–08.
Recent Trend in Fishing Intensity or Proxy	Fishing intensity has declined to below the target in the most recent two years.
Other Abundance Indices	-
Trends in Other Relevant Indicators or Variables	-

Projections and Prognosis	
Stock Projections or Prognosis	Unlikely (< 40%) to be at or above target
Probability of Current Catch or TACC causing Biomass to remain below or to decline below Limits	Soft Limit: Unlikely (< 40%) for current catch Hard Limit: Very Unlikely (< 10%) for current catch
Probability of Current Catch or TACC causing Overfishing to continue or to commence	As Likely as Not (40–60%) for current catch

Assessment Methodology and Evaluation		
Assessment Type	Level 2 - Partial Quantitative Stock Assessment	
Assessment Method	Standardised CPUE based on positive catches	
Assessment Dates	Latest assessment Plenary publication year: 2020	Next assessment: 2025
Overall assessment quality rank	1 – High Quality	
Main data inputs (rank)	- Catch and effort data	1 – High Quality
Data not used (rank)	N/A	
Changes to Model Structure and Assumptions	-	
Major Sources of Uncertainty	- uncertainty in stock structure assumptions	

Qualifying Comments
The lack of historical species-specific reporting for FLA stocks limits the ability to assess the long-term trends in these stocks; after some initial difficulties the adoption of Electronic Reporting of catch has significantly improved the reporting of species-specific estimated flatfish catch.

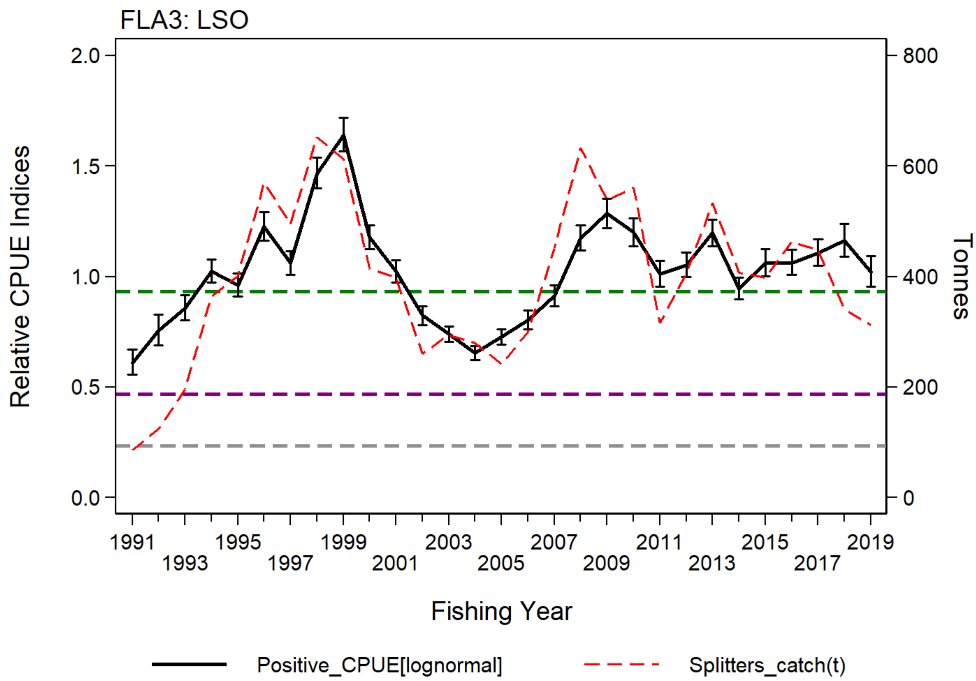
Fishery Interactions
The fishery is mainly confined to the inshore domestic trawl fleet except for a small incidental bycatch of soles, brill, and turbot by offshore trawlers. The main target species landing flatfish as bycatch in FLA 3 are red cod, barracouta, stargazer, gurnard, tarakihi, and elephantfish.

- **FLA 3: Lemon (LSO) sole**

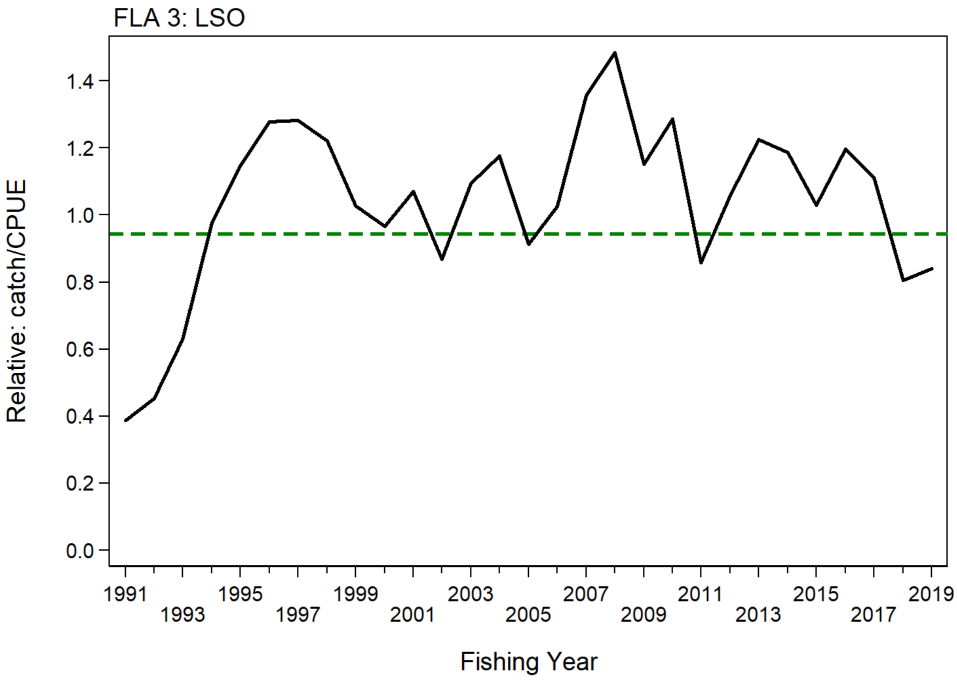
Stock Structure Assumptions
Lemon sole appear to be a continuous population extending from Canterbury Bight to Foveaux Strait.

