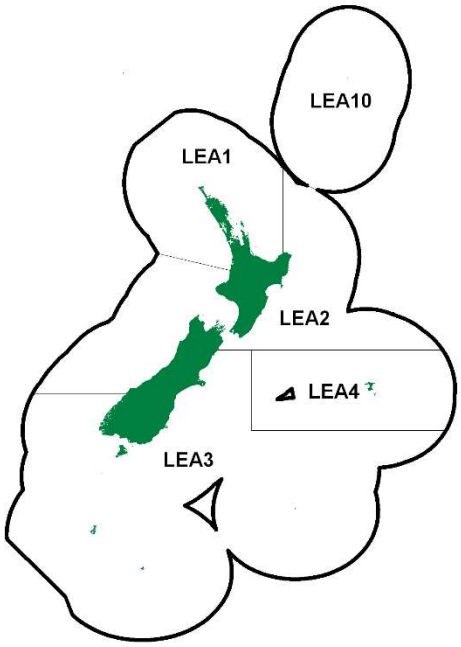
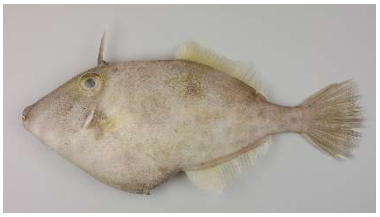
LEATHERJACKET (LEA)

(*Meuschenia scaber*)
Kokiri, Hiriri





1. FISHERY SUMMARY

Leatherjacket was introduced into the QMS on 1 October 2003. Current allowances, TACCs, and TACs are given in Table 1.

Table 1: Recreational and Customary non-commercial allowances (t), TACCs (t), and TACs (t) for leatherjacket by Fishstock.

Fishstock	Recreational Allowance	Customary Non-Commercial Allowance	Other sources of mortality	TACC	TAC
LEA 1	5	1	9	188	203
LEA 2	2	1	57	1 136	1 196
LEA 3	2	1	5	140	138
LEA 4	1	1	1	7	10
LEA 10	0	0	0	0	0
Total	10	4	72	1 431	1 517

1.1 Commercial fisheries

Nationally, very small landings were first reported in 1948. Most of the current leatherjacket catch is taken as a bycatch, and it is very likely that leatherjacket has always been primarily a bycatch species. From less than 2 t in the early 1960s, reported landings increased to 200–400 t in the mid-1970s, 1980s, and early 1990s (Table 2). It is possible actual catches were higher than reported prior to the 1970s, but that some catches were discarded without being reported due to low market demand in this period. Landings increased further in the late 1990s to around 1000 to 1300 t, but have decreased to less than 500 t since 2012–13 (Table 3). In 2018–19 320 t of leatherjacket were landed. On average over the last five years total landings have only been 23% of the total TACC.

Figure 1 shows the historical landings and TACC values for the main leatherjacket stocks. LEA 1 landings fluctuated around the TACC from the fishing year 2003–04 to 2012–13, but have since dropped to approximately half, with 78 t landed in 2019–20. LEA 2 landings have always been much lower than the TACC of 1136 t, with landings averaging 73 t from 2014–15 to 2019–20. LEA 3 landings exceeded the 100 t TACC between 2008–09 and 2012–13, and have fluctuated at or above the 130 t TACC since 2013–14. The LEA 3 TACC was increased to 140 t in 2020–21.

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

Year	LEA 1	LEA 2	LEA 3	LEA 4	Year	LEA 1	LEA 2	LEA 3	LEA 4
1931–32	0	0	0	0	1957	0	0	0	0
1932–33	0	0	0	0	1958	0	0	0	0
1933–34	0	0	0	0	1959	0	0	0	0
1934–35	0	0	0	0	1960	0	0	0	0
1935–36	0	0	0	0	1961	1	0	0	0
1936–37	0	0	0	0	1962	1	0	0	0
1937–38	0	0	0	0	1963	3	0	0	0
1938–39	0	0	0	0	1964	3	0	0	0
1939–40	0	0	0	0	1965	16	0	0	0
1940–41	0	0	0	0	1966	17	0	0	0
1941–42	0	0	0	0	1967	4	0	0	0
1942–43	0	0	0	0	1968	26	4	0	0
1943–44	0	0	0	0	1969	26	13	0	0
1944	0	0	0	0	1970	34	11	0	0
1945	0	0	0	0	1971	49	11	0	0
1946	0	0	0	0	1972	34	32	0	0
1947	0	0	0	0	1973	31	46	0	0
1948	14	0	0	0	1974	51	46	0	0
1949	14	0	0	0	1975	39	29	0	0
1950	8	0	0	0	1976	59	155	0	0
1951	1	0	0	0	1977	49	163	0	0
1952	7	0	0	0	1978	85	85	0	0
1953	7	0	0	0	1979	81	179	0	0
1954	7	0	0	0	1980	81	232	173	0
1955	4	0	0	0	1981	93	199	68	0
1956	0	0	0	0	1982	111	111	5	0

