Food of ducklings of surface feeding ducks at Lake Mývatn, Iceland

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The composition of the diets of small to slightly more than half-grown ducklings of *Anas platyrhynchos* (n=16), *A. crecca* (10), *A. penelope* (16), and *A. strepera* (1), all obtained in Lake Mývatn, NE Iceland, were studied by means of stomach (oesophagus) analyses. By wet weight plant food comprised 80 %, 71 %, and 88 % in *platyrhynchos, crecca,* and *penelope,* respectively. Practically all plant food consisted of seeds; chiefly of *Carex, Sparganium, Hippuris,* and *Scirpus.* Animal food such as adult insects (Diptera, Chironomidae and Simuliidae) was presumably of great importance despite the relatively low values in terms of per cent by wet weight. The small differences in the composition of diets between the *Anas* ducklings are presumably due mainly to differences in habitat selection. No seasonal changes in the dietary composition could be detected, probably due to the small sizes of the samples. The food segregation between ducklings of surface feeding and diving ducks is discussed.

1. Introduction

Most studies of the food of ducks are concerned with conditions outside the breeding season. This is undoubtedly mainly because it is so much easier to obtain ducks for stomach analyses during the shooting season than at the breeding grounds. Extensive studies of the food of breeding ducks are still relatively few in Europe. Especially the food requirements of ducklings are incompletely known even for some of the commonest species of ducks. Today there is an increasing demand for such information because of the increased interest in wildfowl conservation and restoration of duck habitats.

For several years I studied the food and feeding ecology of the diving ducks breeding at Lake Mývatn in northeastern Iceland (BENGTSON 1971 a). The study was based on stomach analyses of adult and young diving ducks that had been drowned in fishing-nets in the lake. The present paper describes the results of analyses of a small number of young of the Mallard *Anas platyrhynchos,* Teal *A. crecca,* Gadwall *A. strepera,* and Wigeon *A. penelope* that were obtained during the course of the above-mentioned study.

The general features, breeding duck populations, and food resources of Lake Mývatn have previously been described (BENGTSON 1970, 1971 a, and 1972).

Material and methods

The material comprises 16 Mallard, 10 Teal, 1 Gadwall, and 16 Wigeon; all ducklings ranging in size from small to slightly more than half-grown. They were all obtained between July 6 and August 23 in 1968—70. The entire bird or the food material was immediately placed in deep-freeze or ethanol alcohol in order to prevent post-mortem digestion. Birds kept in deep-freeze were analysed within three months. Only the content of the oesophagus has been used for the analyses since the con-

tent of the gizzard to a large extent reflects only the digestibility of different food items (see DILLON 1958, BARTONEK and HICKEY 1969, SWANSON and BARTONEK 1970 and BENGTSON 1971 a). In order not to overemphasise the importance of some heavy or bulky types of food I have preferred to give the number of different food items together with frequency (constancy) values. Per cent by wet weight (samples were allowed to dry on a filter paper before weighing) has been used only to indicate the proportions between animal and plant food.

Results

The oseophagus contents of the ducklings of Mallard, Teal, and Wigeon are given in Table 1. The oesophagus of one small duckling of Gadwall contained 43 adult Diptera (chiefly chironomids), 846 seeds of *Carex*, and 727 seeds of *Sparganium*.

Plant food comprised about 80 % by wet weight of the total amount of food found in the Mallards. Most of the food consisted of seeds of *Sparganium* (chiefly eaten by the larger ducklings) and of *Carex* and *Hippuris* (almost entirely eaten by the smaller ducklings). Two of the larger ducklings had consumed a considerable amount of seeds of graminids and some spikes and bulbils of *Polygonum viviparum*. The animal food (about 20 % by weight) was dominated by Diptera and nearly all birds had eaten adult chironomids. Two of the larger ducklings that had been drowned in fishing-nets had consumed a fair amount of pond snails *Lymnaea* and also contained traces of the algae *Nostoc* and single specimens of the bivalv *Pisidium* and Trichoptera (larvae).

TABLE 1. Composition of diets (number of food items) of ducklings of *Anas* species in Lake Mývatn, Iceland, as obtained by stomach analyses. The percentages refer to wet weight and figures in brackets to constancy (=number).

Food item	*A. platyrhynchos* (n=16)	*A. crecca* (n=10)	*A. penelope* (n=16)
Animal food	20 %	29 %	12 %
Diptera (adult) [1]	193 (14)	395 (9)	262 (10)
» (larvae) [2]	19 (7)	—	—
Trichoptera (larvae)	1 (1)	—	—
Coleoptera (ad.)	—	—	12 (1)
Lymnaea (Mollusca)	191 (2)	—	—
Pisidium (Mollusca)	1 (1)	—	—
Plant food	80 %	71 %	88 %
(Seeds)			
Carex spp	33 (7)	49 (6)	420 (11)
Sparganium spp	2,163 (8)	—	207 (4)
Hippuris vulgaris	169 (6)	45 (6)	—
Scirpus sp	—	93 (6)	—
Menyanthes trifoliata	—	1 (1)	—
Potamogeton sp	—	1 (1)	—
Empetrum sp	1 (1)	9 (3)	4 (2)
Betula nana	—	—	3 (1)
Graminae	many (2)	—	310 (1)
Polygonum viviparum [3]	35 (2)	—	73 (5)
Nostoc (algae)	tr. (2)	—	—
Unidentified remains	tr. (16)	tr. (10)	tr. (16)

[1] Chiefly Chironomidae and Simuliidae
[2] Chironomidae
[3] Spikes and bulbils

In the Teal, the plant food comprised about 71 % by wet weight. Again, seeds dominated and both by quantity and constancy *Scirpus, Carex,* and *Hippuris* seemed to be the most important plant food. Three of the larger ducklings had eaten seeds of *Empetrum* and single seeds of *Potamogeton* and *Menyanthes* were found in one oesophagus each. Nine of the ducklings had consumed a considerable number of adult Diptera; most of which were simuliids.

