Foods of Lesser Scaup in Crayfish Impoundments in Louisiana

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Abstract: Digestive tracts were examined from 115 lesser scaup (*Aythya affinis*) killed by hunters in impoundments managed for crayfish (*Procambarus clarkii*) production at Indigo Island, Iberville Parish, Louisiana. Plant material (seeds) comprised 99.7% (by dry weight) of the food material during the 1981-82 wintering season and 99.6% during the 1982-83 season. Twenty-three scaup were collected while they were actively feeding; animal material was present in 21 scaup esophagi and plant material was present in 22. Nevertheless, plant material was the major food and comprised 99.0% of the diet. Seeds of *Echinochloa colonum* and *Fimbristylis miliacea* were the most important food items and were major species in bottom samples where scaup were collected. Dominant animal foods were snails, amphipod crustacea, and Diptera larvae. Small crayfish were abundant in the impoundments but no crayfish remains were found in scaup digestive tracts.

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The number of shallow impoundments in Louisiana has greatly increased in recent years because of interest in crayfish (*Procambarus clarkii*) farming. During 1982, approximately 33,000 ha were managed as shallow impoundments for crayfish production (Louisiana Cooperative Extension Service 1983). The water management cycle involves drainage and drying of impoundments from June through September each year and reflooding to depths of 30 to 80 cm from October through May (LaCaze 1981). This procedure results in excellent crayfish production, and during 1982 approximately 22 million kg of crayfish were harvested from managed impoundments (Louisiana Cooperative Extension Service 1983).

Summer drying of the impoundments encourages growth of plants that contribute to crayfish production after the areas are reflooded (LaCaze 1981). However, the shallow impoundments also attract wintering ducks and seeds from the plants provide a readily available food source. Nassar (1982) monitored duck use of 130 ha of

crawfish impoundments in southern Louisiana and reported duck densities as great as 36 birds/ha. During the 1977-78 wintering season, he noted that lesser scaup were common winter residents and densities of 8 birds/ha were observed.

Although impoundments managed for crayfish production produce favorable duck habitat, managers often express concern over possible conflicts, such as duck predation on crayfish (LaCaze 1981). Many studies have reported the carnivorous habits of lesser scaup (e.g. Harmon 1962, Rogers and Korschgen 1966, Bartonek and Hickey 1969, Thompson 1973).

This study was conducted to determine the feeding habits of lesser scaup in impoundments managed for crayfish production and to determine food use in relation to food availability. The authors express appreciation to R. B. Hamilton and J. W. Avault, Jr. for many helpful comments and to V. L. Wright for assistance in statistical analyses. Gratitude is extended to Williams, Inc. and the staff at Indigo Island Crayfish and Waterfowl Research Station for providing the study area, assistance during field work, and data on lesser scaup killed on the station.

Methods

The study was conducted in a 130 ha system of 10 impoundments at Indigo Island Crayfish and Waterfowl Research Station. The station is located 40 km south of Baton Rouge, Louisiana, and managed for commercial crayfish production and to attract wintering waterfowl. Unit 4 was drained in May 1981 to encourage growth of grasses, sedges, and smartweeds (*Polygonum* spp.). Japanese millet (*Echinochloa frumentacea*) was planted in the area in 1980 and scattered plants grew in 1981 from seeds produced the previous summer. The impoundments were flooded in October 1981 for crayfish production and waterfowl use, and water depth in the impoundments ranged from 40 to 80 cm. Crayfish were harvested in the area from January to May 1982. A similar management procedure was followed during the 1982-83 season.

During the hunting seasons of 1981-82 and 1982-83, 115 lesser scaup were killed on the station by hunters. Esophagi and gizzards were removed from scaup after each hunt, placed in bags, and frozen.

During January and February 1982, 23 actively feeding lesser scaup were shot from a blind after they were observed feeding for at least 10 minutes. Birds were recovered immediately after shooting and esophagi were removed, placed in bags, and frozen. Gizzards were not examined in this segment of the investigation. Four core samples were taken from the bottom soil where each bird was feeding. The soil samples were taken to a depth of 5 cm with an aluminum cylinder, 5 cm in diameter, attached to a pipe handle. Samples were stored separately in plastic bags and frozen until laboratory examination.