Stock Status		
Most Recent Assessment Plenary Publication Year	2020	
Intrinsic Productivity Level	High	
Catch in most recent year of assessment	Year: 2018–19	Catch: 309 t
Assessment Runs Presented	Standardised lognormal bottom trawl CPUE for LSO in FLA 3, based on trips which landed FLA 3 but which did not use the FLA species code	
Reference Points	Interim Target: B_{MSY} proxy based on mean standardised CPUE from 1990–91 to 2006–07 (the final year of unconstrained catches) Soft Limit: 50% B_{MSY} proxy Hard Limit: 25% B_{MSY} proxy Overfishing threshold: F_{MSY} proxy based on mean relative exploitation rate for the period 1990–91 to 2006–07	
Status in relation to Target	About as Likely as Not (40–60%) to be at or above target	
Status in relation to Limits	Soft Limit: Unlikely (< 40%) to be below Hard Limit: Very Unlikely (< 10%) to be below	
Status in relation to Overfishing	About as Likely as Not (40–60%) that overfishing is occurring	

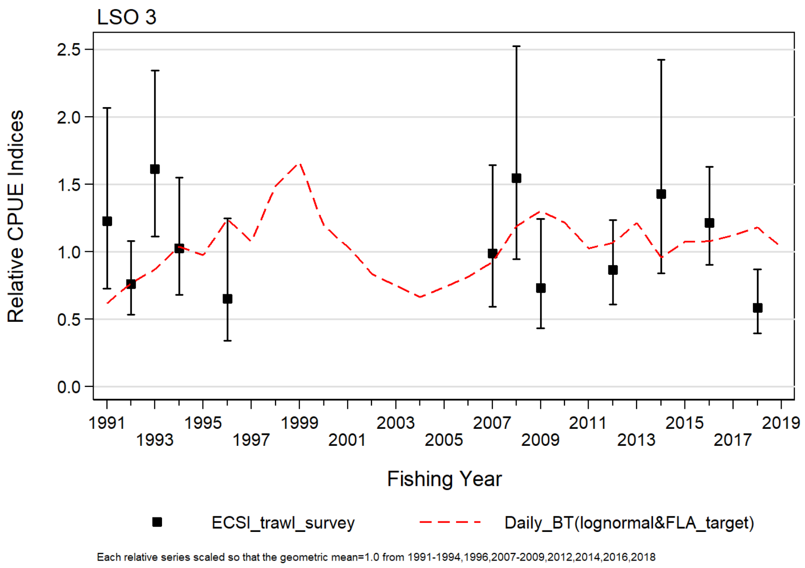
Historical Stock Status Trajectory and Current Status



Standardised indices based on lognormal CPUE series for Lemon sole (LSO), showing the agreed B_{MSY} proxy (green dashed line: average 1990–91 to 2006–07 CPUE index) and the associated Soft (purple dashed line) and Hard (grey dashed line) Limits (Starr & Kendrick 2022a). Also shown is the LSO estimated catch by trips that landed FLA 3 but which did not use the FLA code. Fishing year designated by second year of the pair.



Relative fishing intensity for LSO in FLA 3, based on the LSO 'splitter' catch and the standardised lognormal LSO CPUE series. The horizontal dashed green line corresponds to the mean fishing intensity for the period 1991–2007.



Standardised indices based on the lognormal CPUE series for Lemon sole (LSO) shown with the 12 trawl survey LSO core strata biomass indices from the *Kaharoa* ECSI winter trawl survey. Fishing year designated by second year of the pair.

Fishery and Stock Trends	
Recent Trend in Biomass or Proxy	CPUE reached a nadir in 2003–04, but then climbed to a new level near the long-term mean in 2007–08 and has since remained at that level.
Recent Trend in Fishing Intensity or Proxy	Fishing intensity has fluctuated, mostly above the F_{MSY} proxy since 1994–95 but has dropped to just below target in 2017–18 and 2018–19.
Other Abundance Indices	Relative abundance from the ECSI winter trawl survey has fluctuated without trend since 1991.
Trends in Other Relevant Indicators or Variables	-

Projections and Prognosis	
Stock Projections or Prognosis	About as Likely or Not (40–60%) to remain at or above the target
Probability of Current Catch or TACC causing Biomass to remain below or to decline below Limits	Soft Limit: Very Unlikely (< 10%) Hard Limit: Very Unlikely (< 10%)
Probability of Current Catch or TACC causing Overfishing to continue or to commence	For current catch, About as Likely as Not (40–60%) to occur

Assessment Methodology and Evaluation		
Assessment Type	Level 2 - Partial Quantitative Stock Assessment	
Assessment Method	Standardised CPUE based on positive catches	
Assessment Dates	Latest assessment Plenary publication year: 2020	Next assessment: 2025
Overall assessment quality rank	1 – High Quality	
Main data inputs (rank)	- Catch and effort data	1 – High Quality
Data not used (rank)	N/A	
Changes to Model Structure and Assumptions	-	
Major Sources of Uncertainty	- uncertainty in stock structure assumptions	

Qualifying Comments
The lack of historical species-specific reporting for FLA stocks limits the ability to assess the long-term trends in these stocks; after some initial difficulties the adoption of Electronic Reporting of catch has significantly improved the reporting of species-specific estimated flatfish catch.

Fishery Interactions
The fishery is mainly confined to the inshore domestic trawl fleet except for a small incidental bycatch of soles, brill, and turbot by offshore trawlers. The main target species landing flatfish as bycatch in FLA 3 are red cod, barracouta, stargazer, gurnard, tarakihi, and elephantfish. Interactions with protected species are believed to be low. Incidental captures of seabirds occur.

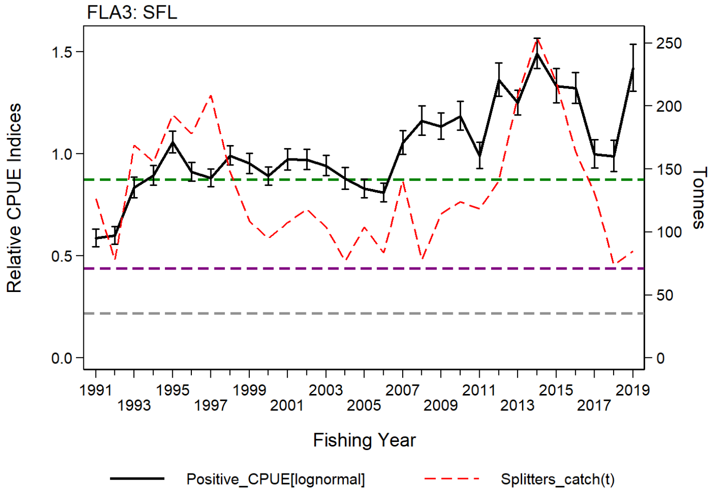
- **FLA 3: Sand Flounder (SFL)**

Stock Structure Assumptions
Sand flounder off the east and south coasts of the South Island show localised concentrations that roughly correspond to the existing statistical areas. The stock relationships among these localised concentrations are unknown.