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

Table 3: Reported commercial landings (tonnes) of leatherjacket by Fishstock for the fishing years from 1989–90 to present. Landings for LEA 10 have not been shown as these were negligible and were rounded to zero.

Fishstock	LEA 1		LEA 2		LEA 3		LEA 4		Total	
FMA (s)	1&9		2&8		3, 5 & 6		4			
	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC
1989–90	114	-	169	-	42	-	-	-	325	-
1990–91	143	-	178	-	61	-	-	-	382	-
1991–92	160	-	85	-	100	-	-	-	345	-
1992–93	154	-	98	-	41	-	-	-	293	-
1993–94	188	-	62	-	37	-	-	-	287	-
1994–95	186	-	148	-	50	-	-	-	384	-
1995–96	152	-	296	-	38	-	-	-	486	-
1996–97	128	-	908	-	70	-	-	-	1 106	-
1997–98	151	-	165	-	66	-	-	-	382	-
1998–99	110	-	413	-	30	-	-	-	553	-
1999–00	115	-	1 136	-	35	-	-	-	1 286	-
2000–01	131	-	880	-	41	-	-	-	1 052	-
2001–02	185	-	953	-	43	-	-	-	1 181	-
2002–03	162	-	568	-	67	-	0	-	797	-
2003–04	189	188	396	1 136	28	100	0	7	613	1 431
2004–05	223	188	221	1 136	56	100	< 1	7	500	1 431
2005–06	173	188	172	1 136	60	100	0	7	405	1 431
2006–07	191	188	215	1 136	49	100	0	7	454	1 431
2007–08	135	188	258	1 136	73	100	0	7	466	1 431
2008–09	178	188	282	1 136	122	100	0	7	582	1 431
2009–10	181	188	455	1 136	117	100	0	7	754	1 431
2010–11	185	188	276	1 136	112	100	< 1	7	573	1 431
2011–12	167	188	277	1 136	127	100	< 1	7	571	1 431
2012–13	178	188	150	1 136	114	100	0	7	442	1 431
2013–14	147	188	105	1 136	132	130	0	7	384	1 461
2014–15	140	188	91	1 136	143	130	0	7	374	1 461
2015–16	151	188	75	1 136	133	130	4	7	363	1 461
2016–17	141	188	80	1 136	122	130	0	7	343	1 461
2017–18	92	188	67	1 136	135	130	0	7	294	1 461
2018–19	97	188	70	1 136	154	130	0	7	320	1 461
2019–20	79	188	59	1 136	131	130	0	7	269	1 461
2020–21	64	188	64	1 136	124	140	0	7	252	1 471

