

OBSERVATIONS OF MOOSE FEEDING ON AQUATICS  
IN BOWRON LAKE PARK, BRITISH COLUMBIA  
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Bowron Lake Provincial Park (lat. 53°N., long. 121°W.) features a chain of lakes forming a rough square with a perimeter of approximately 73 miles. Smaller lakes in the southwest part of the park are shallow, relatively warm, and with little glacial influence while the larger lakes are narrow, deep, and fed by glacial streams.

Moose (*Alces alces*) are abundant summer residents along the slow moving Bowron River and adjacent lakes. We were able to record their feeding behaviour on aquatics during the summer of 1962. The observations were made during a general wildlife survey of the park.

### METHODS

Observations were made from July 20 to August 16, 1962. A 10-minute observation period was taken as a standard. During each observation period, every identifiable food eaten was recorded. Identification of underwater food was possible from portions of the plant or plants hanging from the moose's mouth after surfacing, or from floating parts that appeared after feeding was completed.

The major food item per observation period was also recorded. This was usually easy as many aquatics occurred in pure stands. In mixed stands, identified items were counted. It was necessary to make a subjective choice of the many food item in only a few cases.

### HABITAT

Three types of favoured aquatic feeding areas were evident:

1. Lakes and ponds with little or no current, banks relatively steep, and emergent vegetation generally scarce. These waters had heavy growth of various species of pondweed of which large-leaved pondweed (*Potamogeton amplifolius*) and common floating pondweed (*P. natans*) were most abundant. *P. robinsii* occurred in scattered localities. There were few beds of horse-tail (*Equisetum* spp.) or of bur-reed (*Sparganium* sp.)
2. Ponds with shallow banks and temporarily flooded marshes. Here emergent vegetation was abundant. Higher parts of the meadows were dominated by sedges (*Carex* spp.), with a few grasses scattered throughout. Buck-bean (*Menyanthes trifoliata*) was common in wet depressions and on floating hummocks. The transition from meadow to open water was marked by almost pure stands of swamp horsetail *E. fluviatile*). The transition between marsh edges and the surrounding coniferous forest included stands of bog birch (*Betula glandulosa*), alder (*Alnus* sp.), and scattered willows (*Salix* spp.)
3. Ponds showing the influence of river currents and the slow flowing river between the ponds. The most abundant aquatic in the river was *Potamogeton richardsonii*; ponds had extensive beds composed solely of bur-reed. Borders of the river and ponds were composed mainly of horsetail (primarily swamp horsetail). Willows along the shore were mostly dead or dying as a result of drowning. The survivors were subjected to beaver cutting and moose browsing.

TABLE 1: Aquatic foods eaten by moose, Bowron Lake Park

Food	Occurrence in observation	% occurrence in observations	Occurrence as principal food	% occurrence as principal food
<i>Equisetum fluviatile</i>	35	56.0	25	39.5
<i>Sparganium</i> spp.	28	42.4	18	25.7
<i>Potamogeton</i> spp.	24	36.4	16	24.2
<i>Carex</i> spp.	7	10.6	0	
<i>Menyanthes trifoliata</i>	5	7.6	5	7.6
<i>Salix</i> spp.	4	6.0	0	
<i>Ranunculus</i> sp.	2	3.0	0	
<i>Potentilla palustris</i>	2	3.0	0	
Characeae	1	1.5	1	1.5
<i>Lobelia</i> sp.	1	1.5	1	1.5
<i>Cornus stolonifera</i>	1	1.5	0	
Totals	110		66	100.0

## RESULTS

A total of 66 observations was made in which the major food or foods were identified. This covered a period of eleven feeding hours and approximately 20 different moose were involved.

The most important food was swamp horsetail (Table 1). It occurred in over half of the observations and was the major food in almost 40%. Murie (1934) and Shelford and Olsen (1935) noted that horsetail was an important aquatic food.

Moose feeding on horsetail grazed the stems from a few inches above the water to a few inches below. Usually the plants were chewed off at the surface, and about 6 - 12" of stem was eaten.

De Vos (1958) found that horsetail was eaten until mid-June and suggested that palatability may decrease after this time. No decrease in use was noted in the study through July to mid-August. By then, 90% or more of the tops had been grazed over large areas.

