FOOD HABITS OF WATERFOWL IN CURRITUCK SOUND, NORTH CAROLINA

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ABSTRACT

The food contents of 326 gizzards from 15 species of waterfowl collected on Currituck Sound between 1947 and 1952 were analyzed in detail by the aggregate percentage method. The collection period was a time of generally low and fluctuating waterfowl populations on the Sound. Per cent frequency and per cent volume results are presented for 122 diving ducks (six species), 75 ruddy ducks, 97 dabbling ducks (six species), 17 Canada geese, and 15 coots, both in groups and by species. Plant foods composed 97% of the total.

Potamogeton, Ruppia, and *Najas* were the overwhelmingly important foods for all groups, totaling about 80% by volume for the entire sample (72% identified and probably most of the 11% unidentified vegetative material). Nevertheless, the 7 commonest species—canvasback, redhead, ruddy duck, American widgeon, black duck, pintail, and green-winged teal—each showed distinctive individual differences in types and percentages of foods taken. *Vallisneria,* now present in the Sound in good supply, did not appear in any of the gizzards examined and very possibly was relatively rare or spotty in the Sound during the 1947-1952 period.

INTRODUCTION AND REVIEW OF LITERATURE

Currituck Sound has long been well known as a waterfowl wintering and hunting grounds. The original abundance of waterfowl, and supporting aquatic plant food supplies, began to decline in 1914-1918, at the time of the construction of the Inland Waterway. Market hunting was discontinued in 1918, with the passage of the Migatory Bird Treaty Act. Drastic reductions in duck food plants, and consequently of the numbers of waterfowl, occurred in 1918, however, upon the removal of the tide lock on the Chesapeake and Albemarle Canal, allowing salt water from Norfolk Harbor to flow into Currituck Sound and connected Back Bay, Virginia (Critcher, 1949; Bourn, 1932). These conditions prevailed until the lock was restored in 1932.

Additional suggested and most likely operative causes of the destruction and suppression of certain waterfowl food plants were: intrusion of some salt water into the southern parts of the Sound from Oregon Inlet 20 miles to the South; entrance of salt water over the barrier beaches on storm and hurricane tides, and possibly by seepage through the coarse sands of the beach; increased turbidity attendant upon loss of bottom-stabilizing aquatic vegetation and increasing populations of carp (*Cyprinus carpio*), maintained and aggravated by wind and wave action; and periodic dredging of the Inland Waterway (Allison, 1950; Bourn, 1932; Critcher, 1949; Corps of Engineers, 1929; Rabb, 1943).

The mid-1930's were years of very low waterfowl numbers throughout North America. There was appreciable recovery thereafter through 1944. From 1947 to 1952, the period of the present study, the waterfowl populations of Currituck Sound were generally low but fluctuating and the hunting pressure was markedly on the increase.

The ecological conditions outlined above are discussed in detail in the papers cited as well as in many other sources, and need not be reviewed here. Bourn's 1932 paper alone lists 102 pertinent references, and Critcher (1949) lists 30 references. Nevertheless, a sound understanding of the ecology of the region was still lacking, resulting in the inauguration in 1958 of a new and broad "Cooperative Back Bay-Currituck Sound Study", by the U. S. Bureau of Sports Fisheries and Wildlife, the North Carolina Wildlife Resources Commission, and the Virginia Commission of Game and Inland Fisheries.

The new research project will include some food habits studies. The present paper is offered for background and comparative purposes in the long-time effort to develop a sound management plan for the Currituck Sound-Back Bay region.

