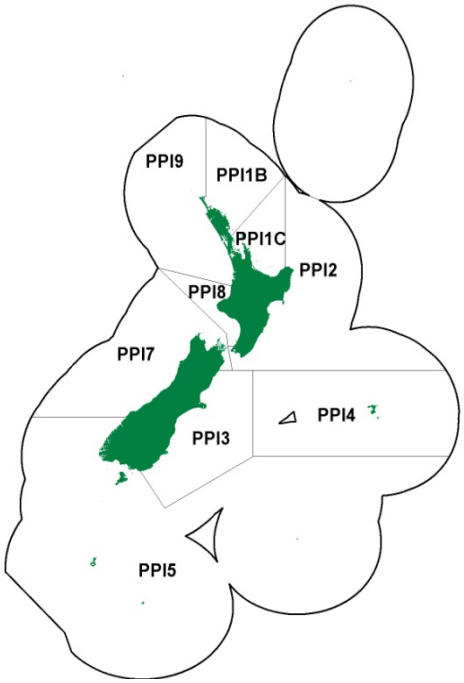
# PIPI (PPI)

(*Paphies australis*)
Pipi




## 1. FISHERY SUMMARY

Pipi are important shellfish both commercially and for non-commercial fishers. PPI 1A (which is located in 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. The total TAC introduced to the QMS was 713 t. This consisted of a 204 t TACC, an allocation of 242 t for both the recreational and customary allowances, and a 25 t allowance for other sources of mortality (Table 1). No changes have occurred to the TAC since. The fishing year is from 1 October to 30 September.

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

**Table 1: Current Total Allowable Catches (TAC, t) allowances for customary fishing, recreational fishing, and other sources of mortality (t) and Total Allowable Commercial Catches (TACC, t) for pipi.**

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

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 35 beaches have been monitored. On average, 12 beaches are sampled each year. The last survey was conducted in 2020 (see Berkenbusch & Neubauer 2020). Nine of the northern survey sites supported pipi populations. Pipi population estimates varied between beaches. The density varied between a high estimate of 849 pipi per $m^2$ at Little Waihi Estuary and a low estimate of 16 pipi per $m^2$ at Grahams Beach.

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 within greater Auckland and the depletion of some shellfish beds have led to the introduction of a range of the above measures at finer spatial scales. Temporary closures to shellfish harvesting under s186A of the Act have been implemented at the request of tangata whenua in the following locations: Marsden Bank and Mair Bank, and Te Mata and Waipatukahu. Closures gazetted under s11 sustainability measures are in place for Ngunguru estuary, Whangateau harbour and Cockle Bay. There are also permanent shellfish closures at Cheltenham, Eastern Beach, and Karekare.

## 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 2014 (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.

[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

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

| Year | Reported landings | Limit (t) |
|---|---|---|
| 2004–05 | 0 | 3 |
| 2005–06 | 0.86 | 3 |
| 2006–07 | 1.69 | 3 |
| 2007–08 | 1.80 | 3 |
| 2008–09 | 0.38 | 3 |
| 2009–10 | 0.62 | 3 |
| 2010–11 | 0 | 3 |
| 2011–12 | 0 | 3 |
| 2012–13 | 0 | 3 |
| 2013–14 | 0 | 3 |
| 2014–15 | 0 | 3 |
| 2015–16 | 0 | 3 |
| 2016–17 | 0 | 3 |
| 2017–18 | 0 | 3 |
| 2018–19 | 0 | 3 |
| 2019–20 | 0 | 3 |