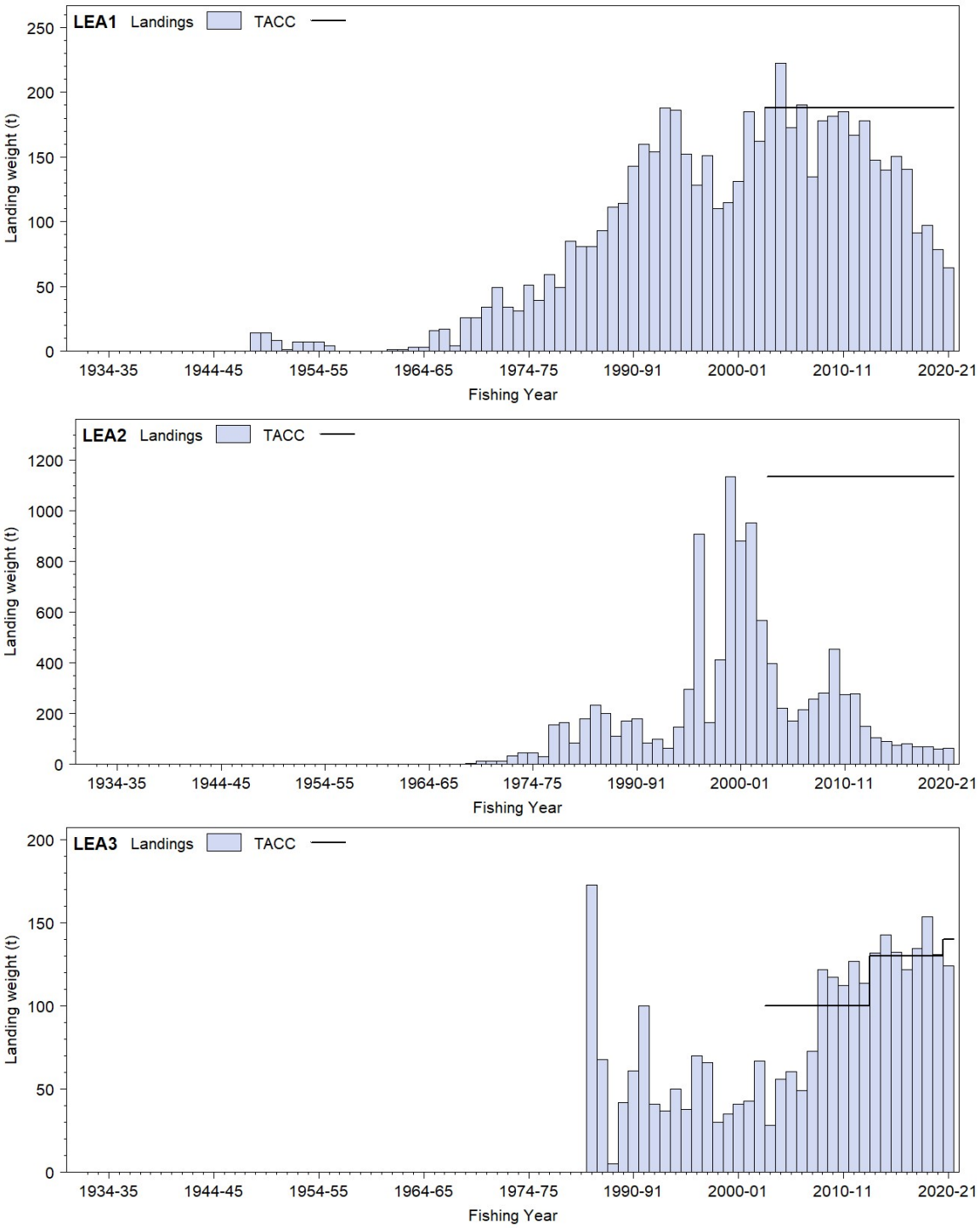


Figure 1: Reported commercial landings and TACCs for the main LEA stocks. From top to bottom: LEA 1 (Auckland), LEA 2 (Central), and LEA 3 (South East).

1.2 Recreational fisheries

Leatherjackets are seldom caught by hook and line but recreational fishers, especially in the northern region, take some leatherjacket by spear fishing, in rock lobster pots, and in set nets. No estimates of recreational harvest of leatherjacket were generated from the telephone/diary surveys conducted in 1994, 1996, and 2000 because so few were reported. 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 (from Wynne-Jones et al 2014). The panel members were contacted regularly about their fishing activities and harvest information collected in standardised phone interviews. The national panel survey was repeated during the 2017–18 fishing year using very similar methods to produce directly comparable results (Wynne-Jones et al 2019). Recreational catch estimates from the two national panel

surveys are given in Table 4. Note that national panel survey estimates do not include recreational harvest taken under s111 general approvals.

Table 4: Recreational harvest estimates (in numbers of fish) for leatherjacket stocks (Wynne-Jones et al 2014, 2019).

Stock	Year	Method	Number of fish	Total weight (t)	CV
LEA 1	2011–12	Panel survey	1 599	–	0.68
	2017–18	Panel survey	2 398	–	0.44
LEA 2	2011–12	Panel survey	831	–	0.58
	2017–18	Panel survey	178	–	0.81
LEA 3	2011–12	Panel survey	506	–	0.65
	2017–18	Panel survey	133	–	1.00

1.3 Customary non-commercial fisheries

There is no quantitative information available to allow the estimation of the amount of leatherjacket taken by customary non-commercial fishers.

