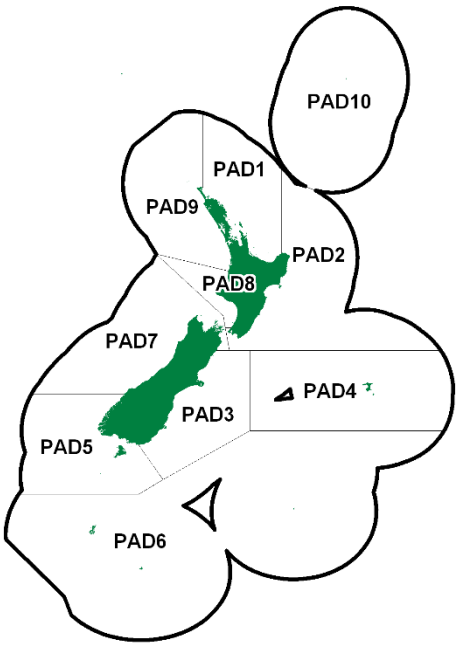
PADDLE CRABS (PAD)

(Ovalipes catharus)
Papaka



1. FISHERY SUMMARY

Paddle crabs were introduced into the QMS from 1 October 2002 Allowances, TACCs, and TACs are shown in Table 1.

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

Fishstock	Description	Recreational allowance	Customary non-commercial allowance	Other sources of mortality	TACC	TAC
PAD 1	Auckland (East)	20	10	–	220	250
PAD 2	Central (East)	10	5	–	110	125
PAD 3	South East (Coast)	8	2	–	100	110
PAD 4	South East (Chatham Rise)	4	1	–	25	30
PAD 5	Southland	4	1	–	50	55
PAD 6	Sub-Antarctic	–	–	–	0	0
PAD 7	Challenger	4	1	–	100	105
PAD 8	Central (West)	4	1	–	60	65
PAD 9	Auckland (West)	20	10	–	100	130
PAD 10	Kermadec	–	–	–	0	0

1.1 Commercial fisheries

Commercial interest in paddle crabs was first realised in New Zealand in 1977–78 when good numbers of large crabs were caught off Westshore Beach, Napier in baited lift and set-pots. Annual catches have varied, mainly due to marketing problems, and estimates are likely to be conservative. Landings increased in the early fishery, from 775 kg in 1977 to 306 t in 1985, and ranging from 403 t to 519 t from 1995–96 to 1999-00, but have since generally decreased. Since 2018–19, landings (mostly originating from PAD 3) dropped to the lowest levels since the 1980s. Paddle crabs are known to be discarded from inshore trawl operations targeting species such as flatfish, and this may have resulted in under-reporting of catches. Crabs are marketed live, as whole cooked crabs, or as crab meat. Attempts were made to establish a soft-shelled crab industry in New Zealand in the late 1980s.

Bycatch is commonly taken during trawl, dredge and set netting operations. Catch rates vary considerably with method, season and area, and there is no clear seasonal trend to paddle crab landings. It is likely that catches are related to the availability of fishers and/or market demands. Commercial landings since 1989–

90 are shown in Table 2, while Figure 1 shows the historical landings and TACC for the six main PAD stocks.

Table 2: Reported landings (t) and TACCs (t) from 1989–90 to present.

