

Long-term population change: Re-assessment of a blackfoot abalone population in New Zealand, after 45 years

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Blackfoot pāua

- New Zealand abalone (*Haliotis iris*)
- A taonga (treasure) for Māori
- Been harvested for hundreds of years¹
- Commercially exploited since the mid 1940s
- Number 9 exported seafood based on revenue in NZ²
- Minimum legal harvestable size = 125 mm

References:

¹Smith, I. (2013). Pre-European Māori exploitation of marine resources in two New Zealand case study areas: species range and temporal change.

²Seafood New Zealand economic review 2019.

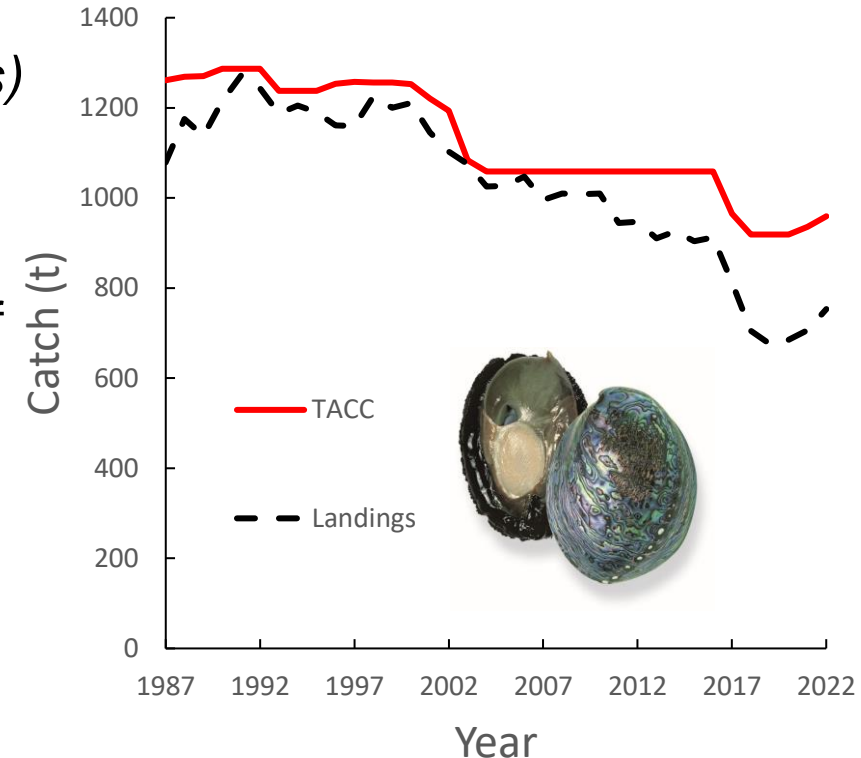


Figure 1: Total allowable commercial catch (TACC) and reported landings (tonnes) for *Haliotis iris* from 1987 to 2022 (data from Stats NZ and Ministry of Fisheries)

Population dynamics and fishery management of the paua, *Haliotis iris* I. Population structure, growth, reproduction, and mortality

K. J. Sainsbury

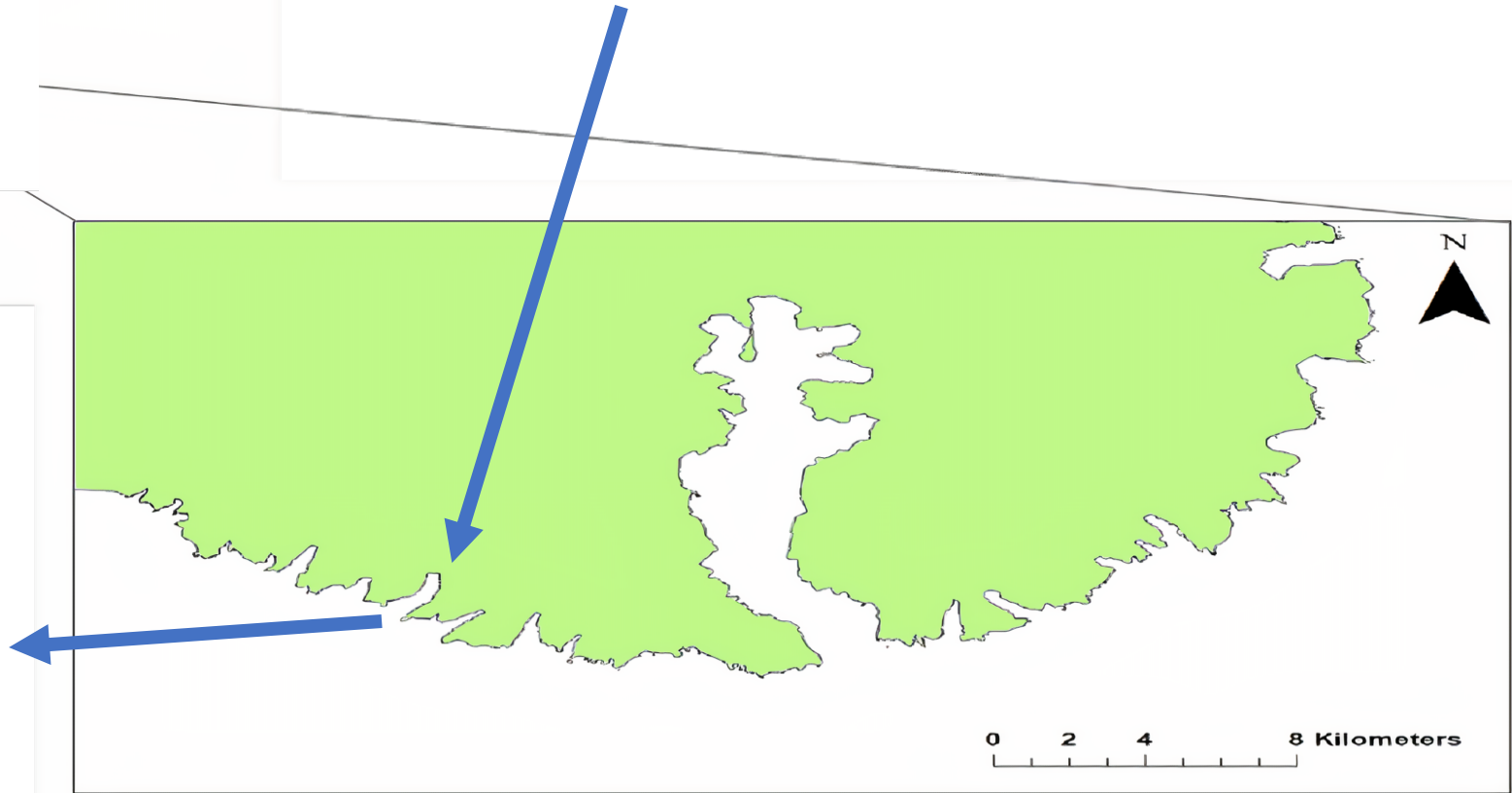
Population dynamics and fishery management of the paua, *Haliotis iris*

II. Dynamics and management as examined using a size class population model

K. J. Sainsbury



Peraki Bay





Aims

- Estimate current population dynamics of pāua in Peraki Bay
- Compare current population dynamics with past estimates

Hypothesis

- Expected a change in size, structure, and recruitment^{3,4}

References:

³Sainsbury, K. J. (1982). Population dynamics and fishery management of the paua, *Haliotis iris* I. Population structure, growth, reproduction, and mortality. *New Zealand journal of Marine and freshwater research*, 16(2), 147-161.

