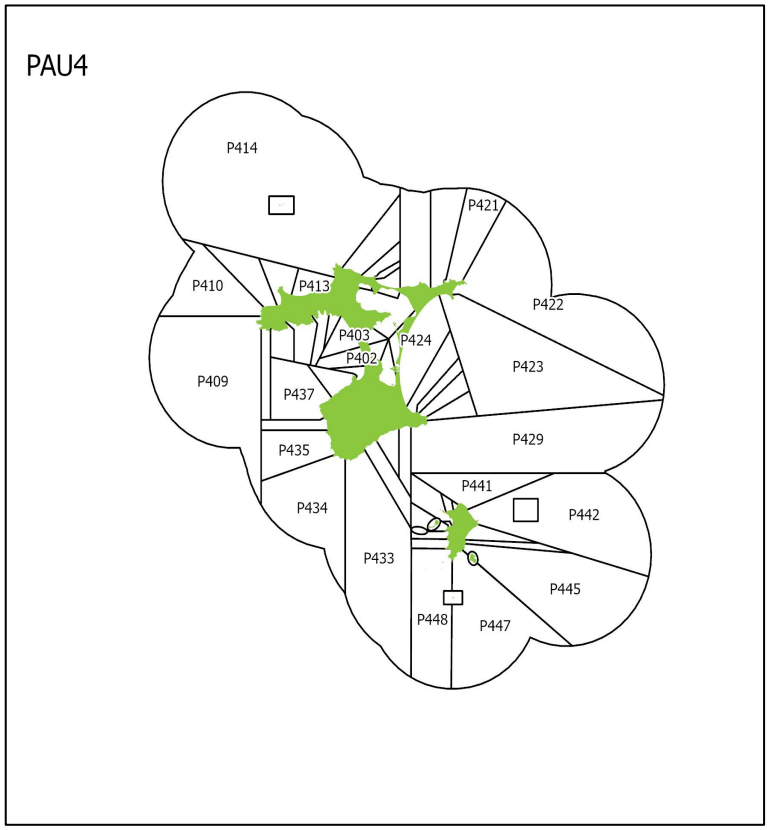
PĀUA (PAU 4) – Chatham Islands

(Haliotis iris)
Pāua



1. FISHERY SUMMARY

PAU 4 was introduced into the Quota Management System (QMS) in 1986–87 with a TACC of 261 t. The TACC was increased to 269 t in 1987–88, 271 t in 1988–89, and 287 in 1989–90. As a result of appeals to the Quota Appeal Authority, the TACC was further increased in 1995–96 to 326 t and has remained unchanged to the current fishing year (Table 1). Before the Fisheries Act (1996) a TAC was not required, and only a TACC was required when PAU 4 entered the QMS.

As a result of a court injunction a review of sustainability measures was undertaken for the 2019–20 fishing year, beginning 1 October 2019. The agreement reached resulted in a TAC, as well as allowances for Māori customary and recreational fishers being set. The TAC was set at 334 t, the TACC at 326.543 t, other mortality at 2 t, customary allowance at 3 t, and the recreational allowance at 3 t.

Because the pāua biomass appeared to be declining, the PAU 4 Fishery Plan (approved in 2019 under section 11A of the Fisheries Act 1996) provides a commitment by PAU 4 quota owners to shelve 40% of the PAU 4 ACE.

Table 1: Total allowable catches (TAC, t) allowances for customary fishing, recreational fishing, and other sources of mortality (t) and Total Allowable Commercial Catches (TACC, t) declared for PAU 4 since introduction into the QMS.

Year	TAC	Customary	Recreational	Other mortality	TACC
1986–1987	–	–	–	–	261
1987–1988	–	–	–	–	269
1988–1989	–	–	–	–	271
1989–1995	–	–	–	–	287
1995–2019	–	–	–	–	326
2019 onwards	334	3	3	2	326

1.1 Commercial fisheries

The fishing year runs from 1 October to 30 September. On 1 October 2001 it became mandatory to report catch and effort on PCELRs using fine-scale reporting areas that had been developed by the New Zealand Pāua Management Company for their voluntary logbook programme (see figure above).

