Notes

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, Bay Mussels, *Mytilus trossulus,* British Columbia.

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. 2000). 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. 2000).

Three observers, on four separate occasions, observed Surf Scoters and/or Barrow's Goldeneyes foraging on Bay Mussels above the water surface in coastal southwestern British Columbia. The first observation, on 22 February 1999, involved juvenile male and female Surf Scoters and Barrow's Goldeneyes eating exposed mussels at a breakwater on Popham Island. The event was photo-documented by D. Kent. On the second occasion, on 7 March 1999, 1 juvenile male and 7 females, mostly juveniles, Barrow's Goldeneyes and 3 Surf Scoters, (1 female and 2 immature males), removed mussels from a rocky point at Cape Roger Curtis, while they sat on a reef, 1.5 m above the water line. Later that day a flock of approximately 12 Barrow's Goldeneyes, mostly juveniles, was seen feeding on mussels while hauled out on a reef on Hermit Island. This above-surface foraging tactic was also noticed later in March when three juvenile Surf Scoters, and six Barrow's Goldeneyes, mostly juveniles, fed on exposed mussels on large boulders. All the observations coincided with low diurnal tides. The tide height ranged between 1.74 to 2.16 m, above Chart Datum (a.c.d.). 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 (49°19.32'N, 123°09.92'W – 49°21.60'N, 123°29.15'W). 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.

Discussion

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, a.c.d. (Quayle 1978). Although Bay Mussels are intertidal, mussel beds are rarely completely exposed during daylight hours in winter as the lowest low tides of the semidiurnal tidal regime occur at night (Thomson 1981). As winter advances into spring, the lowest low tides are diurnal; therefore expose mussel beds during daylight hours (Figure 1). Exposed mussels

FIGURE 1

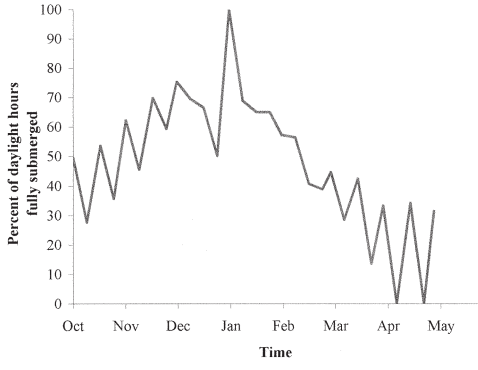

FIGURE 1. The percent of daylight hours that Bay Mussel beds are completely submerged in coastal British Columbia. Mussel submergence time was estimated by calculating the number of hours the tide was above 3.7 m, a.c.d, using Canadian tide charts (1999), during daylight hours, between sunrise and sunset.

may be more vulnerable to diving ducks such as Surf Scoter and Barrow's Goldeneye as the ducks do not need to expend energy diving to reach the mussels. However, Smeathers and Vincent (1979) found that mussels exposed to air have twice the tensile strength of those submerged. If the exposed mussels have undergone some degree of desiccation, they may require more energy to remove than submerged ones, and may therefore, not be as profitable as first postulated. Alternatively, juvenile and sub-adult Surf Scoters and Barrow's Goldeneyes may be forced to feed on exposed mussels owing to the reduced mussel abundance and distribution from over-winter predation. The lower portion of the 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 eliminate the lower distribution of mussels, hence reducing their overall abundance. It is therefore plausible that the ducks observed were forced to forage on the less profitable prey (i.e., the exposed mussels) because there are few or no submerged mussels in the lower portion of their distribution.

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