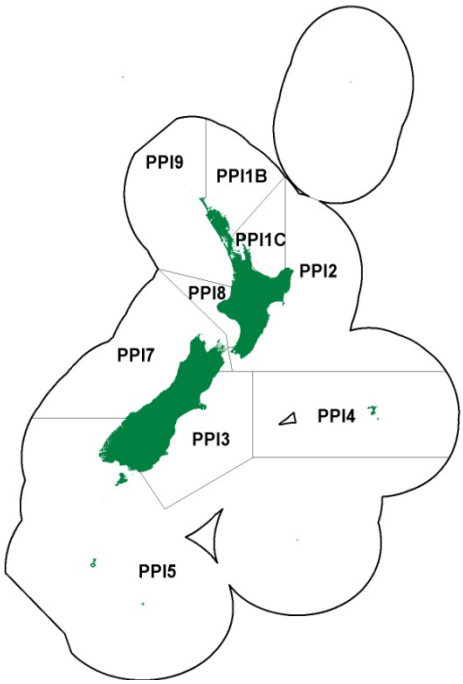
INTRODUCTION – PIPI (PPI)

(*Paphies australis*)
Pipi



1. FISHERY SUMMARY

Pipi are important shellfish both commercially and for non-commercial fishers. PPI 1A (Whangarei harbour) was introduced into the Quota Management System (QMS) on 1 October 2004; the other PPI stocks listed in Table 1 were introduced in October 2005. TACs, TACCs, and allowances are presented in Table 1.

For assessment purposes, an individual report on the largest commercial fishery, PPI 1A, has been produced separately.

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

Fishstock	Recreational allowance	Customary non-commercial allowance	Other sources of mortality	TACC	TAC
PPI 1A	25	25	0	200	250
PPI 1B	76	76	8	0	160
PPI 1C	115	115	10	3	243
PPI 2	3	3	1	0	7
PPI 3	9	9	1	0	19
PPI 4	1	1	1	0	3
PPI 5	1	1	1	0	3
PPI 7	1	1	1	1	4
PPI 8	1	1	1	0	3
PPI 9	10	10	1	0	21

Since 1992, Fisheries New Zealand and its predecessors has commissioned biomass surveys for cockles and pipi in the northern North Island on beaches where there is known recreational and customary fishing pressure. The objective of the surveys is to determine the distribution, abundance, and size frequency of cockles and pipi on selected beaches in the Auckland Fisheries Management Areas (FMA 1 and FMA 9).

Over the years, a total of 37 beaches have been monitored. On average, 12 beaches are sampled each year. The last survey was conducted in 2025 (Berkenbusch & Hill-Moana, in prep.) and focused on 11 sites across northern North Island. Out of these 11 sites, six supported pipi populations (in alphabetical order): Ōhiwa Harbour, Otūmoetai (Tauranga Harbour), Pataua Estuary, Waiotahe Estuary, Whangapoua Harbour, and Whitianga Harbour.

The abundance estimates for this species were generally similar across sites. The smallest population was at Whitianga Harbour, with an estimated abundance of 13.93 million (CV: 9.68%) pipi. In comparison, Waiotahe Estuary supported the largest pipi population, with an estimated 95.89 million (CV: 17.99%) individuals. All population estimates had CV values of less than 20%. Pipi densities were generally high (i.e., several hundred individuals per square metre), except at Pataua Estuary, where the density estimate was 60 pipi per m2 (CV: 11.47%). The maximum density estimate was at Ōhiwa Harbour with 1110 pipi per m2 (CV: 7.62%). Large pipi (≥50 mm shell length) were scarce or absent across all of the sites. Similar to some of the cockle populations, three of the pipi populations had a high proportion of recruits (≤20 mm shell length); at Ōhiwa Harbour, Pataua Estuary, and Waiotahe Estuary, recruits made up between 23 and 50% of the total pipi population.

The tools employed to manage these fisheries include daily bag limits and seasonal, temporary, and permanent closures. Size limits are also an option, but these are not currently in use. Customary management tools such as 186A closures, taiāpure, and mātaitai may also be implemented at the request of tangata whenua.

