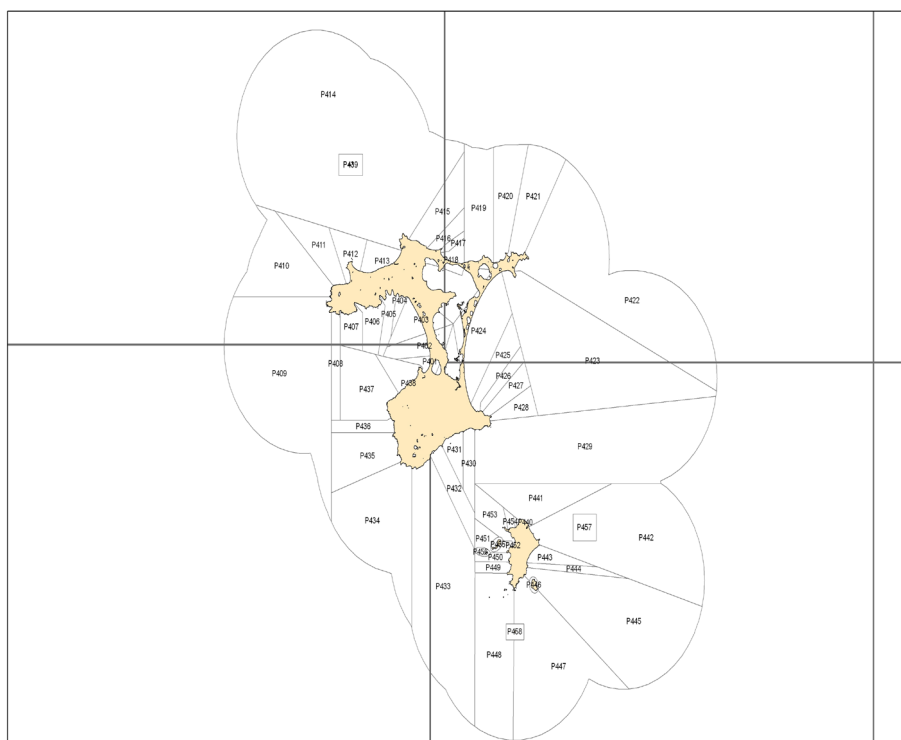


## PĀUA (PAU 4) – Chatham Islands

*(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 appears 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

## PĀUA (PAU 4)

### 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 is still set in greenweight but fishers are now required to report greenweight catch that is estimated from the meatweight measured by the licensed fish receiver (LFR). The meatweight to greenweight conversion factor is 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. However, this reporting requirement was changed back to greenweight at the beginning of the 2017–18 year.

Reported landings have remained below the TACC since 2010–11, averaging 276 t in 2010–11 to 2016–17 before decreasing to 203 t in 2017–18, 185 t in 2018–19 and 188 t in 2019–20. 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
1983–84*	409.00	–
1984–85*	278.00	–
1985–86*	221.00	–
1986–87*	267.37	261.00
1987–88*	279.57	269.08
1988–89*	284.73	270.69
1989–90	287.38	287.25
1990–91	253.61	287.25
1991–92	281.59	287.25
1992–93	266.38	287.25
1993–94	297.76	287.25
1994–95	282.10	287.25
1995–96	220.17	326.54
1996–97	251.71	326.54
1997–98	301.69	326.54
1998–99	281.76	326.54
1999–00	321.56	326.54
2000–01	326.89	326.54
2001–02	321.64	326.54
2002–03	325.62	326.54
2003–04	325.85	326.54
2004–05	319.24	326.54
2005–06	322.53	326.54
2006–07	322.76	326.54
2007–08	323.98	326.54
2008–09	324.18	326.54
2009–10	323.57	326.54
2010–11	262.15	326.54
2011–12	262.07	326.54
2012–13	263.33	326.54
2013–14	291.98	326.54
2014–15	295.16	326.54
2015–16	294.73	326.54
2016–17	264.63	326.54
2017–18	203.03	326.54
2018–19	185.06	326.54
2019–20	188.47	326.54

\* FSU data

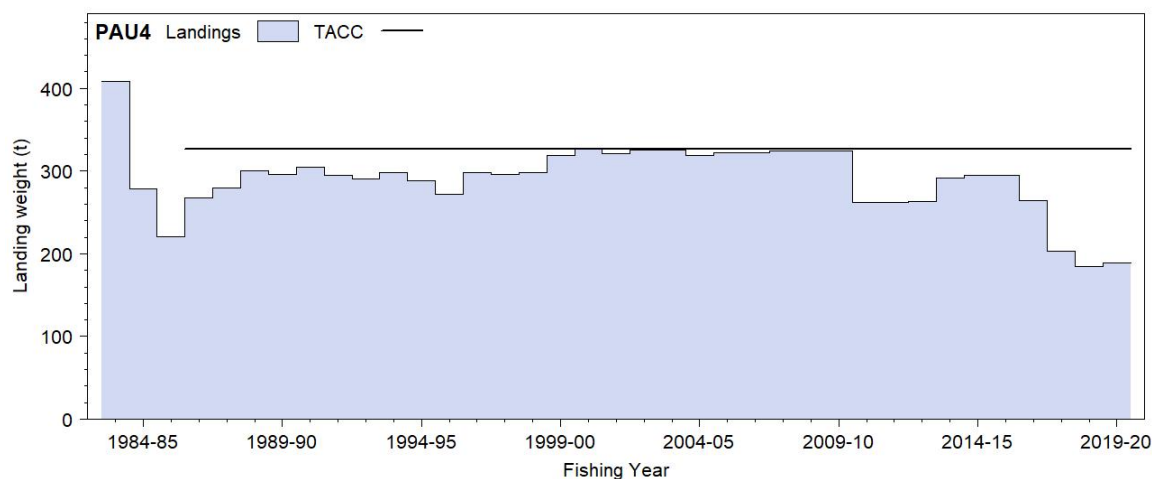


Figure 1: Reported commercial landings and TACC for PAU 4 from 1983–84 to the present.