At the beginning of the 2009–10 fishing year, reporting of catch in PAU 4 was changed from reporting in greenweight to reporting in meatweight. The TACC was still set in greenweight but fishers were required to report greenweight catch that is estimated from the meatweight measured by the licensed fish receiver (LFR). The meatweight to greenweight conversion factor was 2.50 (equivalent to 40% meatweight recovery). The change was made to curb the practice of converting meatweight to landed greenweight after shucking to obtain artificially high recovery rates. It was also made to encourage catch spreading by making it commercially viable for fishers to harvest areas where shells are heavily fouled and meatweight recovery is low. Heavy fouling on shells is a problem that occurs in a number of areas around the Chatham Islands. This meatweight reporting requirement was changed back to greenweight at the beginning of the 2017–18 year. This was due to issues with the accurate meatweight being recorded and delays in weighting the meat which meant that the conversion back to greenweight was not accurate due to blood and moisture loss being variable across the different processors and landing fishing receivers (LFRs).

Reported landings have remained below the TACC since 2010–11, averaging 276 t in 2010–11 to 2016–17 before decreasing to an average of 185 t in 2018-19. Landings for PAU 4 are shown in Table 2 and Figure 1.

Table 2: TACC and reported landings (t) of pāua in PAU 4 from 1983–84 to the present.

Year	Landings	TACC	Year	Landings	TACC
1983–84*	409.00	–	2003–04	325.85	326.54
1984–85*	278.00	–	2004–05	319.24	326.54
1985–86*	221.00	–	2005–06	322.53	326.54
1986–87*	267.37	261.00	2006–07	322.76	326.54
1987–88*	279.57	269.08	2007–08	323.98	326.54
1988–89*	284.73	270.69	2008–09	324.18	326.54
1989–90	287.38	287.25	2009–10	323.57	326.54
1990–91	253.61	287.25	2010–11	262.15	326.54
1991–92	281.59	287.25	2011–12	262.07	326.54
1992–93	266.38	287.25	2012–13	263.33	326.54
1993–94	297.76	287.25	2013–14	291.98	326.54
1994–95	282.10	287.25	2014–15	295.16	326.54
1995–96	220.17	326.54	2015–16	294.73	326.54
1996–97	251.71	326.54	2016–17	264.63	326.54
1997–98	301.69	326.54	2017–18	203.03	326.54
1998–99	281.76	326.54	2018–19	185.06	326.54
1999–00	321.56	326.54	2019–20	188.47	326.54
2000–01	326.89	326.54	2020–21	196.65	326.54
2001–02	321.64	326.54	2021–22	209.10	326.54
2002–03	325.62	326.54	2022–23	202.04	326.54

* FSU data

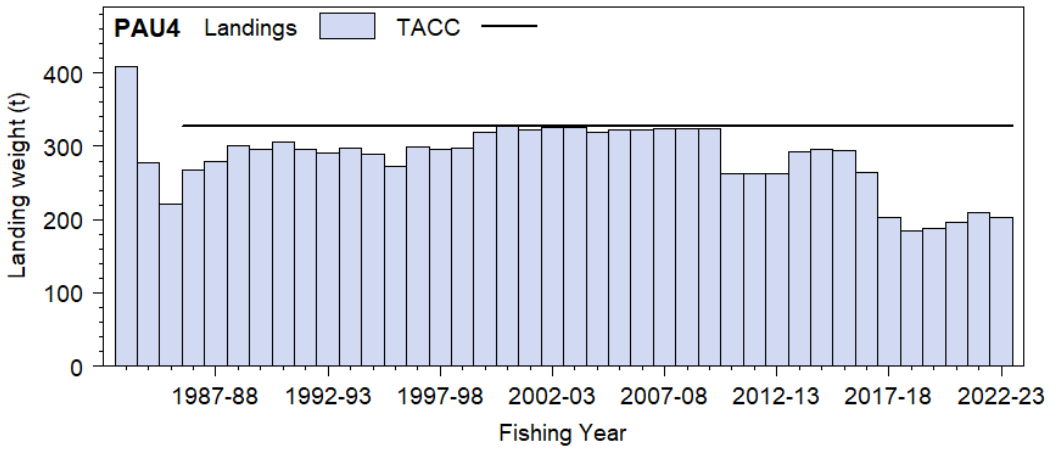


Figure 1: Reported commercial landings and TACC for PAU 4 from 1983–84 to the present.

1.2 Recreational fisheries

There are no estimates of recreational catch for PAU 4. The 1996, 1999–2000, and 2000–01 national marine recreational fishing surveys and the 2011–12 and the 2017–18 national panel surveys did not include PAU 4. There are 14 areas around the Chatham Islands which are closed to commercial fishing and act as recreational/customary only fishing areas. It is assumed that a significant portion of recreational catch is taken from these areas.