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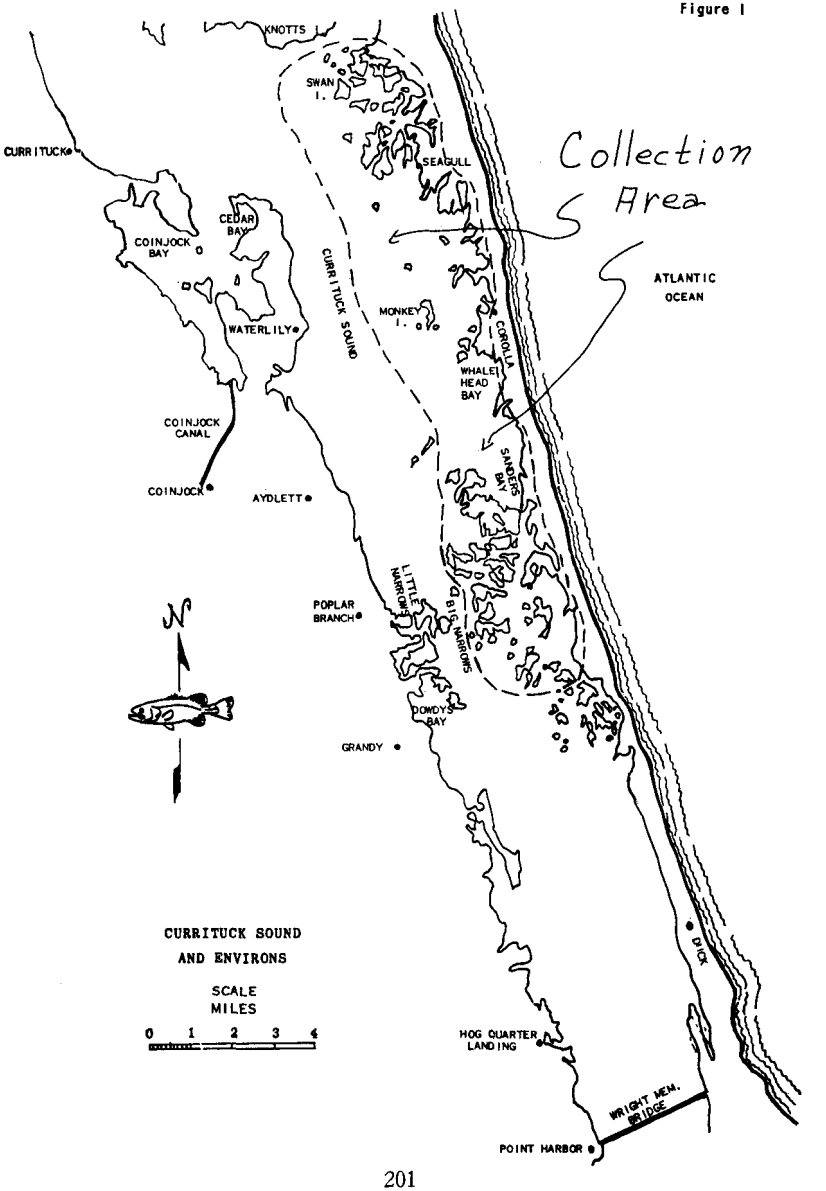
The only previous waterfowl food habits study in Currituck Sound was by Martin and Uhler (1939), in which 362 stomachs were examined but not listed as to date of collection or species of bird. Some of these same stomachs were probably included in Cottam (1939). They would also be in Martin, Zim and Nelson (1951) but not by locality.

MATERIALS AND METHODS

Currituck Sound is a fresh to slightly brackish-water sound in northeastern North Carolina, three to nine miles wide and 40 miles long. The waters of the open Sound are three to eight feet deep, but the shallower and marshy areas in the central and eastern parts are from one to three feet deep (Figure 1). The

Figure 1



total water surface is about 75,000 acres. Before 1914 aquatic vegetation grew in almost unbelievable density throughout the Sound at all depths. In more recent years the best growths of submerged and emergent aquatics have been in the northeastern quadrant, with its shallower waters and large numbers of small, marshy islands, and it was here that the majority of the waterfowl used in the present food habits study were collected (see Figure 1).

The gizzards of 326 waterfowl of 15 species were collected during four winters between December, 1947 and December, 1951 (Table 1). All collections were during the hunting seasons, and all birds were secured from hunters. All but 70 gizzards were taken in the Decembers of the four seasons; 31 were in November, 1951, and 39 were in the Januaries of 1948 and 1949. Sixty per cent (195) were taken during late November and December of 1951. Sex and weights were not secured. The species distribution was in rough proportion to their numbers on the Sound, except for the coot.

