from under their necks. These observations lead the investigators to believe that the birds may not have adjusted to the presence of the transmitters.

It is not the intent of the authors to cast a shadow of credibility upon the use of radio-telemetric techniques. Radio-telemetry is a valuable research tool. However, it is believed that normal behavior of small vertebrates equipped with such devices can not be assumed. More extensive investigations of behavioral and physiological effects of these devices are indicated.

FOOD HABIT STUDY OF MALLARDS AND PINTAILS ON CATAHOULA LAKE, LOUISIANA, WITH NOTES OF FOOD HABITS OF OTHER SPECIES

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ABSTRACT

As a waterfowl wintering area, Catahoula Lake is of national significance and one of the most important natural wintering areas in the nation. It is the key to waterfowl abundance and hunting success in Central Louisiana.

For a ten year period from fall of 1960, through the winter of 1970, there was a yearly average usage of 20,000,000 duck days for Catahoula Lake (Louisiana Wild Life and Fisheries Commission, 1970).

Ducks found in greatest abundance were pintails and mallards.

A food habit study of mallards and pintails was conducted to determine foods eaten by these waterfowl. Notes were also made of the food habits of other ducks that use the Lake.

During the course of the study, gizzards were collected from 139 ducks and gullets were collected from the same birds when they contain food. Mallard and pintail predominated in the collection with 57 and 42 respectively, and six other species were represented in the 39 other gizzard/gullets.

Chufa, (*Cyperus esculentus*) was found to be most important waterfowl food on Catahoula Lake.

INTRODUCTION

Catahoula Lake provides a wintering area for large concentrations of waterfowl. It provides the most valuable waterfowl habitat in Central Louisiana and may winter between 150 to 400 thousand waterfowl annually. It undoubtedly has been a major waterfowl wintering area for many centuries as indicated by the abundance of waterfowl bones found in the Indian midden heap around the lake. Also, older residents of the area state that Catahoula Lake was an important source of waterfowl during the market hunting era.

This study was made to determine the food habits of mallards and pintails on this Lake and also provided information on the food habits of other species.

DESCRIPTION OF STUDY AREA

Location and Description

Catahoula Lake is located in Central Louisiana about 20 miles northeast of Alexandria. This important wildlife area is situated on the western edge of the Mississippi River alluvium in the complex Red River backwater area, and is a structural formation. It is a large, shallow poorly drained, flat, sump area that is subject to drastic seasonal water fluctuations. It is approximately 14 miles long, 3 miles wide and contains about 20,000 acres of open lake bed. At high water the

lake bed contains about 30,000 acres. From the tree line to the lowest area in the lake bed, there is a drop in elevation of about three feet. The lake is bounded on the north by land that rises abruptly to a height of 20 to 30 feet above the high water stage and on the south by low land that is subject to annual overflow.

Catahoula Lake is fed by Little River and numerous smaller streams from the north and west. At high water, drainage is to the east and south through Old River, French Fork of Little River, and several small bayous. At low water, the lake drains only through French Fork of Little River. The lake receives "overflow" or "backwater" from the Red, Black-Ouachita and Mississippi Rivers. The water level is dependent on the seasonal stages of these rivers. Water gradually rises in these river systems and enters the lake by backing up through the normal drainage channels, as well as over the lowland from a southerly direction.

High water normally prevails from late winter to early summer.

The time of flooding and depth of water vary from year to year but generally follow a distinct pattern. A gradual rise in the water level usually begins in November and December, increases sharply in January, remains at a high level through June, then recedes in July. The lake drains to a low water stage about the first of August exposing approximately 15,000 acres of mud flats. At that time, about 5,000 acres are covered by water normally ranging in depth from 1 to 12 inches. Soils over much of the lake bed are of fine silty loam and silty clay loam. Stranded low sandy ridges parallel the perimeter of the lake. A hard clay pan exists at variable depths below the soil surface.

Plants

The lake bed is generally flooded from December through July. The water level fluctuates a great deal during this period and at its peak reaches a depth of 15 to 25 feet. The winter rise and the summer drop are normally gradual. Because of the shallowness of the water and the softness of the bottom, wave action maintains a turbid condition. Few plants are adapted to such a drastic water fluctuation, long period of flooding, and high turbidity; therefore the number of species growing on the lake is limited. Because of the small number of species, interspecific competition is reduced. As a result, the lake is characterized by large acreages of uniform plant types.