⁴Sainsbury, K. J. (1982). Population dynamics and fishery management of the paua, *Haliotis iris*: II. Dynamics and management as examined using a size class population model. *New Zealand Journal of Marine and Freshwater Research*, 16(2), 163-173.

Methods

1973 – 1976

- Feb 1976 - 19 transects
- 150 pāua tagged, 59 recaptured
- 18 gonad collections over 3 years

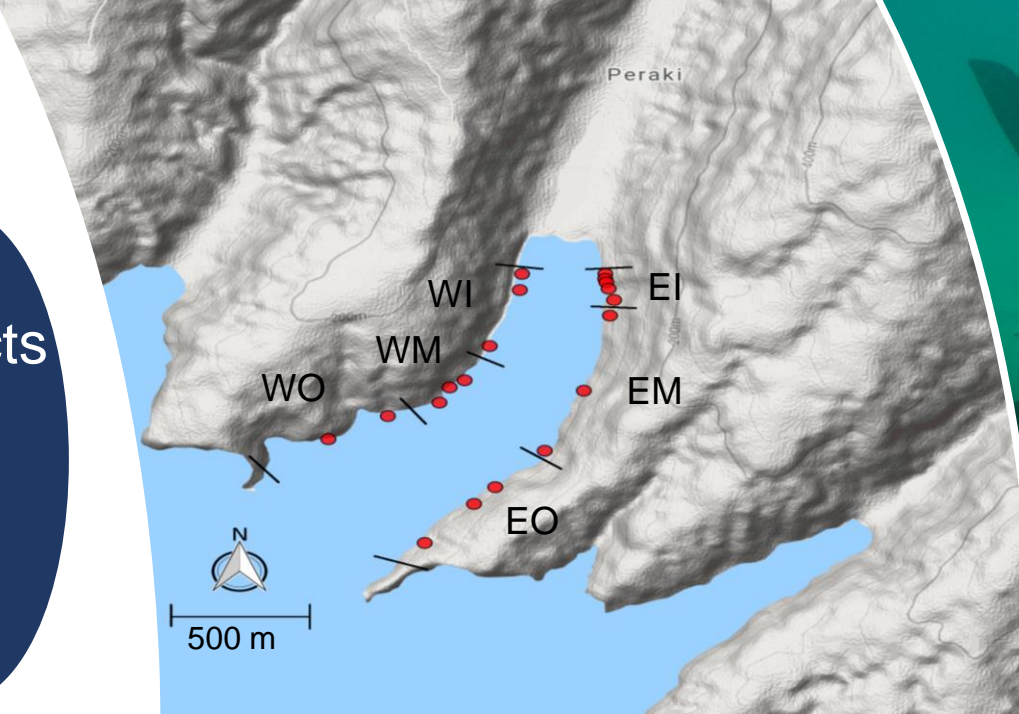


Photo: Lucy Coyle

2019 – 2021

- Mar 2021 - 19 transects
- 284 pāua tagged, 16 recaptures
- 3 gonad collections over 1.2 years