QMA	PAD 1		PAD 2		PAD 3		PAD 4		PAD 5		PAD 6	
	Land.	TACC	Land.	TACC	Land.	TACC	Land.	TACC	Land.	TACC	Land.	TACC
1989–90	20	-	57	-	38	-	< 1	-	< 1	-	0	-
1990–91	34	-	37	-	26	-	0	-	6	-	0	-
1991–92	96	-	32	-	31	-	< 1	-	< 1	-	0	-
1992–93	175	-	14	-	36	-	0	-	< 1	-	0	-
1993–94	277	-	18	-	46	-	0	-	< 1	-	0	-
1994–95	237	-	6	-	36	-	< 1	-	< 1	-	0	-
1995–96	183	-	5	-	18	-	< 1	-	1	-	55	-
1996–97	165	-	25	-	36	-	0	-	1	-	25	-
1997–98	158	-	126	-	18	-	< 1	-	13	-	7	-
1998–99	195	-	197	-	21	-	< 1	-	2	-	10	-
1999–00	265	-	21	-	27	-	1	-	14	-	14	-
2000–01	32	-	10	-	17	-	0	-	0	-	0	-
2001–02	221	-	34	-	22	-	0	-	2	-	22	-
2002–03	145	220	65	110	18	100	< 1	25	< 1	50	< 1	0
2003–04	239	220	46	110	20	100	0	25	0	50	0	0
2004–05	163	220	44	110	30	100	0	25	0	50	0	0
2005–06	109	220	49	110	11	100	0	25	< 1	50	0	0
2006–07	53	220	21	110	13	100	0	25	3	50	0	0
2007–08	86	220	9	110	19	100	0	25	< 1	50	0	0
2008–09	36	220	14	110	37	100	0	25	1	50	0	0
2009–10	35	220	17	110	37	100	0	25	< 1	50	0	0
2010–11	49	220	18	110	47	100	0	25	<1	50	0	0
2011–12	12	220	41	110	47	100	< 1	25	< 1	50	0	0
2012–13	< 1	220	36	110	39	100	< 1	25	< 1	50	0	0
2013–14	3	220	6	110	74	100	1	25	< 1	50	0	0
2014–15	23	220	1	110	45	100	0	25	< 1	50	0	0
2015–16	69	220	6	110	48	100	0	25	< 1	50	0	0
2016–17	36	220	12	110	18	100	< 1	25	< 1	50	0	0
2017–18	3	220	5	110	17	100	< 1	25	0	50	0	0
2018–19	< 1	220	3	110	15	100	< 1	25	< 1	50	0	0
2019–20	< 1	220	4	110	9	100	0	25	0	50	0	0
2020–21	< 1	220	< 1	110	4	100	< 1	25	< 1	50	< 1	0
2021–22	< 1	220	< 1	110	16	100	< 1	25	< 1	50	0	0
2022–23	0	220	< 1	110	16	100	0	25	< 1	50	0	0
2023–24	0	220	< 1	110	9	100	< 1	25	0	50	0	0

QMA	PAD 7		PAD 8		PAD 9		PAD 10		Total	
	Land.	TACC	Land.	TACC	Land.	TACC	Land.	TACC	Land.	TACC
1989–90	94		22	-	0	-	0	-	231	-
1990–91	68		12	-	0	-	0	-	183	-
1991–92	83		21	-	0	-	0	-	264	-
1992–93	59		24	-	0	-	0	-	308	-
1993–94	49		27	-	5	-	0	-	423	-
1994–95	71		46	-	< 1	-	0	-	397	-
1995–96	82		58	-	< 1	-	< 1	-	403	-
1996–97	106		44	-	< 1	-	1	-	403	-
1997–98	63		25	-	< 1	-	< 1	-	410	-
1998–99	59		34	-	0	-	1	-	519	-
1999–00	45		50	-	0	-	< 1	-	437	-
2000–01	0		< 1	-	0	-	0	-	59	-
2001–02	33		24	-	0	-	0	-	358	-
2002–03	42	100	11	60	0	100	0	0	281	765
2003–04	50	100	17	60	< 1	100	0	0	372	765
2004–05	40	100	14	60	1	100	0	0	292	765
2005–06	48	100	14	60	1	100	0	0	232	765
2006–07	32	100	11	60	< 1	100	0	0	132	765
2007–08	47	100	7	60	0	100	0	0	168	765
2008–09	35	100	11	60	0	100	0	0	134	765
2009–10	17	100	13	60	0	100	0	0	120	765
2010–11	11	100	14	60	0	100	0	0	140	765
2011–12	7	100	14	60	0	100	0	0	121	765
2012–13	11	100	17	60	0	100	0	0	103	765
2013–14	4	100	13	60	0	100	0	0	101	765
2014–15	0	100	1	60	0	100	0	0	71	765
2015–16	0	100	4	60	0	100	0	0	127	765
2016–17	< 1	100	3	60	0	100	0	0	66	765
2017–18	< 1	100	1	60	0	100	0	0	27	765
2018–19	0	100	1	60	0	100	0	0	22	765
2019–20	< 1	100	< 1	60	0	100	0	0	13	765
2020–21	< 1	100	< 1	60	0	100	0	0	5	765
2021–22	0	100	< 1	60	0	100	0	0	16	765
2022–23	0	100	< 1	60	0	100	0	0	16	765
2023–24	0	100	0	60	0	100	0	0	9	765