Soil samples were washed through a series of sieves (mesh sizes of 3, 2, 1, and 0.5 mm), oven-dried at 70° C, and then seeds were separated by species and weighed to the nearest 0.1 mg. From each esophagus and gizzard, animal material was identified while wet, separated by species, oven-dried, and weighed to the near-

est 0.1 mg. The remainder of the esophageal contents was oven-dried at 70° C, screened through the series of sieves. Seeds were separated by species and weighed to the nearest 0.1 mg.

Plant taxa used as food by lesser scaup were evaluated with a chi-square goodness-of-fit test (Steel and Torrie 1960). The hypothesis tested was that lesser scaup in the study area utilized seeds of plant taxa present in the soil in proportion to their availability. We assumed that seeds were available in the soil to a depth of 5 cm. The proportion of observed use (esophagi samples) and expected use (soil samples) for each taxa were used to compute chi-square values. Only species with expected values >1 were included in the analysis; others were grouped into 1 category.

Preference or avoidance of individual plant taxa by scaup in regard to availability was determined by using Bonferroni confidence intervals (Neu et al. 1974, Byers et al. 1984).

Results and Discussion

Examination of 115 digestive tracts of lesser scaup killed by hunters indicated that the birds fed almost exclusively on plant materials. Plant materials comprised 99.7% of the foods during the 1981-82 wintering season and 99.6% during the 1982-83 season. Twenty-one of the 23 ducks collected while actively feeding contained some animal matter in their esophagi. Two birds contained only plant materials and 1 bird contained only animal matter. Total plant material present in the esophagi (38.0 g) greatly exceeded the total animal matter (0.4 g). Plant foods made up 99.0% of the food items in the esophagi.

The 2 most abundant animal foods in esophagi were snails (39.8% of animal matter) and amphipod crustacea (37.0%), followed by Diptera larvae (19.7%). By frequency of occurrence, Diptera (mostly chironomids) were the most common (78.3%) animal matter. Ephemeroptera, Coleoptera, Odonata larvae, and unidentified insects comprised 3.5% of the animal foods. Small crayfish were abundant in the impoundment; however, no crayfish remains were found in scaup esophagi or gizzards.

Plant materials were composed solely of seeds (Table 1). *Echinochloa colonum* comprised 50.4% of the total amount of seeds in the esophagi. Other species found were *Fimbristylis miliacea* (40.3%), *Panicum dichotomiflorum* (4.7%), and *Echinochloa frumentacea* (3.4%). These 4 species made up 98.8% of the total amount of seeds in the esophagi; other plant taxa appeared to be of minor importance in the diets of scaup. By frequency of occurrence, *Panicum dichotomiflorum* was the most common item and was found in 73.9% of the esophagi.

Seeds of 15 plant taxa were present in soil samples from sites where scaup were actively feeding when collected. Species most abundant in soil samples were *F. miliacea* (37.3%) and *E. colonum* (36.1%). Other species common in soil samples were *E. frumentacea* (11.0%), *P. dichotomiflorum* (7.9%), and *R. corniculata* (4.7%). The remaining 10 plant taxa comprised a total of only 3% of the seeds present in soil samples.

Table 1. Proportion of plant food items in the esophageal contents of lesser scaup (N=22) and soil samples (N=88) collected on impoundment unit 4, Indigo Island, Louisiana, 1982.

