FOODS OF LESSER SCAUPS ON BREEDING, MIGRATION, AND WINTERING AREAS[1]

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Abstract: This food habits study was based on stomach contents of 164 lesser scaups (*Aythya affinis*): 39 from a breeding area in Manitoba, 88 from a fall concentration area on the Mississippi River in Illinois, and 37 from two wintering areas on the Louisiana coast. Animal foods made up the bulk of the diet of all three groups: 91.1 percent on the breeding area, 93.5 percent on the fall concentration area, and 63.7 percent on the wintering areas. The most important animal foods were amphipod crustaceans on the breeding area, molluscs on the fall concentration area, and fishes on the wintering areas. The percentages of animal foods are similar to those found in other recent investigations, but they differ from earlier findings which show the lesser scaup to be chiefly vegetarian. Additional collecting is needed, especially in early spring, for a more accurate picture of seasonal food habits but present information shows that lesser scaups feed chiefly, and sometimes almost exclusively, on animals most of the year. Animal foods decrease in the diet from summer to winter and probably reach a low point in late winter and early spring. Food habits data reflect the close relationship of the lesser and the greater scaup and show that they differ sharply from other North American members of their genus, which are chiefly vegetarians.

A general picture of the food habits of the lesser scaup was given by Cottam (1939:38–46) who presented data on 1,051 stomachs from various localities in North America and reviewed the findings of earlier investigators. Since then, additional information has been obtained from scaups collected along fall migration routes (Korschgen 1955, Anderson 1959) and on wintering areas (Cronan 1957, Harmon 1962), but little attention has been given to food habits on the breeding ground.

Munro (1941:134–137) reported the foods of 45 lesser scaups from British Columbia breeding areas. Cottam's (1939) data also included specimens from breeding areas but they were not discussed separately, except for 17 juveniles collected in western Canada. No information from other parts of the breeding range was found in the literature.

This paper reports the foods eaten by adult lesser scaups on a breeding area in southwestern Manitoba, a fall concentration area on the Mississippi River in Illinois, and two wintering areas in Louisiana. Comparisons are made with previously published studies.

Data from breeding and wintering areas were derived from 76 stomachs taken from specimens collected primarily for a study of the reproductive organs. Nineteen specimens in 1959 and 20 in 1960 were obtained in the pothole country around Erickson, Manitoba, during spring and summer. The other 37 were collected in marshes around Lake Borgne near New Orleans, Louisiana, in December, 1959 (20 specimens), and from roadside ditches and ponds near Grand Chenier, southwestern Louisiana, in late February and early March, 1960 (17 specimens). Data from the fall concentration area are based on 88 stomachs taken from lesser scaups shot by hunters at Keokuk Pool on the Mississippi River, Hancock County, Illinois, during fall, 1948.

Illinois specimens were provided by George C. Arthur, Illinois Department of Conservation, who generously contributed them to this study. The authors are in-

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METHODS

Stomachs for analysis were preserved in 10 percent formalin as soon as possible after collecting. The gizzards, proventriculi, and gullets were removed and saved as units for Manitoba and Louisiana birds, but gizzards only were saved for Illinois specimens.

In the laboratory the preserved stomach contents were emptied into a preparation dish to which water was added. Large and intact food items were removed and sorted with forceps. Macerated organic material was separated from the grit by vigorous stirring and decantation. By swirling the water and carefully manipulating the dish, most seeds were also segregated and decanted; the remaining few were removed with forceps. Gullets and proventriculi were examined separately from gizzards in order to determine the most recently ingested foods.

Food items, except seeds, were identified at the time of separation. Names of invertebrate animals were taken from Pennak (1953) and plant names from Fernald (1950). Macerated organic material was placed in a petri dish and examined under a binocular microscope. The proportions of various food items were estimated visually, as percentages of the volume of macerated materials. Food items and grit were then air-dried and stored in separate vials for volumetric measurements. Seeds were sorted and identified after drying.

Volumetric measurements of the dried food items were made to the nearest 0.05 cc in a graduated cylinder. Shrinkage, as a result of drying, was noted in a few test samples: about 70 percent by volume for tendipedid larvae, 50 percent for other invertebrates, and 20 percent for fish. Volumes of animal foods were not corrected for shrinkage so they should be regarded as minimal measurements. No shrinkage of plant foods was noted. Allowance was made for air spaces between irregularly shaped items like insects and crayfish by embedding them in dry sand. The volume of the sand was then subtracted from the total volume. Volumes for the various kinds of foods were totaled and expressed as percentages of the entire food content.