Photo: Louise Bennett-Jones



Population size and distribution

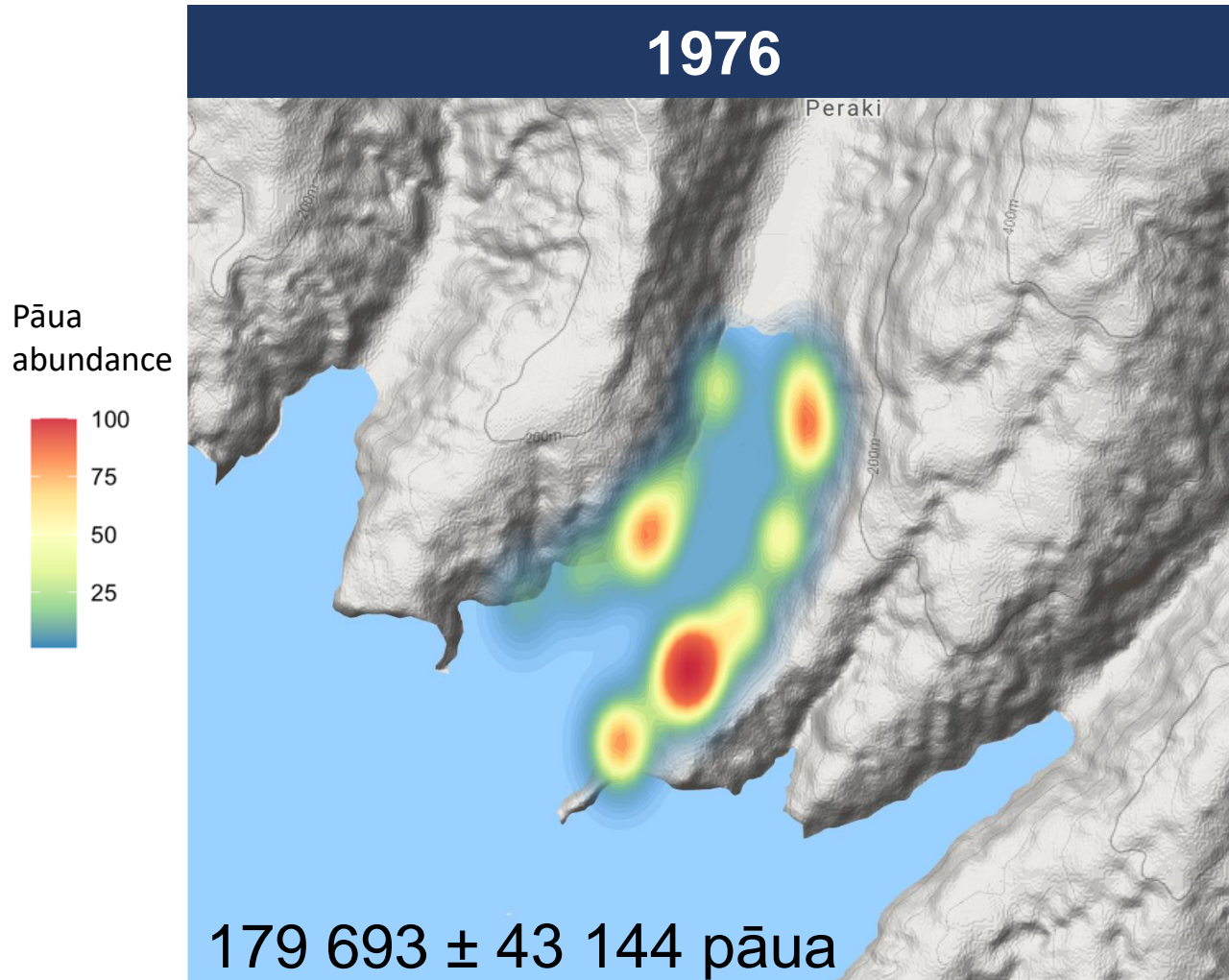


Figure 2: Count of pāua measured in February 1976 transects. **N = 691**

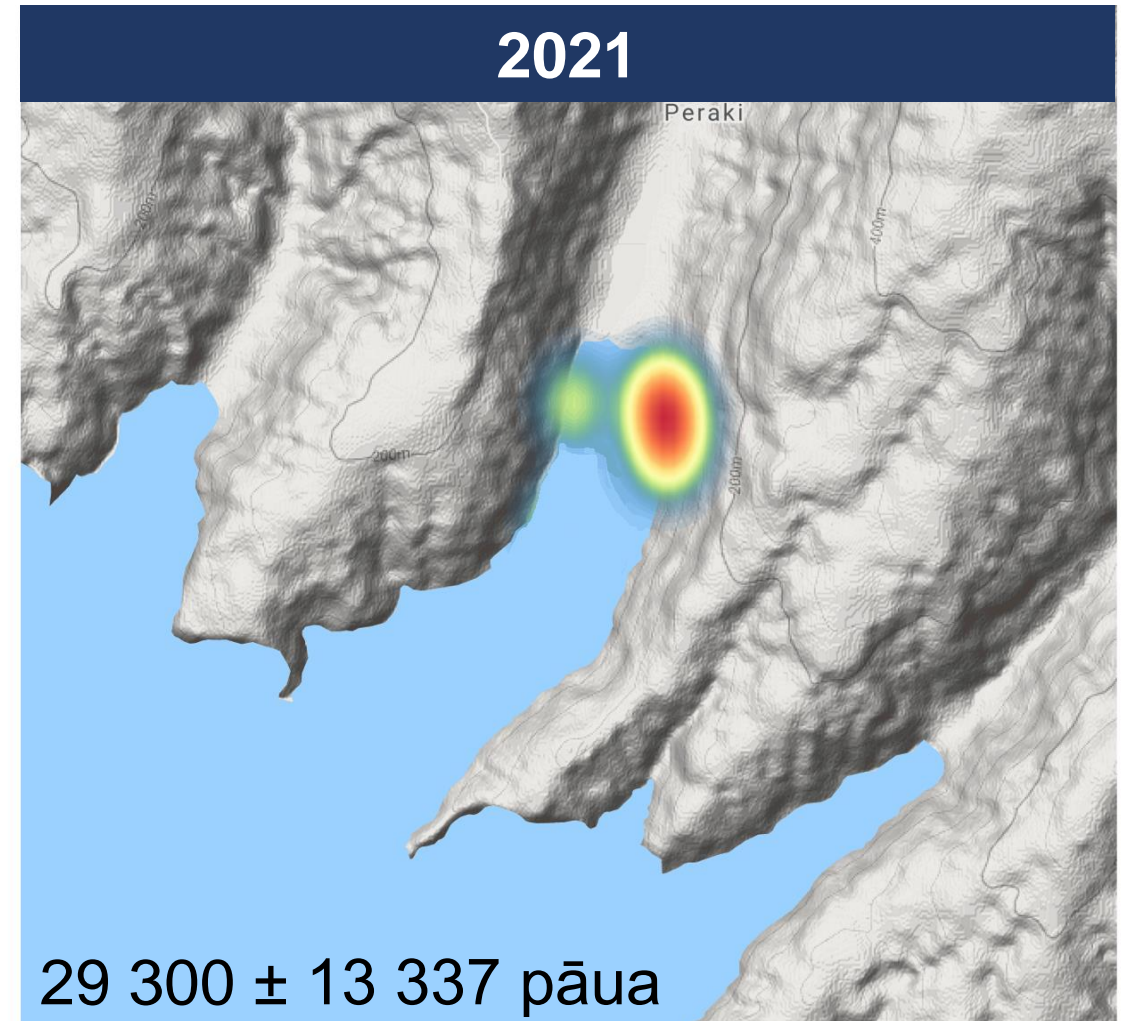


Figure 3: Count of pāua measured in March 2021 transects. **N = 724**



Size structure

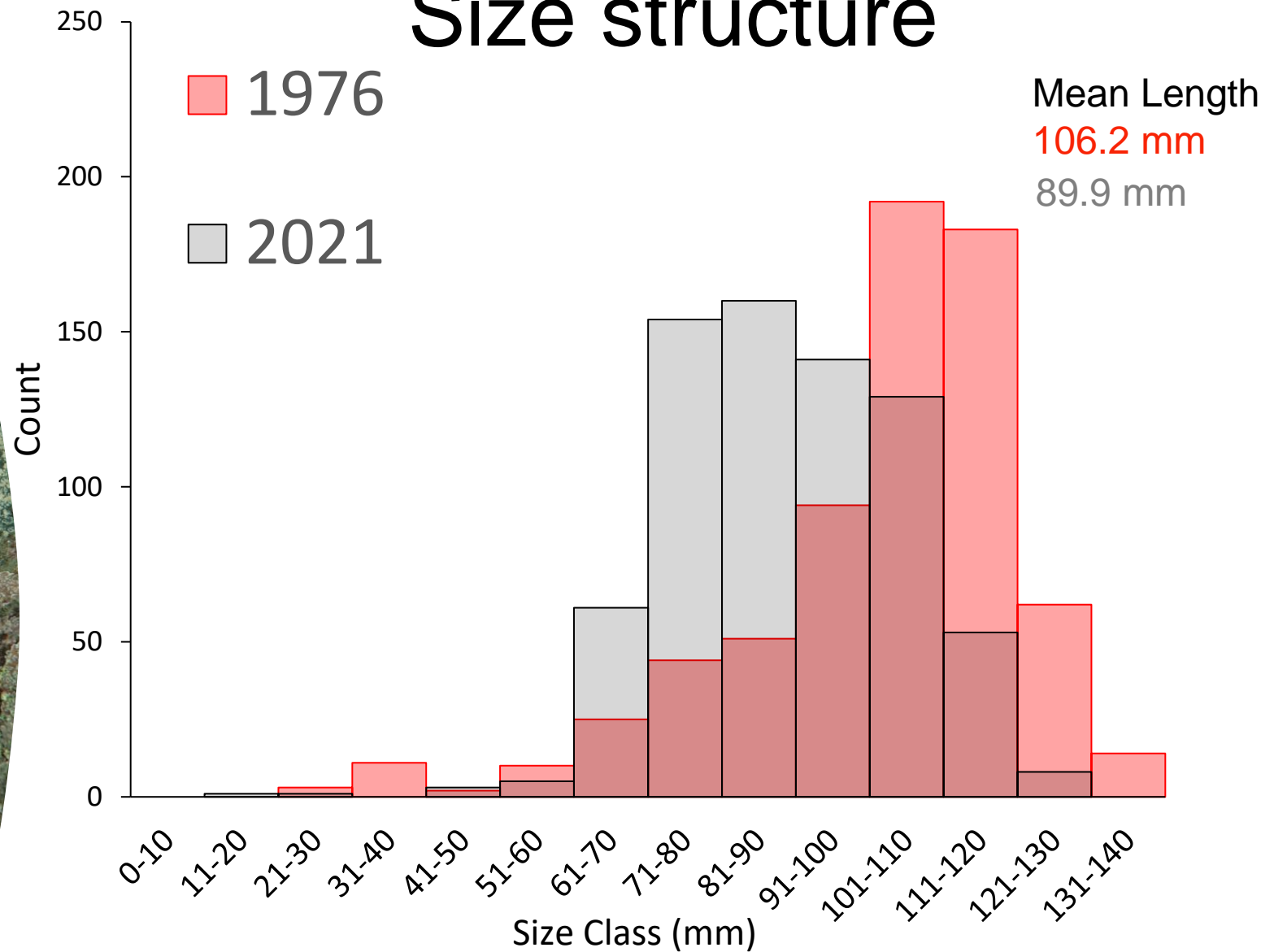


Figure 4: Size frequency of pāua within Peraki Bay, Banks Peninsula in February 1976 (□), n = 691, and March 2021 (■), n = 724.