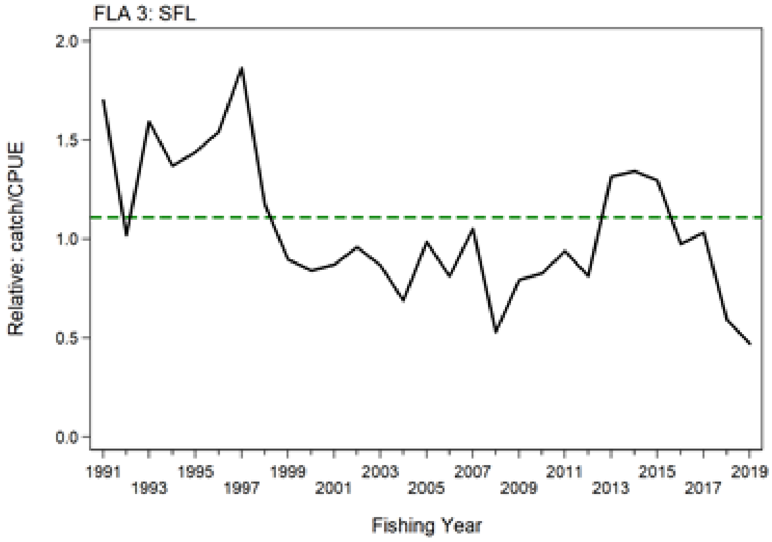
Stock Status		
Most Recent Assessment Plenary Publication Year	2020 – now considered out of date	
Intrinsic Productivity Level	High	
Catch in most recent year of assessment	Year: 2018–19	Catch: 83 t
Assessment Runs Presented	Standardised lognormal bottom trawl CPUE for SFL in FLA 3, based on trips which landed FLA 3 but which did not use the FLA species code	
Reference Points	Interim Target: B_{MSY} proxy based on mean standardised CPUE from 1990–91 to 2006–07 (the final year of unconstrained catches) Soft Limit: 50% B_{MSY} proxy Hard Limit: 25% B_{MSY} proxy Overfishing threshold: F_{MSY} proxy based on mean relative exploitation rate for the period 1990–91 to 2006–07	

Status in relation to Target	Very Likely (> 90%) to be at or above target
Status in relation to Limits	Soft Limit: Very Unlikely (< 10%) to be below Hard Limit: Very Unlikely (< 10%) to be below
Status in relation to Overfishing	Unlikely (< 40%) that overfishing is occurring

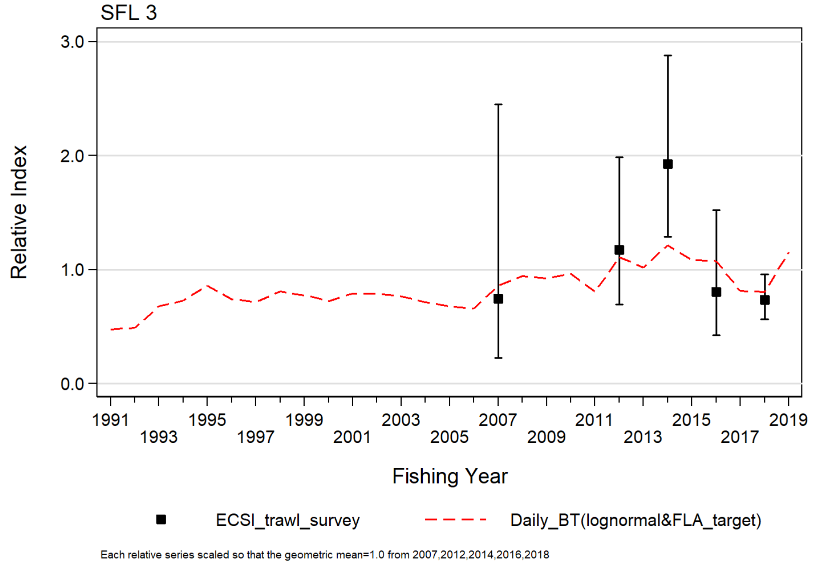
Historical Stock Status Trajectory and Current Status



Standardised indices based on lognormal CPUE series for Sand flounder (SFL), showing the agreed B_{MSY} proxy (green dashed line: average 1990–91 to 2006–07 CPUE index) and the associated Soft (purple dashed line) and Hard (grey dashed line) Limits (Starr & Kendrick 2018). Also shown is the SFL estimated catch by trips that landed FLA 3 but which did not use the FLA code. Fishing year designated by second year of the pair.



Relative fishing intensity for SFL in FLA 3, based on the SFL 'splitter' catch and the standardised lognormal SFL CPUE series. The horizontal dashed green line corresponds to the mean fishing intensity for the period 1991–2007.



Standardised indices based on the lognormal CPUE series for sand flounder (SFL), shown with the 5 total (core+shallow strata) trawl survey SFL biomass indices from the *Kaharoa* ECSI winter trawl survey.

