A note on the food consumption of the Red-breasted Merganser

K. M. ATKINSON and D. P. HEWITT

Introduction

For two consecutive years attempts were made to hatch and rear Red-breasted Mergansers *Mergus serrator*. Mergansers are normally only present on Windermere during the breeding season, the males leave once the clutches of eggs are complete. Most ducklings hatch in July at which time shoals of young perch *Perca fluviatilis* are seen in the shallows around the lake edge. For many years the fish of Windermere have been studied, particular attention being paid to fluctuations in numbers and mortality. As the young Mergansers are thought to feed on the young perch it was decided to investigate possible fish consumption by the ducklings.

Previous work (Aass 1956; Mills 1962) based on stomach contents of shot adults shows that Red-breasted Mergansers are voracious feeders and that they will eat a wide range of fish species. These studies, however, are not suitable for estimating the amount of fish eaten by ducklings.

Methods

Hatching and rearing

In both 1973 and 1974 clutches of eggs were incubated at 39°C until hatching. The ducklings were allowed to dry in the incubator and were then transferred to a run under a laboratory bench. This run was heated by a 300 watt infra-red bulb and always contained a bath of clean water.

Two eggs hatched in 1973, one on 12th July, the other on 13th July. Of these the younger died, without having eaten voluntarily, on 18th July. From the time they were placed in the run live *Gammarus*, small O+ class perch and small strips of perch were provided. (O+ class perch are those under 1 year of age.) The duckling that survived ate one *Gammarus* on 14th July and on that day and the following, it caught and killed several O+ perch (0·5 g) but did not eat any of them. It was hand fed with 22 dead decapitated O+ perch on the 15th July and from then on ate steadily. This duckling was kept in the laboratory until day 20 when it was placed daily in an outside run which enclosed part of the lake shore. It was brought in each night until day 50. It was then left outside until the experiment was terminated on day 57.

Three eggs hatched in 1974, all on 10th July. In the previous year feeding the single duckling had proved extremely difficult because of the numbers of fish (>200) required each day. It was decided that it was not practicable to feed three ducklings on fish and that another food source would have to be used. From the time they were placed in the run under the laboratory bench these ducklings were provided with live *Gammarus* and the smallest size of Beta trout pellets (Cooper Nutrition Products Ltd; composition: Oil 4·5%; Protein 41·0%; Fibre 4·5%; Ash 13·0%; Moisture 10%; Carbohydrate 27·0%). Pellets were floated on the water bath and the ducklings started to feed on them on 12th July. Unfortunately the pellets sank rapidly and the ducklings then showed no interest in them. A few dry pellets were provided and the ducklings ate these, so from 16th July only dry pellets were given to the ducklings.

The three ducklings were kept in the laboratory until day 28 when they were moved to an unheated wooden hut. They were provided with a tank of water large enough for swimming and diving and a large wooden box on which they roosted.

On day 86 the ducklings were again moved, this time to an outside enclosure made from a disused concrete fish pond roofed with wire-netting and partially covered with polythene in order to keep the food dry. The pond leaked too much to allow it to be flooded permanently so the tank and box from the hut were also used in this enclosure.

Growth

Growth was measured by weight changes in the birds. The 1973 duckling was weighed irregularly while the number of fish provided each day was noted. The three 1974 ducklings were weighed each day for the first ten days then every second day until they were put outside, from then they were weighed once a week. The weight of food eaten was calculated daily.

In order that the weight of fish consumed in 1973 could be compared with the weight of dry pellets eaten in 1974 the latter were converted to a wet weight. In O+ perch used in this study the average water content was equivalent to 80% of the body wet weight,

Wildfowl 29 (1978): 87–91

whereas the water content of the dry pellets was equivalent to only 10% of the pellet weight.

The conversion ratios for the two years was calculated using the formula

$$\text{Conversion ratio} = \frac{\text{weight gained}}{\text{weight food eaten}} \times 100$$

Results

Growth

Similar growth curves were obtained each year (Figure 1). Ducklings 1, 2, and 4 were male and reached a greater final weight than duckling 3 which was female.

Published adult weights for Red-breasted Mergansers are 950–1,350 g (♂) and 700–1,100 g (♀) (Geroudet 1959). The 1973 duckling did not reach this weight during the time of the experiment, but at age 17 months after being kept for a year at the Wildfowl Trust, Slimbridge, it weighed 1,070 gm. It was then in full adult male plumage. The 1974 ducklings reached the lower limits of the weight range and the maximum weight of the female, 693 g, falls within the weight range of 644–760 g for juvenile females approximately 8 months old (Dementiev & Gladkov 1952).

