

Progress report: Assessing the sustainability of Venus Bay's pipi fishery

March 2018

Here I present preliminary interpretation of patterns in our survey data. More rigorous statistical modelling that explicitly tests for spatial (along and across the beach) and temporal (tidal monthly, annual) patterns in data will be performed for the final report (due in October 2018).

Patterns in pipi size

Monthly to bi-monthly pipi size and abundance surveys have been conducted since December 2015. During this time, we have captured 1285 individuals using our corer (good for surveying distribution across beach), and 1368 individuals using a kick sampling method (rapid assessment). The biggest pipi caught was 58.5mm, and the smallest 3.48mm (both from far SE section of the beach).

Exploratory analyses suggest that the average size of adult pipis (individuals bigger than 30mm) is greater at sites further away from beach access points (Figure 1). There is apparently no temporal trend in adult size through time.

Size implications: These results could be interpreted as there being a harvest impact close to access points, with bigger individuals selectively removed. The lack of a temporal trend in adult size across the year suggests that whilst harvesting predominantly occurs in summer, smaller individuals do not have enough time to grow during other times. Indeed, the bigger individuals found further away from access points are likely to be 2-4 years old, whereas the older age classes are absent close to access points. Such a result is supported by tagging data (see below) that suggests that adults are not moving very far along the beach.

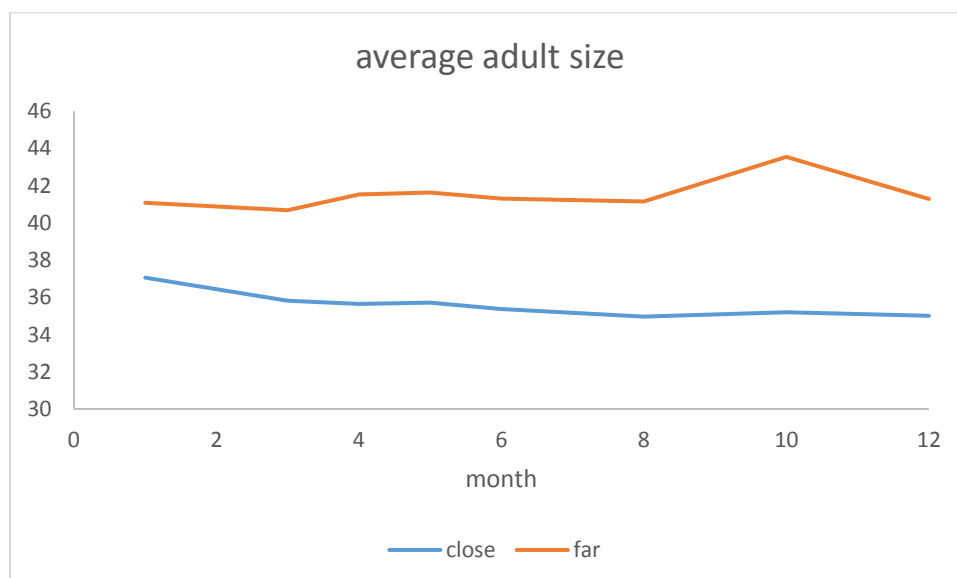


Figure 1: Average adult size (>30mm) through time for sites close to, and far away from beach access points.

Patterns in abundance

The total abundance of pipis increased through time within each year of study, with little apparent difference between sites close to and further away from beach access points (Figure 2). This overall pattern was primarily driven by the rapid increase in the number of pipi recruits on the Venus Bay beach in November and December (Figure 3). 'Recruits' is a term we use to describe new juveniles who have recently settled onto the beach after a period of time in the plankton. There was no obvious temporal trend in adult abundance, although these larger individuals were more common further away from beach access points (Figure 4).