2. BIOLOGY

The New Zealand leatherjacket (*Meuschenia scaber*) is present around much of New Zealand, but is most common in the north. Trawl survey records show it to be widespread over the inner shelf north of East Cape and Cape Egmont, in the South Taranaki Bight, in Tasman Bay and Golden Bay, Pegasus Bay, and the South Canterbury Bight, extending to depths below 100 m, but with greatest abundance at 10–60 m (Anderson et al 1998). It was less commonly caught along the east coast of the North Island south of East Cape, off the northeast South Island (Cook Strait to Pegasus Bay), northwest South Island (Cape Farewell to Cape Foulwind), and around the South Otago and Southland coast. It has not been taken by trawl off the west coast south of Cape Foulwind.

The New Zealand leatherjacket also occurs in Australia, from New South Wales to the southern coast of West Australia. In the Australian southeast trawl fishery, *Meuschenia scaber* is the main leatherjacket species caught (Yearsley et al 1999). It was once believed that two similar species of leatherjacket occurred in New Zealand – 'rough' and 'smooth' – but these are now considered to be a single species with variable colouring. Kokiri is the Maori name, but is not in common usage. 'Creamfish' is a New Zealand trade name for the processed (headed/gutted/skinned) product, rather than a name for the fish itself.

Leatherjacket usually occur near reefs and over rough seafloor, but may be found over sand or some distance above the bottom. Although not a schooling species, it does occur in small groups.

A recent study showed that fifty percent sexual maturity was attained at 19 cm and 1.5 y in the Hauraki Gulf, and there were not significant differences between sexes (Visconti et al 2017, 2018). Maximum age was 9.8 y for males and 18.1 y for females. Males defend territories and eggs are laid within nests on the seafloor from late winter to early summer (Ayling & Cox 1982, Milicich 1986, Visconti et al 2017, 2018).

3. STOCKS AND AREAS

3.1 Biomass estimates

There have been no biological studies directly relevant to the recognition of separate stocks.

The west coast South Island (WCSI) trawl survey probably monitors adult biomass and most of the survey catch comes from Tasman Bay and Golden Bay. The total biomass estimates are shown in Figure 2. Biomass estimates have been relatively stable throughout the time series but increased substantially in 2019 and again in 2021 to the time series high. These higher estimates in 2019 and 2021 are however associated with higher CVs of 44 and 46% respectively. CVs have been less than 35% in most other surveys.

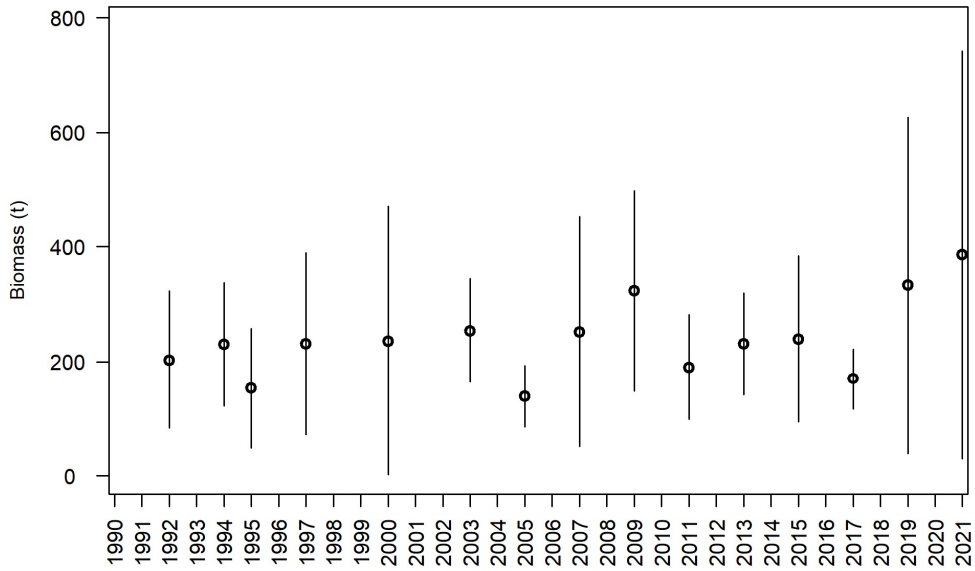


Figure 2: Leatherjacket biomass estimates from the WCSI inshore trawl survey time series. Error bars are ± two standard deviations.