1.3 Customary fisheries

Pāua is a taonga species and as such there is an important customary use of pāua by Maori for food, and the shells have been used extensively for decorations and fishing devices.

For information on customary catch regulations and reporting refer to the Introduction – Pāua chapter.

Estimates of customary catch for PAU 4 are shown in Table 3. These numbers are likely to be an underestimate of customary harvest because only the catch approved and harvested in kilograms and numbers are reported in the table. In addition, many tangata whenua also harvest pāua under their recreational allowance and these are not included in records of customary catch.

Table 3: Fisheries New Zealand records of customary harvest of pāua (approved and reported as weight (kg) and in numbers) of pāua in PAU 4 from 2009–10 to present. – no data.

	Weight (kg)		Numbers	
Fishing year	Approved	Harvested	Approved	Harvested
2009–10	–	–	635	635
2010–11	–	–	–	–
2011–12	–	–	–	–
2012–13	–	–	–	–
2013–14	–	–	110	110
2014–15	–	–	150	150
2015–16	–	–	320	120
2016–17	–	–	366	366
2017–18	53	85	820	764
2018–19	330	330	–	–
2019–20	–	–	–	–
2020–21	–	–	–	–
2021–22	–	–	–	–
2022–23	–	–	–	–

For the 2004 stock assessment the customary catch was assumed to be zero.

For further information on customary fisheries refer to the Introduction – Pāua chapter.

1.4 Illegal catch

There are no estimates of illegal catch for PAU 4. For the 2004 stock assessment and 2023 operational models for harvest control rule evaluations this catch was assumed to be zero. For further information on illegal catch refer to the Introduction – Pāua chapter.

1.5 Other sources of mortality

For further information on other sources of mortality refer to the Introduction – Pāua chapter.

2. BIOLOGY

For further information on pāua biology refer to the Introduction – Pāua chapter.

3. STOCKS AND AREAS

For further information on stocks and areas refer to the Introduction – Pāua chapter.

4. STOCK ASSESSMENT

4.1 Estimates of fishery parameters and abundance

A standardised CPUE analysis for PAU 4 (Fu 2010) from 1989–90 to 2007–08 was completed in February 2010.

The Shellfish Working Group (SFWG) agreed that, because of extensive misreporting of catch in PAU 4, catch and effort data from the Fisheries Statistical Unit and from the CELR and PCELR forms might be misleading in CPUE analyses and therefore, CPUE cannot be used as an index of abundance in this fishery.

4.2 Stock assessment 2004

The last stock assessment for PAU 4 was completed in 2004 (Breen & Kim 2004). A Bayesian length-based stock assessment model was applied to PAU 4 data to estimate stock status and yield.

In February 2010 the SFWG agreed that, because of the lack of adequate data as input into the Bayesian length-based model, a stock assessment for PAU 4 using this model was not appropriate.

4.3 Operating model development and harvest control rule evaluation

From 2020 to 2023, a series of projects aimed to develop an operating model and to test management procedures that could formalise current statistical area-scale industry management initiatives (Neubauer & Kim 2023). Operating models were developed as spatial length-based models at the scale of individual pāua statistical areas. Due to a lack of sufficiently reliable time series of catch and CPUE, stock assessment models could not be fitted statistically but were conditioned on assumed catch time series. Conditioning assumed a distribution of plausible current stock status levels and simulated a range of stock trajectories that are consistent with assumed status.

Status assumptions were initially derived from a meta-analysis of stock status against catch-per-unit-effort in QMAs with accepted stock assessments. Results from this analysis suggested very high status and did not reflect industry concerns that have led to shelving of annual catch entitlements over the past decade. More conservative assumptions about stock status were therefore used to condition models, with conditioning scaled spatially from an analysis of recent spatial CPUE, which was judged more reliable than past CPUE trends based on CELR or PCELR data.

Control rules for management procedures were developed from a template applied in other pāua fisheries and centred on a target catch-rate given by fishers and catches as specified in the 2022 PAU 4 annual operating plan for each statistical area. Rules were then scaled according to assumed differences in available biomass between statistical areas derived from spatial CPUE (Figure 2). These rules were used as a preliminary set of rules to test the potential of formalising current industry management practice which considers catch as a function of perceived status at the statistical area level.