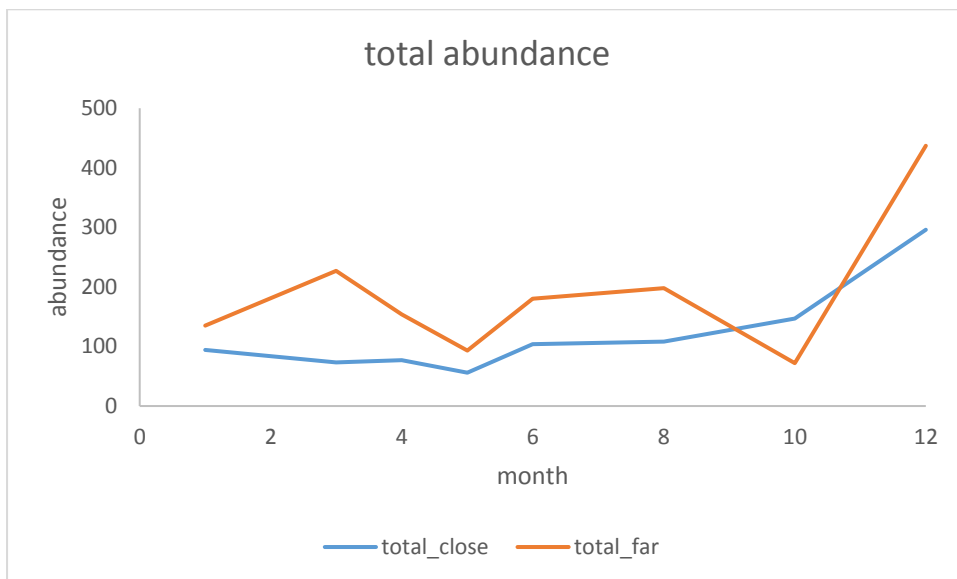


Figure 2: Total abundance of pipis in surveys through time close to, and far away from beach access points.

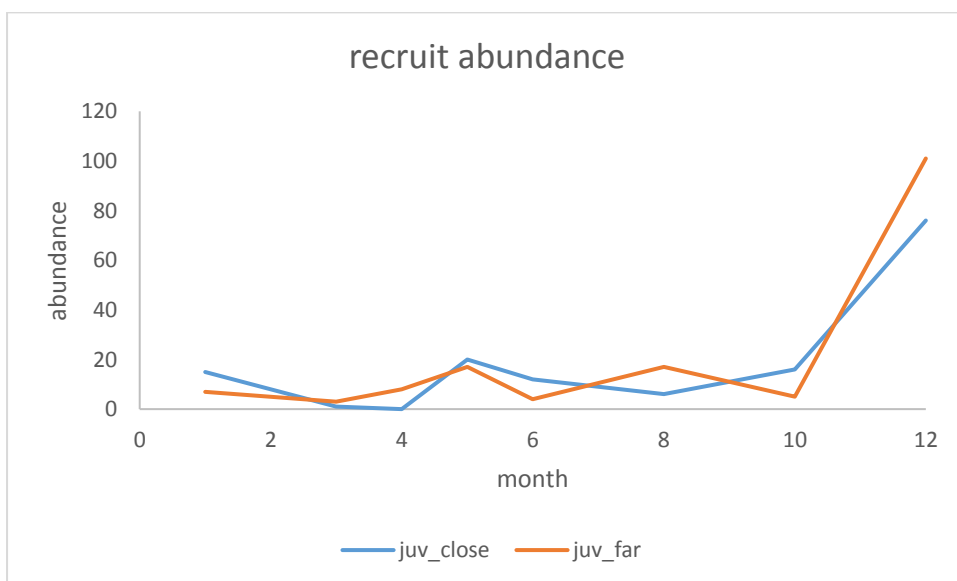


Figure 3: Total abundance of recruits (pipis < 8mm) in surveys through time close to, and far away from beach access points.

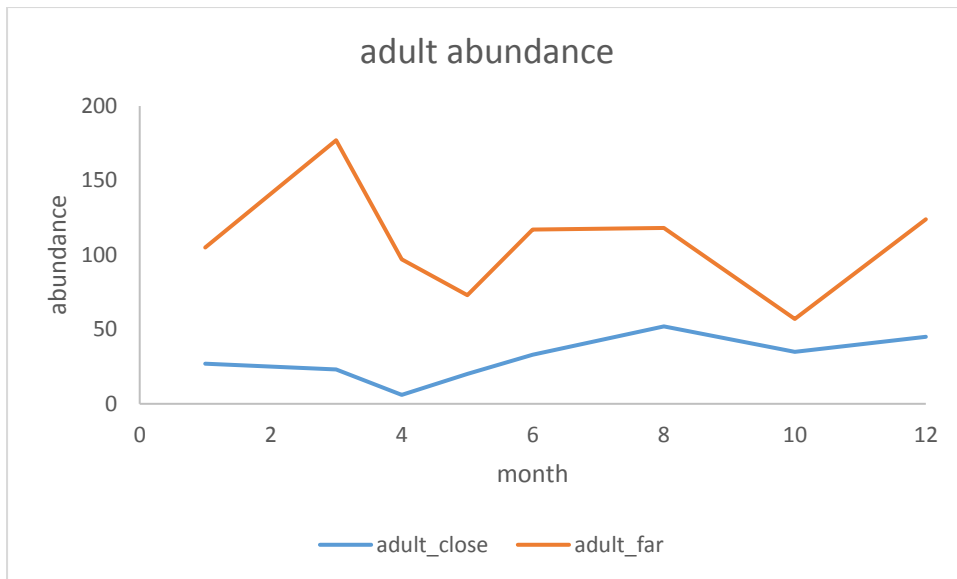


Figure 4: Total abundance of adults (pipis > 30mm) in surveys through time close to, and far away from beach access points.