TABLE I

NUMBERS AND COLLECTION DATES, BY SPECIES AND YEARS, OF 326 WATERFOWL AND COOT GIZZARDS FROM CURRITUCK SOUND, WINTERS OF 1947-1948 TO 1951-1952

Species	*1947–1948*	*1948–1949*	*1949–1950*	*1951–1952*	*Grand Total*	*Total in December*
Diving Ducks	21	13	33	55	122	95
Canvasback	9	1	19	33	62	56
Redhead	10	12	8	14	44	23
Ring-necked Duck	1	..	..	4	5	5
Scaup	..	..	5	..	5	5
Bufflehead	..	..	1	4	5	5
Oldsquaw	1	..	..	..	1	1
Ruddy Duck	5	..	..	70	75	74
Dabbling Ducks	4	8	15	70	97	58
Am. Widgeon	..	6	..	28	34	28
Black Duck	2	..	9	11	22	22
Pintail	1	..	..	18	19	1
Green-winged Teal	..	..	6	11	17	6
Mallard	1	..	..	2	3	1
Gadwall	..	2	..	..	2	0
Canada Goose	4	1	12	..	17	15
Coot	1	14	..	..	15	14
Grand Total	35	36	60	195	326	..
Total in December	17	15	60	164	..	256

The gizzards were analyzed by the aggregate percentage method and the results tabulated by both per cent frequency and per cent volume (Tables 2, 3, 4, 5). The inaccuracies and difficulties inherent in using only gizzards were recognized, but only gizzards were available. All seeds were identified at least to genus and usually to species. Rootstocks and tubers were identified at least to genus and often to species. Leaves and stems were likewise identified to genus or species, except for an amount equal to 11.3 per cent of the total food contents. The special food habits collection of the Zoology Department, and the herbarium of the Botany Department, at North Carolina State College were used for comparative material, and invaluable assistance in the identification of unknown items was furnished by the Patuxent Research Refuge Food Habits Laboratory of the U. S. Bureau of Sports Fisheries and Wildlife, so that a high degree of detailed identification was achieved. Animal materials were identified primarily to class or order level. Plant names used are according to Fernald (1950).

RESULTS

The food contents of the 326 gizzards are shown both by natural groups and by the species of waterfowl in Tables 2-7. Ninety-seven per cent of the total volume was plant material and three per cent animal matter. While both per cent frequency and per cent volume measures are given, we consider the per

TABLE II

FOOD CONTENTS OF ALL 326 WATERFOWL AND COOT GIZZARDS FROM CURRITUCK SOUND, WINTERS OF 1947-1948 TO 1951-1952. THE FIGURES IN THE HEADINGS ARE THE NUMBER OF GIZZARDS AND (IN PARENTHESIS) THE AVERAGE VOLUME OF FOOD PER GIZZARD IN CC FOR EACH SPECIES OR GROUP. ABBREVIATIONS: % F—PER CENT FREQUENCY; % V—PER CENT VOLUME; TR—TRACE (LESS THAN 0.1% VOLUME)

	Diving Ducks 122 (4.1)		*Ruddy Ducks* 75 (1.5)		*Dabbling Ducks* 97 (2.9)		*Canada Goose* 17 (11.5)		*Coot* 15 (7.4)		*Total* 326 (3.7)	
Food Item	% F	% V	% F	% V	% F	% V	% F	% V	% F	% V	% F	% V
Potamogeton veg.	83	22.3	77	6.4	85	31.4	100	46.5	99	33.6	84	23.1
Potamogeton	87	28.4	95	23.5	47	5.8	29	2.8	20	.3	71	17.9
Ruppia veg.	72	9.3	60	2.8	75	16.4	82	18.5	99	17.0	75	10.7
Ruppia	58	3.8	99	33.8	34	1.6	18	0.6	6	tr	56	9.7
Najas veg.	33	10.9	24	1.5	40	7.9	53	11.2	93	15.5	38	8.1
Scirpus	20	0.9	43	1.6	45	10.0	6	tr	6	tr	31	3.8
Myrica	25	0.8	27	1.8	16	1.2	..	...	..	...	20	1.1
Characeae	2	tr	47	4.4	7	0.1	..	...	13	0.2	11	1.0
Characeae veg.	4	tr	11	0.5	14	0.8	..	...	93	13.0	12	1.0
Zea Mays	3	1.6	3	1.2	2	0.4	..	...	..	...	2	1.0
Eleocharis	10	0.2	4	0.1	32	1.8	..	...	..	...	14	0.6
Cladium	5	0.3	3	tr	13	1.5	..	...	..	...	6	0.5
Rootstocks	15	3.3	21	4.4	8	1.5	..	...	..	...	13	2.7
Tubers	3	0.6	7	1.1	1	tr	6	1.8	..	...	3	0.6
Misc. Plant	..	1.7	..	3.8	..	8.1	..	4.1	..	tr	..	3.9
Unidentified veg.	66	13.1	80	7.1	82	9.3	88	14.5	93	20.4	76	11.3
Animal Matter	..	2.8	..	6.0	..	2.2	..	...	..	...	..	3.0
Total		100.0		100.0		100.0		100.0		100.0		100.0