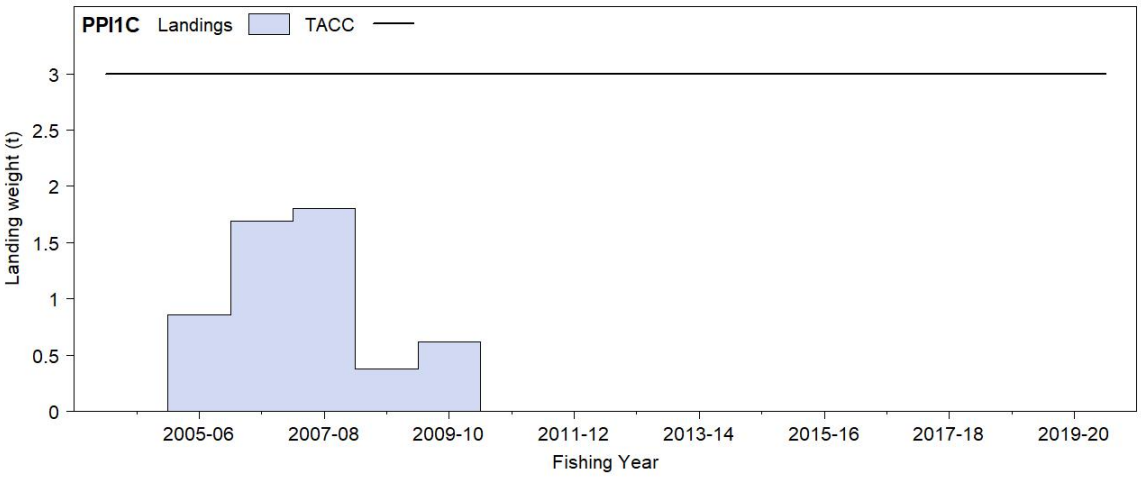



**Figure 1: Reported commercial landings and TACC for PPI 1C (Hauraki Gulf and the Bay of Plenty).**

## 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 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 (Wynne-Jones et al 2019). Harvest estimates (in numbers of pipi) are given in Table 3 (from Wynne-Jones et al 2014 and Wynne-Jones et al 2019).

**Table 3: Recreational harvest estimates for pipi stocks from the national panel survey in 2011–12 (Wynne-Jones et al 2014) and 2017–18 (Wynne-Jones et al 2019). Mean weights were not available from boat ramp surveys to convert these estimates to weights.**

| Stock | Number of pipi | CV |
|---|---|---|
| 2011–12 (national panel survey) | | |
| PPI 1A | 21 620 | 0.89 |
| PPI 1B | 84 476 | 0.39 |
| PPI 1C | 255 207 | 0.30 |
| PPI 2 | 167 155 | 0.54 |
| PPI 3 | 5 295 | 0.51 |
| PPI 7 | 10 057 | 0.58 |
| PPI 8 | 32 632 | 0.52 |
| PPI 9 | 45 847 | 0.48 |
| PPI total | 622 288 | 0.20 |
| | | |
| 2017–18 (national panel survey) | | |
| PPI 1A | 0 | –– |
| PPI 1B | 46 243 | 0.44 |
| PPI 1C | 315 540 | 0.38 |
| PPI 2 | 16 157 | 0.59 |
| PPI 3 | 14 892 | 0.82 |
| PPI 5 | 12 326 | 1.00 |
| PPI 7 | 27 997 | 0.70 |
| PPI 8 | 102 037 | 0.53 |
| PPI 9 | 112 785 | 0.63 |
| PPI total | 647 978 | 0.24 |

## 1.3 Customary fisheries

In common with many other intertidal shellfish, pipi are very important to Māori as a traditional food. Limited quantitative information on the level of customary take is available from Fisheries New Zealand (Table 4). These numbers are likely to be an underestimate of customary harvest because only the catch in kilograms and numbers are reported in the table.

**Table 4: Fisheries New Zealand records of customary harvest of pipi (reported as weight in kilograms and as numbers), since 2001–02. – no data. [Continued on next 2 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 | – | – | – | – | – | – | – | – |

| | 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 |

**Table 4: [Continued]**

| | PPI 1C | | | | PPI 2 | | | |
|---|---|---|---|---|---|---|---|---|
| | Weight (kg) | | Numbers | | Weight (kg) | | Numbers | |
| Fishing year | Approved | Harvested | Approved | Harvested | Approved | Harvested | Approved | Harvested |
| 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 | 1 415 | 1 105 | | | – | – | – | – |
| 2018–19 | 640 | 450 | | | – | – | – | – |
| 2019–20 | – | – | – | – | – | – | – | – |

| | 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 | – | – | – | – | – | – | – | – |

| | 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 | – | – | – | – | – | – | – | – |

| | 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 | – | – |

**Table 4: [Continued]**

| | PPI 9 | | | |
|---|---|---|---|---|
| | Weight (kg) | | Numbers | |
| Fishing year | Approved | Harvested | Approved | Harvested |
| 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 | – | – |

### 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).

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.