Abundance implications: There is a distinct increase in the number of recruits in November and December, suggesting these individuals were spawned 2-3 months previously. Recruitment rates appear similar for all sites, however adult abundances are much greater further away from beach access points. These results provide strong evidence for increased harvest, rather than spatially variable recruitment patterns, being the primary factor in driving reduced adult biomass near beach access points. Interestingly, there is no apparent pattern in adult abundance through time. It must be noted that these abundance data have yet to be properly corrected for variable effort and other spatio-temporal factors like tidal cycle and distance of sample up the beach.

Maturity

Female maturity surveys have been conducted from June 2016 onwards. Sexually mature females have been found across all sample events, with peaks in occurrence over summer (December-March; Figure 5). The smallest mature female found was 27mm long, although across the 11 sampling events the average minimum size was 35.4mm.

Maturity implications: spawning likely occurs year-round with a peak during the period of most intense harvest (summer). It is possible that harvesting might impact on the productivity of Venus Bay, although this is unlikely given the localised nature of fishing effort. The minimum size of 35mm for the commercial fishery matches that generally observed at Venus Bay. It is possible that smaller individuals may not get a chance to breed, or only breed once before capture.

The pattern of spawning also matches when we detect high numbers of recruits on the beach (Figure 3). The small pipis detected in our corer survey are likely to be 2-3 months old, meaning that they originated from spawning occurring in Aug-Sept. More analysis is required before we can speculate on whether Venus Bay experiences high or low levels of self-recruitment (pipis spawned on Venus Bay return to Venus Bay).

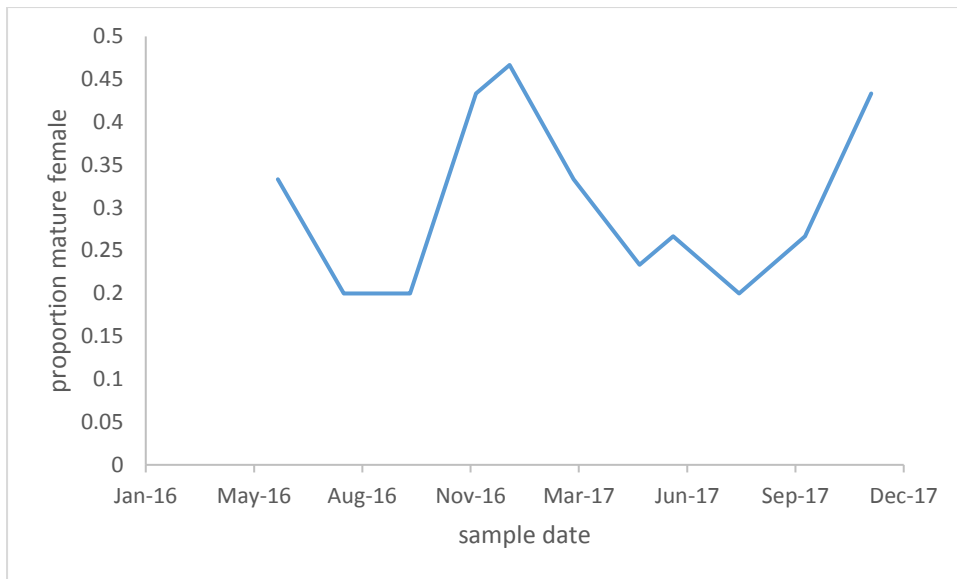


Figure 5: Proportion of a 30-individual sample that was comprised of mature females. Remaining pipis could be mature males or immature individuals of both sexes.

Multi-year time series of recreational fishing effort and extent

We record the number and distribution of harvesters during each of our monthly/ bimonthly surveys. Harvesters have been seen on the beach from October to January in groups ranging from 1 to 40 individuals. Most effort has been concentrated around Beach 1.

Implications: Harvest pressure is likely localised (as already shown by Fisheries Victoria surveys).

Estimating levels of pipi movement along Venus Bay beach

In January 2017, 2000 pipis were tagged and released at Beach 1. The following day, over 150 members of the public helped us try and find the tagged pipis in an event called 'The Great Pipi Hunt'. We have had about 100 reported recaptures over the following 12 months, with most confined to the area of release around Beach 1. In January and February 2018 we received two further recapture reports from near the Beach 1 access ramp that indicate that at least some pipis do not move very far during tidal drift. We have also received one recapture report from near Beach 3, potentially the biggest movement reported to date (1km to the NW).

Implications: Our data suggests that some adult pipis do not move very much and this increases the vulnerability of populations to local depletion due to harvesting. Recovery in pipi biomass will then primarily occur due to recruitment and growth of new individuals, rather than movement of adults from other areas.

We have relied heavily on recreational anglers to report recaptures. Therefore, our data set is biased to where and when anglers harvest. It is plausible that some tagged pipis have

moved considerably further along the beach but we have failed to detect these due to limited sampling effort occurring in these areas.