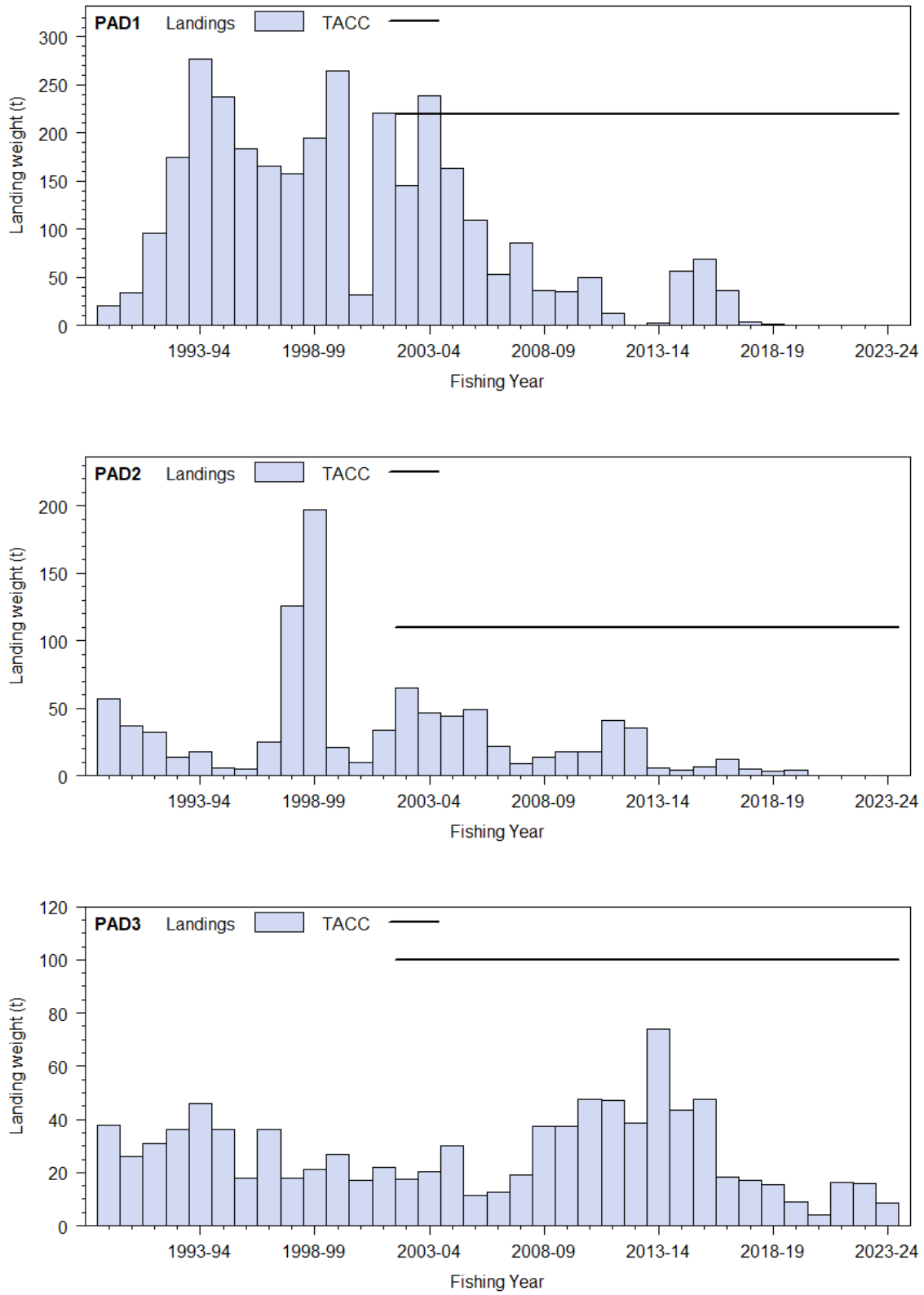
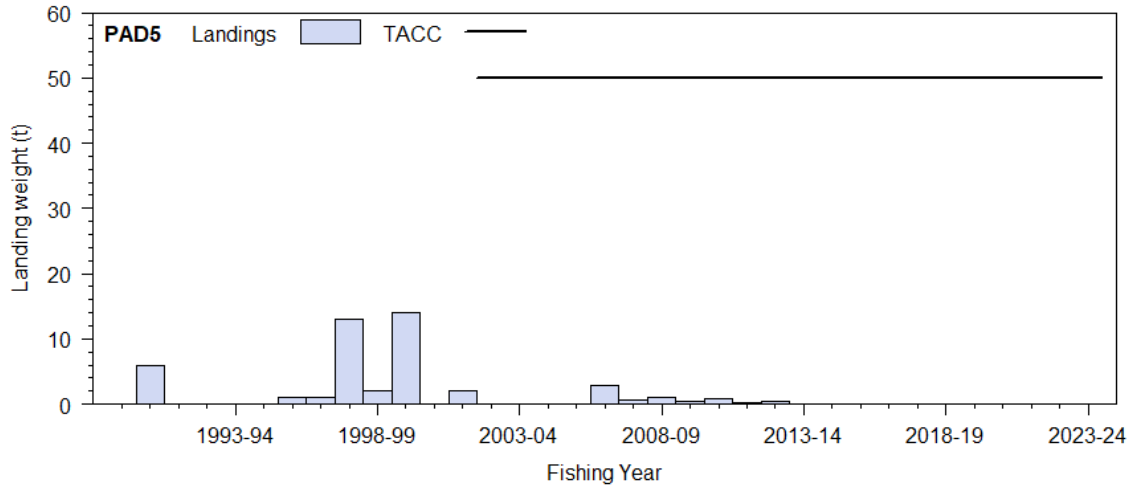