The food of the Wigeon consisted, by wet weight, of about 88 % plant food. The dominant seeds were *Carex* and *Sparganium;* the latter being eaten only by the smaller ducklings and the former being the most frequently eaten. Seeds of *Empetrum, Betula nana,* and graminids were found in one or two of the birds. Five of the ducklings had consumed spikes and bulbils of *P. viviparum.* The majority of the samples contained a fairly large number of adult Diptera (chiefly chironomids). One, slightly less than halfgrown, young had consumed 12 adult Coleoptera.

Discussion

Ducklings of all three species (i.e. Mallard, Teal, and Wigeon) investigated had been feeding predominantly on plant material (71—88 % by wet weight). Nevertheless, animal food is presumably also a very important food requirement since most of the oesophagus samples contained a considerable number of adult insects; chiefly chironomids and simuliids. Bottom living invertebrates and subaquatic plants (e.g. larvae of chironomids, molluscs, *Nostoc,* and *Potamogeton)* were little utilized, although on a few occasions they occurred in large quantity (e.g. *Lymnaea* in two Mallards). The bulk of the plant material consisted of seeds of *Carex, Sparganium,* and *Hippuris.* Seeds of graminids were found on several occasions and spikes and bulbils of *P. viviparum* seem to be a favoured food resource as indicated by the analyses and direct field-observations.

Ducklings of the diving ducks at Lake Mývatn also take a considerable amount of plant material although again, animal food (adult insects and larvae of chironomids) presumably is of great importance (BENGTSON 1971 a). In the young of the diving ducks the proportion of animal food in the diet usually increases with the age (BENGTSON op.cit.). No such shifts in the composition of the diets of *Anas* ducklings at Mývatn could be detected. However, this is probably due to the small samples since in North America surface feeding ducks (e.g. Mallard and American Wigeon *Anas americana)* ate progressively more plant food as they became older (MUNRO 1949, CHURA 1961, and BARTONEK 1972).

The diets of the Mallard and Wigeon differed little from each other, except that the former had often eaten *Hippuris* and sometimes bottom living invertebrates. The diet of the Teal differed slightly in that no *Sparganium* had been consumed but some *Scirpus.* These differences between the species (which would probably be more pronounced had the material been larger) probably reflect specific differences in habitat selection of the broods. The Teal favours small ponds and potholes with a vegetation including *Hippuris, Menyanthes,* and *Scirpus,* whereas the Wigeon frequents open water and feeds along reeds of *Carex,* and the Mallard is somewhat intermediate (BENGTSON 1971 b).

Ecological segregation in breeding ducks is incompletely understood. Generally speaking, adult diving ducks feed mainly on animal food (bottom living invertebrates) and adult surface feeding ducks on plant material al-

though they also eat insects, Cladocera etc. The food segregation in small ducklings of the two types of ducks is less clear. Both feed on seeds and insects (adult and larvae). At Lake Mývatn the insect food is basically the same (chironomids and simuliids) although the diving ducks take more larvae. As to the seeds there is a considerable overlap (e.g. *Carex* and *Hippuris)* but the ducklings of the diving ducks eat more *Potamogeton* and, when they grow bigger, *Batrachium trichophyllum* which was not recorded in the *Anas* ducklings. The surface feeders, on the other hand, ate plenty of *Sparganium* and *Scirpus* (in the Teal) which were rarely found in the diving ducks (BENGTSON 1971 a). Larger samples of the *Anas* species would probably also indicate seasonal changes in the abundance/availability of the seeds of various species.

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Selostus: **Puolisukeltajasorsien poikaskauden ravinnosta Mývatn-järvellä Islannissa.**

Ruokavalion koostumusta sinisorsan (n=16), tavin (10), haapanan (16) ja harmaasorsan (1) pienillä — puolikasvuisilla poikasilla tutkittiin mahanäytteiden perusteella Islannin Mývatn-järvellä. Taulukossa 1 on esitetty kustakin ravintokohteesta näytteissä todettu kokonaismäärä (eläimistä yksilömäärä, kasveista siementen lukumäärä); sulkeissa on mainittu, monessako tutkituista näytteistä ko. ravintokohde esiintyi. Ravinnon tuorepainosta oli kasvien osuus sinisorsalla 80, tavilla 71 ja haapanalla 80 %. Lähes kaikki kasviravinto käsitti siemeniä, pääasiassa *Carex-, Sparganium-, Hippuris-* ja *Scirpus*-suvun lajien. Eläinravinnolla, kuten aikuisilla hyönteisillä (Diptera, Chironomidae ja Simuliidae), on ilmeisesti tärkeä merkitys huolimatta sen suhteellisen vähäisestä osuudesta tuorepainosta. Lajien väliset pienet erot ravinnon koostumuksessa johtunevat pääasiassa eroista niiden elinympäristössä. Ravinnossa ei todettu muutoksia poikasten kehityskauden aikana, mikä luultavasti johtui vain näytteiden pienestä määrästä. Lopuksi tarkastellaan eroja sukeltaja- ja puolisukeltajasorsien poikaskauden ravinnossa.

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