Fishery and Stock Trends	
Recent Trend in Biomass or Proxy	CPUE rose from a nadir in 2003–04 to above the long-term mean by 2007–08 and has fluctuated above this level since then.
Recent Trend in Fishing Intensity or Proxy	Fishing intensity has dropped steeply since 2014–15 and was well below the target in 2018–19.
Other Abundance Indices	-
Trends in Other Relevant Indicators or Variables	-

Projections and Prognosis		
Stock Projections or Prognosis	- Likely (> 60%) to remain at or above the target	
Probability of Current Catch or TACC causing Biomass to remain below or to decline below Limits	Soft Limit: Very Unlikely (< 10%) for current catch Hard Limit: Very Unlikely (< 10%) for current catch	
Probability of Current Catch or TACC causing Overfishing to continue or to commence	Unlikely (< 40%) for current catch	
Assessment Methodology and Evaluation		
Assessment Type	Level 2 - Partial Quantitative Stock Assessment	
Assessment Method	Standardised CPUE based on positive catches	
Assessment Dates	Latest assessment Plenary publication year: 2020	Next assessment: 2025
Overall assessment quality rank	1 – High Quality	
Main data inputs (rank)	- Catch and effort data	1 – High Quality
Data not used (rank)	N/A	
Changes to Model Structure and Assumptions	-	
Major Sources of Uncertainty	- uncertainty in stock structure assumptions	

Qualifying Comments
The lack of historical species-specific reporting for FLA stocks limits the ability to assess the long-term trends in these stocks; after some initial difficulties the adoption of Electronic Reporting of catch has significantly improved the reporting of species-specific estimated flatfish catch.

Fishery Interactions
The fishery is mainly confined to the inshore domestic trawl fleet except for a small incidental

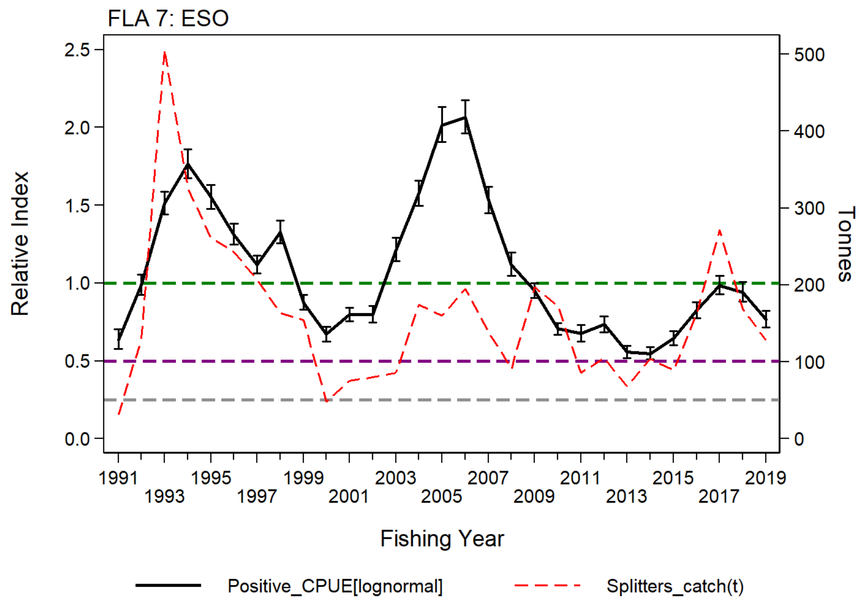
bycatch of soles, brill, and turbot by offshore trawlers. The main target species landing flatfish as bycatch in FLA 3 are red cod, barracouta, stargazer, gurnard, tarakihi, and elephantfish.

- **FLA 7: New Zealand (ESO) sole**

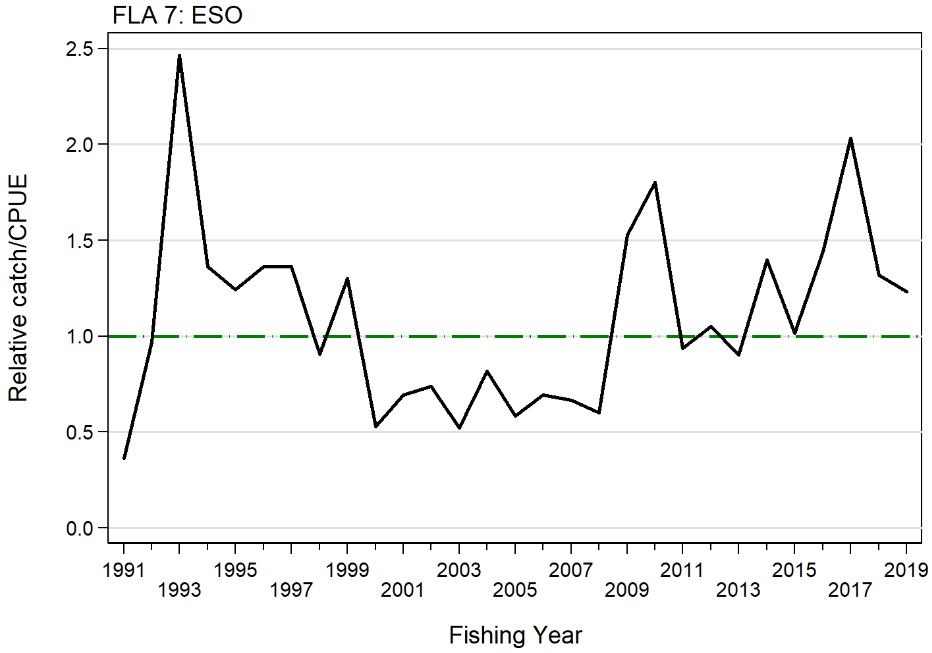
Stock Structure Assumptions
New Zealand sole are mostly taken off the west coast South Island portion of FLA 7, and there is very little catch taken in Tasman Bay/Golden Bay. The CPUE analysis presented in the table below is based on catch and effort data from the west coast (Statistical Areas 032, 033, 034, and 035).

Stock Status		
Most Recent Assessment Plenary Publication Year	2020 – now considered out of date	
Intrinsic Productivity Level	High	
Catch in most recent year of assessment	Year: 2018–19	Catch: 126 t
Assessment Runs Presented	Standardised lognormal bottom trawl CPUE for ESO in FLA 7, based on trips which landed FLA 7 but which did not use the FLA species code	
Reference Points	Interim Target: B_{MSY} proxy based on mean standardised CPUE from 1990–91 to 2018–19 Soft Limit: 50% B_{MSY} proxy Hard Limit: 25% B_{MSY} proxy Overfishing threshold: F_{MSY} proxy based on mean relative exploitation rate for the period 1990–91 to 2018–19	
Status in relation to Target	Unlikely (< 40%) to be at or above target	
Status in relation to Limits	Soft Limit: Unlikely (< 40%) to be below Hard Limit: Very Unlikely (< 10%) to be below	
Status in relation to Overfishing	Likely (> 60%) that overfishing is occurring	

Historical Stock Status Trajectory and Current Status



Standardised indices based on lognormal CPUE series for New Zealand sole (ESO), showing the agreed B_{MSY} proxy (green dashed line: average 1990–91 to 2018–19 CPUE index) and the associated Soft (purple dashed line) and Hard (grey dashed line) Limits (Starr & Kendrick 2022b). Also shown is the ESO estimated catch by trips that landed FLA 7 but which did not use the FLA code. Fishing year designated by second year of the pair.