It is possible that in this, as in other food habits studies, plant and animal foods were identified in amounts disproportionate to what was consumed. Except in birds collected during or soon after feeding, soft plant foods may have digested more rapidly than hard seeds, insects, or molluscs. However, soft-bodied insect larvae, crustaceans, and other invertebrates also were subject to rapid loss in volume through digestion. It is assumed that losses were similar in both plant and animal materials and residues were representative of what was eaten.

RESULTS

The foods eaten by lesser scaups on breeding areas near Erickson, Manitoba, are shown in Table 1. Data for 1959 and 1960 were combined because the foods consumed did not differ significantly in these years. Animal material predominated in the diet, making up 91.1 percent of the identified organic matter. Plant material made up only a small proportion of the food but some was found in every stomach.

Crustaceans were the most important class of animals eaten, especially the amphi-

Table 1. Foods eaten by 39 adult lesser scaups in spring and summer, 1959 and 1960, on breeding areas near Erickson, Manitoba.

Foods	Percent Occurrence	Percent Volume
Animal Foods		
Crustacea		
Scuds (*Gammarus* spp.)	54	51.9
Water fleas (*Daphnia* spp.)	8	7.7
Other crustaceans	5	0.5
Insecta		
Midges (Tendipedidae)	36	10.2
Caddis flies (Lymnephilidae and Phryganeidae)	18	7.4
Dragonflies (Aeschnidae and Coenagrionidae)	8	1.4
Water boatmen (Corixidae)	38	1.3
Other insects (Ephemeroptera, Coleoptera, and unidentified fragments)	21	2.6
Annelida		
Leeches (Hirudinea)	18	5.3
Miscellaneous animal foods	23	2.8
Total Animal Foods	82	91.1
Plant Foods		
Miscellaneous plant fragments	51	2.6
Bulrushes (*Scirpus* spp.)	97	2.4
Pondweeds (*Potamogeton* spp.)	46	1.3
Water milfoils (*Myriophyllum* spp.)	67	0.9
Other seeds, each in small amount	79	0.6
Total Plant Foods	100	7.8
Unidentified organic matter	21	1.1
Total Food Volume = *125.8 cc*		100.0

pod *Gammarus* which made up more than one-half the total food. *Gammarus* was one of the most conspicuous invertebrates in potholes and lakes used by lesser scaups in the Erickson district. They were especially abundant in 1957 when they swarmed in shallow water at the pothole edges and were frequently seen clinging to the belly feathers of preening scaups. In 1959 and 1960 they were much scarcer but this study showed that they were an important food item. Munro (1941:137) also found that amphipods predominated in the food of lesser scaups in British Columbia nesting areas. Pending additional studies in other areas, amphipods must be regarded as one of the most important foods on the breeding ground.

Among the other crustaceans eaten, the most important was *Daphnia*. However, only three scaups had eaten these organisms and more than one-half the total volume was found in the stomach of one bird. This bird when collected was straining *Daphnia* from the surface of the water in company with several species of dabbling ducks. Lesser scaups seldom feed in this manner but several were doing so on this occasion.

Aquatic insects were also important foods and made up nearly one-fourth of the diet. About half of all the insects eaten were midge larvae and pupae (Tendipedidae). These probably were more abundant than *Gammarus* in the potholes, even in deep water where scaups fed. However, they may have been less conspicuous than *Gammarus*, thus accounting for their lower rank in the diet.

Crustaceans and insects made up 82.5 percent of the 1959 foods and 83.4 percent of the 1960 foods, thus showing both the importance of arthropods in the diet and

Table 2. Foods in 88 lesser scaups from Keokuk Pool, Hancock County, Illinois, 1948.

FOODS	PERCENT OCCURRENCE	PERCENT VOLUME
ANIMAL FOODS		
Gastropods		
Unclassified snails (Gastropoda)	46	28.0
Freshwater snails (*Campeloma* sp.)	22	15.4
Freshwater snails (*Amnicola* sp.)	30	13.7
Freshwater snails (*Somatogyrus* sp.)	8	5.5
Freshwater snails (*Lioplax* sp.)	6	4.1
Freshwater snails (*Pleurocera* sp.)	5	2.5
Freshwater snails (*Viviparus* sp.)	1	0.8
Land snail (*Polygyra* sp.)	1	0.1
Pelecypods		
Fingernail clams (*Sphaerium* sp.)	33	11.9
Mussel (*Unio* sp.)	3	2.9
Unclassified clams and mussels (Pelecypoda)	2	0.1
Insecta		
Mayflies (Ephemeridae)	15	7.8
Other insects (Coleoptera, Odonata, Corixidae)	5	0.1
Unclassified insects	5	0.1
Crustacea		
Crayfish (Cambarinae)	1	0.5
TOTAL ANIMAL FOODS	90	93.5
PLANT FOODS		
Pondweeds (*Potamogeton* spp.)	27	3.3
Bulrushes (*Scirpus* spp.)	26	2.9
Other seeds, each in small amount	26	0.2
Unclassified plant material	5	0.1
TOTAL PLANT FOODS	47	6.5
TOTAL FOOD VOLUME = *133.5 cc*		100.0

the similarity in food habits in the 2 years.