## 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.

## 1.3 Customary fisheries

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 in kilograms and numbers are reported in the table.

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

For further information on customary fisheries refer to the introductory PAU Working Group Report.

Table 3: Reported customary landings (number of individuals) of pāua in PAU 4 from 2009–10 to 2018–19. – no data.

Fishing year	Weight (kg)		Numbers	
	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	–	–	–	–

## 1.4 Illegal catch

There are no estimates of illegal catch for PAU 4. For the 2004 stock assessment this catch was assumed to be zero. For further information on illegal catch refer to the introductory PAU Working Group Report.

## 1.5 Other sources of mortality

For further information on other sources of mortality refer to the introductory PAU Working Group Report.

## 2. BIOLOGY

For further information on pāua biology refer to the introductory PAU Working Group Report.

### 3. STOCKS AND AREAS

For further information on stocks and areas refer to the introductory PAU Working Group Report.

### 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. A reference period from 1991–93 was chosen: this was a period after which exploitation rates increased and then leveled off, and after which biomass declined somewhat and then stabilised. It was not intended as a target. Assessment results suggested that then-current recruited biomass was just above  $B_{AV}$ , but with high uncertainty (83% to 125%), and current spawning biomass appeared higher than  $S_{AV}$  (130%), but with cautions related to maturity ogives. Projections suggested that 2007 recruited and spawning biomasses could be above  $B_{AV}$ , but this was uncertain.

The SFWG advised that major uncertainties in the assessment required the results to be treated with great caution. The major uncertainties included very sparse research diver survey data, misreported CELR and PCELR data, growth and length frequency data most likely not being representative of the whole population, and the assumption that CPUE was an index of abundance.

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 Biomass estimates

There are no current biomass estimates for PAU 4.

#### 4.4 Yield estimates and projections

There are no estimates of PAU 4.

### 5. STATUS OF THE STOCKS

#### Stock Structure Assumptions

*H. iris* individuals collected from the Chatham Islands were found to be genetically distinct from those collected from coastal sites around the North and South Islands (Will & Gemmell 2008).

#### PAU 4 - *Haliois iris*

Stock Status	
Year of Most Recent Assessment	2004
Assessment Runs Presented	None
Reference Points	Target: 40% $B_0$ (Default as per HSS) Soft Limit: 20% $B_0$ (Default as per HSS) Hard Limit: 10% $B_0$ (Default as per HSS) Overfishing threshold: $U_{40\%B_0}$
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

In 2010 the SFWG rejected CPUE as an index of abundance, therefore the 2004 stock assessment (Breen & Kim 2004) is no longer considered reliable.

### Fishery and Stock Trends

Recent Trend in Biomass or Proxy	Unknown
Recent Trend in Fishing Intensity or Proxy	Unknown
Other Abundance Indices	None
Trends in Other Relevant Indicators or Variables	None

### Projections and Prognosis

Stock Projections or Prognosis	The 2004 stock assessment is no longer considered reliable
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	Full Quantitative Stock Assessment, but subsequently rejected	
Assessment Method	Length-based Bayesian model	
Assessment Dates	Last assessment: 2004	Next assessment: No fixed date
Overall assessment quality rank	3 - Low Quality	
Main data inputs (rank)	Catch history	3 - Low Quality
	CPUE indices	3 - Low Quality
	Tag recapture growth data	2- Medium Quality
	Research diver abundance survey data	2- Medium Quality
	Research diver length frequency data	2- Medium Quality
Data not used (rank)	-	
Changes to Model Structure and Assumptions	-	
Major Sources of Uncertainty	<ul style="list-style-type: none"> <li>• Potential bias in RDSI</li> <li>• Unreliable reporting of catch and effort data</li> <li>• Assuming CPUE as a reliable index of abundance</li> <li>• Model assumes a homogeneous population</li> <li>• Other model assumptions may be violated</li> </ul>	

### Qualifying Comments

The 2004 full quantitative stock assessment is no longer considered reliable; *i.e.* the previous assessment has been rejected and there is currently no valid assessment for this stock.

### Fishery Interactions

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## 6. FOR FURTHER INFORMATION

## PĀUA (PAU 4)

- 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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- Schiel, D R; Breen, P A (1991) Population structure, ageing and fishing mortality of the New Zealand abalone *Haliotis iris*. *Fishery Bulletin* 89: 681–691.
- Will, M C; Gemmell, N J (2008) Genetic Population Structure of Black Foot paua. Final Research Report for project GEN2007A. 37 p. (Unpublished report held by Fisheries New Zealand).