MISCELLANEOUS—FROM 0.1% TO 0.4% VOLUME

Brasenia 0.1	*Glycine max* 0.2	*Paspalum* 0.1
Ceratophyllum 0.1	Gramineae veg. ..0.2	*Pinus* 0.4
Cyperaceae veg. 0.4	*Lemna* 0.4	*Polygonum* 0.4
Cyperus 0.2	*Najas* 0.4	*Sparganium* 0.2
Echinochloa 0.3	*Panicum* 0.1	*Zostera* veg. 0.4

TRACE—LESS THAN 0.1% VOLUME

Algae	*Elodea*	*Ludwigia*	
Carex	*Elodea* veg.	*Nyssa*	*Rhynchospora*
Chenopodium	*Fimbristylis*	*Oenothera*	*Rhus*
Digitaria	*Lippia*	*Proserpinaca*	*Rubus*
Eleusine	*Liquidambar*	*Quercus*	*Zannichellia*
			Unidentified seeds

cent volume figure to be the more important and will use it in our discussions. The full list of 38 genera and 54 species of plants identified, not counting the family Characeae, is given in Table 7. In Tables 2, 3, and 4 the plant foods are listed at the genus level, as is common practice in food habits papers (Martin, Zim, and Nelson, 1951), and our discussions will also be primarily by genus.

The seeds and vegetative parts of *Potamogeton, Ruppia,* and *Najas* were the overwhelmingly important foods, totaling about 80% by volume for the entire sample—70% in seeds, stems, and leaves; 3% in rootstocks and tubers; and probably about 7% in the vegetative material not definitely identified—(Table 2). The primary dependence on these three genera extended to all five groups of waterfowl—the six species of diving ducks, the ruddy duck, the six species of dabbling ducks, the Canada goose, and the coot, but with variations in the percentages used. The divers ate mainly the seeds and vegetation of *Potamogeton,* and the vegetation of *Najas* and *Ruppia.* The ruddy duck ate mainly the seeds of *Potamogeton* and *Ruppia.* The dabblers fed principally on *Potamogeton, Ruppia,* and *Najas* vegetation and on seeds of *Scirpus.* The Canada goose took 76% of its food in vegetative *Potamogeton, Ruppia,* and *Najas,* plus another 14.5% in unidentified vegetation. The coot ate 66% vegetative *Potamogeton, Ruppia,* and *Najas,* 20.4% unidentified vegetation, and 13% Characeae vegetation. Only seven genera of plants were used by the entire sample as much as 1% by volume (Table 2), the two in addition to the five already mentioned being *Zea* and *Myrica.* Only four other genera were used as much as 1% by any species, these being *Cladium, Eleocharis, Polygonum,* and *Pinus* (Tables 2, 3, 4).