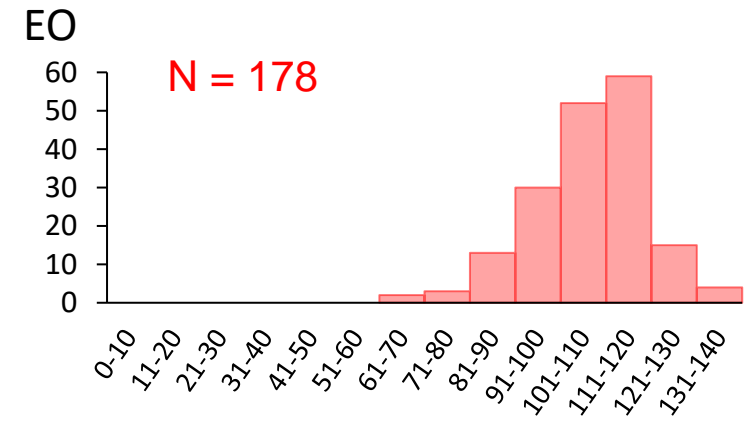
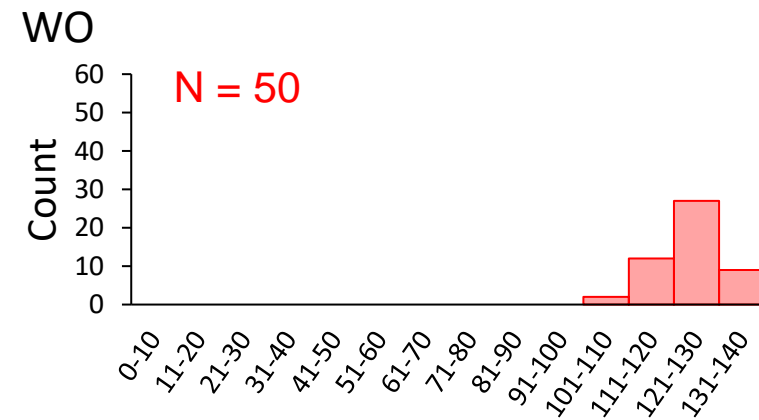
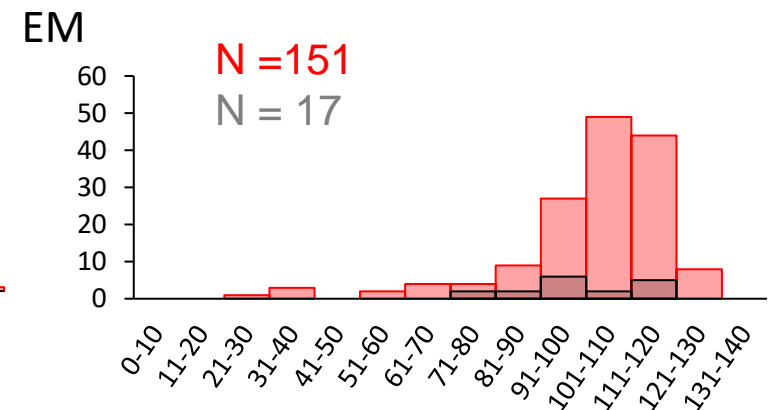
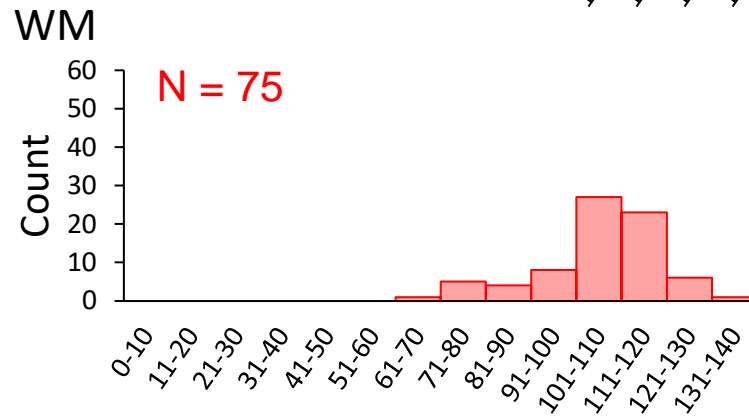
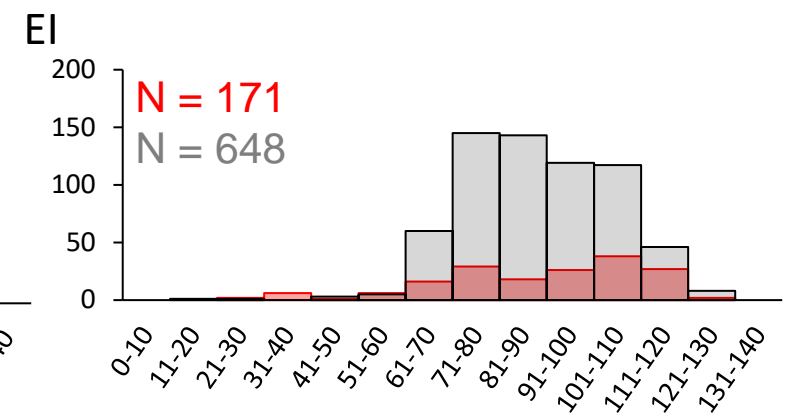
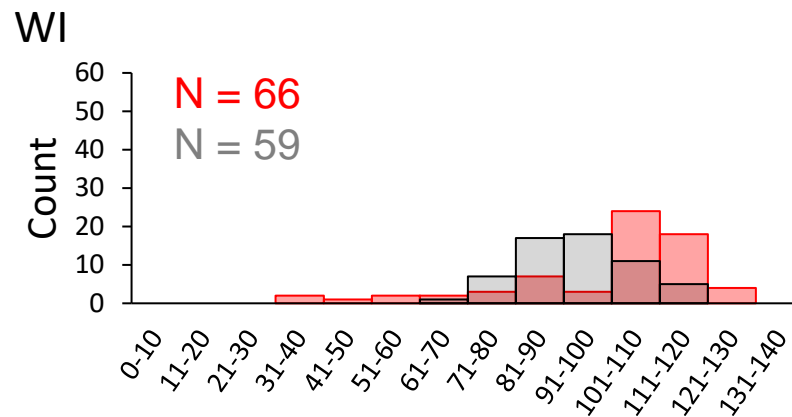
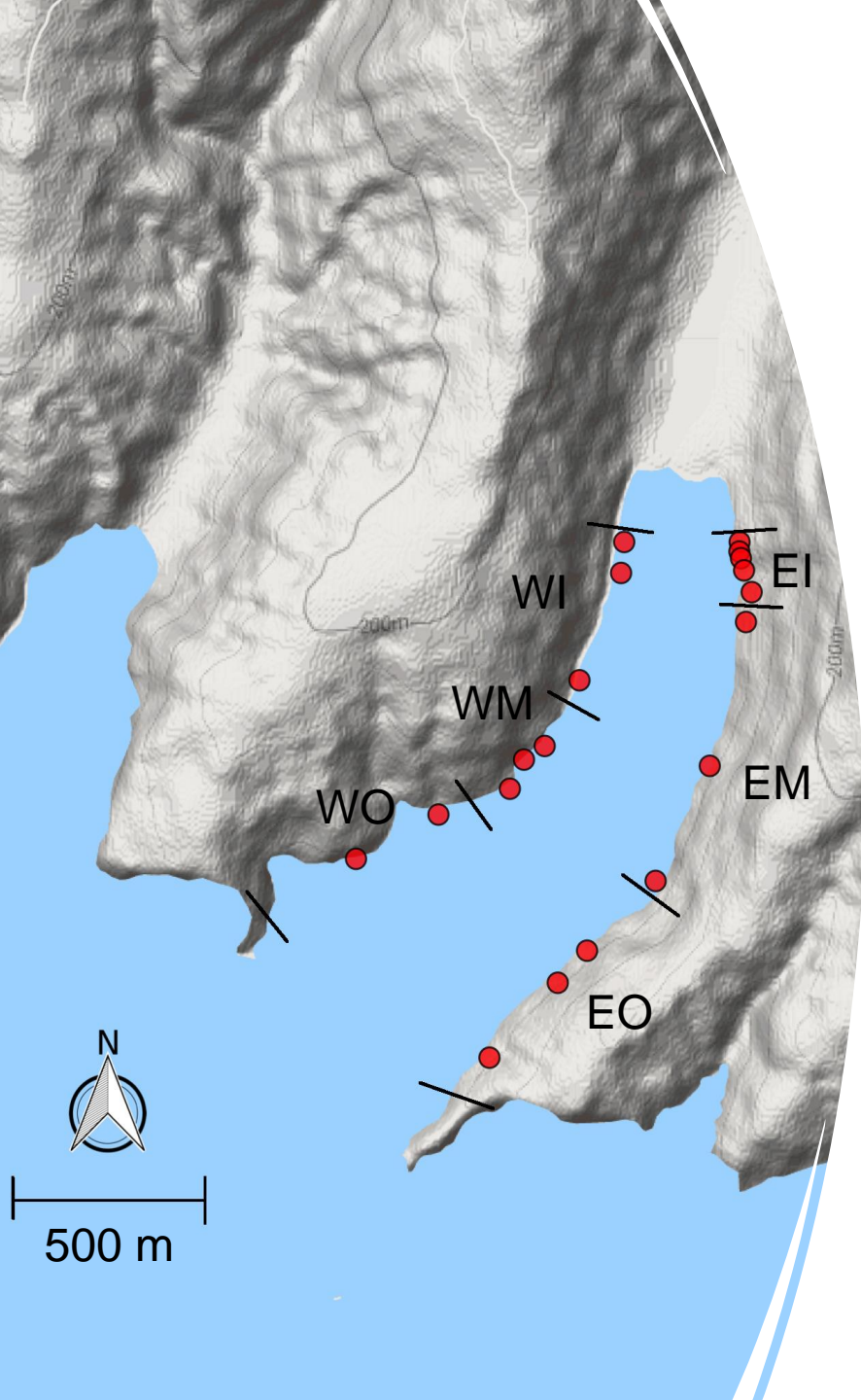