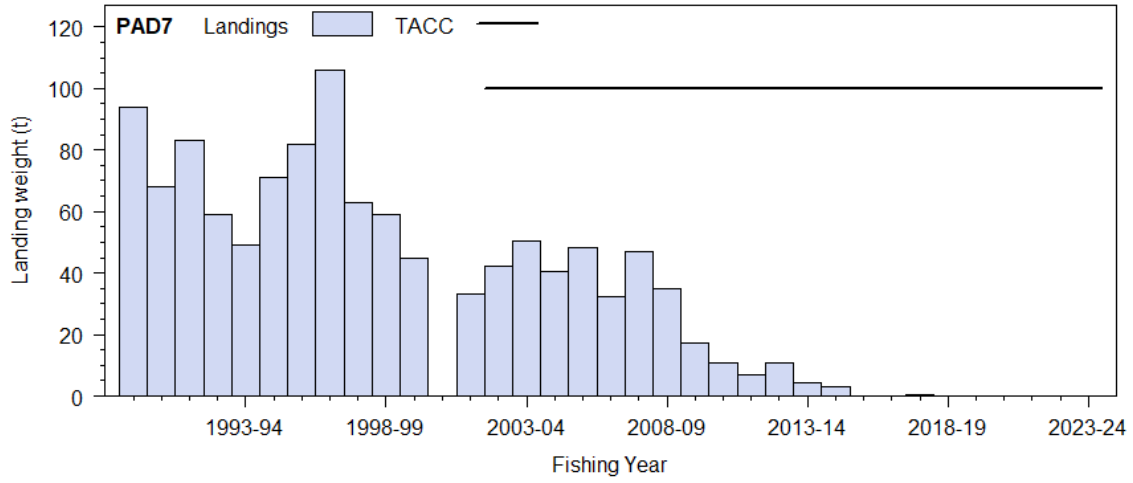