The food contents of the 273 gizzards from the seven species of ducks collected in the largest numbers are shown in Table 3. Each of these seven species exhibited marked differences in the main types and percentages of foods taken, demonstrating species and plant-part selectivity among the foods available in the general Sound habitat. The canvasback ate 38% *Potamogeton* seeds, 21% *Potamogeton* vegetation, and 8% *Ruppia* vegetation. The redhead ate 25% *Potamogeton* vegetation, 16% *Potamogeton* seeds, and 22% and 11% *Najas* and *Ruppia* vegetation respectively. The ruddy duck took 34% and 23.5% of *Ruppia* and *Potamogeton* seeds respectively. The American widgeon took 47% and 25% of *Potamogeton* and *Ruppia* vegetation respectively. The black duck used a wider variety of items, but mainly *Potamogeton* (27%) and *Ruppia* (11.5%) vegetation and *Scirpus* (13%) seeds. The pintail used 33% *Potamogeton* vegetation, and lesser but still large amounts of *Ruppia* and *Najas* vegetation and *Scirpus* seeds. The green-winged teal selected the most widely of all, but fed more on *Scirpus* seeds (29.6%) than on anything else and more so than any other species of waterfowl. The foods taken by the ring-neck, scaup, and bufflehead (five gizzards each, Table 4), and by the three mallards and the two gadwalls, followed the same patterns described for the other species as regards plant food selectivity. While only the major food items are mentioned by name and percentage in this discussion, the species-specific differences indicated extended also to the larger number of items taken in lesser amounts, as shown by the Tables.

Table III

Food Contents of 273 Gizzards from the Seven Species of Ducks Collected in the Largest Numbers on Currituck Sound, Winters of 1947-1948 to 1951-1952. The Figures in the Headings are the Number of Gizzards, and (in Parenthesis) the Average Volume of Food Per Gizzard in cc. for Each Species. Abbreviations: % F—Per Cent Frequency; % V—Per Cent Volume; Tr—Trace (Less than 0.1% Volume)

	Canvasback 62 (4.2)		*Redhead* 44 (4.1)		*Ruddy Duck* 75 (1.5)		*Am. Widgeon* 34 (3.1)		*Black Duck* 22 (7.2)		*Pintail* 19 (2.3)		*G. W. Teal* 17 (1.2)		*Total* 273 (2.9)	
Food Item	% F	% V	% F	% V	% F	% V	% F	% V	% F	% V	% F	% V	% F	% V	% F	% V
Potamogeton veg.	91	21.0	69	25.2	77	6.4	97	47.4	87	27.2	89	32.8	65	5.1	83	21.3
Potamogeton	84	38.2	88	15.9	95	23.5	29	2.4	55	8.6	53	7.1	71	8.9	76	19.7
Ruppia	65	4.1	44	2.1	99	33.8	26	1.5	13	0.8	42	2.0	65	2.9	61	11.2
Ruppia veg.	75	8.2	62	10.8	70	2.8	97	25.2	64	11.5	78	21.8	53	2.3	72	10.1
Najas veg.	18	4.6	54	21.9	24	1.5	41	9.1	41	6.7	31	10.4	47	3.6	33	7.6
Scirpus	14	1.5	14	0.3	43	1.6	15	0.8	55	13.0	47	9.4	88	29.6	33	4.5
Characeae	..	...	..	...	47	4.4	12	0.1	..	...	5	0.2	12	0.2	16	1.2
Zea Mays	5	1.5	2	2.3	3	1.2	..	...	4	1.4	..	...	..	...	2	1.2
Myrica	32	0.6	9	0.1	27	1.8	3	tr	27	4.1	21	1.0	29	0.4	22	1.1
Eleocharis	12	0.3	7	0.1	4	0.1	3	tr	41	3.0	26	1.2	88	5.1	16	0.8
Cladium	8	0.5	2	tr	3	tr	3	0.1	14	1.6	5	0.3	47	5.7	8	0.6
Najas	8	tr	5	tr	33	1.8	..	...	4	tr	5	tr	35	0.1	15	0.5
Pinus	2	tr	..	...	..	...	..	...	4	0.6	..	...	12	7.6	2	0.5
Polygonum	18	0.4	5	.1	7	tr	3	0.1	13	0.8	16	2.0	29	2.4	12	0.5
Rootstocks	16	4.1	14	2.9	21	4.4	6	0.7	18	4.6	10	0.8	..	...	6	1.2
Tubers	5	0.9	..	...	7	1.1	..	...	4	tr	..	...	..	...	3	0.5
Misc. Plant	..	0.7	..	2.9	..	1.2	..	1.2	..	8.1	..	0.5	..	8.0	..	2.0
Unidentified veg.	73	13.4	50	13.2	80	8.4	91	11.4	59	7.8	90	10.2	88	6.2	75	12.7
Animal Matter	..	tr	..	2.2	..	6.0	..	...	..	0.2	..	0.3	..	11.9	..	2.8
Total		100.0		100.0		100.0		100.0		100.0		100.0		100.0		100.0