Figure 5: Size frequency of pāua within each stratum of Peraki Bay, Banks Peninsula in February 1976 (red) and March 2021 (grey).

Reproduction

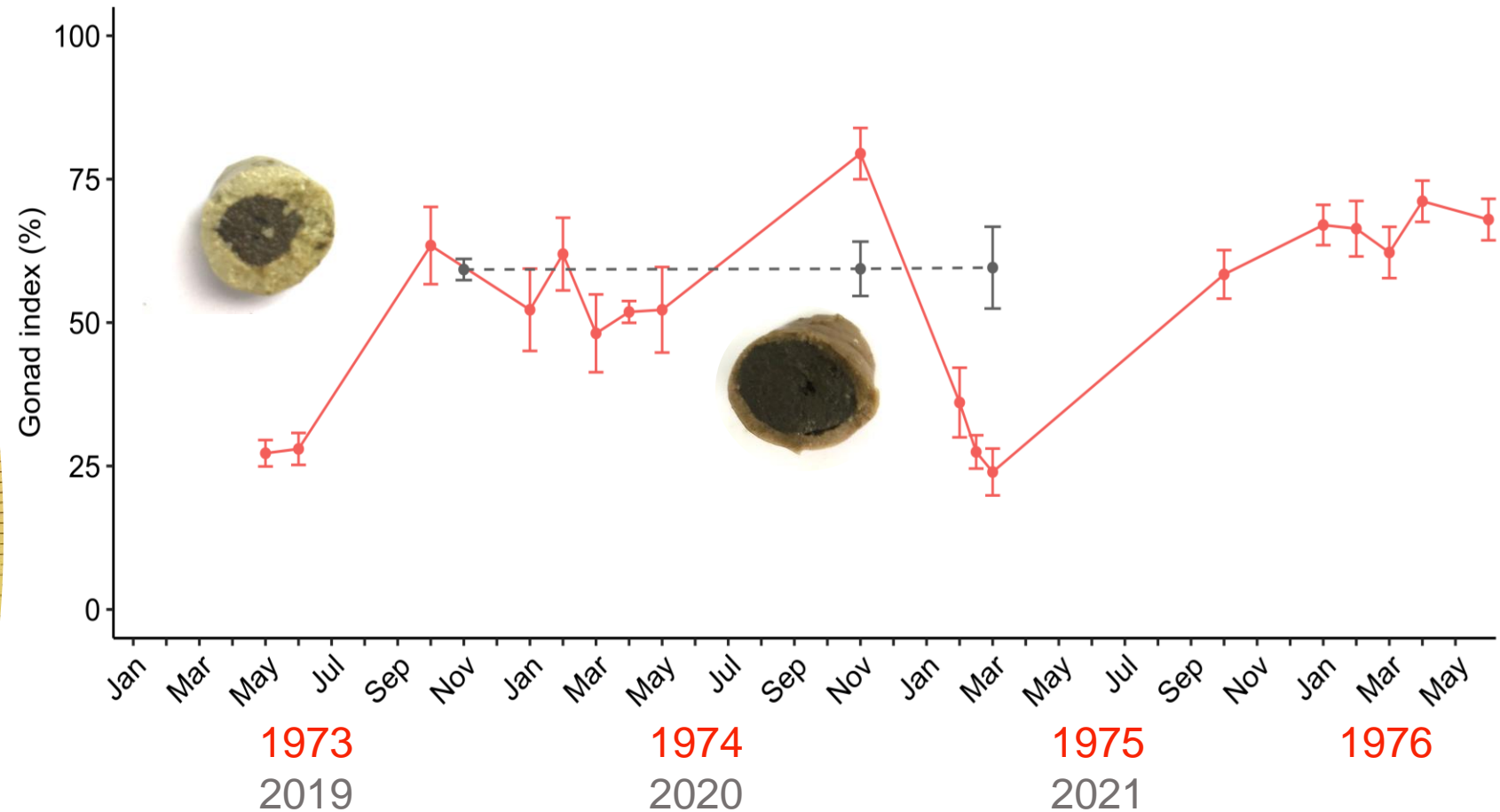


Figure 6: Mean *H. iris* gonad index from 1973 – 1976 (n = 7 – 25) and 2019 - 2021 (n = 10).

Recruitment

⁵Seber, G. A. F. (1982).