Figure 1: Reported commercial landings and TACCs for the six main PAD stocks: PAD 1 (Auckland East), PAD 2 (Central East) and PAD 3 (south East Coast). [Continued on next page]





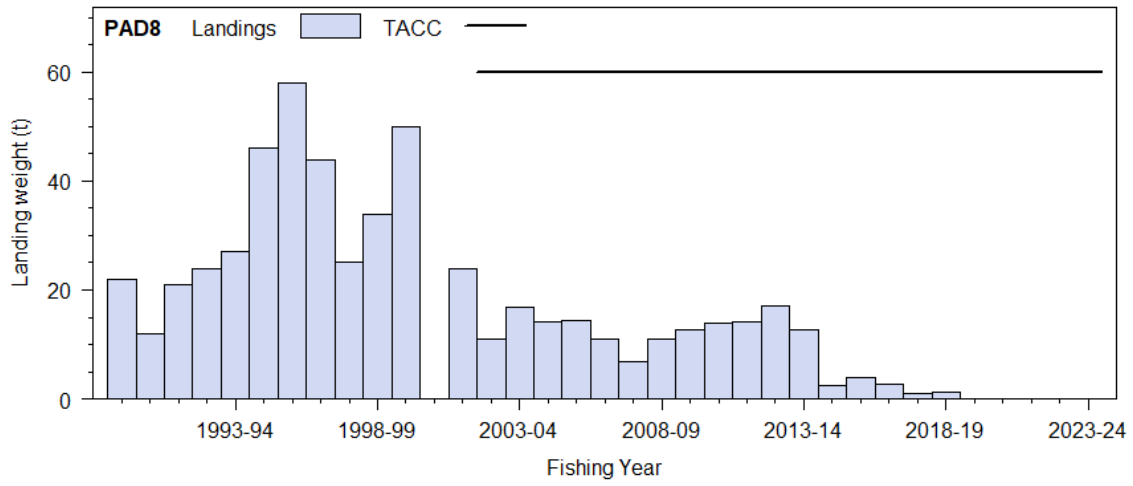


Figure 1 [Continued]: Reported commercial landings and TACCs for the six main PAD stocks: PAD 5 (Southland), PAD 7 (Challenger) and PAD 8 (Central Egmont).

1.2 Recreational fisheries

Paddle crabs are targeted by recreational fishers using baited pots or baited mesh (which crabs become tangled in) and they are taken as bycatch when beach and estuarine seining and in setnets throughout much of their geographical range. A National Panel Survey of recreational fishers was conducted for the first time throughout the 2011–12 fishing year (Wynne-Jones et al. 2014). 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 collected 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). Recreational catch estimates from the three national panel surveys are given in Table 3. Note that national panel survey estimates do not include recreational harvest taken on charter vessel trips or under s111 general approvals. These estimates are all very uncertain because of the small number of fishers reporting catch.

Table 3: Recreational harvest estimates for paddle crab stocks from the national panel surveys (2011–12, 2017–18 and 2022–23). *: no estimates of mean weights were available to convert catches in numbers to tonnes. From Wynne-Jones et al. (2014), Wynne-Jones et al. (2019) and Heinemann & Gray (2024).

Area	Number (thousands)	CV	Catch (t)*
2011–12 (national panel survey)			
PAD 1	2 003	0.86	-
PAD 2	827	1.02	-
PAD 3	1 768	1.01	-
PAD 5	2 532	1.02	-
PAD 8	2 225	0.71	-
PAD total	9 354	0.43	-
2017–18 (national panel survey)			
PAD 1	775	0.84	-
PAD 7	5 139	1.00	-
PAD total	5 914	0.88	-
2022–23 (national panel survey)			
PAD 1	682	1.00	-
PAD 3	145	1.01	-
PAD 7	221	1.02	-
PAD total	1 048	0.70	-

1.3 Customary non-commercial fisheries

Paddle crabs form a fishery for customary non-commercial, but the total annual catch is not known.

Māori customary fishers can utilise the provisions under both the recreational fishing regulations and the various customary regulations. Many tangata whenua may harvest paddle crabs under their recreational allowance and these are not included in records of customary catch. Customary reporting requirements vary around the country. Customary fishing authorisations issued in the South Island and Stewart Island would be under the Fisheries (South Island Customary Fishing) Regulations 1999. Many rohe moana / areas of the coastline in the North Island and Chatham Islands are gazetted under the Fisheries (Kaimoana Customary Fishing) Regulations 1998 which require reporting on authorisations. In the areas not gazetted, customary fishing permits would be issued would be under the Fisheries (Amateur Fishing) Regulations 2013, where there is no requirement to report catch.

The information on Māori customary harvest under the provisions made for customary fishing is very limited (Table 4). These numbers are likely to be an underestimate of customary harvest as only the catch approved and harvested in kilograms and numbers are reported in the table.

Table 4: Fisheries New Zealand records of customary harvest of paddle crabs (approved and reported as weight (kg) and numbers), since 2007-08. – no data.

		Weight (kg)		Numbers	
Stock	Fishing year	Approved	Harvested	Approved	Harvested
PAD 1	2010–11	10	0	50	0
PAD 3	2007–08	–	–	50	0

1.4 Illegal catch

There is qualitative data to suggest illegal, unreported, unregulated (IUU) activity in this Fishery.

1.5 Other sources of mortality

There is no quantitative information available on other sources of mortality, although unknown quantities of paddle crabs have been discarded from commercial fishing operations such as the inshore trawl, setnet and dredge fisheries.