Table 2 shows the foods eaten by 88 lesser scaups collected at Keokuk Pool on the Mississippi River. The amount of food per stomach was about one-half that found in the others examined during this study, probably because gullets and proventriculi were not collected with the gizzards. The proportion of animal foods was 93.5 percent—the highest on record for the lesser scaup. The importance of molluscs is shown by the fact that they made up 85 percent of the diet. Most of the other animal foods consisted of aquatic insects, primarily mayflies. Crustacea, the most important food animals in Manitoba, were found in only one Illinois bird.

Anderson (1959:315–317) found nearly identical food proportions in the diet of lesser scaups collected along the Illinois and Mississippi rivers during 1938–40: 90.4 percent animal foods and 86.1 percent molluscs. This region apparently had a very rich molluscan fauna that provided an attractive food supply for migrating scaups.

Foods eaten by lesser scaups on wintering areas in Louisiana are shown in Table 3. Data from Lake Borgne and Grand Chenier were combined because there were no significant differences in the foods consumed in the two areas, even though they are about 200 miles apart.

As in Manitoba and Illinois, animal foods were predominant and made up nearly two-thirds of the total foods. The most important animal food was fish. Scales, bones, and intact and macerated fish were found in nearly half of the stomachs, and made

Table 3. Foods eaten by 37 lesser scaups on the Louisiana coast in late fall and winter, 1959–60.

Foods	Percent Occurrence	Percent Volume
Animal Foods		
Vertebrates		
Unclassified fish fragments	43	26.7
Sheepshead minnow (*Cyprinodon variegatus*)	3	15.1
Crustacea		
Crayfish (Cambarinae)	3	7.0
Freshwater shrimp (*Palaemonetes* sp.)	14	4.5
Sideswimmers (*Hyalella* sp.)	19	3.1
Opossum shrimp (Mysidae)	3	1.3
Other crustaceans	32	0.7
Insecta		
Water boatmen (Corixidae)	3	1.5
Midges (Tendipedidae)	19	1.1
Other insects (Odonata, Coleoptera, and unidentified fragments)	14	1.6
Gastropods		
Unclassified snails (Gastropoda)	32	1.0
Miscellaneous animal foods	19	0.3
Total Animal Foods	89	63.7
Plant Foods		
Miscellaneous plant fragments	70	18.0
Saw-grass (*Cladium jamaicense*)	89	6.9
Bulrushes (*Scirpus* spp.)	81	3.8
Ditch-grass (*Ruppia maritima*)	70	1.9
Other seeds, each in small amount	70	2.0
Filamentous algae	8	3.7
Total Plant Foods	95	36.3
Total Food Volume = *112.2 cc*		100.0

up 41.9 percent of the total food. Crustaceans, the most important food organisms in the Manitoba specimens, were of secondary importance in Louisiana, and insects were relatively unimportant. Few identifiable molluscs were found, but nearly every gizzard contained crushed shell suggesting that molluscs had been eaten recently. The importance of molluscs in the fall and winter diet of Louisiana scaups was shown by Harmon (1962) and is well documented for other areas by Cottam (1939: 41), Cronan (1957:463), and Anderson (1959:317).

Plant foods were more important in Louisiana than in the other areas and made up more than one-third of the total foods.

DISCUSSION

Since the publication of Cottam's (1939) monograph on diving duck food habits, the lesser scaup has been regarded as chiefly vegetarian, with animal foods amounting to only 40 percent of its diet. Among North American ducks of the genus *Aythya*, only the greater scaup (*Aythya marila*) was found to feed predominantly on animals (Cottam 1939:53, 134). The present study and other recent investigations indicate that, contrary to earlier findings, the lesser scaup also feeds predominantly on animals (Table 4). In 495 stomachs examined from 1941 to the present, 77.9 percent of the food consisted of animal material, as compared to only 40.5 percent in the 1,051 stomachs reported by Cottam (1939:41).

1959–60.

	PERCENT OCCURRENCE	PERCENT VOLUME
	43	26.7
	3	15.1
	3	7.0
	14	4.5
	19	3.1
	3	1.3
	32	0.7
	3	1.3
	19	1.1
	14	1.6
	32	1.0
	19	0.3
	89	63.7
	70	18.0
	89	6.9
	81	3.8
	70	1.9
	70	2.0
	8	3.7
	95	36.3
		100.0

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Table 4. The proportion of animal foods in the diet of lesser scaups at different seasons. Combined seasonal percentages are weighted averages.