1976 = 2980 recruits \pm 1181

2021 = 220 recruits \pm 90

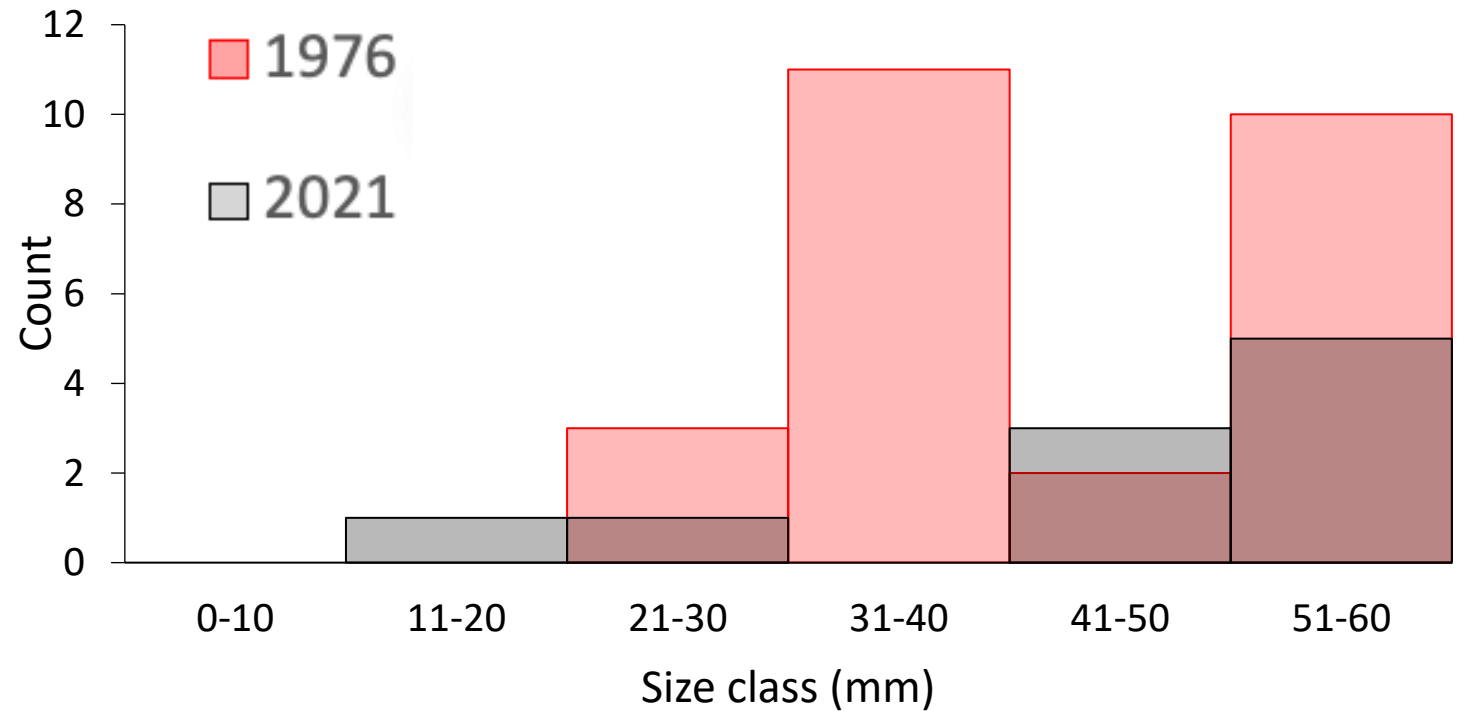
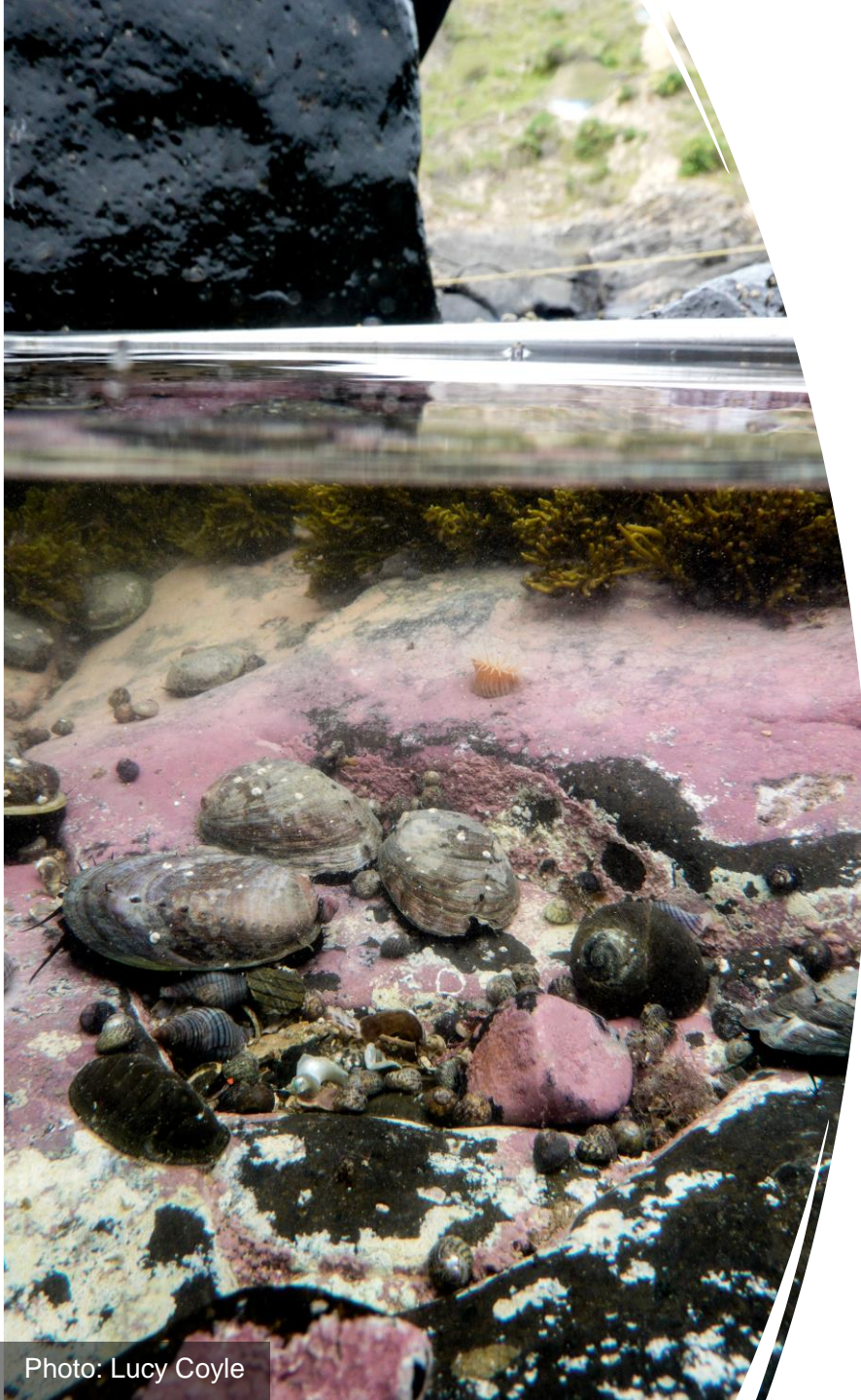


Figure 7: Count of pāua < 60 mm in Peraki Bay in 1976 (■), n = 26 and 2021 (■), n = 10.





