

Observations of Above Surface Littoral Foraging in Two Sea Ducks, Barrow's Goldeneye, Bucephala islandica, and Surf Scoter, Melanitta perspicillata, in Coastal Southwestern British Columbia.

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Barrow's Goldeneyes (Bucephala islandica) and Surf Scoters (Melanitta perspicillata) were observed on four separate occasions, by three different observers, foraging on Bay Mussels (Mytilus trossulus) above the water surface. This unique foraging behaviour could be attributed to diurnal spring tides and reduced lower intertidal mussel abundance.

Key Words: Barrow's Goldeneye Bucephala islandica, Surf Scoter Melanitta perspicillata, foraging behaviour, sea ducks, British Columbia, Mytilus trossulus Bay mussels

The sea ducks, Barrow's Goldeneye (Bucephala islandica) and Surf Scoter (Melanitta perspicillata), winter in abundance along the coast of British Columbia where they forage diurnally on marine invertebrates in bays, harbours, beaches, and inlets (Bellrose

1980; Vermeer 1981, 1982; Vermeer and Bourne 1984; Campbell et al. 1990 Savard et al. 1998; Eadie et al. in press). In rocky habitats, both sea ducks forage predominantly on Bay Mussels (Mytilus trossulus) (formerly classified as M. edulis; McDonald and Koehn 1988, McDonald et al. 1991) (Vermeer and Levings 1977; Hirsch 1980; Vermeer 1981, 1982; Vermeer and Bourne 1984; Lacroix 2001). Both sea ducks dive to locate and retrieve mussels. Mussels are pried from the substrate and swallowed whole (Savard et al. 1998; Eadie et al. in press).

Three observers on four separate occasions, observed Surf Scoters and/or Barrow's Goldeneyes foraging on bay mussels above the water surface (Fig. 1) in coastal southwestern British Columbia (49°22'N, 123°29'W). The first observation on 22 February, 1999 involved juvenile and/or female Surf Scoters and Barrow's Goldeneye eating exposed mussels at a breakwater on Popham Island (Table 1). On the second occasion, on 7 March 1999, juvenile and female Barrow's Goldeneyes removed mussels from a rocky point (Cape Roger Curtis) while they sat 1.5 m above the water line on a reef. Later that day a flock of approximately 12 Barrow's Goldeneye, mostly juveniles and females, were seen feeding on mussels while hauled out on a reef. This above-surface foraging tactic was also noticed later in March when three juvenile Surf Scoters, and six Barrow's Goldeneyes, mostly females and juveniles, fed on exposed mussels on large boulders. We are unaware of any previously published or unpublished accounts of this foraging behaviour. Our multiple observations suggest that the behaviour occurs frequently but has gone unreported.

All of these observations were made during late February and March in Howe Sound and Burrard Inlet, British Columbia, located in the same geographic vicinity. These observations share several similar characteristics including: 1) all ducks were feeding on Bay Mussels; 2) the observations were made during low diurnal tides; 3) only small groups, often consisting of mixed species flocks, were exhibiting this foraging behaviour, and 4) these foraging groups consisted mostly of juveniles and females.

Bay Mussels are a dominant species in protected coastal rocky intertidal areas (Seed and Suchanek 1992; Ricketts et al. 1995). In our observation area, the vertical distribution of the Bay Mussel ranges from 1.5 to 3.7 m (Quayle 1978). Although bay mussels are

intertidal, they are rarely completely exposed during daylight hours in the winter since the lowest low tides of the semidiurnal tidal regime occurs at night (Thomson 1981). As winter advances into spring, the lowest low tides are diurnal; therefore, exposing mussel beds during daylight hours (Fig.2). These exposed mussels may be more vulnerable to mussel foraging diving ducks such as Surf Scoter and Barrow's Goldeneye since these ducks do not need to dive to feed. However, Smeathers and Vincent (1979) found that mussels exposed to air are more difficult to remove since byssal threads are twice as strong in air as when submerged. This suggests that exposed mussels may require more energy to remove than submerged ones, therefore not being as profitable. Alternatively, juvenile and female Surf Scoters and Barrow's Goldeneyes may be forced to feed on these exposed mussels due to the reduced mussel abundance and distribution from over-winter predation. The lower vertical distribution of bay mussels is determined by biological factors primarily predation, from the ochre sea star (Pisaster ochraceus) (Seed and Suchanek 1992, Quayle 1978) and sea ducks (Lacroix 2001). Through the winter, the combination of sea star and sea duck predation may reduce the lower distribution of mussels hence reducing their abundance. It is therefore possible that these ducks are forced to forage on the less profitable prey (i.e. the exposed mussels) since there are few submerged mussels in the lower portion of its distribution. This can be supported by the observation that mostly small groups of juveniles were seen adopting this foraging technique. Likewise, if it were more profitable to feed on exposed mussels you would predict that adult birds would also adopt the behaviour.