The fishing pressure and the depletion of some shellfish beds have led to the introduction of a range of the above measures at finer spatial scales:

Mātaitai reserves	
Bay of Plenty	Aotea Harbour and adjacent waters
Waikato	Marokopa
Temporary closures to shellfish harvesting under s186A of the Act	
Northland	Tutukaka Harbour, Ngunguru Bay, Ngunguru River, Horahora River and surrounding areas (Rehuotane Ki Tai)
Auckland	Marsden bank and Mair Bank
Coromandel	Te Mātā and Waipatukahu
Closures gazetted under s11 sustainability measures	
Northland	Ngunguru estuary
Northland	Whangateau Harbour
Auckland	Cockle Bay
Fisheries (Amateur Fishing) Regulations 2013 Permanent shellfish closures	
	Cheltenham
	Eastern Beach
Taiāpure	
Waikato	Kawhia Aotea

1.1 Commercial fisheries

Commercial catches are measured in greenweight. The largest commercial fishery was in PPI 1A until Mair Bank was closed to fishing in 2014 due to historically low biomass.

Regulations require that all commercial gathering is conducted done by hand. Fishers typically use a mask and snorkel. There is no minimum legal size (MLS) for pipi, although fishers probably favour larger pipi (over 60 mm shell length). There is no apparent seasonality in the pipi fishery, because pipi are available for harvest year-round.

Some commercial catch was taken from PPI 1C during the 2005–06 to 2009–10 fishing years, but no landings have been reported since 2010 (Table 2 and Figure 1). The great majority of commercial catch was reported from PPI 1A until 2011-12 (see PPI 1A Working Group report).

New Zealand operates a mandatory shellfish quality assurance programme for all areas of commercial growing or harvesting bivalve shellfish for human consumption. Shellfish caught outside this programme can be sold only for bait. This programme is based on international best practice and is managed by Food Safety New Zealand in cooperation with the District Health Board Public Health Units and the shellfish industry[1]. Before any area can be used to grow or harvest bivalve shellfish, public health officials survey both the water catchment area to identify any potential pollution issues and microbiologically sample water and shellfish over at least a 12-month period, so that all seasonal influences are explored. This information is evaluated and, if suitable, the area is classified and listed by New Zealand Food Safety for harvest. There is then a requirement for regular monitoring of the water and shellfish flesh to verify levels of microbiological and chemical contaminants. Management measures stemming from this testing include closure after rainfall to deal with microbiological contamination from runoff. Natural marine biotoxins can also cause health risks, so testing also occurs for this at regular intervals. If toxins are detected above the permissible level, the harvest areas are closed until the levels fall below the permissible level. Products are also traceable so the source and time of harvest can always be identified in case of contamination.

Table 2: Reported commercial landings and TACC of pipi (t greenweight) for PPI 1C from 2004–05 to present.

Year	Landings	TACC	Year	Landings	TACC
2004–05	0	3	2014–15	0	3
2005–06	0.86	3	2015–16	0	3
2006–07	1.69	3	2016–17	0	3
2007–08	1.80	3	2017–18	0	3
2008–09	0.38	3	2018–19	0	3
2009–10	0.62	3	2019–20	0	3
2010–11	0	3	2020–21	0	3
2011–12	0	3	2021–22	0	3
2012–13	0	3	2022–23	0	3
2013–14	0	3	2023–24	0	3

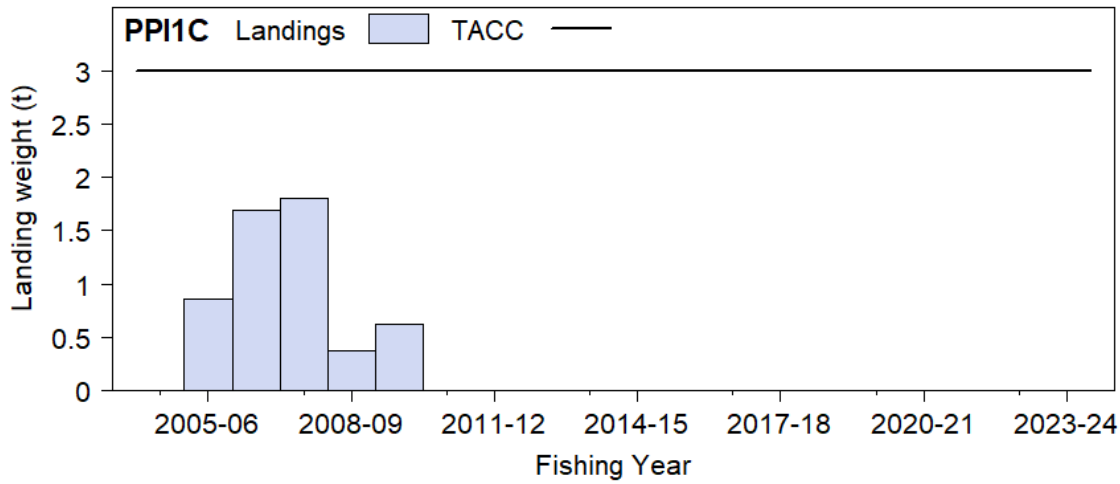


Figure 1: Reported commercial landings and TACC for PPI 1C (Hauraki Gulf and the Bay of Plenty).