Conversion ratios

The conversion ratio shown in Figure 2 is that of bird No. 4 but it is typical of all the ratios obtained in 1974. Up to day 10 the 1974 ratios were higher than that of 1973, but after this time the ratios were similar. Up to day 10 the conversion ratios varied between 15 and 20, but after this they dropped steadily until they reached a value of about 1 at day 50. From this time onwards the conversion ratios remained steady unless the birds were disturbed sufficiently to stop or reduce their eating, when the ratio became negative.

Food consumption

This was similar in both years, although the amount consumed in 1973 dropped after day 40 as a result of difficulties in supplying sufficient fish.

During 1974 food was provided on an *ad libitum* basis; nevertheless food consumption dropped dramatically on several occasions. These drops always coincided with some unusual occurrence in the birds' environment. On two occasions there were severe storms and once the compound flooded.

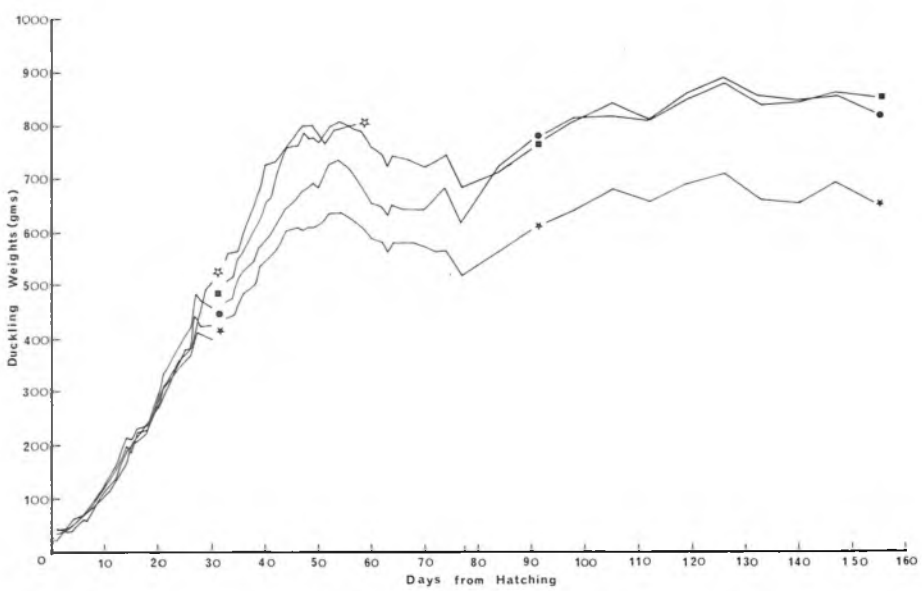


Figure 1. Growth curve for all ducklings reared

☼ bird 1 1973 ♂; ● bird 2 1974 ♂; ★ bird 3 1974 ♀; ■ bird 4 1974 ♂.