Relative fishing intensity for ESO in FLA 7, based on the ESO 'splitter' catch and the standardised lognormal ESO CPUE series. The horizontal dashed green line corresponds to the mean fishing intensity for the period 1991–2019.

Fishery and Stock Trends	
Recent Trend in Biomass or Proxy	CPUE declined from a 2005–06 peak to a low in 2013–14, increased to 2016–17, and declined again to 0.77 in 2018–19.
Recent Trend in Fishing Intensity or Proxy	Fishing intensity has increased since 2010–11 to above the mean level.
Other Abundance Indices	-
Trends in Other Relevant Indicators or Variables	-

Projections and Prognosis	
Stock Projections or Prognosis	Likely (> 60%) to remain below target for current catch
Probability of Current Catch or TACC causing Biomass to remain below or to decline below Limits	Soft Limit: Unlikely (< 40%) for current catch Hard Limit: Very Unlikely (< 10%) for current catch
Probability of Current Catch or TACC causing Overfishing to continue or to commence	Likely (> 60%) for current catch

Assessment Methodology and Evaluation		
Assessment Type	Level 2 - Partial Quantitative Stock Assessment	
Assessment Method	Standardised CPUE based on positive catches	
Assessment Dates	Latest assessment Plenary publication year: 2020	Next assessment: 2025
Overall assessment quality rank	1 – High Quality	
Main data inputs (rank)	- Catch and effort data	1 – High Quality
Data not used (rank)	N/A	
Changes to Model Structure and Assumptions	-	
Major Sources of Uncertainty	- uncertainty in stock structure assumptions	

Qualifying Comments
The lack of historical species-specific reporting for FLA stocks limits the ability to assess the long-term trends in these stocks; after some initial difficulties the adoption of Electronic Reporting of catch has significantly improved the reporting of species-specific estimated flatfish catch.

Fishery Interactions
The fishery is mainly confined to the inshore domestic trawl fleet except for a small incidental bycatch of soles, brill, and turbot by offshore trawlers. The main non-FLA target species landing flatfish as bycatch in FLA 7 are red cod, barracouta, gurnard, and tarakihi. The bycatch of FLA 7 in other QMS species has averaged 18% of the total 1989–90 to 2018–19 FLA 7 catch.

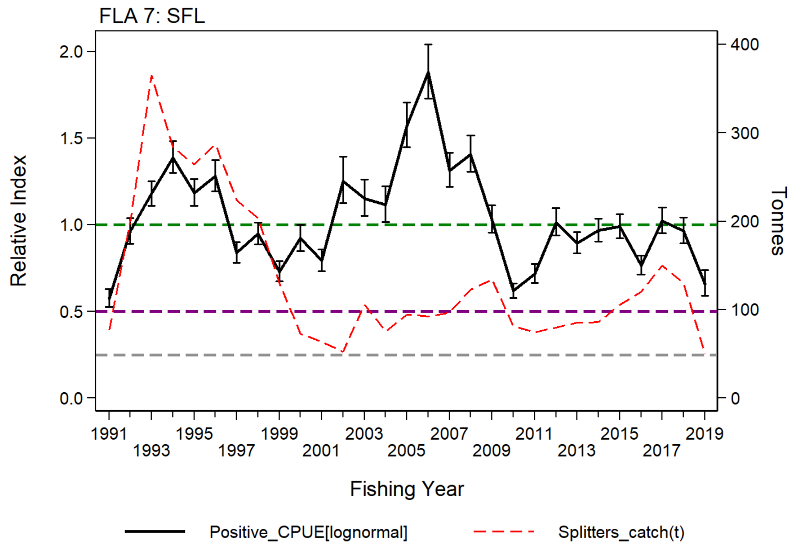
- **FLA 7: Sand Flounder (SFL)**

Stock Structure Assumptions

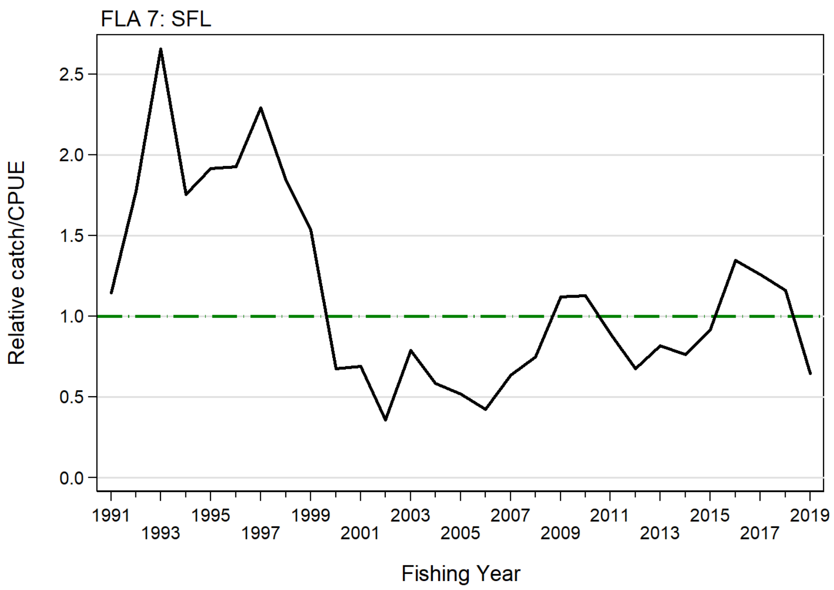
Sand flounder in FLA 7 is mostly taken in Tasman Bay/Golden Bay, with a small component of the catch coming from eastern Cook Strait. There is very little SFL catch from the west coast of the South Island. The analysis presented in the table below is based on catch and effort data from Tasman Bay/Golden Bay (Statistical Area 038).