1.2 Recreational fisheries

The recreational fishery is harvested entirely by hand digging. Large pipi 50 mm (maximum shell length) or greater are probably preferred. The 1996, 1999–2000, and 2000–01 telephone-diary surveys recorded recreational harvests in FMA 1 of 2.1, 6.6, and 7.2 million pipi, respectively, but no mean weight was available to convert these harvest estimates to tonnages. The harvest estimates provided by these telephone-diary surveys are no longer considered reliable for various reasons. A Recreational Technical Working Group concluded that these harvest estimates should be used only with the following qualifications: a) they may be very inaccurate; b) the 1996 and earlier surveys contain a methodological error; and c) the 2000 and 2001 estimates are implausibly high for many important fisheries. In response to these problems and the cost and scale challenges associated with onsite

[1] For full details of this programme, refer to the Animal Products (Regulated Control Scheme-Bivalve molluscan Shellfish) Regulations 2006 and the Animal Products (Specifications for Bivalve Molluscan Shellfish) Notice 2006 (both referred to as the BMSRCS), at: http://www.foodsafety.govt.nz/industry/sectors/seafood/bms/growers-harvesters.htm

methods, 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. The panel members were contacted regularly about their fishing activities and harvest information collected in standardised phone interviews. The panel survey was repeated in 2017–18 and 2022–23 (Wynne-Jones et al 2019, Heinemann & Gray 2024). Harvest estimates (in numbers of pipi) are given in Table 3.

Table 3: Recreational harvest estimates for pipi stocks from the national panel survey in 2011–12, 2017–18 and 2022-23 (Wynne-Jones et al 2014, 2019, Heinemann & Gray 2024). Mean weights were not available to convert these estimates to weights.

	2011–12		2017–18		2022–23	
Stock	Number of pipi	CV	Number of pipi	CV	Number of pipi	CV
PPI 1A	21 620	0.89	0	–	0	–
PPI 1B	84 476	0.39	46 243	0.44	59 445	0.62
PPI 1C	255 207	0.30	315 540	0.38	99 747	0.36
PPI 2	167 155	0.54	16 157	0.59	5 581	0.72
PPI 3	5 295	0.51	14 892	0.82	1 062	1.01
PPI 7	10 057	0.58	12 326	1.00	4 673	0.69
PPI 8	32 632	0.52	27 997	0.70	25 929	0.66
PPI 9	45 847	0.48	102 037	0.53	6 616	1.01
PPI total	622 288	0.20	112 785	0.63	203 052	0.27

1.3 Customary fisheries

In common with many other intertidal shellfish, pipi are very important to Māori as a traditional food. Pipi form an important fishery for customary non-commercial, but the total annual catch is not known.

Māori customary fishers utilise the provisions under both the recreational fishing regulations and the various customary regulations. Many tangata whenua harvest pipi 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 can be 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 pipi (approved and reported as weight (kg) and in numbers), since 2001–02. – no data. [Continued on next two pages]

	PPI 1A				PPI 1B			
	Weight (kg)		Numbers		Weight (kg)		Numbers	
Fishing year	Approved	Harvested	Approved	Harvested	Approved	Harvested	Approved	Harvested
2001–02	–	–	–	–	–	–	–	–
2002–03	–	–	–	–	–	–	–	–
2003–04	–	–	–	–	–	–	–	–
2004–05	–	–	–	–	–	–	–	–
2005–06	–	–	–	–	–	–	–	–
2006–07	–	–	–	–	350	350	300	300
2007–08	–	–	–	–	150	150	–	–
2008–09	120	120	–	–	270	270	450	450
2009–10	235	235	–	–	100	100	–	–
2010–11	100	100	–	–	380	380	–	–
2011–12	80	40	–	–	350	350	–	–
2012–13	110	110	–	–	140	140	–	–
2013–14	–	–	–	–	–	–	400	400
2014–15	–	–	–	–	–	–	–	–
2015–16	–	–	–	–	–	–	–	–
2016–17	–	–	–	–	–	–	–	–
2017–18	–	–	–	–	–	–	–	–
2018–19	–	–	–	–	–	–	–	–
2019–20	–	–	–	–	–	–	–	–
2020–21	–	–	–	–	–	–	–	–
2021–22	–	–	–	–	–	–	–	–
2022–23	–	–	–	–	–	–	–	–
2023–24	–	–	–	–	–	–	–	–

