

## Diving by wintering puddle ducks

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Foraging dives by surface-feeding ducks have been reported in several species of waterfowl (Kear & Johnsgard, 1968), and occur much more frequently than is generally appreciated (Johnsgard, 1968), although there is little precise information published on this type of behaviour, nor on the extent to which it occurs under natural conditions.

This note describes the diving behaviour and ability of three species of puddle (dabbling) ducks wintering in the vicinity of Montreal and discusses its importance to ducks wintering in harsh conditions.

Data were collected by observation from vantage points while doing winter surveys. Spotting scope with oculars varying from 15x to 40x and stopwatches were used to register diving times of waterfowl. Observations on times of dives were made over a two-day period at the end of February 1974. General observations were made throughout the winters of 1971–1974.

Lake St. Louis, an enlargement of the St. Lawrence River near Montreal, possesses several areas of rapid flowing waters that are free of ice throughout winter. Despite the severity of the winter, this locality represents an important wintering ground for waterfowl in Quebec (Reed & Bourget, in press). During the day, puddle ducks tend to congregate on choice feeding grounds in shallow water, particularly in or near the Lachine rapids. Diving ducks are scattered in small feeding groups over the open water.

Shallow water areas are particularly liable to freeze over during cold spells, rendering the typical dabbling duck feeding areas unusable. Loss of feeding areas at a time when weather conditions are especially severe makes existence precarious for the dabblers; death from starvation and/or exposure has been

noted amongst surface-feeding ducks in the Lachine area quite frequently (A. Reed, pers. comm.) and a severe die-off occurred in 1967 (Reed, 1967).

### Results and discussion

An inventory conducted on Lake St. Louis in February 1974 revealed the presence of a population of about 400 puddle ducks, principally Black Ducks *Anas rubripes*, with a few Mallard *Anas platyrhynchos* and Pintail *Anas acuta*. These three species were observed repeatedly from late January to late March to dive to obtain food.

The ranges and means of diving times for the three species were similar (Table 1), although the mean duration for the Black Duck was significantly less than that for the Pintail and Mallard ( $P \leq 0.05$ ). Both males and females of each species were seen diving, but no significant difference between the sexes in frequency and duration of dives, as well as depth of the area exploited was evident. Such differences have never been investigated in puddle ducks, although Willi (1970) reported differential feeding patterns and amount of feeding by two types of partial immersion (upending) in male and female Green-winged Teal *Anas crecca*.

The differences in diving times between these three species may be related to physiology: Olney (1963) suggested that differences in the length of time for which surface-feeding ducks can maintain their heads under water could be related to specific differences in respiratory and circulatory adaptations, with particular reference to apnoea, the cessation of respiratory movements. Table 2 is an assembly of published informa-

Table 1. Foraging diving times by wintering surface-feeding ducks near Montreal, Quebec, late February 1974.

Species	No. of dives observed	Range of diving time (sec.)	Mean diving time (sec.)	S.D.
Black Duck	229	2–10	4.9	1.30
Mallard	154	2–9	5.2	1.51
Pintail	149	2–10	5.4	1.45

**Table 2. Published information on duration of feeding dives by Mallard and Pintail and of the period in which the head can be kept wholly submerged while feeding by tilting.**

Species	Range of diving time (sec.)	Time of head submergence (sec.)	Source
Mallard	6-10, in 1-2 m	4.2-5.8	Sziji, 1965
Pintail	up to 10	4.8-6.2	Chapman, King and Webb, 1959; Sziji, 1965

tion on duration of feeding dives and head immersion for these species. The performance of the ducks in the Lachine area is consistent with that noticed elsewhere, although the occurrence of dives as brief as two seconds is unusual.

It is perhaps worth remarking that 10 seconds does not represent an upper limit on the time that *Anas* sp. can remain submerged. As Oring (1964) remarked, referring to American Wigeon *A. americana* and Gadwall *A. strepera*, if alarmed while flightless, puddle ducks often dive and individuals can remain under water for 30 seconds or more, often travelling considerable distances while doing so.

The depth of water in the feeding area was not measured directly. The area was also heavily used by American Goldeneyes *Bucephala clangula*: the mean duration of 114 dives by them was 20.46 seconds. Dewar (1924) found that the Goldeneye conformed well to his 20:10 second rule, an empirical relationship between dive times and depths, in which the average duration of dives at one fathom was found to be 20 seconds, with an additional ten seconds for each subsequent fathom. Thus it seems probable that the puddle ducks were diving in about 2 m of water at Lachine. The brevity of their dives suggests that they were spending little if any time at the bottom, but like coots *Fulica* sp. were collecting material instantly for sorting and eating at the surface.

When diving for food, the puddle ducks formed a very tight oblong-shaped group facing the current, and produced a small splash when disappearing under the surface. When one or two individuals began diving, all the members of the raft soon followed with frantic diving. This 'contagious' feeding behaviour usually continued for several minutes. The birds appeared to feed on vegetation, several individuals being seen to bring plant remnants to the surface where they sorted and ate them.

Throughout the winter of 1973-1974,

Black Ducks, Mallards and Pintails associated regularly with Goldeneyes in the Lachine rapids area. Mendall (1949) reported the association of Black Ducks and diving ducks in Maine. He indicated that roots and tubers became available to Black Ducks after having been dislodged by the divers. In the winter of 1970-1971 on the St. John's River, New Brunswick, the senior author observed a Black Duck apparently attempting to usurp food from Goldeneyes when they had surfaced from forage dives. However, in the present investigation no evidence of dabbling ducks obtaining advantages by associating with divers was obtained; the association resulted from the freezing over of the typical shallow water feeding areas of the dabblers which prompted them to exploit the deeper water diving duck habitat.

This behaviour trait is probably very important for puddle ducks wintering in cold regions like Quebec, where shallow feeding ground may become temporarily unexploitable during cold spells. Although this foraging technique may be inefficient for ducks adapted to surface feeding, it may contribute to the survival of individuals which otherwise would have succumbed under these severe conditions.

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#### Summary

Observation of foraging dives by Black Ducks *Anas rubripes*, Mallard *A. platyrhynchos* and Pintail *A. acuta*, were made during the 1973-1974 winter near Montreal, Quebec. Mean duration diving times from Pintail (5.4 sec) and Mallard (5.2 sec) were significantly longer than for the Black Duck (4.9 sec). This type of feeding behaviour by puddle ducks followed temporary loss of shallow-water feeding areas during cold spells.

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A male Red-crested Pochard *Netta rufina* in the rain (Brian Crosby).