Bur-reed was recorded as the second major food item although species were not identified as few of the plants were in fruit. Use of bur-reed by moose has been recorded in Alaska (Palmer 1933), in Ontario (Peterson 1955, by Cringan in De Vos 1958 study). In Wells Gray Park, British Columbia, it is the chief aquatic food.

McCabe and McCabe (1928) stated that 'a sedge of a more fleshy type, with a triangular stem, is an autumn delicacy' in their study of the Bowron Lake moose. This 'sedge' was described as having its leaves flat and growing along the surface of the water for a foot or more. They examined stomachs crammed with this material. We believe this to be a species of bur-reed rather than a sedge.

Two methods of feeding on this plant were observed. Usually, moose walked or swam about, picking up mouthfuls of floating leaves. Alternatively, the head was submerged to just below eye level with leaves, stems, and sometimes roots being eaten. No noticeable depletion of bur-reed beds occurred through the study period.

Use of several species of pondweed was recorded: *Potamogeton richardsonii*, *P. robinsii*, *P. gramineus*, *P. natans*, and *P. amplifolius*, in order of occurrence. Other narrow-leaved pondweeds were eaten, but not positively identified. Although it would be difficult to determine the preference for the various species, it appeared that *P. robinsii* and *P. richardsonii* were taken more frequently, in relation to their abundance, than the others. De Vos (1958) records use of seven species of pondweed in Ontario, four of which were eaten in this study.

In 12 of 20 observations, moose feed with the head more or less completely under water to obtain pondweeds. Diving was observed twice. The plants involved in surface feeding were often those washed up along the shore by storms after being cut loose by outboard motors or feeding moose. The pondweeds showed no evidence of being depleted by heavy feeding.

Pondweed use might have been heavier in the absence of tourist traffic. The main travel route for boats dissected some of the better pondweed areas.

The occurrence of all other foods as major items in the diet totaled approximately 10%. Some of these may be classified as semi-aquatics but we have preferred to use the definition of Fassett (1957) for an aquatic: 'a plant that may, under normal conditions, germinate and grow with at least its base in the water and is large enough to be seen by the naked eye.'

The water line on feeding moose was recorded in each observation. The observations (Table 2) showed that adults tended to feed in deeper water than yearlings, and that calves fed only in shallow water. However, yearlings were often seen swimming, and calves were seen swimming on occasion. This suggests that deep water feeding is probably learned after the ability to swim. Observations in Wells Gray Park substantiate these findings.

There were insufficient data to evaluate the influence of climatic factors on aquatic feeding. The situation further defied statistical analysis because disturbances by boaters were more numerous on hot, clear days. De Vos (1958) saw more moose along lakes in Ontario during clear periods than during light rains. We believe that deep water feeding occurs more frequently on hot days and that flies may induce moose to use deeper water. On several occasions, moose were seen shaking their heads with lowered ears when they lifted their heads from the water. The flies which attacked the exposed heads appeared to be large tabanids.

The nutritive value of aquatic plants eaten by moose has not been examined. However, almost all moose observed in this study were in good condition by the end of summer. As aquatic plants appeared so frequently in our observations, we believe that they form the bulk of the summer diet (although examination of the periphery of the study area showed that moose ate considerable portions of browse in the form of deciduous leaves). We further believe the nutritional state of

moose in this region by summer's end must depend, to a large part, on their intake of aquatic plants.

TABLE 2: Observed waterline on feeding moose

Age	Feet to hocks		Hocks to belly		Belly to back	
	# of observations	% of observations	# of observations	% of observations	# of observations	% of observations
Adults	24	49	15	31	10	20
Yearlings	14	93	1	7	--	--
Calves	3	100	--	--	--	--
All moose	41	61	16	24	10	15

### SUMMARY

Observations of moose summering on the lakes and rivers of Bowron Lake Park showed their distribution to depend on lakes with relatively shallow, warm water. Plants of three genera: *Equisetum*, *Sparganium*, and *Potamogeton* were the most important food. Adult moose fed more frequently in deep water than did yearlings. Calves did not feed in deep water. A high percentage of available horsetail tips were browsed but no depletion of other important foods was noted. The moose appeared to be in a good state of nutrition after summering for a large part on aquatic vegetation.

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