Table 4 [Continued]

	PPI 1C				PPI 2			
	Weight (kg)		Numbers		Weight (kg)		Numbers	
Fishing year	Approved	Harvested	Approved	Harvested	Approved	Harvested	Approved	Harvested
2001–02	–	–	–	–	–	–	–	–
2002–03	–	–	–	–	–	–	–	–
2003–04	–	–	5 000	4 000	–	–	–	–
2004–05	–	–	–	–	–	–	–	–
2005–06	763	638	4 500	2 000	–	–	–	–
2006–07	10 411	9 806	12 850	9 850	–	–	9 076	8 076
2007–08	5 235	3 360	6 000	3 750	–	–	29 576	25 076
2008–09	5 760	4 889	10 000	8 000	–	–	30 250	24 350
2009–10	3 585	3 105	6 700	6 700	–	–	2 000	2 000
2010–11	4 558	3 741	4 430	4 430	–	–	56 000	54 200
2011–12	900	660	500	300	–	–	66 100	63 400
2012–13	1 340	950	–	–	–	–	92 600	58 300
2013–14	40	40	–	–	–	–	44 400	20 800
2014–15	3 035	2 800	5 000	5 000	–	–	–	–
2015–16	2 345	1 653	–	–	–	–	–	–
2016–17	2 675	1 878	30	0	–	–	–	–
2017–18	1 522	1 212	–	–	–	–	–	–
2018–19	755	525	–	–	–	–	–	–
2019–20	600	375	800	0	–	–	–	–
2020–21	475	325	–	–	–	–	–	–
2021–22	120	60	–	–	–	–	–	–
2022–23	–	–	–	–	–	–	–	–
2023–24	10	10	–	–	–	–	–	–

	PPI 3				PPI 4			
	Weight (kg)		Numbers		Weight (kg)		Numbers	
Fishing year	Approved	Harvested	Approved	Harvested	Approved	Harvested	Approved	Harvested
2001–02	–	–	202	202	–	–	–	–
2002–03	–	–	–	–	–	–	–	–
2003–04	–	–	–	–	–	–	–	–
2004–05	–	–	–	–	–	–	–	–
2005–06	–	–	–	–	–	–	–	–
2006–07	–	–	1 000	30	–	–	–	–
2007–08	–	–	–	–	–	–	–	–
2008–09	–	–	2 500	1 987	–	–	–	–
2009–10	–	–	–	–	–	–	400	400
2010–11	–	–	100	100	–	–	–	–
2011–12	–	–	950	950	–	–	–	–
2012–13	–	–	–	–	–	–	–	–
2013–14	–	–	120	119	–	–	–	–
2014–15	–	–	–	–	–	–	–	–
2015–16	–	–	60	60	–	–	–	–
2016–17	–	–	–	–	–	–	–	–
2017–18	–	–	350	350	–	–	–	–
2018–19	–	–	–	–	–	–	–	–
2019–20	–	–	–	–	–	–	–	–
2020–21	–	–	–	–	–	–	–	–
2021–22	–	–	450	325	–	–	–	–
2022–23	–	–	–	–	–	–	–	–
2023–24	–	–	–	–	–	–	–	–

	PPI 5				PPI 7			
	Weight (kg)		Numbers		Weight (kg)		Numbers	
Fishing year	Approved	Harvested	Approved	Harvested	Approved	Harvested	Approved	Harvested
2001–02	–	–	–	–	–	–	–	–
2002–03	–	–	–	–	–	–	–	–
2003–04	–	–	–	–	–	–	–	–
2004–05	–	–	–	–	–	–	–	–
2005–06	–	–	–	–	–	–	–	–
2006–07	–	–	–	–	–	–	80	80
2007–08	–	–	–	–	–	–	–	–
2008–09	–	–	–	–	–	–	–	–
2009–10	–	–	–	–	–	–	–	–
2010–11	–	–	–	–	–	–	–	–
2011–12	–	–	–	–	–	–	–	–
2012–13	–	–	–	–	–	–	–	–
2013–14	–	–	–	–	–	–	–	–
2014–15	–	–	–	–	–	–	–	–
2015–16	–	–	50	50	–	–	–	–
2016–17	–	–	–	–	–	–	–	–
2017–18	–	–	–	–	–	–	–	–
2018–19	–	–	–	–	–	–	–	–
2019–20	–	–	–	–	–	–	–	–