MISCELLANEOUS—FROM 0.1% TO 0.4% VOLUME

Brasenia	0.1	*Cyperaceae* veg.	0.3	*Lemna*	0.1
Ceratophyllum	0.1	*Cyperus*	0.2	*Paspalum*	0.1
Characeae veg.	0.4	*Glycine max*	0.1	*Proserpinaca*	0.1
				Zostera veg.	0.4

TRACE—LESS THAN 0.1% VOLUME

Algae	*Elodea* veg.	*Oenothera*	*Rhus*
Carex	*Fimbristylis*	*Panicum*	*Rubus*
Digitaria	*Gramineae* veg.	*Quercus*	*Sparganium*
Echinochloa	*Lippia*	*Rhynchospora*	*Zannichellia*
Elodea			

TABLE IV

FOOD CONTENTS OF FIFTEEN GIZZARDS FROM THREE SPECIES OF DIVING DUCKS COLLECTED ON CURRITUCK SOUND IN DECEMBER, 1949 AND 1951. THE FIGURES IN THE HEADINGS ARE THE NUMBER OF GIZZARDS AND (IN PARENTHESIS) THE AVERAGE VOLUME OF FOOD PER GIZZARD IN CC, FOR EACH SPECIES. ABBREVIATIONS: % F—PERCENT FREQUENCY; % V—PERCENT VOLUME; TR.—TRACE (LESS THAN 0.1% VOLUME)

	Ring-necked Duck 5 (3.8)		*Scaup 5 (3.7)*		*Bufflehead 5 (2.6)*		*Total 15 (3.4)*	
Food Item	% F	% V	% F	% V	% F	% V	% F	% V
Potamogeton	100	31.2	80	26.5	80	20.4	87	25.9
Potamogeton veg.	80	22.8	100	30.8	80	8.2	87	20.6
Ruppia veg.	80	11.5	100	16.0	80	4.2	87	10.6
Ruppia	80	10.5	60	3.4	80	8.4	73	7.3
Najas veg.	80	11.5	20	5.0	20	2.0	40	6.1
Myrica	40	0.2	80	10.0	20	tr.	47	3.4
Scirpus	40	0.4	60	tr.	80	0.6	60	0.3
Characeae veg.	20	0.4	..	..	80	0.4	33	0.2
Characeae	..	..	..	..	60	0.4	20	0.1
Najas	..	..	..	..	20	0.2	13	0.1
Pinus	20	0.2	..	..	..	..	7	0.1
Nyssa	..	..	20	tr.	..	..	7	tr.
Polygonum	..	..	..	..	20	tr.	7	tr.
Rootstocks	..	..	..	..	60	4.8	20	1.6
Tubers	..	..	..	..	20	1.8	7	0.6
Unidentified veg.	80	11.1	80	8.3	60	3.2	73	9.2
Animal Matter	..	0.2	..	tr.	..	45.4	..	13.9
TOTAL		100.0		100.0		100.0		100.0

For the entire sample of 326 gizzards, *Potamogeton* was the single most important plant, amounting to 41% by volume. The frequency was also the highest. Most of this, both seeds and vegetation, was *Potamogeton pectinatus* (sago pondweed). In addition to broken seeds and chewed vegetative parts, many gizzards held from 50 to 100 whole sago seeds. The volume and frequency of *Ruppia maritima* was next highest; *Ruppia* seeds are tiny in comparison to sago seeds, and mostly were still whole in the gizzards.

In the genus *Eleocharis, olivacea* and *palustris* (type) were the commonest. In *Polygonum, arifolium* was rare but the other five species about equally common. The three species of *Potamogeton* other than *pectinatus* formed about 15% of all the *Potamogeton* material. *Scirpus acutus* and *Scirpus americanus* were about equally common with each other, and *S. robustis* less so. It is likely that some species were overlooked in all of these common and important genera, as well as in some of the less common genera.