Conditioned models suggested a range of outcomes across individual statistical areas; these differences were attributed to conditioning assumptions in the model. While application of control rules led to variable outcomes at the statistical area-scale, the spatial variability averaged out on the large scale, leading to highly stable trends at the QMA scale for an implementation window of 5 years (Figure 3) and indicating low risk of further declines under the trialled preliminary harvest control rules.

4.4 Biomass estimates

There are no current biomass estimates for PAU 4.

4.5 Yield estimates and projections

There are no estimates of PAU 4.

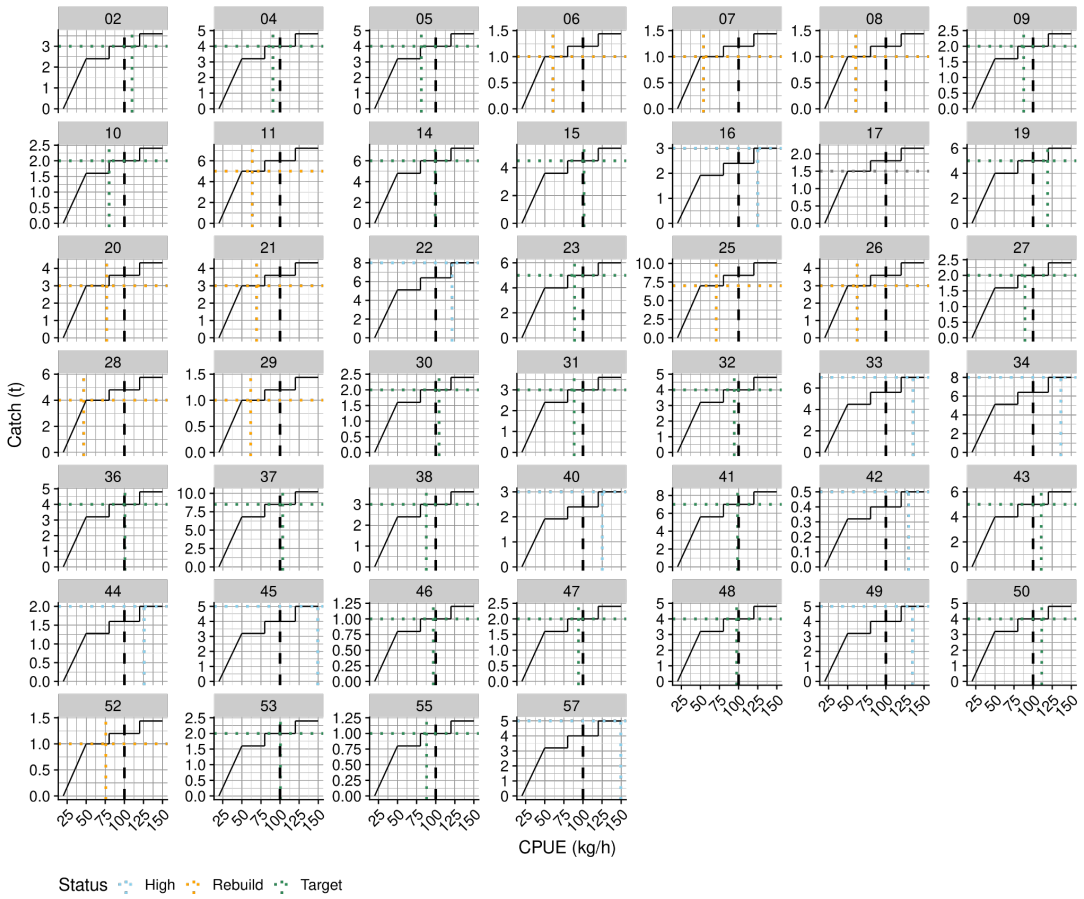


Figure 2: Preliminary harvest control rules for PAU 4 (by statistical area): total commercial catch (TCC) as a function of catch-per-unit-effort (CPUE). Target CPUE is shown as the dashed vertical line, recent CPUE and corresponding control rule catch are shown in coloured dotted lines, corresponding to estimates of areas being below ('Rebuild'), at ('Target'), or above target ('High').