East coast South Island (ECSI) winter trawl survey biomass estimates in the core strata (30–400 m) are probably do not track abundance because so few fish were caught, and coefficients of variations are generally high ranging from 36 to 76% (mean = 55%, up to 2012). There is nevertheless an increase in abundance from 2009 (Figure 3). Most of the biomass is captured in the 10–30 m depth indicating that the core plus shallow strata (10–400 m) is the only valid depth range within which to monitor leatherjacket biomass; although it is doubtful that these surveys index leatherjacket abundance well because they are also found over foul ground and hence not fully available to trawl gear (Beentjes & MacGibbon 2013). There was no trend in biomass in the 10–400 m depth range.

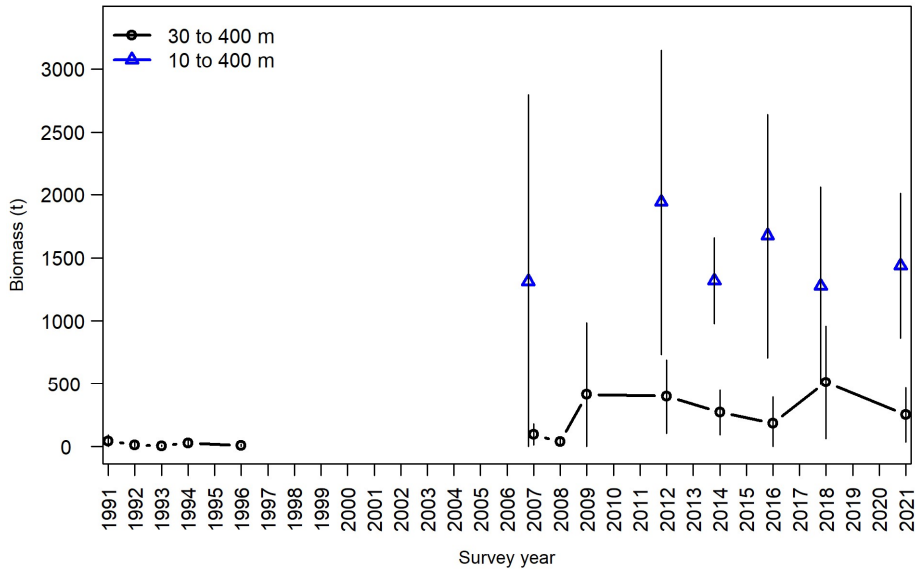


Figure 3: Leatherjacket total biomass for the ECSI winter surveys in core strata (30–400 m), and core plus shallow strata (10–400 m) in 2007, 2012, 2014, 2016, 2018, and 2021. Error bars are 2 Standard Deviations.

3.2 Length distributions

Leatherjacket were not caught in significant numbers in the ECSI winter surveys until 2007 when the shallow strata were included in the surveys. The length distributions in the core plus shallow strata (10–400 m show three clear modes at about 10 cm, 16 cm, and 23 cm, and these vary in strength and appearance among surveys (combined males, females, and unsexed) (Beentjes & MacGibbon 2013); only the 23 cm mode was present in the 2021 survey. The core plus shallow strata survey is monitoring both pre-recruited cohorts, and fish in the recruited size range.

4. STOCK ASSESSMENT

There has been no scientific assessment of the maximum sustainable yield, reference, or current biomass of any of the leatherjacket stocks.
A characterisation and CPUE analysis for the LEA 3 fishery was undertaken by Langley (2013). Leatherjacket in LEA 3 are landed throughout the year, taken almost exclusively by bottom trawl gear in Statistical Areas 021–025 and 030 (Figure 4). Almost all of the LEA catch is taken in the 10–50 m depth range. The characterisation revealed that most of the increase in LEA 3 catch since 2005–06 is attributable to increased landings of leatherjacket catch from bottom trawls targeting spiny dogfish in Foveaux Strait (025).