Growth

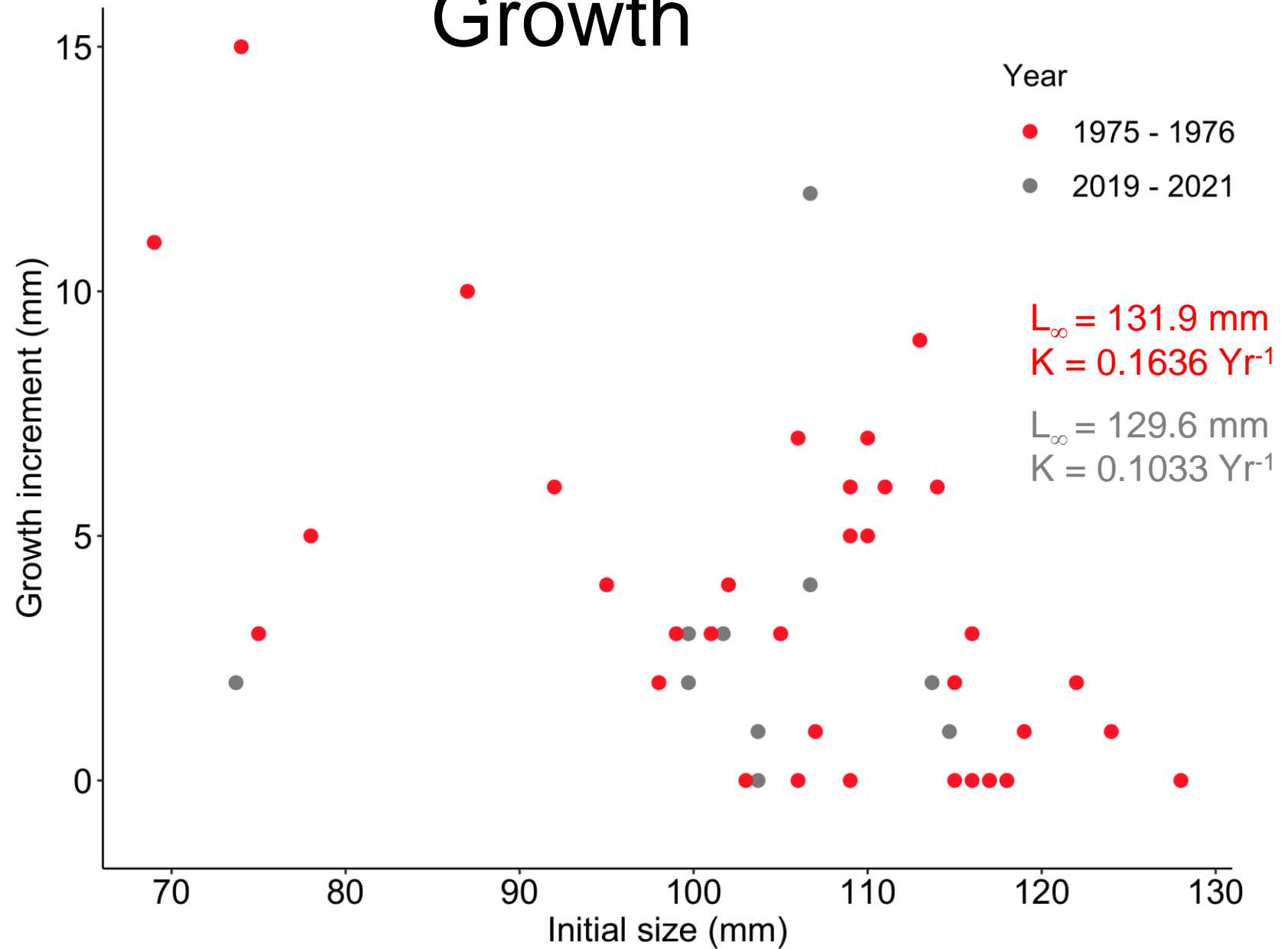
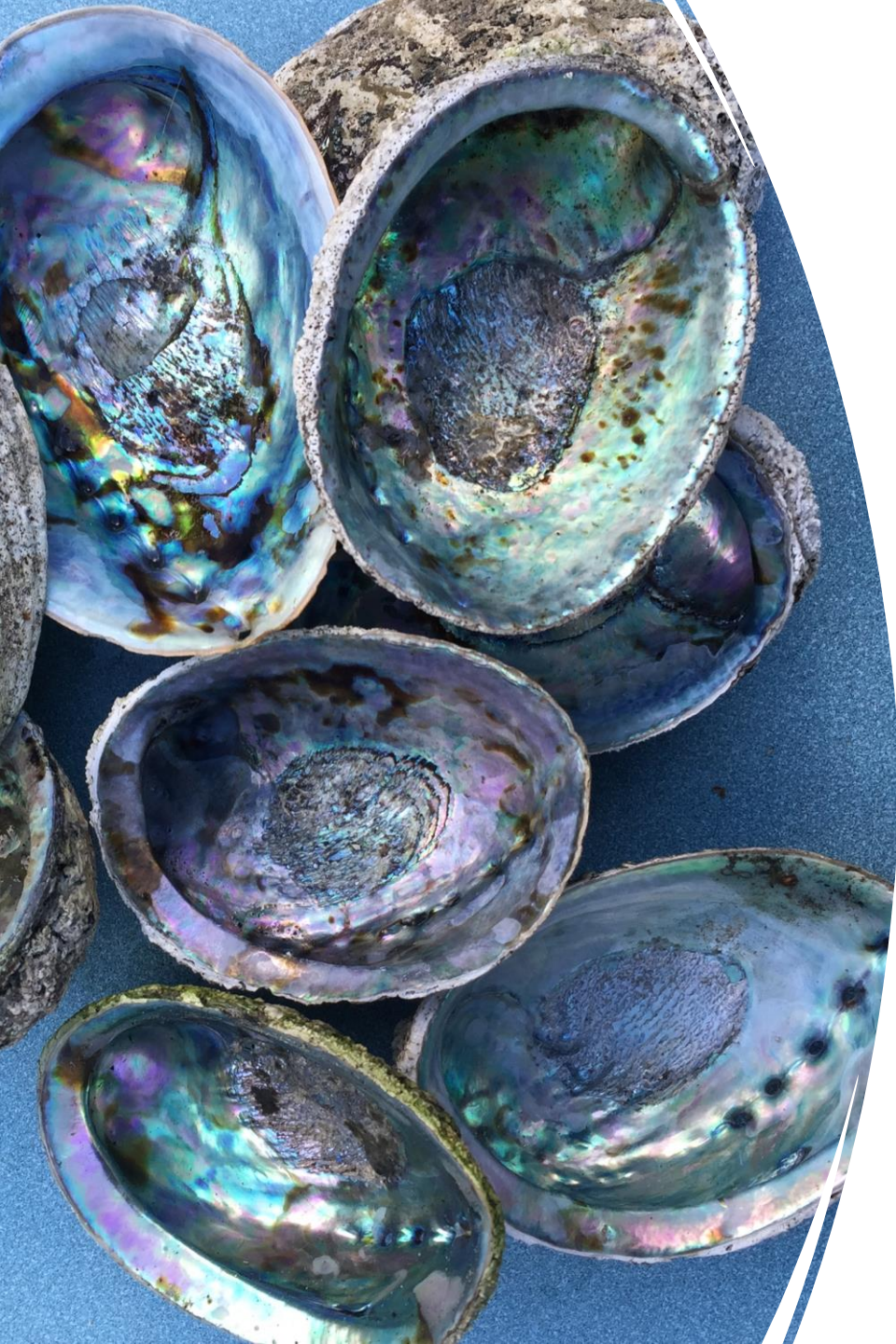


Figure 8: Initial size (mm) and growth increment (mm) of pāua in Peraki Bay tagged in 1975 (●), n = 37 and 2019 (●), n = 10.



