



Black Oystercatcher (*Haematopus bachmani*) Foraging on Varnish Clams (*Nuttalia obscurata*) in Nanaimo, BC.



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BACKGROUND

- The Black Oystercatcher (*Haematopus bachmani*) (BLOY) is a non-passerine shorebird found year-round along the North American Pacific Coast. It lives on rocky coastlines and islands, and forages in the intertidal zone.
- Black Oystercatchers have been the focus for priority conservation action in part due to their small global population size, restricted range, threats to preferred habitat, and lack of baseline data to assess conservation status.¹
- Predators such as the Black Oystercatcher often display selective foraging to maximize their net energy gain.²
- The rapid and very successful invasion of the varnish clam (*Nuttalia obscurata*), a newly introduced species to British Columbia waters, has the potential to alter pre-existing ecological interactions.^{2,3}
- No studies of Black Oystercatcher foraging on varnish clams have previously been conducted.

OBJECTIVES

- To investigate whether and to what extent varnish clams represent a significant part of the diet of Black Oystercatchers.
- To determine if Black Oystercatchers forage selectively on specific size classes of varnish clams.

METHODS AND MATERIALS

- Study sites were established at Departure Bay Beach and Piper's Lagoon in Nanaimo, British Columbia (Figure 1).
- Observations were conducted from October 2013 to February 2014. Focal animal sampling⁴ was carried out to assess the number and species of prey items eaten by Black Oystercatchers in 5-minute observational periods.



Figure 1. Aerial photographs of the Departure Bay Beach and Piper's Lagoon study sites in Nanaimo, BC.

- The discarded shells of varnish clams eaten by Black Oystercatchers were measured with Vernier calipers to the nearest millimetre.
- Beach profiles of available varnish clams were conducted to a depth of 0.10 m at each study site based on stratified random sampling with 0.25-m² quadrats. Available varnish clams were also measured with Vernier calipers to the nearest millimetre.
- The average size of available and eaten varnish clams were compared with a Welch's *t*-test to assess size-selective foraging by Black Oystercatchers.



RESULTS

Table 1. Summary of observations of Black Oystercatcher (BLOY) feeding on varnish clams (VC) at Departure Bay Beach and Piper's Lagoon during various dates from October 2013 to February 2014.

Parameter	Departure Bay Beach	Piper's Lagoon
Number of observation periods	76	29
Periods with BLOY present	10 (13%)	11 (38%)
Median flock size (range)	4 (2 - 7)	1 (1 - 2)
Tidal range when BLOY present (m)	3.0 - 3.1	3.1 - 3.7
Periods with VC consumed	5 (7%)	9 (31%)
Median number of VC consumed per period (range)	0 (0 - 3)	3 (0 - 4)

- A total of 105 5-minute observational periods were conducted at the study sites (Table 1). Black Oystercatchers were present more often at Piper's Lagoon, where they consumed varnish clams more often, in greater number, and throughout a greater tidal range than at Departure Bay Beach.