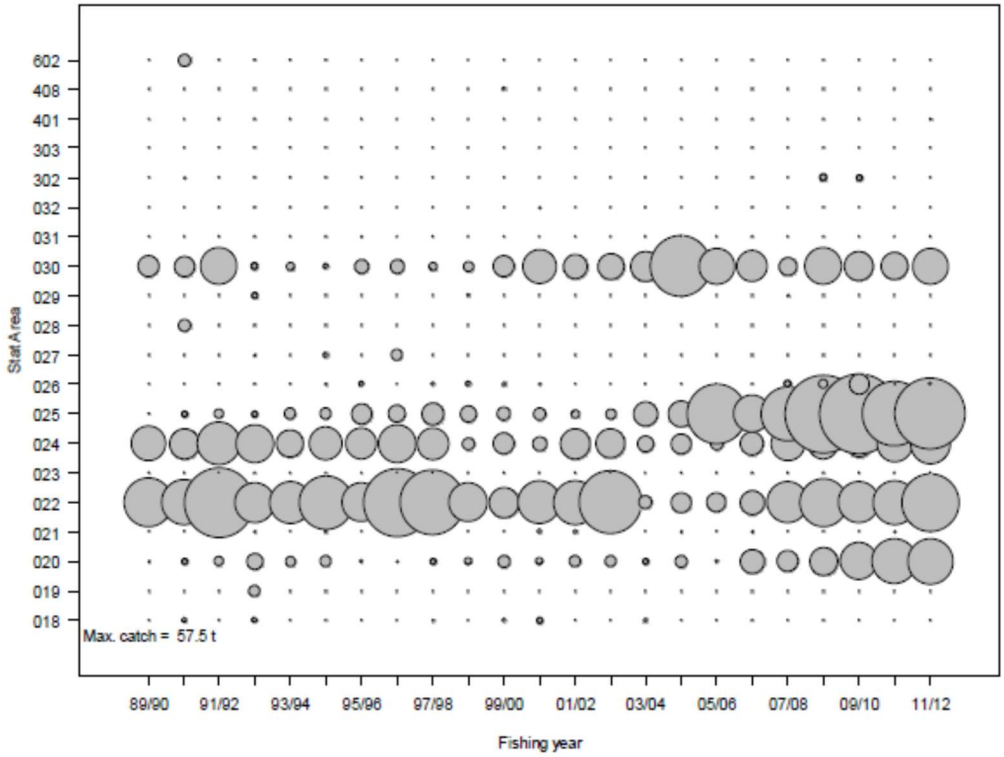


Figure 4: Distribution of reported catch for bottom trawl by Statistical Area in LEA 3 and fishing year from trips which landed leatherjacket in LEA 3 (Langley 2013).

A CPUE standardisation was undertaken using catch and effort data that included all trips that landed or targeted LEA 3, but did not include trips that did not catch LEA 3. Landed catch was assigned to effort records proportional to estimated catch, following the Starr (2007) methodology, with some refinements where the data were aggregated to CELR equivalent format (vessel/day/method/statistical area/target species) and then the records were defined as CELR equivalent. This method was somewhat problematic due to differences in the reliability of reporting of fishing location and target species between the CELR and TCER form types. The Foveaux Strait and Canterbury Bight fisheries were analysed separately. The Foveaux Strait analysis was rejected by the Working Group and is therefore not reported further.

The Canterbury Bight analysis was limited to the bottom trawl (BT) fishery in Statistical Areas 020 and 022, targeting a range of target species (RCO, BAR, FLA, ELE, TAR, WAR, and GUR). The dataset included trips where 1 kg or more of LEA 3 were landed. The analysis had large numbers of very small catches. Eight vessels accounted for 80% of the catch. The Working Group requested that the Canterbury Bight delta lognormal model targeting FLA, ELE, GUR from 2002 (Target FLA, GUR, ELE post QMS) be used because these are the years when the reporting is likely to be more reliable. There was an indication that CPUE from the Canterbury Bight fishery has increased since the early 2000s, and these indices were robust to some key assumptions. The index (Figure 5) showed that the CPUE remained low at the start of the series and then began to increase from 2007–08 to 2011–12. However, some concerns were raised about the low number of vessels in the analysis and the

development of new markets for this species that may have increased targeting or retention of this species in recent years, suggesting that the index may not be reliable as an index of abundance.

The Working Group concluded that this analysis only pertains to the stock unit for the East Coast of the South Island; is the best available information on the stock abundance at this stage, but trawl survey data may provide better information in the medium and long term; and that this is a Level 2 assessment and should be given a medium or mixed (2) overall assessment quality rank.