Plant zonation, which is pronounced, is correlated with the lake bed contour, the length of time of flooding, and the length of the growing period.

Woody plants that withstand flooding, primarily water elm (*Planera aquatica*) and swamp privet (*Forestiera acuminata*), form dense stands of the perimeter of the lake. There is some scattered cypress (*Taxodium distichum*), water locust (*Gleditsia aquatica*) and buttonpush (*Cephalanthus occidentalis*) in this zone. The water elm is slowly advancing into the lake.

Herbaceous plants make up all the vegetation in the lake bed. The outer contour of the lake which is higher, firmer and dewatered first, has the longest growing season. The first herbaceous plant zone is dominated by chufa (*Cyperus esculentus*), but it also contains some spike rush (*Elocharis* sp.), highland pursley (*Ammania coccinea*), heliotrope (*Heliotropium* sp.) and cocklebur (*Xanthium* sp.). When this zone is dewatered early, the broad-leaved plants just mentioned spread and occupy a far greater area than normal. *Chufa makes up about 85 percent of the vegetation in this zone.*

The next concentric zone is dominated by a mixture of sprangle-top (*Leptochloa fascicularis*) and teal grass (*Eragrostis hypnoides*), but it also contains a little chufa.

Millet (*Echinochloa* sp.) does not exhibit the same degree of concentric zonation. Although it is scattered thinly over much of the lake, pure, dense, tall stands occupy the more marshy, seepy areas in which there is some humus in the soil. Millet stands occupy "pockets", rather than concentric zones.

The lowest evaluation on which plant growth occurs is covered by extensive stands of bull tongue (*Saggittaria* sp.), mud plantain (*Heternantheria limosa*), dwarf spikerush (*Eleocharis parvula*), and scatter water hyssop (*Bacopa rotundifolia*). True aquatics are excluded from the lake by water depth, period of flooding, and high turbidity. The acreage and the kind of plants occupying the lower zones may vary from year to year but the relative position of each plant species in the zones remain the same.

Utilization

Waterfowl. For a 10 year period from the fall of 1960 through the winter of 1969-70, Louisiana Wild Life and Fisheries Commission biologists reported a yearly average usage of 20,369,000 duck days for Catahoula Lake (Waterfowl Inventory, Louisiana Wild Life and Fisheries Commission, 1970). Ducks found in greatest abundance were pintail, mallard, teal, baldpate and gadwall. Those present in lesser numbers were ringneck, scaup, shoveller, ruddy, canvasback and wood ducks. A few geese and coots were present. Waterfowl species and abundance on the lake are influenced by water levels and migrational patterns. They are most abundant in the fall when water levels range from 6 to 8 inches. Under present conditions, the water cycle is highly favorable to the production of two excellent duck foods, chufa and millet. The widespread and intensive rooting by hogs in search of chufa tubers probably creates excellent feeding conditions for ducks by not only exposing tubers but also by tilling the feeding site so that ducks can readily puddle out additional tubers.

Hunting. Between 1400 and 1500 permanent duck blinds are maintained on the lake. In addition, many people hunt the brushy edges without erecting a blind. It is estimated that 8 to 10 thousand hunters use the area annually.

STUDY METHOD

Field Procedure

Duck gizzards/gullets were obtained through the cooperation of professional duck pickers. Gizzards or combinations of gullets and gizzards were placed in envelopes supplied to the cooperators. The head of each duck from which the gizzard/gullet was removed was placed in the envelope with the gizzard/gullet for identification purposes. The gizzards/gullets were taken from ducks killed during the 1968 waterfowl season. These were then stored by freezing until processed.

Laboratory Procedure

After thawing the gizzard/gullet contents, the animal matter and the unidentifiable vegetative matter was removed. The remaining vegetative material was placed in a container and oven dried.

After drying, the material was sifted through a series of graduated sieves and the contents retained by each sieve were, in some cases, run through a forced air seed cleaner in which items were separated by varying the intensity of the air stream.