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Literature Cited

- Bellrose, F. C.** 1980. Ducks, geese and swans of North America. Stackpole Books, Harrisburg, Pennsylvania. 540 pages
- Campbell, R. W., N. K. Dawe, I. McTaggart-Cowan, J. M. Cooper, and G. W. Kaiser.** 1990. The birds of British Columbia. Volume 1. Nonpasserines, introduction and loons through waterfowl. Royal British Columbia Museum, Victoria, British Columbia. 513 pages
- Fisheries and Oceans Canada.** 1999. Canadian Tide Tables.
- Hirsch, K. V.** 1980. Winter ecology of sea ducks in the inland marine waters of Washington. M. S. thesis, University of Washington, Seattle, Washington. 92 pages
- Lacroix, D. L.** 2001. Foraging impacts and patterns of wintering surf scoters feeding on bay mussels in coastal Strait of Georgia, British Columbia. M. Sc. thesis, Simon Fraser University, Burnaby, British Columbia. 126 pages.
- McDonald, J. H. and R. K. Koehn.** 1988. The mussels Mytilus galloprovincialis and M. trossulus on the Pacific coast of North America. Marine Biology 99: 111-118.
- McDonald, J. H., R. Seed, and R. K. Koehn.** 1991. Allozymes and morphometric characters of three species of Mytilus in the Northern and Southern Hemispheres. Marine Biology 111: 323-333.
- Quayle, D. B.** 1978. A preliminary report on the possibilities of mussel culture in British Columbia. Fisheries and Marine Service Technical Report, 815. 37 pages.
- Ricketts, E. F., J. Calvin, J. W. Hedgpeth, and D. W. Philips.** 1995. Between Pacific tides. Fifth Edition. Stanford University Press, Stanford, California.
- Savard, J-P. L., D. Bordage, and A. Reed.** 1998. Surf Scoter (Melanitta perspicillata). Pages 1-28 in The Birds of North America. Edited by A. Poole and F. Gill, Philadelphia, Pennsylvania.

- Seed, R., and T. H. Suchanek.** 1992. Population and community ecology of Mytilus. Pages 87-157 in The mussel Mytilus: ecology, physiology, genetics and culture. Edited by E. Gosling, Developments in Aquaculture and Fisheries Science, 25, Elsevier, Amsterdam. 589 pages
- Smeathers, J. B., and J. F. Vincent.** 1979. Mechanical properties of mussel byssus threads. Journal of Molluscan Studies 45: 219-230.
- Thomson, R. E.** 1981. Oceanography of the British Columbia coast. Canadian Special Publication Fisheries and Aquatic Science 56. 291 pages.
- Vermeer, K.** 1981. Food and populations of Surf Scoters in British Columbia. Wildfowl 32: 107-116.
- Vermeer, K.** 1982. Food and distribution of three Bucephala species in British Columbia. Wildfowl 33: 22-30.
- Vermeer, K. and N. Bourne.** 1984. The White-winged Scoter diet in British Columbia waters: resource partitioning with other scoters. Pages 62-73. in Marine birds: their feeding ecology and commercial fisheries relationships. Edited by D. N. Nettleship, G.A. Sanger, and P.F. Springer. Proceedings of the Pacific Seabird Group Symposium, Seattle, Washington, 1982.
- Vermeer, K., and C. D. Levings.** 1977. Populations, biomass and food habits of ducks on the Fraser Delta intertidal area, British Columbia. Wildfowl 28: 49-60.

FIGURE CAPTIONS

FIGURE 1. Surf Scoters and Barrow's Goldeneyes foraging on Bay Mussels above the water surface, 22 February 1999, Popham Island, British Columbia. Photo: Daniel Kent.

FIGURE 2. The percent of daylight hours that Bay Mussel beds are completely submerged in coastal British Columbia. Mussel submergence time was estimated by calculating the number of hours the tide was above 3.7 m, using Canadian Tide Charts (Fisheries and Oceans Canada 1999), during daylight hours, between predicted sunrise and sunset.

FIGURE 2

ABLE 1. Description of the four observational accounts of Surf Scoters (SUSC) and/or Barrow's Goldeneye (BAGO) on exposed mussels in coastal southeastern British Columbia.

Date	Time	Tide Height (m)	Location	Species	Habitat	Observer
22 Feb 99	ca. 14:00	2.16	Popham Island, Howe Sound	SUSC & BAGO	rocky breakwater	D. Kent
7 Mar 99	13:30	2.16	Cape Roger Curtis, Howe Sound	SUSC & BAGO	rocky intertidal	K. Wright
7 Mar 99	17:00	2.13	Hermit Island, Howe Sound	BAGO	rocky intertidal	K. Wright
19 Mar 99	12:00	1.74	Stanley Park, Burrard Inlet	SUSC & BAGO	rocky intertidal	D. Lacroix