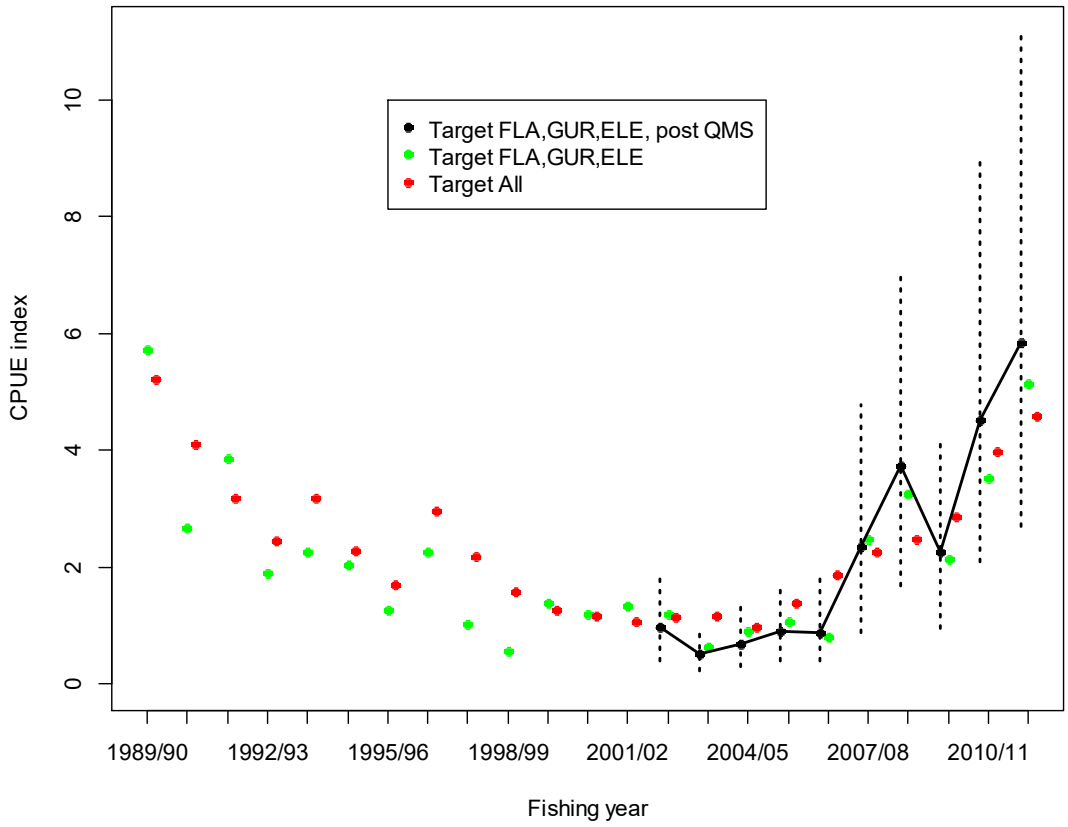


Figure 5: A comparison of three standardised CPUE indices for leatherjacket on the East Coast South Island Langley (2013).

5. STATUS OF THE STOCK

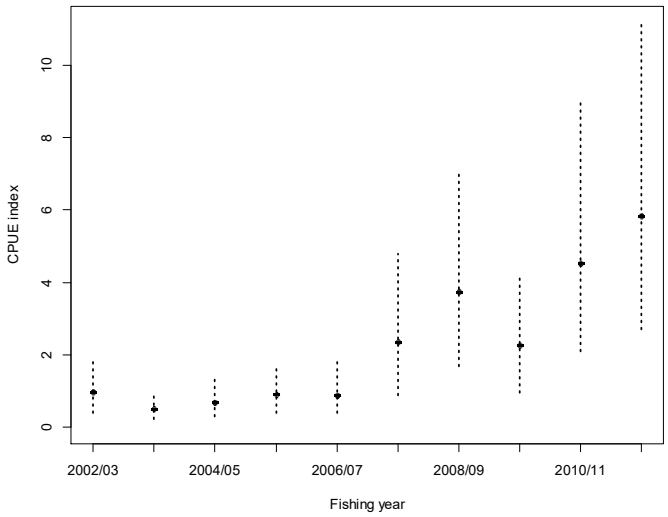
Stock Structure Assumptions

Stock structure is unknown but for management purposes the QMA boundaries are assumed to represent the stock boundaries for this species. There are two distinct areas of catch distribution within LEA 3 (Foveaux Strait and East Coast South Island) and these may represent distinct biological stocks.