Stock Status		
Most Recent Assessment Plenary Publication Year	2020 – now considered out of date	
Intrinsic Productivity Level	High	
Catch in most recent year of assessment	Year: 2018–19	Catch: 18 t
Assessment Runs Presented	Standardised lognormal bottom trawl CPUE for SFL in FLA 7, based on trips which landed FLA 7 but which did not use the FLA species code	
Reference Points	Interim Target: B_{MSY} proxy based on mean standardised CPUE from 1990–91 to 2018–19 Soft Limit: 50% B_{MSY} proxy Hard Limit: 25% B_{MSY} proxy Overfishing threshold: F_{MSY} proxy based on mean relative exploitation rate for the period 1990–91 to 2018–19	
Status in relation to Target	About as Likely as Not (40–60%) to be at or above target	
Status in relation to Limits	Soft Limit: Unlikely (< 40%) to be below Hard Limit: Very Unlikely (< 10%) to be below	
Status in relation to Overfishing	About as Likely as Not (40–60%) that overfishing is occurring	

Historical Stock Status Trajectory and Current Status



Standardised indices based on lognormal CPUE series for Sand flounder (SFL), showing the agreed B_{MSY} proxy (green dashed line: average 1990–91 to 2018–19 CPUE index) and the associated Soft (purple dashed line) and Hard (grey dashed line) Limits (Starr & Kendrick 2022b). Also shown is the SFL estimated catch by trips that landed FLA 7 but which did not use the FLA code. Fishing year designated by second year of the pair.



Relative fishing intensity for SFL in FLA 7, based on the SFL 'splitter' catch and the standardised lognormal SFL CPUE series. The horizontal dashed green line corresponds to the mean fishing intensity for the period 1991–2019.

Fishery and Stock Trends	
Recent Trend in Biomass or Proxy	CPUE has fluctuated without trend near the long-term average from 2010–11.
Recent Trend in Fishing Intensity or Proxy	Fishing intensity dropped to relatively low levels in the late 2000s, and has since climbed back to the level of the F_{MSY} proxy.
Other Abundance Indices	Relative abundance from the WCSI trawl survey has fluctuated without trend since 1992.
Trends in Other Relevant Indicators or Variables	-

Projections and Prognosis	
Stock Projections or Prognosis	About as Likely as Not (40–60%) to remain near target for current catch
Probability of Current Catch or TACC causing Biomass to remain below or to decline below Limits	Soft Limit: Unlikely (< 40%) for current catch Hard Limit: Very Unlikely (< 10%) for current catch
Probability of Current Catch or TACC causing Overfishing to continue or to commence	About as Likely as Not (40–60%) to remain near overfishing threshold for current catch

Assessment Methodology and Evaluation		
Assessment Type	Level 2 - Partial Quantitative Stock Assessment	
Assessment Method	Standardised CPUE based on positive catches	
Assessment Dates	Latest assessment Plenary publication year: 2020	Next assessment: 2025
Overall assessment quality rank	1 – High Quality	
Main data inputs (rank)	- Catch and effort data	1 – High Quality
Data not used (rank)	N/A	
Changes to Model Structure and Assumptions	-	
Major Sources of Uncertainty	- uncertainty in stock structure assumptions	

Qualifying Comments
The lack of historical species-specific reporting for FLA stocks limits the ability to assess the long-term trends in these stocks; after some initial difficulties the adoption of Electronic Reporting of catch

has significantly improved the reporting of species-specific estimated flatfish catch.

Fishery Interactions
The fishery is mainly confined to the inshore domestic trawl fleet fishing in Tasman Bay/Golden Bay, which primarily targets gurnard and snapper, in addition to flatfish. Other species are incidental.