The high selectivity of coots for Characeae is notable, though muskgrasses were possibly taken by the other species more than the analyses show. Of the ten occurrences of tubers, nine were of sago and one *Eleocharis palustris*. Twenty-nine of the 37 occurrences of rootstocks were of *Potamogeton*, apparently *pectinatus*: the others were distributed among *Ruppia, Najas, Cyperus, Eleocharis,* and *Zostera*. The complete absence of *Vallisneria* was a surprise,

TABLE V

ANIMAL FOOD CONTENTS (3 PERCENT OF TOTAL) OF THE 326 WATERFOWL AND COOT GIZZARDS FROM CURRITUCK SOUND, WINTERS OF 1947-1948 TO 1951-1952 (SEE TABLE II). THE 17 CANADA GEESE AND 15 COOTS TOOK NO ANIMAL FOODS, BUT THEIR NUMBERS ARE INCLUDED IN FIGURING THE TOTALS. ABBREVIATIONS: % F—PERCENT FREQUENCY; % V—PERCENT VOLUME; TR.—TRACE (LESS THAN 0.1% VOLUME).

	Diving Ducks (122)		*Ruddy Duck (75)*		*Dabbling Ducks (97)*		*Total (326)*	
Food Item	*% F*	*% V*	*% F*	*% V*	*% F*	*% V*	*% F*	*% V*
Nematoda	5	tr.	11	tr.	6	..	6	tr.
Gastropoda	6	0.1	..	..	2	tr.	3	tr.
Pelecypoda	1	tr.	..	..	..	..	1	tr.
Arachnoidea (Water mites)	..	..	..	..	9	tr.	3	tr.
Insecta (total)	..	0.4	..	1.4	..	0.4	..	0.5
Coleoptera	2	tr.	..	..	6	0.1	2	tr.
Diptera	2	tr.	7	0.2	1	tr.	3	0.1
Homoptera	2	0.4	1	0.1	5	tr.	2	0.2
Odonata	1	tr.	5	1.1	1	tr.	2	0.2
Trichoptera	..	..	..	..	2	0.2	1	tr.
Unidentified	2	tr.	3	tr.	8	0.1	4	tr.
Crustacea (total)	..	0.5	..	2.2	..	1.3	..	1.3
Amphipoda	3	0.5	29	2.2	9	0.2	11	0.8
Isopoda	..	..	..	..	2	0.1	1	tr.
Ostracoda	..	..	..	..	5	1.0	2	0.3
Unidentified	2	tr.	5	0.7	..	..	2	0.2
Fish Eggs	3	1.8	11	1.7	..	..	4	1.1
Fish Scales	..	..	..	..	1	0.5	1	0.1
TOTAL		2.8		6.0		2.2		3.0

TABLE VI

AVERAGE AND RANGE OF NUMBER OF FOOD ITEMS IDENTIFIED IN THE 326 WATERFOWL AND COOT GIZZARDS COLLECTED ON CURRITUCK SOUND, WINTERS OF 1947-1948 TO 1951-1952

	No. of	*Plant*		*Animal*	
Species	*Gizzards*	*Avg.*	*Range*	*Avg.*	*Range*
Diving Ducks	122	4.0	1-10	0.3	1-4
Canvasback	62	4.0	1-10	0.1	1-2
Redhead	44	3.4	1- 7	0.3	1-2
Ring-necked Duck	5	4.6	3- 5	0.4	2
Scaup	5	4.4	2- 5	0.2	1
Bufflehead	5	5.8	2- 8	2.2	1-4
Oldsquaw	1	7.0	7	4.0	4
Ruddy Duck	75	3.7	2- 8	0.7	1-3
Dabbling Ducks	97	5.1	1-14	0.5	1-6
Am. Widgeon	34	3.9	1- 8	..	..
Black Duck	22	5.7	1-14	0.7	1-4
Pintail	19	4.4	1- 9	0.2	2
Green-winged Teal	17	7.3	5-10	1.6	1-6
Mallard	3	8.3	5-11	1.7	1-3
Gadwall	2	4.0	4	..	..
Canada Goose	17	3.8	2- 7	..	..
Coot	15	4.8	3- 5	..	..
TOTAL	326	4.2	1-14	0.4	1-6

since this plant has apparently always been a mainstay of waterfowl in Currituck Sound and presumably was present during the 1947-1952 period.