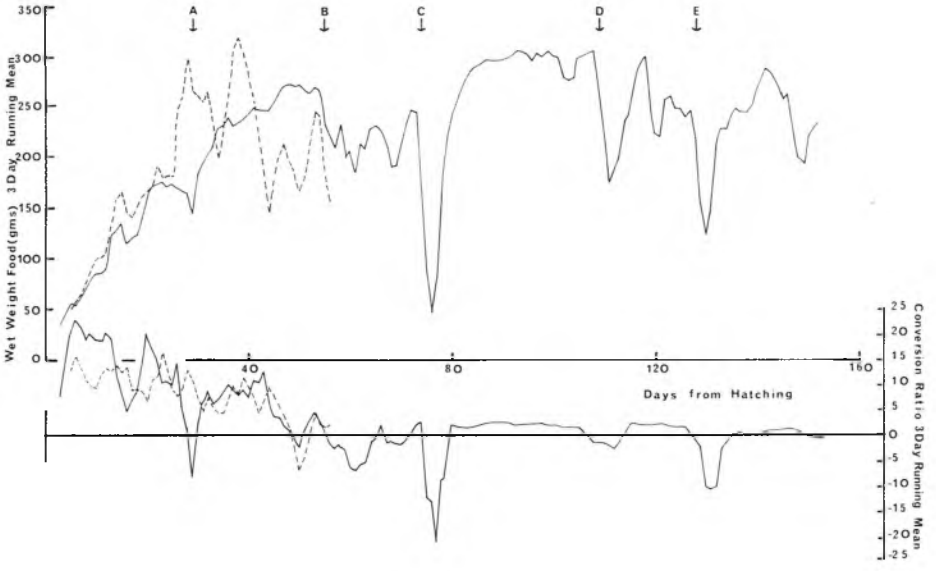


Figure 2. Wet weight of food eaten and conversion ratios for 1973 (- - -) **and 1974** (—), **both expressed as 3 day running means for ease of presentation.** The 1974 conversion ratio is that of bird 4 but is typical of the year. A. 1974 birds moved to hut; B. 1974 start of week's disturbance in hut; C. 1974 birds moved to outside enclosure immediately before severe storm; D. 1974 storm; E. 1974 compound flooded.

Discussion

The feeding methods were very different in the two years but the growth of the ducklings fed on the artificial food was the same as the duckling fed on fish. The conversion ratios over the two years were also similar.

In experiments with Black Ducks *Anas rubripes* and American Coots *Fulica americana*, Penney & Bailey (1970) found that the conversion ratio shown by their ducks varied little between groups of two and groups of four, but the amount of food eaten and the growth rate did vary. Birds in groups of four ate more and put on more weight than in groups of two. This was thought to be caused by social facilitation, more stimulation to feed being provided in groups of four. The 1974 growth curves in our experiments also suggest that social facilitation occurred as the curves all rise and fall together. However, the growth rate for the two years is similar. Although mutual stimulation can induce communal feeding, the same mutual stimulation may cause the ducks to leave the food and return to the water where they spend most of their time.

The *ad libitum* feeding compared with the fixed feeding resulted in only a small difference in food consumption until circumstances forced a reduction in the fish supply. It seems that the amount of food eaten during the experiment was that required for optimum growth under the conditions provided. As both food and heating were provided the conditions were more favourable than those encountered in the wild. To grow at the rate of the experimental ducks a bird in the wild would probably have to consume more food to provide the extra energy necessary for heat maintenance and finding food.

In experiments with captive Lesser Scaup *Aythya affinis* from hatching to 12 weeks old, Sugden & Harris (1972) found that for the first five weeks ducklings kept indoors grew at the same rate as those kept outdoors or in the wild. However, at a critical period at age 6–9 weeks, due to stress of feathering just before flying, weight losses, usually small, occurred in birds kept indoors whilst those kept outdoors continued to increase in weight. A drop in weight also occurred in our 1974 Merganser ducklings at about the 8th week. Unfortunately it is not clear if this drop was the result of feathering stress, because it coincided with a disturbance in the hut which lasted for one week. During this time food consumption was reduced. After

the birds had been moved outside there was a marked increase in both their food consumption and body weight, which was probably the result of the more rigorous conditions encountered in the outside enclosure.

Table 1 shows the cumulative weight of food consumed by the experimental birds. Using a regression of O+ perch weights and lengths, and knowing the growth rate, the equivalent of the food weights in O+ perch can be calculated.

White (1957) kept three American Mergansers *Mergus merganser americanus* for a year and noted their food consumption. Over the first sixty days the American Mergansers ate 11 kilos of fish compared with 10·7 (1973) and 10·4 (1974) for our Mergansers, and over 120 days 32·4 kilos compared with 25·3 kilos. The American Merganser is a larger species (about 1½ times heavier) so that the figures obtained for food consumption of the two species compare well. The American Mergansers, as immature birds from November to June, consumed an average of 310 g food per day which is 27·8% of their mean body weight. This is a much lower figure than that for another tame male bird, which during 19 days in November consumed 447·6 g fish per day, 38·5% of its own body weight.

During 33 days in November and December the Red-breasted Merganser consumed 235 g food per day, 29·4% of their mean body weight during the same period. These figures are higher than those of Miller (1973) who found that to maintain constant body weight of two captured immature male American Mergansers, 286 g fish per day were needed, 22·5% of body weight. Latta and Sharkey (1966) maintained three captured female immature American Mergansers for an average of 50 days with 179·9 g fish per day, 19% of their mean body weight, while adult birds kept for an average of 63 days consumed 18–27% body weight of fish per day.