SEASON	NUMBER OF STOMACHS	PERCENT ANIMAL FOODS		AREA AND AUTHORITY
All seasons	1,051	40.5		North America (Cottam 1939)
Spring and summer	42	72.7	81.6	British Columbia*
Spring and summer	39	91.1		Manitoba (this study)
Fall	44	11.3	80.7	Missouri (Korschgen 1955)
Fall	220	90.4		Illinois (Anderson 1959)
Fall	10	61.7		Connecticut (Cronan 1957)
Fall	88	93.5		Illinois (this study)
Fall and winter	15	25.7	52.7	British Columbia*
Fall and winter	37	63.7		Louisiana (this study)

* Calculated from data presented by Munro (1941:134–137).

The differences in percentages of animal foods cannot be resolved with satisfaction because the data on which they are based were gathered in different years and localities and were subjected to different treatments. However, it should be noted that nearly one-half (507 birds) of Cottam's (1939) sample was collected in April, apparently during spring migration, when foods consisted of 98.3 percent plant material. Most of these birds were taken near Marquette, Wisconsin, where they fed chiefly on wild rice (*Zizania aquatica*). Another 382 birds were collected on wintering areas, based upon localities given by Cottam (1939:40). Thus, 85 percent of the specimens were collected in early spring, or in winter.

No subsequent studies have included lesser scaups in spring migration so it is not known whether a predominantly plant diet is usual at this season. However, a decrease in the proportion of animal food in the fall and winter diet is evident in Table 4 and, if this trend continued, plant foods would predominate in early spring.

The occurrence of such a change may be simply a matter of food availability. Large supplies of animal foods, such as molluscs, generally are available to scaups in their winter quarters on the coast, and on some, but not all, inland areas used during migration. The Illinois and Mississippi rivers are rich in animal foods, judged by the diet of scaups collected there (Anderson 1957:315–317 and this study). In other areas, as in Missouri, animal foods appear to be scarce and the birds feed chiefly on plant materials (Korschgen 1955:22–23). As the bulk of Cottam's birds were collected at times or in areas where animal foods were least important in the diet, this may account for the differences between his and subsequent studies.

Additional collecting in different localities and seasons is needed to obtain a more accurate picture of seasonal food habits, but the information presently available shows that lesser scaups feed chiefly, and sometimes almost exclusively, on animals during most of the year. The proportion of animal food in the diet decreases from summer to winter and probably reaches a low point in late winter and early spring.

Food habits data reflect the close relationship of the lesser and the greater scaup and show that they differ sharply from other North American *Aythya*, which are chiefly vegetarians.

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PROPORTION OF RECOVERED DUCK BANDS THAT ARE REPORTED

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Abstract: Band-reporting rates (the proportion of duck bands recovered by hunters that are actually reported to the Bird Banding Laboratory) appear to have decreased between the late 1950's and early 1960's. About one-half the banded ducks bagged during the 1958–59 and 1959–60 hunting seasons were reported—a rate similar to those recorded in other studies conducted during the early and mid-1950's. Band-reporting rates were lower for the 1962–63 and 1963–64 hunting seasons; less than one-third of the banded ducks bagged were reported. This decrease in band-reporting rates was concurrent with significant changes in duck hunting regulations, the volume of duck banding, and the method used to relay information to the person who reports a band. Band-reporting rates differed for various species of ducks. In general, band-reporting rates were high on canvasbacks (*Aythya valisineria*), redheads (*A. americana*), and pintails (*Anas acuta*) and low for teals (*Anas discors* and *A. carolinensis*).

The purpose of this paper is to present recent data about reporting rates for duck bands. Because not all banded ducks shot and retrieved by hunters are reported, it is necessary to know the proportion reported, or band-reporting rate, to interpret band recovery data. For example, the determination of harvest rates from band recovery rates is possible only if the band-reporting rate is known. Also, harvest distribution patterns based on band recoveries are invalid if regional variations in band-reporting rates exist and are not considered. Bellrose (1945, 1955) and Geis and Atwood (1961) previously reported on this subject but evidence that band-reporting rates may have decreased is discussed in this study. The calculations were made with data from the 1958–59, 1959–60, 1962–63, and 1963–64 hunting seasons. Similar data for the 1960–61 and 1961–62 hunting seasons were not available.

R. I. Smith, C. F. Kaczynski, and A. D. Geis helped with the work and Geis provided data from his previous study to complement the analysis of reporting rates for some species of ducks.

PROCEDURES

Band-reporting rates were calculated by comparing estimated numbers of duck bands recovered by hunters in the contiguous