Following separation, the food items were identified and measured volumetrically in a small graduated centrifuge tube.

The gizzard/gullet contents were analyzed by aggregate percent method and the results tabulated by percent volume. The inaccuracies of using gizzards or combination of gizzard/gullets were recognized; however, these were the only materials available, and are considered to be representative of true food consumption patterns.

RESULTS AND DISCUSSION

Mallard Foods

Plant material, consisting of tubers, seeds and unidentified vegetable matter made up 99.7 percent of the food of mallards on Catahoula Lake. The remaining 0.3 percent included animal material (Table 1). The sedge family, represented by 5 genera, made up over 60.4 percent of

the food. Chufa ranked first among the sedges and supplied 57.5 percent of the volume of all food eaten. The grass family represented 16.0 percent volume. Millet and sprangletop were the more important representatives of this family, with volume percentage of 9.3 and 5.8 respectively. Other grasses occurring were rice, teal grass and panicum. Unidentified vegetative material, excluding tubers and seeds, made up 18.7 percent of the volume of all food eaten.

Eight other plant families were represented, however, they supplied only a minor part (4.4 percent) of the food.

Pintail Foods

All food eaten by pintail on Catahoula Lake was composed of vegetative material with the exception of 0.2 percent. The Cyperaceae family provided 67.4 percent of the food and chufa was the most important food, making up 63.3 percent of the total foods eaten by pintail (Table 1).

TABLE 1. Food Contents of Mallards and Pintails by Percent Volume

Food Item	*Mallard %*	*Pintail %*
Cyperaceae	60.4	67.4
Cyperus esculentus		
Tubers	57.5	63.3
Seeds	Tr	Tr
Cladium jamaicensis	2.1	1.5
Eleocharis sp.	.8	2.6
Cyperus albomarginatus	Tr	Tr
Fimbristylis sp.	Tr	Tr
Gramineae	16.0	13.0
Echinochloa sp.	9.3	8.8
Leptochloa fascicularis	5.8	3.8
Oryza sativa	0.7	Tr
Eragrostis hypnoides	0.2	0.4
Panicum sp.	Tr	Tr
Unidentified Vegetable	18.7	15.8
Miscellaneous Seeds	4.4	3.6
Nymphaeacea		
Brasenia Schreberi	2.2	1.3
Vitaceae		
Vitis sp.	1.3	. . .
Rubiaceae		
Cephalanthus occidentalis	0.6	. . .
Diodia virginiana	0.1	0.2
Cucurbitaceae		
Unknown cucurbitaceae	0.1	. . .
Boraginaceae		
Heliotropium curassavicum	0.1	. . .
Polygonaceae		
Polygonum hydropiperoides	Tr	. . .
Polygonum portoricense	. . .	.5
Rosaceae		
Cragaegus viridis	Tr	1.2
Leguminosae		
Desmodium tortuogum	Tr	. . .

TABLE 1 (continued)

Food Item	*Mallard %*	*Pintail %*
Buettneriaceae		
Melochia corchorifolia	Tr	0.2
Commelinaceae		
Commelina nudiflora		Tr
Rubiaceae		
Rubus sp.		Tr
Lemnaceae		
Lemna minor		Tr
Unknown Seed	Tr	
Animal Material	0.3	Tr
Insect	Tr	0.2

The grass family was represented by millet (8.8 percent), sprangletop (3.8 percent), teal grass (0.4 percent) and trace amounts of rice and an unknown panicum.

The unidentified vegetative material made up 15.8 percent of the total volume. The remaining 3.6 percent of foods were made up of representatives of eight plant families.

Foods of Other Ducks

The food contents of the 39 gizzards/gullets from the five species of ducks collected along with the mallard-pintail collection are shown in Table 2. The foods taken by the widgeon, blue-winged teal, green-winged teal, ring-necked duck and lesser scaup followed the same pattern described for the mallard and pintail because chufa was the most important food item taken by this group and made up 67.0 percent of the foods eaten by these five species. Unidentified animal material provided 17.6 percent while miscellaneous seed contributed 15.4 percent of the volume.