Miller found that there was a drop of 14–24% in body weight of the American Mergansers immediately after capture and this loss was not regained. The quoted food consumption was that required to maintain this lower body weight. Latta and Sharkey noted a similar drop in body weight of 11–18% of the adult birds on capture but not in the immature birds where only one showed a drop in weight.

Although there is a good correlation between the food consumption of the two species when raised in captivity the Red-breasted Merganser observations ended at day 153 and so it is not possible to make direct comparisons with the American Mergansers of Miller and Latta and Sharkey which were captured as immature or adult birds and then kept in captivity during their experiments.

Normally Red-breasted Mergansers are present on Windermere only during the summer time. A bird which hatches in July will leave in October about 100 days later. During this time one of the experimental ducks would have eaten 20·14 kilos of food. Between 1970 and 1975 there was an average of 131 ducklings per year reared on

Table 1. Weight of food eaten and its equivalent in numbers of 0+ perch for 1973 and 1974.

	1973 Cumulative		1974 Cumulative	
Day	Wet weight food (g)	Equivalent Nos. 0+ perch	Wet weight food (g)	Equivalent Nos. 0+ perch
20	1,901	2,676	1,704	2,434
40	6,784	7,003	5,491	6,113
57*	10,003	9,468	9,797	9,063
60	10,659†	9,613†	10,391	9,418
80			14,263	11,467
100			20,136	14,012
120			25,337	15,940
140			29,896	17,408
153			33,081	18,336

* Last day of 1973 experiment.
† Estimated.

the lake. If these birds ate the same amount of food as the experimental ducklings it is estimated that they would have consumed 2,638 kilos (2·6 tonnes) of fish per summer.

The results obtained in this experiment are not strictly applicable to natural conditions. The conditions under which the birds were reared were optimal for growth but are likely to give a minimum requirement for food.

Summary

In 1973 one Red-breasted Merganser *Mergus serrator* was hatched and reared for 57 days. In 1974 three birds were hatched and reared for 153 days. Growth and food consumption were monitored. It was estimated that the average summer population of young mergansers on Windermere would consume 2·6 tonnes of fish per year.

References

Aass, P. 1956. Sil-andens naering i ferskvann. *Norg. Jeger-og Fisk Forb.* 85: 8–14.

Dementiev, G. P. & Gladkov, N. A. 1952. *Birds of the Soviet Union* Vol. 4. Moscow.

Geroudet, P. 1959. Les Palmipedes. English translation (1965) London: Blandford Press.

Latta, W. C. & Sharkey, R. F. 1966. Feeding behaviour of the American Merganser in captivity. *J. Wildl. Mgmt.* 30: 17–23.

Miller, S. W. 1973. Predation by the common merganser in a warm water reservoir. *Q. Rep. Okla. Coop. Wildl. Res. Unit* 26: 14–20.

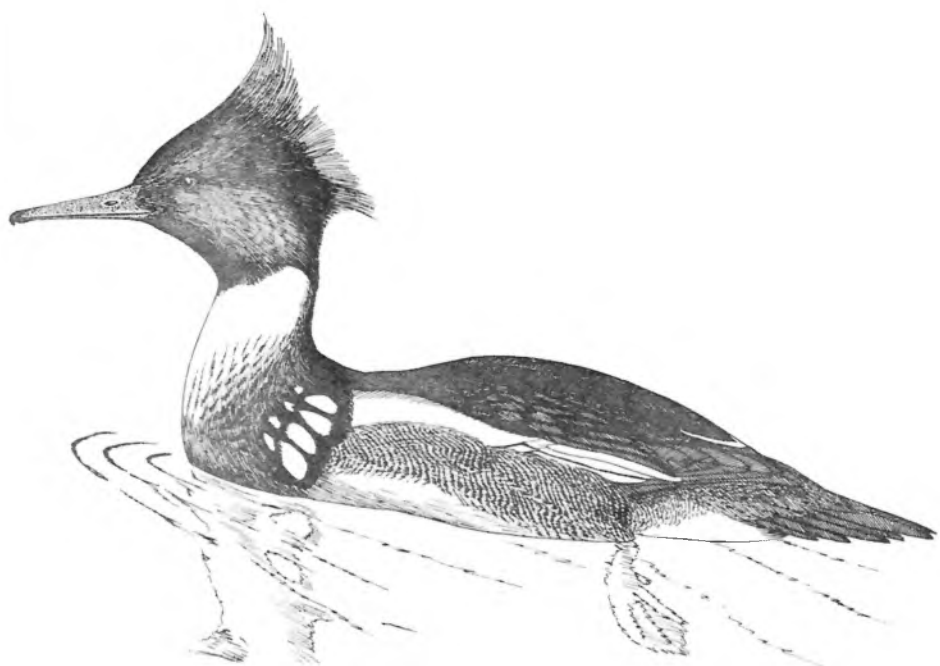
Mills, D. H. 1962. The Goosander and Red-breasted Merganser as predators of salmon in Scottish waters. *Freshwat. Salm. Fish. Res.* No. 29. 10 pp.