Plant Taxa	Total Weight (g)		Relative Weight (%)		Frequency (%)	
	Esophagi	Soil	Esophagi	Soil	Esophagi	Soil
Echinochloa colonum	19.146	5.493	50.4	36.1	52.2	77.3
Fimbristylis milacea	15.307	5.670	40.3	37.3	65.2	87.5
Panicum dichotomiflorum	1.766	1.205	4.7	7.9	73.9	63.6
Echinochloa frumentacea	1.300	1.667	3.4	11.0	34.8	72.7
Echinochloa walteri	0.229	0.062	0.6	0.4	65.2	52.3
Leptochloa filiformis	0.100	0.161	0.3	1.1	57.2	37.5
Panicum fasciculatum	0.063	0.066	0.2	0.4	17.4	45.5
Cyperus iria	0.022	0.031	0.1	0.2	17.4	48.9
Heliotropium indicum	0.015	0.043	Tr.[a]	0.3	17.4	36.4
Polygonum spp.	0.009	0.052	Tr.	0.3	26.1	27.3
Cyperus odoratus	0.003	0.014	Tr.	0.1	13.0	18.2
Unknown Compositae	0.005	0.015	Tr.	0.1	17.4	36.4
Lippia nodiflora	0.001	0.003	Tr.	Tr.	8.7	12.5
Rhynchospora corniculata	0.000	0.707	0.0	4.7	0.0	100.0
Cephalanthus oxidentalis	0.000	0.019	0.0	0.1	0.0	23.9
Total	37.966	15.208	100.0	100.0		

[a]Tr. = <0.1%

Seeds of 13 of the taxa were present in esophagi of the scaup. The chi-square tests disclosed significant differences between overall availability and usage ($P < 0.01$, $\chi^2 = 19.2$, df = 5), and the hypothesis that scaup utilized seeds in the soil in proportion to their availability was rejected. Therefore, Bonferroni confidence intervals were computed for the 6 major plant taxa eaten by scaup. The expected usage of each major taxa was within the confidence interval of observed usage (Table 2) and indicated that all were consumed in proportion to their availability in the soil. The combined expect usage of other taxa exceeded the confidence interval and indicated avoidance of the group by scaup. However, considerable variation in availability and use was noted among individual species in the group.

Rhynchospora corniculata and *Cephalanthus occidentalis* were present in soil

Table 2. Proportion of expected and actual use of plant taxa as food by lesser scaup, Indigo Island, Louisiana.

Plant Taxa	Proportion of Expected Use	Proportion of Actual Use	Confidence Intervals for Actual Use
Echinochloa colonum	0.361	0.504	$0.217 < P < 0.791$
Fimbristylis milacea	0.373	0.403	$0.121 < P < 0.684$
Panicum dichotomiflorum	0.079	0.047	$-0.074 < P < 0.168$
Echinochloa frumentacea	0.110	0.034	$-0.070 < P < 0.138$
Echinochloa walteri	0.004	0.006	$-0.038 < P < 0.050$
Leptochloa filiformis	0.011	0.003	$-0.023 < P < 0.034$
Other taxa	0.062	0.003	$-0.023 < P < 0.034$[a]

[a]A significant difference at the 0.05 level of significance.

samples but were not eaten by scaup examined. *R. corniculata* was one of the most abundant species in the study area (Nassar 1982) and its seeds occurred in all soil samples.

Use of the major plant taxa in proportion to their availability suggests that the scaup were opportunistic feeders. Rejection of the hypothesis by the chi-square test probably resulted from inclusion of the other taxa as a group in the analysis.

Conclusions

Although most studies support the carnivorous habits of scaup, some studies stressed the importance of plant food in the diet of scaup (e.g. Korschgen 1955, Quay and Critcher 1965, Kerwin and Webb 1971). Dirschl (1969) recognized significant changes between months in proportions of plant and animal materials in diets of scaup responding to changing availability of food items. Although the availability of animal foods was not assessed in the present study, we believe that the predominance of plant material in the diet of scaup at Indigo Island was related to the birds' preference for plant foods in the impoundment in late winter. Seeds have a higher carbohydrate content than animal material, and scaup may have met nutritional or energy demands by feeding on seeds.

Crayfish were abundant and commercial fishermen were working in the area during the time of the study; however, no crayfish were found in scaup esophagi. From these data, we conclude that scaup do not prey on crayfish in managed impoundments during late winter. However, the impoundments provide an abundant supply of plant food used by scaup and greatly increase the amount of high quality wintering habitat. Crayfish feed mainly on plant debris and algae (LaCaze 1981) and competition between crayfish and scaup is not considered an important factor.

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