Mortality

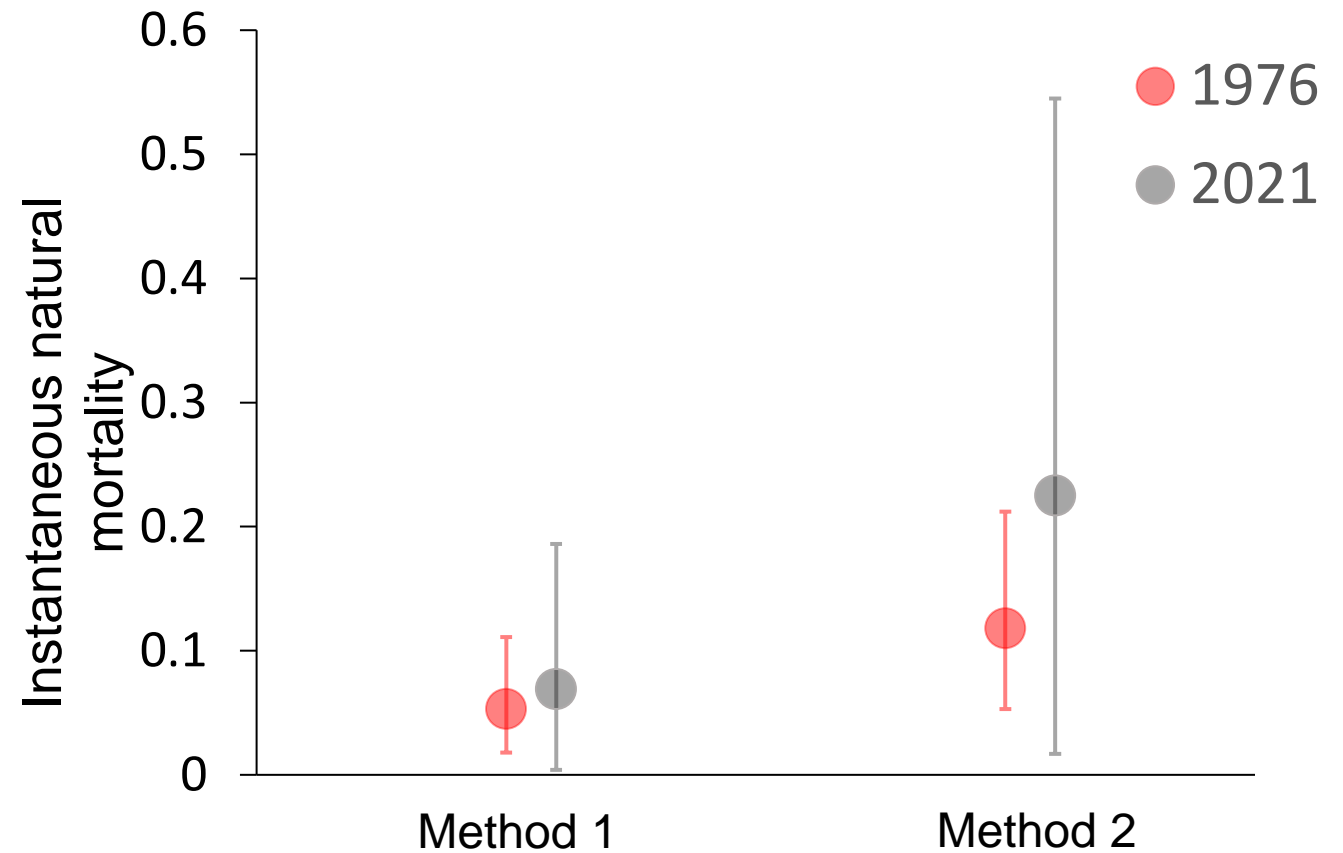
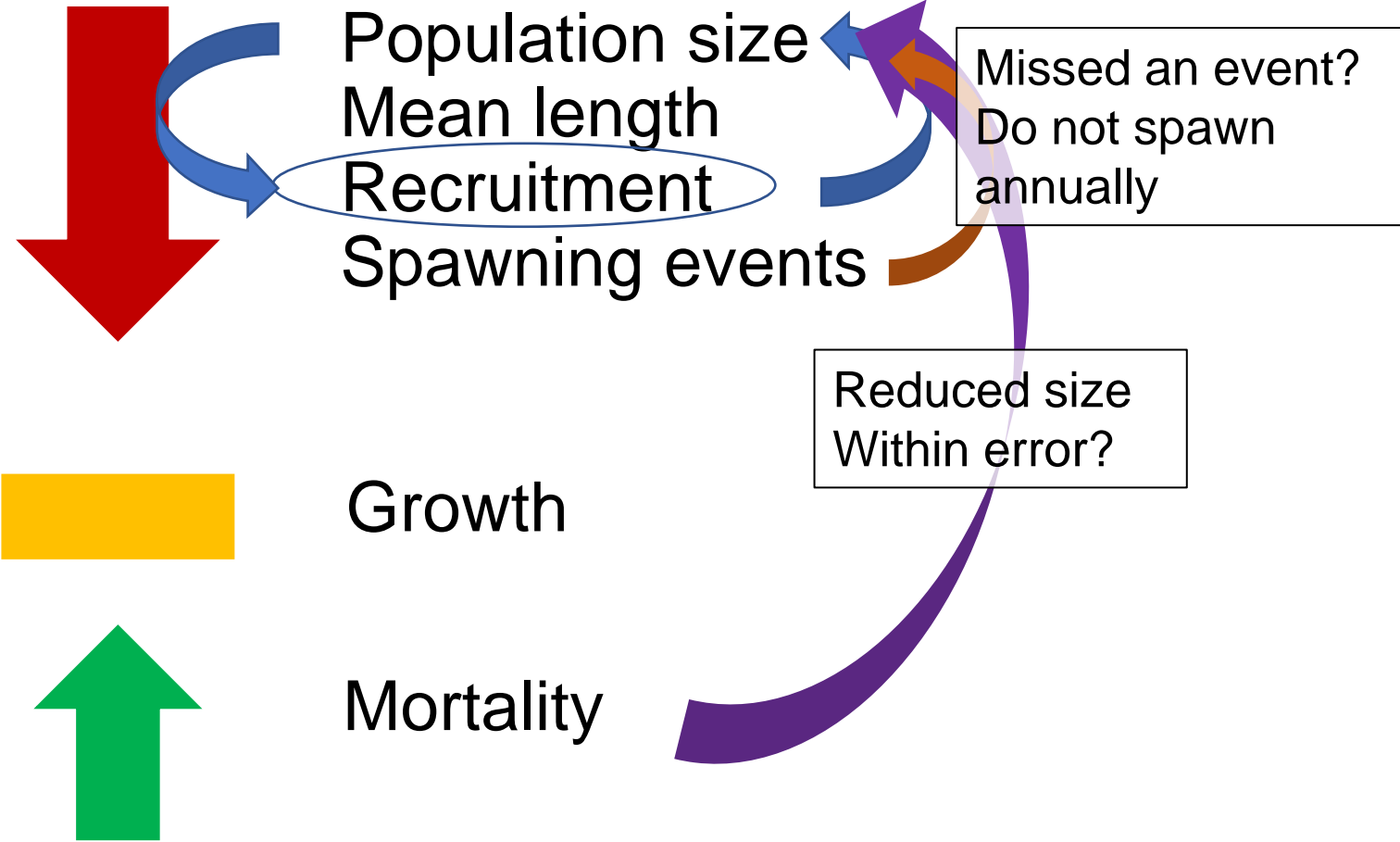


Figure 9: Instantaneous natural mortality rate (M) \pm 95 % Confidence interval for *Haliotis iris* in Peraki Bay. Method 1: Beverton & Holt (1956)⁶. Method 2: Ssentongo & Larkin (1973)⁷.

Discussion



Conclusions

- Irregular and low recruitment has caused a decline in population size
- Potential for large recruitment with high densities
- Long-term data is key for management



Acknowledgments

- Fieldwork crew: Lucy Coyle, Maryann Watson, Louise Bennett-Jones
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