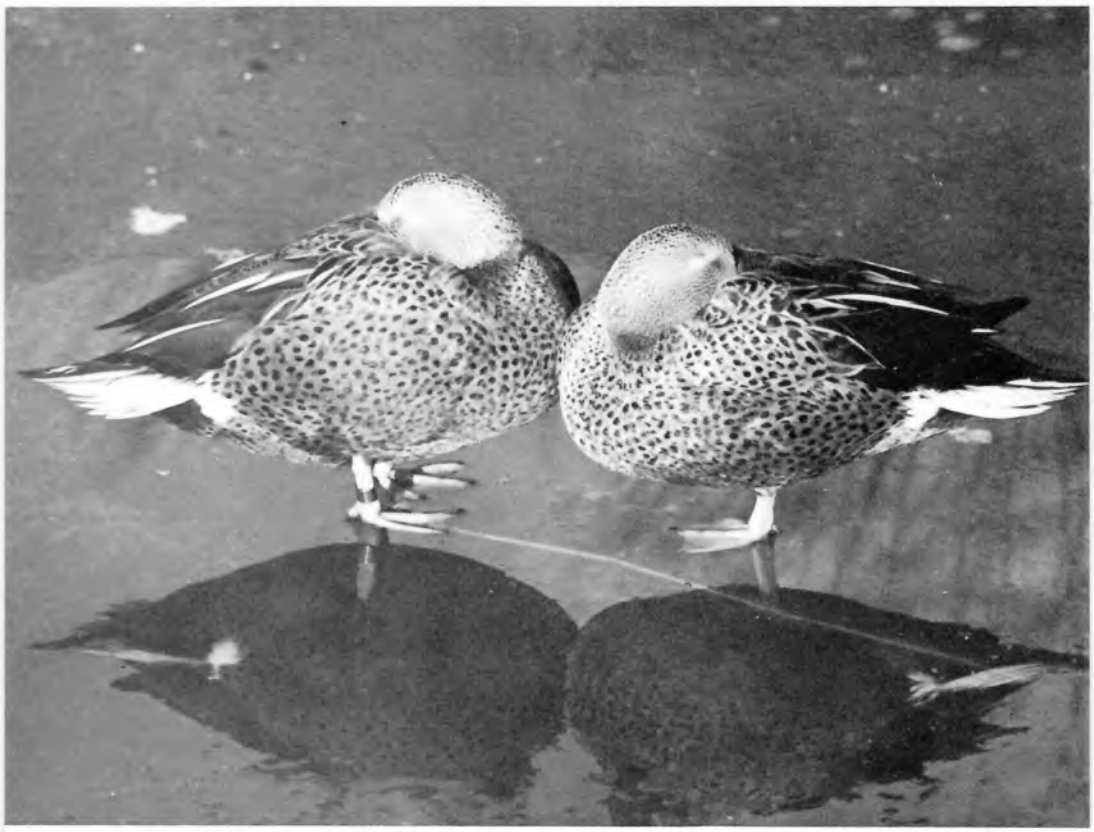
Penney, J. G. & Bailey, E. D. 1970. Comparison of the energy requirements of fledgling Black Ducks and American Coots. *J. Wildl. Mgmt.* 34: 105–14.

Sugden, L. G. & Harris, L. E. 1972. Energy requirements and growth of captive Lesser Scaup. *Poult. Sci.* 51: 625–33.

White, H. C. 1957. Food and natural history of Mergansers on salmon waters in the Maritime Provinces of Canada. *Bull. Fish. Res. Bd. Can.* 116. 63 pp.

Miss K. M. Atkinson and Miss D. P. Hewitt, Freshwater Biological Association, Windermere Laboratory, Ambleside, England.





Sleeping ducks. Above: Argentine Red Shovelers *Anas platalea* on ice. Below: two male Mandarins *Aix galericulata* on land. (*Philippa Scott*)