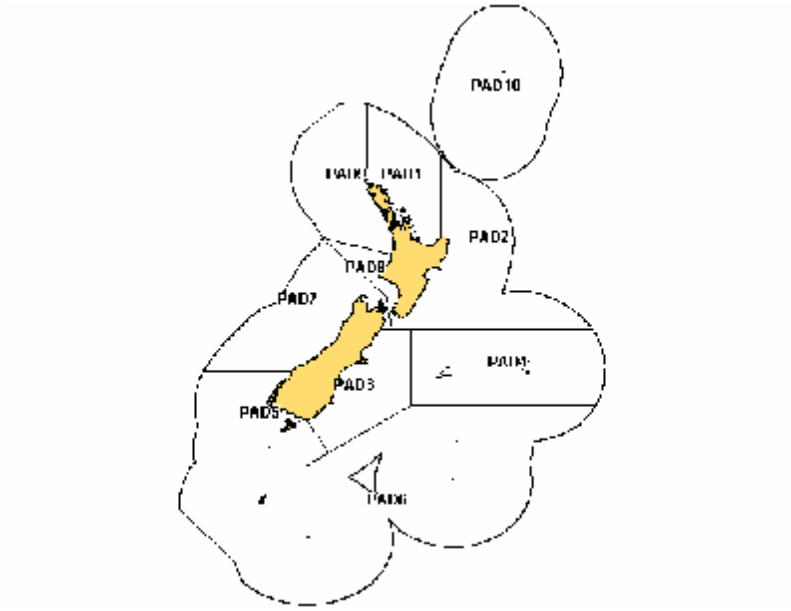
PADDLE CRABS (PAD)

(Ovalipes catharus)



1. FISHERY SUMMARY

(a) 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. Since then landings have increased markedly from 775 kg in 1977 to 306 t in 1985 and 403 t in 1995–96. Annual catches have varied, mainly due to marketing problems, and estimates are likely to be conservative. 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.

Table 1: Reported landings (t) of paddle crabs by QMA and fishing year, from CLR and $CELR_{landed}$ data from 1989–90 to 2004–05.

QMA	1		2		3		4		5	
	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC
1989-90	20		57		38		<1		<1	
1990-91	34		37		26		0		6	
1991-92	96		32		31		<1		<1	
1992-93	175		14		36		0		<1	
1993-94	277		18		46		0		<1	
1994-95	237		6		36		<1		<1	
1995-96	183		5		18		<1		1	
1996-97	165		25		36		0		1	
1997-98	158		126		18		<1		13	
1998-99	195		197		21		<1		2	
1999-00	265		21		27		1		14	
2000-01	32		10		17		0		0	
2001-02	221		34		22		0		2	
2002-03	145	220	65	110	18	100	<1	25	<1	50
2003-04	239	220	46	110	20	100	-	25	-	50
2004-05	163	220	44	110	30	100	-	25	-	50

QMA	6		7		8		9		Other	
	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC
1989-90	0		94		22		0		0	
1990-91	0		68		12		0		0	
1991-92	0		83		21		0		0	
1992-93	0		59		24		0		0	
1993-94	0		49		27		5		0	
1994-95	0		71		46		<1		0	
1995-96	55		82		58		<1		<1	
1996-97	25		106		44		<1		1	
1997-98	7		63		25		<1		<1	
1998-99	10		59		34		0		1	
1999-00	14		45		50		0		<1	
2000-01	0		0		<1		0		0	
2001-02	22		33		24		0		0	
2002-03	<1	0	42	100	11	60	0	100	0	0
2003-04	-	0	50	100	17	60	<1	100	0	0
2004-05	0	0	40	100	14	60	1	100	0	0

QMA	Total	
	Landings	TACC
1989-90	231	
1990-91	183	
1991-92	264	
1992-93	308	
1993-94	423	
1994-95	397	
1995-96	403	
1996-97	403	
1997-98	410	
1998-99	519	
1999-00	437	
2000-01	59	
2001-02	358	
2002-03	281	765
2003-04	372	765
2004-05	292	765

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 from 1989–90 are shown in Table 1.

Paddlecrabs were introduced into the QMS from 1 October 2002 with allowances, TACCs and TACs as follows:

Fishstock	Recreational Allowance	Māori Customary Allowance	TACC	TAC
PAD 1	20	10	220	250
PAD 2	10	5	110	125
PAD 3	8	2	100	110
PAD 4	4	1	25	30
PAD 5	4	1	50	55
PAD 6	0	0	0	0
PAD 7	4	1	100	105
PAD 8	4	1	60	65
PAD 9	20	10	100	130
PAD 10	0	0	0	0

(b) Recreational fisheries

Preliminary data from the 1996 National Marine Recreational Fishing Survey indicate that paddle crabs are seldom caught (NIWA, unpublished). Paddle crabs are taken as a bycatch of beach and estuarine seining and in set-nets throughout much of their geographical range.

(c) Maori customary fisheries

There is no quantitative information on the current level of customary take.

(d) Illegal catch

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

(e) 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 set-net and dredge fisheries.

2. BIOLOGY

The paddle crab is 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, cumaceans, and occasionally on algae. A high proportion of the molluscs eaten are *Paphies* species such as 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. *O. 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 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 2.

Table 2: Estimates of biological parameters

	Estimate		Source
1. Natural Mortality (females only) (Percentage mortality at each instar stage)			
Instar	**Tasman Bay (QMA 7)**	**Canterbury (QMA 3)**	Osborne (1987)
8	15.3	15.0	
9	31.2	30.0	
10 (68–75mm CW)	78.1	39.1	
11	30.7	38.9	
12	55.6	18.2	
13 (> 100mm CW)	100	100	

2. log weight = a + b log CW (carapace width)

Area	**Males**		**Females**		
	a	**b**	**a**	**b**	
Canterbury (QMA 3)	-3.46	2.89	-3.32	2.79	Davidson & Marsden (1987)

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 700m). Genetically distinct populations may occur in isolated areas such as the Chatham Islands and Australia.

4. STOCK ASSESSMENT

(a) Estimates of fishery parameters and abundance

None are available at present.

(b) 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.

(c) Estimation of Maximum Constant Yield (MCY)

MCY cannot be estimated.

(d) Estimation of Current Annual Yield (CAY)

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

(e) Other yield estimates and stock assessment results

None are available at present.

5. STATUS OF THE STOCKS

Estimates of current and reference biomass are not available.

Landings have fluctuated significantly in most QMAs, mainly due to market variations. Paddle crabs are abundant throughout most of their range and the fishery is probably only lightly exploited.

It is not known if recent catch levels are sustainable or will allow the stocks to move towards a size that will support the maximum sustainable yield.

6. FOR FURTHER INFORMATION

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