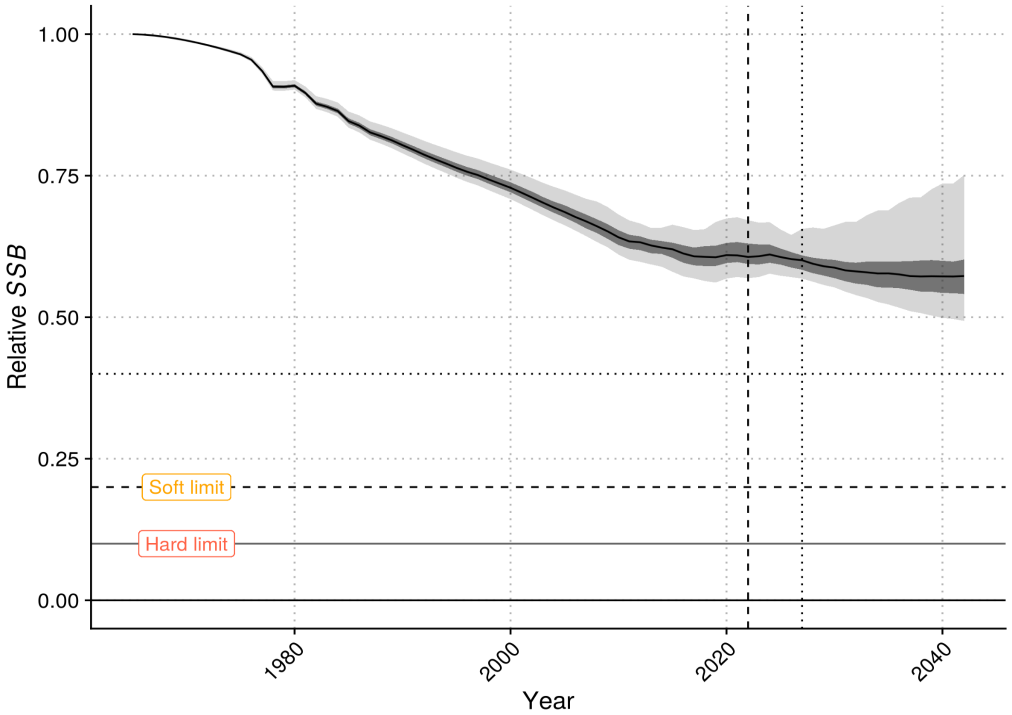


Figure 3: Projected relative spawning stock biomass (*SSB*) under base conditioning and biological assumptions in the PAU 4 operating model. The dashed vertical line shows the beginning of simulated trends based on the assessed harvest control rule, the dotted vertical line shows the tested limit of validity (5 years) of the tested rule. The last projection year is 2041.

5. STATUS OF THE STOCKS

Stock Structure Assumptions
Haliotis iris individuals collected from the Chatham Islands were found to be genetically distinct from those collected from costal sites around the North and South Islands (Will & Gemmell 2008).

PAU 4 - Chatham Islands

Due to concerns over reported catch and effort, no formal integrated stock assessment of the resource has been successful for several years, and the status of the fishery continues to be unknown. However, an operating model was developed in 2022, and management procedures were tested to attempt to formalise current statistical-area scale industry management initiatives.

Operating models were developed as spatial length-based models at the scale of individual pāua statistical areas. Due to a lack of sufficiently reliable time-series of catch and CPUE, stock assessment models could not be fitted statistically, but were conditioned on assumed catch times series. Conditioning assumed a distribution of plausible current stock status levels and simulated a range of stock trajectories that are consistent with assumed status.

Status assumptions were initially derived from a meta-analysis of stock status against catch-per-unit-effort in QMAs with accepted stock assessments. Results from this analysis suggested very good status and did not reflect industry concerns that have led to shelving of annual catch entitlements over the past decade. More conservative assumptions about stock status were therefore used to condition models, with conditioning scaled spatially from an analysis of recent spatial CPUE, which was judged more reliable than past CPUE trends based on CELR or PCELR data.

The model suggested potential declines in statistical areas with low CPUE and low past catch. However, due to their low biomass, these areas contribute relatively little to the QMA-wide trends. Despite a range of outcomes and variable trends at small spatial scales, trends at the QMA scale were relatively stable and suggested an overall stable fishery with low risk of further declines under the trialled harvest control rules.

6. FOR FURTHER INFORMATION

Breen, P A; Kim, S W (2004) The 2004 stock assessment of paua (*Haliotis iris*) in PAU 4. *New Zealand Fisheries Assessment Report 2004/55.* 79 p.

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