2. BIOLOGY

Paddle crabs are found off sandy beaches and in harbours and estuaries throughout mainland New Zealand, the Chatham Islands, and east and South Australia. They are abundant from the intertidal zone to at least 10 m depth, although they do occur in much deeper water. Paddle crabs are mainly active in early evening or at night, when they move into the shallow intertidal zone to feed.

Paddle crabs are versatile and opportunistic predators. They feed mainly on either molluscs or crustaceans, but also on polychaetes, several fish species, cumacean crustaceans, and occasionally on algae. A high proportion of the molluscs eaten are *Paphies* species. These include: tuatua (*P. subtriangulata);* pipi (*P. australis);* and toheroa (*P. ventricosa).* The burrowing ghost shrimp *Callianassa filholi,* isopods and amphipods are important crustacean prey items. Cannibalism is common, particularly on small crabs and during the winter moulting season.

Anecdotal information suggests there has been a significant increase in paddle crab numbers since the 1970s. Concern has been expressed as to the impact of an increased number of paddle crabs on bivalve shellfish stocks in coastal waters. Feeding studies have shown that although paddle crabs do eat large adult toheroa and other shellfish, they more usually eat bivalve shellfish spat which are found in abundance.

Mating generally occurs during winter and spring (May to November) in sheltered inshore waters. Female paddle crabs can only mate when they are soft-shelled. Male crabs protect and carry pre-moult females to ensure copulation. Female crabs are thought to migrate to deeper water to spawn over the warmer months (September to March). After spawning, the eggs are incubated until they hatch. Paddle crab (*Ovalipes catharus)* has an extended larval life characterised by eight zoea stages and a (crab-like) megalopa. The larvae are thought to live offshore in deeper water, migrating inshore in the megalopa stage to settle from January to May.

Two spawning mechanisms have been observed in *O. catharus*. In Wellington, Tasman Bay, and Canterbury, spawning does not appear to be synchronised and females may spawn several times during the season (non-synchronous spawning). In Blueskin Bay, Otago, paddle crabs are group-synchronous, with one clutch of eggs developing to maturity over winter and spawned from September to February.

Annual fecundity is determined by the number of eggs per brood (brood fecundity) and the number of broods per year. Both these parameters are size dependent and highly variable. Brood fecundity estimates vary considerably geographically from between 82 000–638 000 in Wellington waters, to 100 000–1 200 000 in Canterbury waters, and 931 000–2 122 807 in Otago waters. The number of broods per year also varies geographically from 1.2–3.3 in Wellington waters, to 1.2–2.2 in Canterbury waters, and 1 brood per year in Otago waters (group synchronous spawning).

O. catharus is a relatively large and fast-growing species of *Ovalipes.* In Canterbury waters, paddle crabs reach a maximum size of 130 mm carapace width (CW - males only) after 13 postlarval moults and 3 to 4 years after settlement. Other studies have reported maximum sizes up to 150 mm CW. In Wellington waters, crabs of approximately 100 mm carapace width, of either sex, would be at least 3 years old, while larger crabs could be 4 or 5 years old.

The Intrinsic Productivity Level is categorised as High for this species.

The differences in growth rate, size at first maturity, and fecundity (particularly the number of broods) appear to be largely environmentally regulated. At lower temperatures and higher latitudes, paddle crabs grow slower, mature at a larger size, have a shorter breeding season, and produce fewer broods per year.

Estimates of biological parameters relevant to stock assessment are presented in Table 5.

Table 5: Estimates of biological parameters.

Fishstock			Estimate		Source
1. Natural mortality (females only)					
(Percentage mortality at each instar stage)					
Instar	Tasman Bay (QMA 7)		Canterbury (QMA 3)		
8	15.3		15.0		Osborne (1987)
9	31.2		30.0		
10 (68–75 mm CW)	78.1		39.1		
11	30.7		38.9		
12	55.6		18.2		
13 (> 100 mm CW)	100		100		
2. $\log_{10}$(weight) = a + b* $\log_{10}$(CW) (carapace width)					
	Females		Males		
Canterbury (QMA 3)	a	b	a	b	Davidson & Marsden (1987)
	-3.32	2.79	-3.46	2.89	

3. STOCKS AND AREAS

It is not known whether biologically distinct stocks occur, although this seems unlikely given that the species is found throughout New Zealand waters, and from tagging experiments, appears to be highly migratory. There is probably also widespread larval dispersal as larvae spend two months offshore in deeper water (to at least 700 m). Genetically distinct populations may occur in isolated areas such as the Chatham Islands.