Table 4 [Continued]

	PPI 5				PPI 7			
	Weight (kg)		Numbers		Weight (kg)		Numbers	
Fishing year	Approved	Harvested	Approved	Harvested	Approved	Harvested	Approved	Harvested
2020–21	–	–	–	–	–	–	–	–
2021–22	–	–	–	–	–	–	–	–
2022–23	–	–	–	–	–	–	–	–
2023–24	–	–	–	–	–	–	–	–

	PPI 9			
	Weight (kg)		Numbers	
Fishing year	Approved	Harvested	Approved	Harvested
2001–02	–	–	–	–
2002–03	–	–	–	–
2003–04	–	–	–	–
2004–05	–	–	–	–
2005–06	–	–	–	–
2006–07	–	–	1 383	883
2007–08	25	25	–	–
2008–09	80	80	4 000	3 500
2009–10	350	340	–	–
2010–11	60	60	–	–
2011–12	450	450	–	–
2012–13	390	308	–	–
2013–14	580	475	–	–
2014–15	670	670	–	–
2015–16	110	110	–	–
2016–17	230	130	–	–
2017–18	–	–	–	–
2018–19	–	–	–	–
2019–20	200	100	–	–
2020–21	–	–	–	–
2021–22	–	–	–	–
2022–23	–	–	–	–
2023–24	–	–	–	–

1.4 Illegal catch

No quantitative information on the level of illegal catch is available.

1.5 Other sources of mortality

No quantitative nationwide information on the level of other sources of mortality is available.

2. BIOLOGY

The pipi (*Paphies australis*) is a common burrowing bivalve mollusc of the family Mesodesmatidae. Pipi are distributed around the New Zealand coastline, including the Chatham and Auckland Islands (Powell 1979), and are characteristic of sheltered beaches, bays and estuaries (Morton & Miller 1968). Pipi are tolerant of moderate wave action, and commonly inhabit coarse shell sand substrata in bays and at the mouths of estuaries where silt has been removed by waves and currents (Morton & Miller 1968). They have a broad tidal range, occurring intertidally and subtidally in high-current harbour channels to water depths of at least 7 m (Dickie 1986a, Hooker 1995a), and are locally abundant, with densities greater than 1000 m^{-2} in certain areas (Grace 1972).

Pipi reproduce by free-spawning, and most individuals are sexually mature at about 40 mm shell length (SL) (Hooker & Creese 1995a). Gametogenesis begins in autumn, and by late winter many pipi have mature, ready-to-spawn gonads (Hooker & Creese 1995a). Pipi have an extended breeding period from late winter to late summer, with greatest spawning activity occurring in spring and early summer. Fertilised eggs develop into planktotrophic larvae, and settlement and metamorphosis occur about three weeks after spawning (Hooker 1997). In general, pipi have been considered sedentary when settled, although Hooker (1995b) found that pipi may utilise water currents to disperse actively within a harbour. The trigger for movement is unknown, but this ability to migrate may have important implications to their population dynamics.

Pipi growth dynamics are not well known. Growth appears to be fairly rapid, at least in dynamic, high-current environments such as harbour channels. Hooker (1995a) showed that pipi at Whangateau

harbour (northeastern New Zealand) grew to about 30 mm in just over one year (16–17 months), reached 50 mm after about three years, and grew very slowly after attaining 50 mm. There was a strong seasonal component to growth, with rapid growth occurring in spring and summer, and little growth in autumn and winter. Williams et al (2007) used Hooker's (1995a) tag-recapture and length frequency time series data to generate formal growth estimates for Whangateau harbour pipi (Table 5). Estimates are also available from time series of size frequencies on sheltered Auckland beaches (Table 5; Morrison & Browne 1999, Morrison et al 1999), although these were likely to have been poorly estimated due to variability in the length data. Growth on the intertidal section of Mair Bank was estimated by Pawley et al (2013) using the results of a notch-tagging experiment in 2009–10. These estimates are likely to underestimate growth of pipi in the commercial fishery because tagged shells came from the intertidal zone whereas commercial harvesting is conducted primarily in the subtidal (where growth is expected to be quicker).