TABLE 2. Food Contents from 39 Gizzards/Gullets From Five Species of Waterfowl by Percent Volume

[( ) = Number in Sample]

Food Item	Widgeon (14)	GW Teal (8)	BW Teal (7)	Ring-Necked (6)	Scaup (4)	Total
	%	%	%	%	%	
Chufa Tubers	70.8	81.4	63.7	58.1	76.3	67.0
Unidentified Veg.	23.9		26.2	7.4	13.4	17.6
Misc. Seed	5.3	18.6	10.1	34.5	10.3	15.4
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0

SUMMARY

Chufa is the most important food for mallards and pintails on Catahoula Lake. This study revealed that the tubers of this plant, (*Cyperus esculentus*) provided 57.5 per cent of the mallard food and 63.3 percent of the pintail's diet. It also contributed 67.0 percent of food eaten by the five other species of ducks examined. For the entire sample of 139 gizzards/gullets, chufa provided 61.5 percent by volume for the entire samples.

The value of chufa to waterfowl is probably much greater than that of all other species of *Cyperus* combined. Based on the analysis of 7.887

duck gizzards of 18 species collected in 247 localities in the United States and Canada, chufa ranked tenth in order of importance of all food eaten. In the lower Mississippi region, chufa ranked first in order of percentage of total foods eaten as indicated by the analysis of 1,228 gizzards (Martin and Uhler, 1939).

The unidentified vegetive material made up 18.7 percent of the mallard's food and 15.8 percent of the pintail's food. These vegetative parts were believed to be stems, leaves and roots of aquatics growing on the lake.

Five grasses contributed 16.0 percent and 13.0 percent of the foods of mallards and pintails respectively. Millet and sprangletop were the most important representatives of the grass family.

All other plant, represented by eight families, supplied only a minor part of the foods eaten by mallards (4.6 per cent) and pintails (3.6 percent).

The major herbaceous plant growing on Catahoula Lake is chufa. The production of chufa on the lake is dependent upon the annual water level fluctuation. After the water receeds from the lake beds, thousands of acres of chufa are produced. Therefore, future management of Catahoula Lake should be directed towards a de-watering schedule to permit the normal production of this important waterfowl food. Any permanent pooling of water on the lake bed will destroy the value of Catahoula Lake as a waterfowl wintering area.

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TECHNIQUES FOR CAPTURING, HANDLING, AND MARKING NUTRIA

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ABSTRACT

Trapping, handling, and marking methods were evaluated for wild nutria (*Myocastor coypus*) in agricultural areas in Louisiana and Texas. Treadle-operated box traps, set on rafts instead of land, increased retrap response and reduced mortality. A modified leg-hitch sling and the tail-hold method were found best for simple handling, and a light-weight restraining device was developed for close examination. Sodium pentobarbital injected intrathoracically at 50-60 mg/kg was the safest and most consistent anesthetic; carrot baits treated with diazepam effectively tranquilized nutria for safe handling. Nutria showed gross physiological rejection of nearly all marking materials tested (coloring agents and such objects as tags, flags, pins, and collars attached to or through the skin of various parts of the body). A No. 3 self-piercing monel metal animal tag inserted through a web in the hind foot was the only reliable, long-lasting marking method tested, but it was inconspicuous. Acceptable short-term markers included ear tags, a white reflective paint, and radio-transmitter collars.

INTRODUCTION

In a study of nutria and nutria damage in agricultural areas of coastal Louisiana and Texas, population studies and research on control methods required capturing, handling, and marking large numbers of animals. Techniques previously used for marsh nutria proved generally unsatisfactory for agricultural nutria, and we tested a number of additional methods—many originally described for other animals, some modified from the form used for marsh nutria, and some new. This paper presents the results of these evaluations.

For brevity and ease of reference, most of the material is given in tabular form, in order of the methods' general effectiveness, and is discussed only briefly in the text.

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LIVE-TRAPPING

Twelve techniques of live-trapping were evaluated (Table 1). Chasing, with or without dogs (Kays 1956, Williams 1964), was not included because it was impractical in our study areas. Most of the techniques tested, including several successfully used by other workers for marsh nutria, were unsatisfactory for agricultural nutria because of mortality,

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