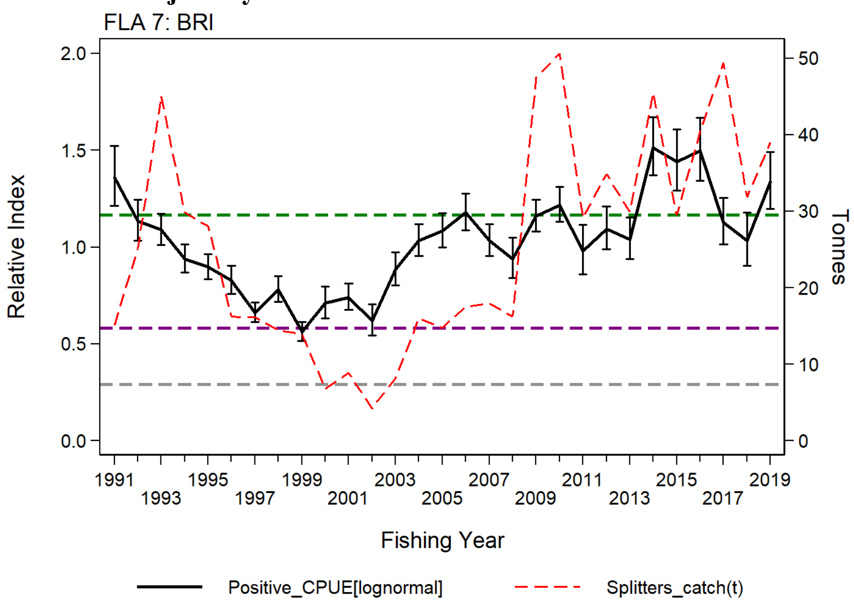
- **FLA 7: Brill (BRI)**

Stock Structure Assumptions

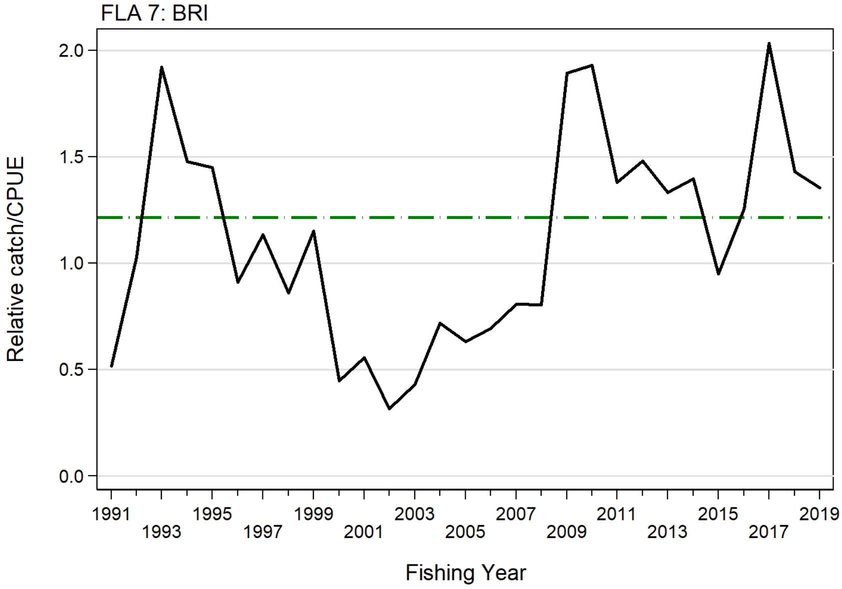
Brill are mostly taken off the west coast South Island portion of FLA 7, where they appear to comprise a continuous population, and there is very little catch taken in Tasman Bay/Golden Bay. The CPUE analysis presented in the table below is based on catch and effort off the west coast (Statistical Areas 032, 033, 034, and 035).

Stock Status		
Most Recent Assessment Plenary Publication Year	2020	
Intrinsic Productivity Level	High	
Catch in most recent year of assessment	Year: 2018–19	Catch: 39 t
Assessment Runs Presented	Standardised lognormal bottom trawl CPUE for BRI in FLA 7, based on trips which landed FLA 7 but which did not use the FLA species code	
Reference Points	Interim Target: B_{MSY} proxy based on mean standardised CPUE from 2004–05 to 2018–19 Soft Limit: 50% B_{MSY} proxy Hard Limit: 25% B_{MSY} proxy Overfishing threshold: F_{MSY} proxy based on mean relative exploitation rate for the period 1990–91 to 2018–19	
Status in relation to Target	About as Likely as Not (40–60%) to be at or above target	
Status in relation to Limits	Soft Limit: Very Unlikely (< 10%) to be below Hard Limit: Very Unlikely (< 10%) to be below	
Status in relation to Overfishing	About as Likely as Not (40–60%) that overfishing is occurring	

Historical Stock Status Trajectory and Current Status



Standardised indices based on lognormal CPUE series for Brill (BRI), showing the agreed B_{MSY} proxy (green dashed line: average 2004–05 to 2018–19 CPUE index) and the associated Soft (purple dashed line) and Hard (grey dashed line) Limits (Starr & Kendrick 2022b). Also shown is the BRI estimated catch by trips that landed FLA 7 but which did not use the FLA code. Fishing year designated by second year of the pair.



Relative fishing intensity for BRI in FLA 7, based on the BRI 'splitter' catch and the standardised lognormal BRI CPUE series. The horizontal dashed green line corresponds to the mean fishing intensity for the period 2005–2019.

Fishery and Stock Trends	
Recent Trend in Biomass or Proxy	CPUE has been relatively constant at a high level since 2004–05 with a three-year excursion to 1.5 × the long-term average from 2014–15 to 2016–17.
Recent Trend in Fishing Intensity or Proxy	Fishing intensity has fluctuated, mostly above the F_{MSY} proxy since 2004–05, and was near the F_{MSY} proxy in 2018–19.
Other Abundance Indices	-
Trends in Other Relevant Indicators or Variables	-

Projections and Prognosis	
Stock Projections or Prognosis	About as Likely as Not (40–60%) to remain near target for current catch
Probability of Current Catch or TACC causing Biomass to remain below or to decline below Limits	Soft Limit: Very Unlikely (< 10%) for current catch Hard Limit: Very Unlikely (< 10%) for current catch
Probability of Current Catch or TACC causing Overfishing to continue or to commence	About as Likely as Not (40–60%) to remain near overfishing threshold for current catch

Assessment Methodology and Evaluation		
Assessment Type	Level 2 - Partial Quantitative Stock Assessment	
Assessment Method	Standardised CPUE based on positive catches	
Assessment Dates	Latest assessment Plenary publication year: 2020	Next assessment: 2025
Overall assessment quality rank	1 – High Quality	
Main data inputs (rank)	- Catch and effort data	1 – High Quality
Data not used (rank)	N/A	
Changes to Model Structure and Assumptions	-	
Major Sources of Uncertainty	- uncertainty in stock structure assumptions	

Qualifying Comments
The lack of historical species-specific reporting for FLA stocks limits the ability to assess the long-term trends in these stocks; after some initial difficulties the adoption of Electronic Reporting of catch has significantly improved the reporting of species-specific estimated flatfish catch.

Fishery Interactions
The fishery is mainly confined to the inshore domestic trawl fleet except for a small incidental bycatch of soles, brill, and turbot by offshore trawlers. The main non-FLA target species landing flatfish as bycatch in FLA 7 are red cod, barracouta, gurnard, and tarakihi. The bycatch of FLA 7 in other QMS species has averaged 18% of the total 1989–90 to 2018–19 FLA 7 catch.

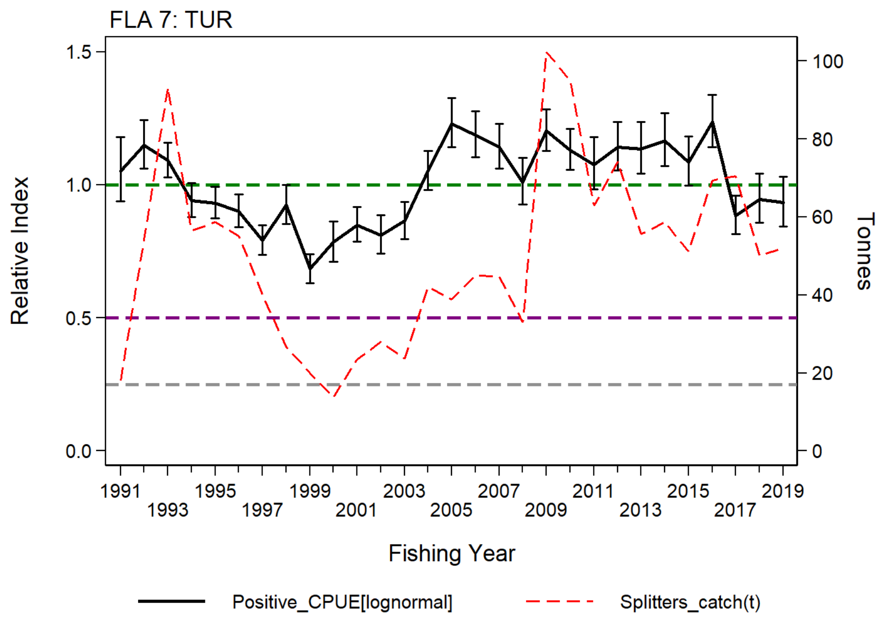
- **FLA 7: Turbot (TUR)**

Stock Structure Assumptions

Turbot are mostly taken off the west coast South Island portion of FLA 7, where they appear to comprise a continuous population, and there is very little catch taken in Tasman Bay/Golden Bay. The CPUE analysis presented in the table below is based on catch and effort off the west coast (Statistical Areas 032, 033, 034, and 035).