Table 5: Estimates of biological parameters for pipi.

Growth		Location	Year	Source
L_∞ (mm SL)	K			
57.3	0.46	Inner Whangateau Harbour site	1992–93	Williams et al (2007)
63.9	0.57	Whangateau Harbour entrance	1992–93	Williams et al (2007)
41.1	0.48	Cheltenham Beach, North Shore	1997–98	Morrison et al (1999)
58.9	0.15	Mill Bay, Manukau Harbour	1997–98	Morrison et al (1999)
84.6	0.09	Mill Bay, Manukau Harbour	1998–99	Morrison & Browne (1999)
Natural mortality				
M = 0.3–0.5 (assumed values)		–	–	Williams et al (2007)
Size at maturity				
40 mm SL		Whangateau Harbour	–	Hooker & Creese (1995a)

Little is known about the natural mortality or maximum longevity of pipi. Haddon (1989) suggested that pipi are unlikely to live much more than 10 years, and used assumed maximum ages of 10, 15, and 20 years old to estimate maximum constant yield for Mair Bank pipi in 1989. The estimation of the rate of instantaneous natural mortality (M) is difficult for pipi because of the immigration and emigration of individuals from different areas. As the timing and frequency of these movements are largely unknown, the separation of mortality from movement effects is likely to be problematic. Williams et al (2007) assumed values of M = 0.3, 0.4, and 0.5 to estimate yields for Mair Bank in 2005–06. The Intrinsic Productivity Level is categorised as Medium for this species.

3. STOCKS AND AREAS

A molecular study was undertaken to determine patterns of population structure and genetic connectivity in *P. australis* and the location of any potential barriers to connectivity (Hannan et al 2016). The study suggested that, at a large spatial scale, *P. australis* could be differentiated into three genetically distinct groups (northern, south eastern, south western), but at a smaller spatial scale there was evidence for genetic differentiation amongst populations separated by only tens to hundreds of kilometres (Figure 2).

4. STOCK ASSESSMENT

A stock assessment has been conducted for PPI 1A (see PPI 1A Working Group report).

5. STATUS OF THE STOCKS

The status of all PPI stocks other than PPI 1A are unknown. There has not been any reported commercial catch since 2016–17. Following sustainability concerns by recreational or customary fishers, several beaches have been closed to fishing across Northland, Auckland, Coromandel and Bay of Plenty. Local populations might be reduced from historical overfishing but that might not be reflective of the status of the stocks at the QMA level. In many estuaries, sedimentation has (a) reduced habitat suitability which has resulted in a reduced contemporary distribution, and (b) resulted in reduced growth rates.

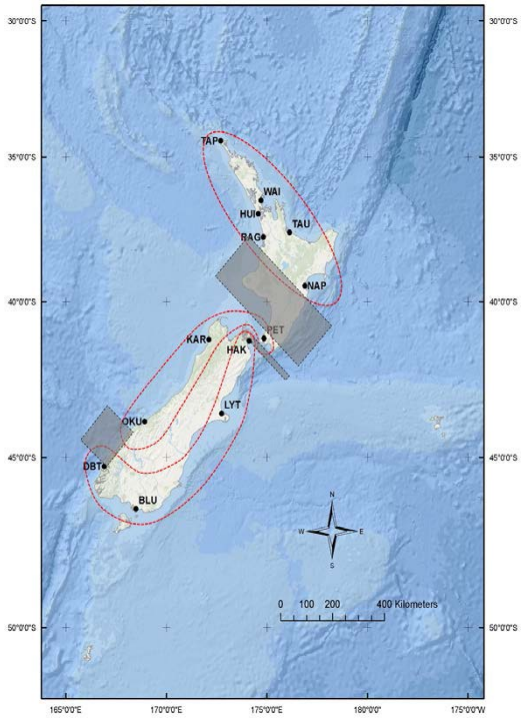


Figure 2: Location of genetically differentiated populations of *Paphies australis* and barriers to genetic connectivity. Populations are those sampling locations enclosed by red dashed lines. The geographic areas where barriers to genetic connectivity are assumed to occur are indicated by shaded grey boxes (these boxes cover large sections of coastline because it was not possible to pinpoint the exact location of barriers; it is assumed the barrier lies somewhere within the shaded area).

6. FOR FURTHER INFORMATION

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