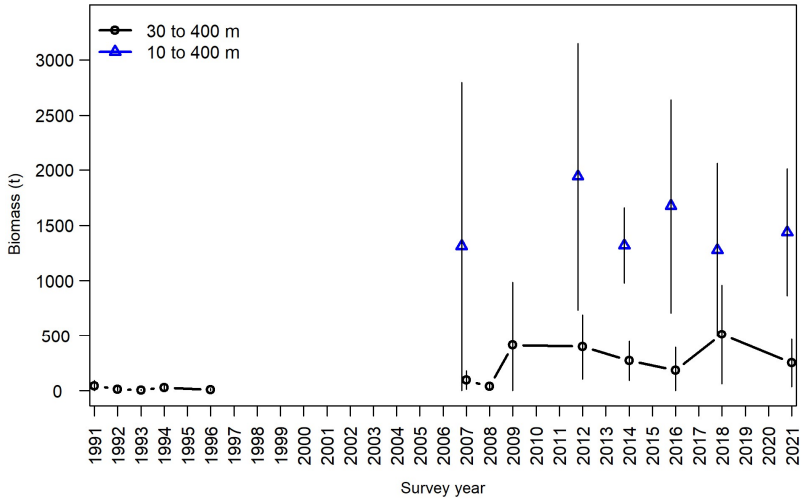
- **LEA 3 (**East Coast South Island only**)**

Stock Status	
Year of Most Recent Assessment	2013
Assessment Runs Presented	CPUE: Target FLA, GUR, ELE post QMS ECSI winter inshore survey
Reference Points	Target: 40% B_0 Soft Limit: 20% B_0 Hard Limit: 10% B_0 Overfishing threshold: F_{MSY}
Status in relation to Target	Unknown
Status in relation to Limits	Soft Limit: Unknown Hard Limit: Unlikely (< 40%)
Status in relation to Overfishing	Unknown

Historical Stock Status Trajectory and Current Status



The 2013 standardised CPUE index for leatherjacket on the East Coast South Island.



Biomass and 95% confidence intervals (total biomass only) for leatherjacket caught by the ECSI winter trawl survey core strata (30–400), and core plus shallow strata (10–400 m).

Fishery and Stock Trends	
Recent Trend in Biomass or Proxy	CPUE remained low at the start of the series (2002) and then began to increase from 2007–08 to 2011–12. The biomass index from the East Coast South Island trawl survey 30–400 m strata has increased since 2008, but there was no trend in biomass in the valid 10–400 m strata.
Recent Trend in Fishing Intensity or Proxy	Unknown because new markets for this species may have increased targeting or retention in recent years.
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	
Assessment Dates	Latest assessment: 2013	Next assessment: Unknown
Overall assessment quality rank	2 - Medium or Mixed Quality: CPUE may be compromised by the low number of vessels in the analysis and trends in targeting or retention of leatherjacket; the trawl survey has only covered the entire habitat since 2007.	
Main data inputs (rank)	- catch and effort data from bottom trawl sets targeting FLA, GUR and ELE - trawl survey biomass index	2 - Medium or Mixed Quality: few vessels in analysis 2 - Medium or Mixed Quality: limited years with full coverage of LEA area
Data not used (rank)	- Foveaux Strait CPUE index - Trawl survey biomass estimates from the 10–400 m strata.	3 – Low Quality: based on only a single vessel that has recently started targeting LEA 3 – Low Quality: confidence intervals large and only six data points
Changes to Model Structure and Assumptions	New model	
Major sources of Uncertainty	The low number of vessels in the analysis and new markets for this species may have increased targeting or retention in recent years. Trends in CPUE may therefore be a result of changes in reporting and retention rather than abundance. Total trawl survey biomass estimates for the entire survey area (10–400 m) have large confidence intervals for most surveys.	

Qualifying Comments
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Fishery Interactions
Leatherjacket are landed in fisheries targeting RCO, BAR, FLA, ELE, TAR, WAR and GUR, but are most commonly caught in FLA, GUR and ELE target bottom trawl sets. Some concerns have been raised about catch being taken in “hay paddocks”; these are polychaete worm beds that are biologically sensitive, habitat forming areas, which appear to be diminishing in areal extent as a consequence of disturbance from bottom trawling. Interactions with other species are currently being characterised.

Research Needs
Fishery characterisations that include interviews with fishers and processors are required to assess the degree to which changes in fishing practices and economic drivers may have influenced CPUE trends. Trawl surveys need to continue to include the shallow strata in order to monitor the abundance of leatherjacket on the east coast of the South Island.

6. FURTHER INFORMATION

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