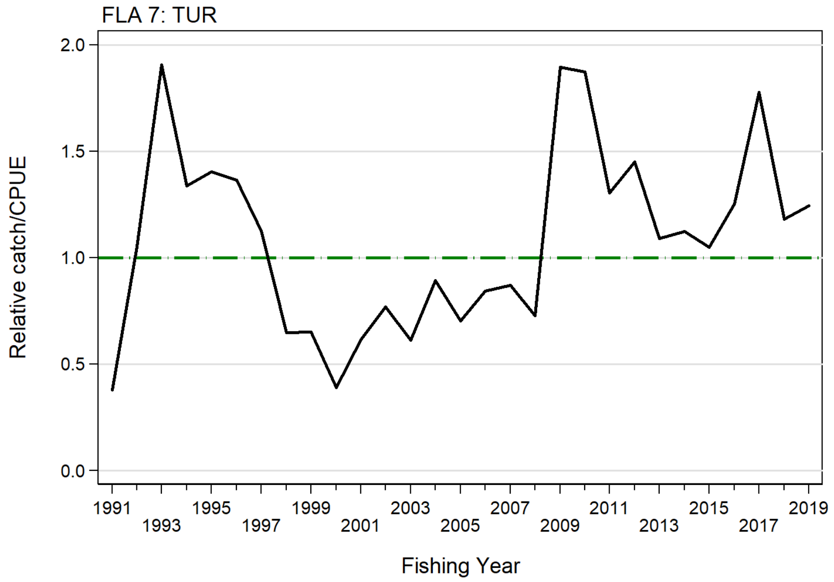
Stock Status		
Most Recent Assessment Plenary Publication Year	2020	
Intrinsic Productivity Level	High	
Catch in the most recent year of assessment	Year: 2018–19	Catch: 52 t
Assessment Runs Presented	Standardised lognormal bottom trawl CPUE for TUR in FLA 7, based on trips which landed FLA 7 but which did not use the FLA species code	
Reference Points	Interim Target: B_{MSY} proxy based on mean standardised CPUE from 1990–91 to 2018–19 Soft Limit: 50% B_{MSY} proxy Hard Limit: 25% B_{MSY} proxy Overfishing threshold: F_{MSY} proxy based on mean relative exploitation rate for the period 1990–91 to 2018–19	
Status in relation to Target	About as Likely as Not (40–60%) to be at or above target	
Status in relation to Limits	Soft Limit: Very Unlikely (< 10%) to be below Hard Limit: Very Unlikely (< 10%) to be below	
Status in relation to Overfishing	About as Likely as Not (40–60%) that overfishing is occurring	

Historical Stock Status Trajectory and Current Status



Standardised indices based on lognormal CPUE series for Turbot (TUR), showing the agreed B_{MSY} proxy (green dashed line: average 1990–91 to 2018–19 CPUE index) and the associated Soft (purple dashed line) and Hard (grey dashed line) Limits (Starr & Kendrick 2022b). Also shown is the TUR estimated catch by trips that landed FLA 7

but which did not use the FLA code. Fishing year designated by second year of the pair.



Relative fishing intensity for TUR in FLA 7, based on the TUR 'splitter' catch and the standardised lognormal TUR CPUE series. The horizontal dashed green line corresponds to the mean fishing intensity for the period 1991–2019.

Fishery and Stock Trends	
Recent Trend in Biomass or Proxy	CPUE has been relatively stable in this fishery, with a long period above the long-term average from 2004–05 to 2015–16; CPUE has dropped to below the long-term average after 2016–17.
Recent Trend in Fishing Intensity or Proxy	Fishing intensity has fluctuated, above the F_{MSY} proxy since 2007–08 and was just above the Fmsy proxy in 2018–19.
Other Abundance Indices	-
Trends in Other Relevant Indicators or Variables	-

Projections and Prognosis	
Stock Projections or Prognosis	About as Likely as Not (40–60%) to remain near target for current catch
Probability of Current Catch or TACC causing Biomass to remain below or to decline below Limits	Soft Limit: Very Unlikely (< 10%) for current catch Hard Limit: Very Unlikely (< 10%) for current catch
Probability of Current Catch or TACC causing Overfishing to continue or to commence	About as Likely as Not (40–60%) to remain near overfishing threshold for current catch

Assessment Methodology and Evaluation		
Assessment Type	Level 2 - Partial Quantitative Stock Assessment	
Assessment Method	Standardised CPUE based on positive catches	
Assessment Dates	Latest assessment Plenary publication year: 2020	Next assessment: 2025
Overall assessment quality rank	1 – High Quality	
Main data inputs (rank)	- Catch and effort data	1 – High Quality
Data not used (rank)	N/A	
Changes to Model Structure and Assumptions	-	
Major Sources of Uncertainty	- uncertainty in stock structure assumptions	

Qualifying Comments
The lack of historical species-specific reporting for FLA stocks limits the ability to assess the long-

term trends in these stocks; after some initial difficulties the adoption of Electronic Reporting of catch has significantly improved the reporting of species-specific estimated flatfish catch.

Fishery Interactions
The fishery is mainly confined to the inshore domestic trawl fleet except for a small incidental bycatch of soles, brill, and turbot by offshore trawlers. The main non-FLA target species landing flatfish as bycatch in FLA 7 are red cod, barracouta, gurnard, and tarakihi. The bycatch of FLA 7 in other QMS species has averaged 18% of the total 1989–90 to 2018–19 FLA 7 catch.

6. FOR FURTHER INFORMATION

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