The three per cent of animal foods taken are listed in Table 5, by class and order. Many of these animals were identified to family, genus, and species, but detailed analysis does not seem warranted. The majority of these animal items must have been taken incidentally, and are mainly a measure of the kinds and

TABLE VII

ALPHABETICAL LIST OF PLANT GENERA AND SPECIES IDENTIFIED IN THE 326 WATERFOWL AND COOT GIZZARDS COLLECTED FROM CURRITUCK SOUND, WINTERS OF 1947-1948 TO 1951-1952

Brasenia schreberi
Carex spp.
Ceratophyllum demersum
Chenopodium spp.
Cladium jamaicense
Cyperus esculentus
Digitaria ischaemum
Digitaria sanguinalis
Echinochloa crusgalli
Eleocharis obtusa
Eleocharis olivacea
Eleocharis palustris
Eleocharis parvula
Eleocharis quadrangulata
Eleusine indica
Elodea spp.
Fimbristylis caroliniana
Glycine max
Lemna spp.
Lippia lanceolata
Liquidambar styraciflua
Ludwigia spp.
Myrica spp.
Najas guadalupensis
Nyssa sylvatica
Oenothera spp.
Panicum agrostoides
Panicum dichotomiflorum
Paspalum boscianum
Pinus taeda
Polygonum arifolium
Polygonum hydropiperoides
Polygonum pensylvanicum
Polygonum portoricense
Polygonum punctatum
Polygonum setaceum
Potamogeton diversifolius
Potamogeton pectinatus
Potamogeton perfoliatus
Potamogeton pulcher
Proserpinaca palustris
Quercus nigra
Rhus spp.
Rhynchospora corniculata
Rubus spp.
Ruppia maritima
Scirpus acutus
Scirpus americanus
Scirpus robustus
Sparganium americanum
Tribonema spp.
Zannichellia palustris
Zea mays
Zostera marina

amounts of aquatic arthropods and mollusks present in the vegetation in the middle of the winter.

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NUTRITIONAL ANALYSES OF FOODS EATEN BY PINTAIL AND TEAL IN SOUTH LOUISIANA [1]

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INTRODUCTION

In the interest of waterfowl management, it is important to know the nutritive value of the foods consumed by waterfowl, especially those foods which are available for the building up of nutritive reserves to carry the birds through the winter period and the following spring. Only after various seeds have been evaluated is it possible to know which plants to encourage for the production of high quality foods. Although feeding tests are necessary to determine the actual nutritive value of wild foodstuffs, data on their proximate composition serves as a guide in suggesting their probable nutrient contributions to ducks.

If the body cavities of the birds from which food is recovered contain appreciable quantities of fat, it is reasonable to assume that the foods are meeting at least the minimum nutritional needs. Therefore, by chemically analyzing foods obtained from a large number of crops from fat ducks, it is possible to determine the nutritional levels that support wild waterfowl.

Little is known concerning the nutritional requirements of wild ducks; however, limited studies have indicated that the dietary requirements are met by diets which promote excellent growth in domestic ducks.

The purposes of this study were: (1) to identify foods removed from the crops of teal (*Anas discors, Anas carolinensis*) and pintail (*Anas acuta*), (2) to determine by proximate analyses the nutrient content of foods removed from the crops, (3) to compare the nutritional levels recommended for semi-domestic and domestic ducks with the analyses of the crop contents of wild ducks.

DESCRIPTION OF COLLECTION AREAS

Two hundred teal and 65 pintail crops were collected in four communities located in three parishes in South Louisiana. All of the samples were obtained from prairie marshes in southwestern Louisiana with the exception of one which was collected from delta marshes near the mouth of the Mississippi River.

The delta marshes are predominantly fresh and are associated with the active delta of the Mississippi River; therefore, the soils are chiefly alluvial deposits from the river. The primary plants are cattail (*Typha* spp.), reedgrass (*Phragmites communis*), common three-square (*Scirpus americanus*), giant

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