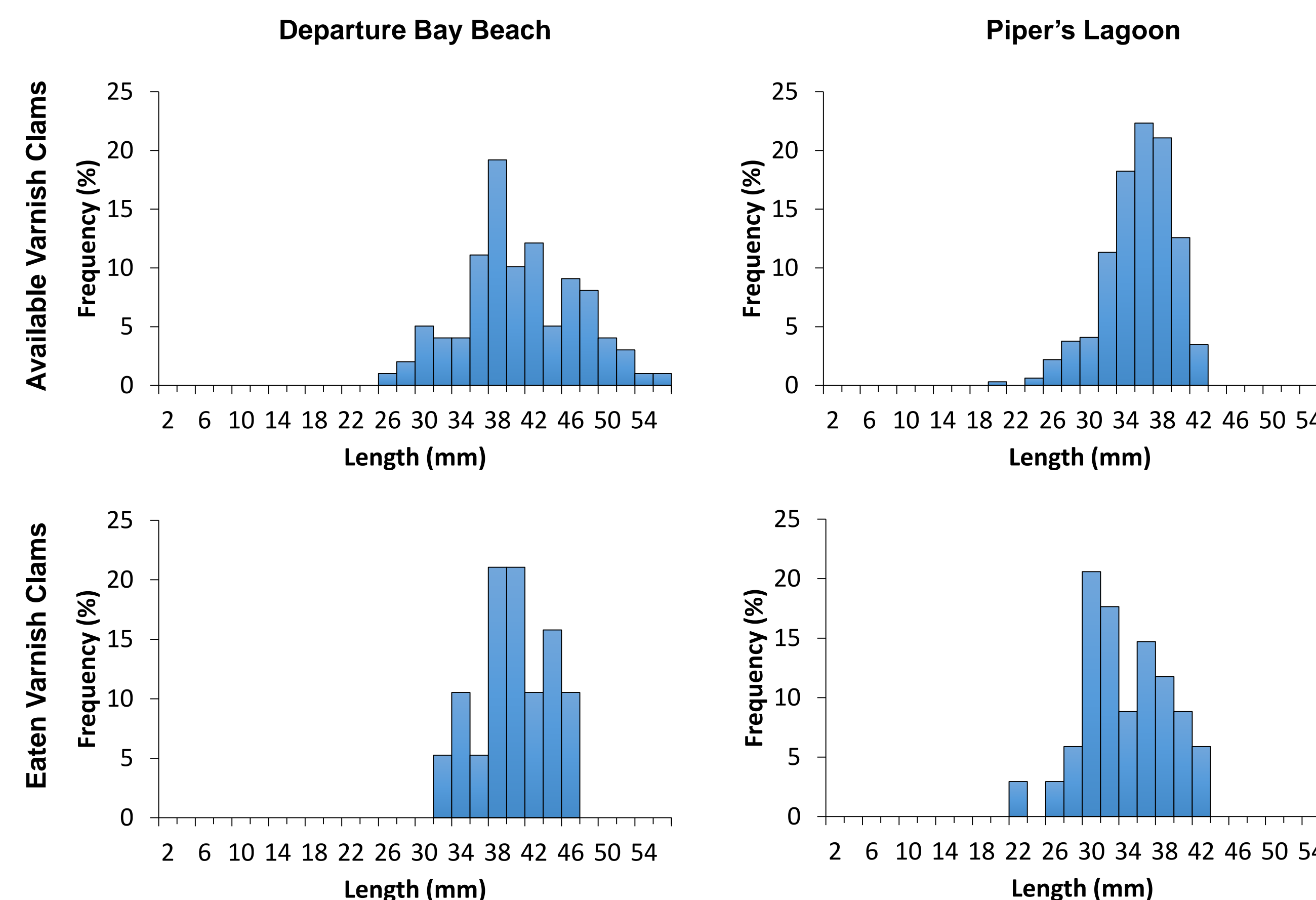


Figure 2. Size distribution of available and eaten varnish clams at Departure Bay Beach and Piper's Lagoon during various dates from October 2013 to February 2014.

Table 2. Descriptive statistics comparing available and eaten varnish clams at Departure Bay Beach and Piper's Lagoon during various dates from October 2013 to February 2014 (NS = not significant; $\alpha = 0.025$, with Bonferroni correction for multiple comparison).

Parameter	Departure Bay Beach	Piper's Lagoon
Mean length (mm; \pm SD) and sample size of available varnish clams	39.9 \pm 6.3 <i>n</i> = 99	35.0 \pm 3.7 <i>n</i> = 318
Mean length (mm; \pm SD) and sample size of varnish clams eaten by Black Oystercatchers	39.3 \pm 3.9 <i>n</i> = 19	33.0 \pm 4.8 <i>n</i> = 34
<i>t</i> -value	0.55	2.28
<i>P</i> -value	0.59 ^{NS}	0.03 ^{NS}
Mean density (m ⁻² ; \pm SD) of available varnish clams	198 \pm 59	212 \pm 177

- There was no significant difference between the mean size of available varnish clams and the mean size of varnish clams eaten by Black Oystercatchers at Departure Bay Beach (Figure 2; Table 2). Interestingly, the largest and smallest sizes of available varnish clams did not appear to be consumed by Black Oystercatchers (Figure 2).
- There was a nearly significant difference between the mean size of available varnish clams and those eaten by Black Oystercatchers at Piper's Lagoon (Figure 2; Table 2), although the range of available and eaten varnish clams were similar.
- The mean density of available varnish clams was slightly higher at Piper's Lagoon than at Departure Bay Beach (Table 2), but this difference was not significant ($t = 0.17$; $df = 6$; $P = 0.87^{\text{NS}}$).

DISCUSSION

- In this study, Black Oystercatchers were repeatedly observed to consume varnish clams at two locations around Nanaimo, BC. Piper's Lagoon appeared to be an especially important foraging site for Black Oystercatchers since they consumed varnish clams more frequently and in greater quantity at this location than at Departure Bay Beach.
- A predator's preference for prey can be affected by the abundance of the prey.⁵ According to basic foraging theory, when prey are less abundant, a predator should expand its preferred diet to also eat less profitable prey sizes, and when valuable prey are abundant, the predator should reject less profitable prey sizes.²
- There was no obvious indication of size-selective foraging by Black Oystercatchers in this study. However, there was a slight difference between the mean size of available (larger) and eaten varnish clams at Piper's Lagoon but not at Departure Bay Beach. Black Oystercatchers were also found to feed on varnish clams at a higher rate at Piper's Lagoon and throughout a larger tidal range. Therefore, these results suggest possible selective foraging by Black Oystercatchers.
- Reasons for the Black Oystercatcher to selectively forage for smaller sized varnish clams could include a possibly shorter handling time, higher consumption rate, and increased profitability.² Further behavioural studies could be conducted to address this.

CONCLUSION

- This study found that the varnish clam is now an important food source for the Black Oystercatcher. When Black Oystercatchers were present at Departure Bay Beach and Piper's Lagoon, they were observed to forage on varnish clams during 50% and 82% of observation periods, respectively.
- Black Oystercatchers appear to exploit the varnish clams and may be able to obtain a substantial part of their daily energy requirements from this invasive species. The indirect effects of this subsidy on either marine or terrestrial food webs remain unknown and could be the subject of further studies.



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ACKNOWLEDGMENTS

I would like to express my gratitude to Dr. Eric Demers, my research advisor, for his guidance, enthusiasm, and volunteer time in the field. Thank you to Dr. Liz Demattia and Dr. Rosemarie Ganassin for their support as committee members, and to Nathan Hollenberg, Kim Wetten and Stephanie Wetten for their volunteer time in the field.