4. STOCK ASSESSMENT

4.1 Estimates of fishery parameters and abundance

None are available at present.

4.2 Biomass estimates

No estimates of current or virgin biomass are available. The landings, CPUE, and area data are considered too unreliable or incomplete to allow modelling.

4.3 Yield estimates and projections

MCY cannot be estimated.

CAY cannot be estimated because of the lack of current biomass estimates.

5. STATUS OF THE STOCKS

Until the early 2000s, landings have fluctuated significantly in most QMAs, mainly due to market variations. Until recently, paddle crabs were considered to be abundant throughout most of their range and the fishery only lightly exploited. However, commercial catch in recent years has declined to low levels compared to historical catches. For all PAD fishstocks there is insufficient information to estimate current stock status

6. FOR FURTHER INFORMATION

Armstrong, J H (1985) Aspects of the biology of the swimming crab, *Ovalipes catharus* (White, 1843) in the Otago region. Unpublished MSc thesis, University of Otago, Dunedin.

Clark, M R (1978) Aspects of the population biology of the swimming crab *Ovalipes catharus* (White, 1843) (Crustacea; Decapoda; Portunidae) in the Plimmerton Area, Wellington. Unpublished BSc (Hons). Zoology Department, Victoria University, Wellington. 115 p.

Davidson, R J (1987) Natural food and predatory activity of the paddle crab, *Ovalipes catharus*. Unpublished MSc thesis. Zoology Department, University of Canterbury, Christchurch, New Zealand. 110 p.

Davidson, R J; Marsden, I D (1987) Size relationships and relative growth of the New Zealand swimming crab *Ovalipes catharus* (White, 1983). *Journal of Crustacean Biology* 7: 308–317.

Haddon, M (1988) Impact of paddle crabs on shellfish. *Catch* 15: 9–11.

Heinemann A; Gray, A. (2024) National Panel Survey of Recreational Marine Fishers 2022-23. *New Zealand Fisheries Assessment Report 2024/51*. 116 p.

Kung, H T (1973) Some aspects of the biology of the swimming crab *Ovalipes catharus* (White, 1843) in Paremata Harbour, New Zealand. Unpublished MSc thesis, Victoria University, Wellington.

McLay, C L (1988) Brachyura and crab-like Anomura of New Zealand. Leigh Laboratory Bulletin No: 22, University of Auckland. 463 p.

NZFIB (1996) The New Zealand seafood industry economic review 1994–1996. New Zealand Fishing Industry Board, Wellington. 65 p.

Osborne, T A (1987) Life history and population biology of the paddle crab, *Ovalipes catharus.* Unpublished PhD thesis. Zoology Department, University of Canterbury, Christchurch, New Zealand. 156 p.

Stead, D (1983) Paddle crab investigations. *Catch* 10: 14–15.

Stead, D (1984) Crab fishery expansion possible. *Catch* 11: 13–14.

Stevens, D W (1999) A summary of biology and commercial landings and a stock assessment of paddle crabs *Ovalipes catharus* White, 1843 (Crustacea, Portunidae) in New Zealand waters. New Zealand Fisheries Assessment Research Document 1999/18. 26 p. (Unpublished document held by NIWA library, Wellington.)

Wear, R G (1988a) Paddle crab fishery has potential in New Zealand. *Catch* 15: 11 p.

Wear, R G (1988b) Paddle crabs eat small shellfish. *Catch* 15: 12–13.

Wear, R G; Haddon, M (1987) Natural diet of the crab *Ovalipes catharus* (Crustacea, Portunidae) around central and northern New Zealand. *Marine Ecology (Progress series)* 35: 39–49.

Wynne-Jones, J; Gray, A; Heinemann, A; Hill, L; Walton, L (2019) National Panel Survey of Marine Recreational Fishers 2017–2018. *New Zealand Fisheries Assessment Report 2019/24*. 104 p.

Wynne-Jones, J; Gray, A; Hill, L; Heinemann, A (2014) National Panel Survey of Marine Recreational Fishers 2011–12: Harvest Estimates. *New Zealand Fisheries Assessment Report 2014/67*.