**Table 5: Estimates of biological parameters for pipi.**

| Growth | | Location | Year | Source |
|---|---|---|---|---|
| $L_\infty$ (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) |

## 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).

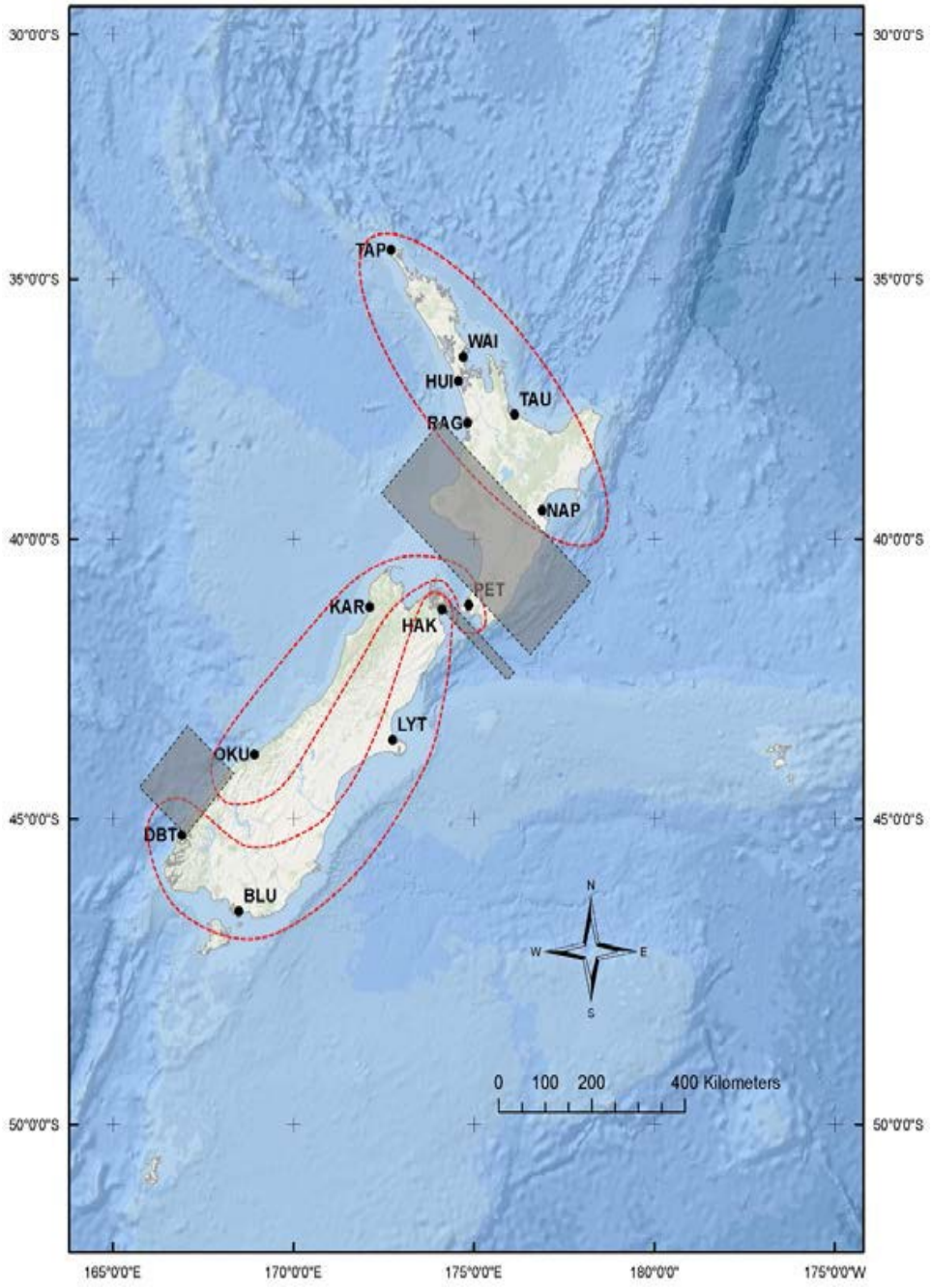



**Figure 2: Location of genetically differentiated populations of *Paphies australis* and barriers to genetic connectivity. Populations are those sampling locations enclosed by red dashed lines. The geographic areas where barriers to genetic connectivity are assumed to occur are indicated by shaded grey 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).**

## 4. STOCK ASSESSMENT

A stock assessment has been conducted for PPI 1A.

## 5. STATUS OF THE STOCKS

There were negligible reported landings in 2019–20 for any PPI stocks. The status of all PPI stocks other than PPI 1A are unknown but are assumed to be close to virgin biomass.

# 6. FOR FURTHER INFORMATION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