

Individually, the enthusiastic hunter deserves more consideration than the casual hunter, and may insist on the spectacular programs that only deer and waterfowl provide. His license fees, though, will not support these programs. The vast majority of casual hunters must make up these deficits and pay for the administration and law enforcement of the state fish and game agencies.

Hunters who restricted their hunting to their home counties were thought to be less enthusiastic, and more likely to quit hunting than those who traveled farther. Questionnaires and interviews of 1,176 home-county hunters, though, showed little variation from the state-wide average. They hunted squirrels and groundhogs a little more, deer, doves and waterfowl a little less, and killed a little less game.

A survey of all hunters in Kentucky in 1961-62 indicated a vast preponderance of small upland game hunting. Ninety per cent of the hunters sought no other type, and small upland game accounted for 96% of all hunting trips.

Only 47% of the hunters left their home counties to hunt, and only 28% went farther than the adjoining counties. The National Survey of Fishing and Hunting indicates that the average hunting trip is only 42.7 miles, round-trip.

PINTAIL AND TEAL FOODS IN SOUTH LOUISIANA ¹

By LESLIE L. GLASGOW ² and JOHN L. BARDWELL ³

The pintail (*Anas acuta*) is second only to the mallard (*A. platyrhynchos*) in popularity among hunters. According to Smith (1961), the wintering population of pintails in Louisiana averaged about 300,000 birds for a 12-year period from 1949 to 1961 but in the late 50's the population increased to an average of about one-half million birds. This fact is supported by the *Midwinter Waterfowl Inventory* (1962), which showed a population of 514,150 pintails. Louisiana always supports the great majority of the pintails wintering in the Mississippi Flyway. Atwood and Wells (1960) reported a kill of approximately 44,000 pintails during the 1959-1960 waterfowl season.

As reported in the 12-year study by Smith (1961), Louisiana's mid-December population of green-winged teal (*A. carolinensis*) averaged 350,000, and in some years over one-half million birds were present. This is in agreement with the 1962 *Midwinter Inventory*, which reported 506,900 green-winged teal in Louisiana in early January. Louisiana winters over 90 percent of the Mississippi Flyway population in most years. Atwood and Wells (1961) reported a kill of 26,328 green-winged teal in Louisiana in the 1959-1960 hunting season.

Although many blue-winged teal (*A. discors*) have always migrated through Louisiana, few remained over winter prior to 1957. Since that time, Smith (1961), has reported a winter population of about 300,000 ducks. The *Midwinter Inventory* (1962) indicates that 298,700 blue-winged teal were wintering in Louisiana. Atwood and Wells (1960) reported a kill of about 36,000 in Louisiana during the 1959-1960 season.

Thus in Louisiana, pintail and teal are not only among the more abundant of the wintering ducks but they also contribute heavily to the hunter's bag.

Data for this report were obtained during a study by Bardwell (1962) of the nutrient contents of foods removed from 65 pintail and 140 teal crops collected in South Louisiana. The purpose of this paper is to report the kinds and amounts of food eaten by these ducks.

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¹ A contribution of Louisiana State University and the Louisiana Wildlife and Fisheries Commission.

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TABLE I
GULF COAST WATERFOWL, FOOD-HABITS STUDIES THAT CONTAIN PINTAIL AND TEAL FOODS

<i>Authors</i>	<i>Date</i>	<i>Location</i>	<i>Contents Examined</i>	<i>No. of Pintails</i>	<i>No. of Teals</i>	<i>Other Ducks</i>	<i>Rank of Plant Families</i>
Martin and Uhler	1939	Gulf Coast	Gizzard	367	171	Yes	1. Zosteraceae 3. Gramineae 2. Cyperaceae
Smith	1951	Southeast Louisiana	Gizzard	21	24	No	1. Cyperaceae 2. Zosteraceae
Singleton	1953	Texas Coast	Gizzard	177	46	Yes	1. Gramineae 3. Zosteraceae 2. Cyperaceae
Beter	1957	Southeast Louisiana	Gizzard	6	5	No	1. Zosteraceae 2. Cyperaceae
Dillon	1957	Southwest Louisiana	Gullet Gizzard	Yes	Yes	Yes	1. Gramineae 2. Cyperaceae
Chamberlain	1959	Southwest Louisiana	Gizzard	174	110	Yes	1. Cyperaceae 3. Nymphaeaceae 2. Gramineae
Kimble and Ensminger	1959	Southwest Louisiana	Gizzard	58	15	No	1. Cyperaceae 3. Gramineae 2. Zosteraceae
This Study	1961	South Louisiana	Crop	65	140	No	1. Gramineae 2. Cyperaceae

PREVIOUS WORK

Waterfowl food-habits studies that include pintail and teal collected on the Gulf Coast are shown in Table I. Some are very general investigations in which foods eaten by several species of waterfowl are reported collectively while others present foods for individual species. A few studies that were restricted to waterfowl species other than pintail and teal are not reviewed.

COLLECTION AREAS

Duck crops were collected in southeast and southwest Louisiana from fresh to brackish marshes. Since the prairie marshes of southwest Louisiana are high and firm they support many grasses. They can be divided into three major marsh types:

(1) Salt marshes parallel the coast line and extend inland 3 to 5 miles depending on the invasion of salt water. They support a salt marsh-wire grass plant type. (2) Brackish marshes occupy a zone 2 or 3 miles in width and extend inland to the nearest stranded beach ridges. Wire grass and three corner grasses (*Scirpus*) are predominate. A transition zone which occurs near the ridges contains cutgrass (*zizaniopsis*), millets (*Echinochloa*) and bull-whip (*Scirpus californicus*). (3) Fresh marshes which lie between the ridges and high ground support grasses such as millets, paspalums, panicums, sprangle-top (*Leptochloa*) and bag scale grass (*Sacciolepis*). *Sagittaria* is also a common plant in this zone.

Some crops were removed from ducks that were shot near the mouth of the Mississippi River where delta marshes are predominantly fresh. The major plants are coontail (*Ceratophyllum demersum*), sago pondweed (*Potamogeton pectinatus*), water hyacinth (*Eichornia crassipes*), alligator weed (*Alternanthera philoxeroides*), delta duck potato (*Sagittaria platyphylla*), common three-square (*Scirpus americanus*) and giant cutgrass (*Zizaniopsis miliacea*).

Collections were made in the fall of 1961 at the following places:

Place	Pintail	Teal*
Creole	20	20
Pecan Island	30	115
Gueydan	15	0
Pass-a-Loutre	0	5
	<hr/> 65	<hr/> 140

* Includes greenwinged and bluewinged teal.

STUDY METHODS

Field Procedure

Duck crops were obtained through the cooperation of biologists, hunters, and professional duck pickers. No gizzards were collected. Professional duck pickers were the greatest source of crops.

Cooperators were supplied with envelopes that were labelled as follows: Species of duck, sex, date, location shot, collector and condition of duck (rated as good, fair or poor, according to the amount of fat observed). Cooperators were instructed to place each crop in a separate envelope; to label envelope completely, and to freeze as quickly as possible. Crops were collected from the cooperators at the end of the waterfowl season and stored in a deep-freeze until processed.

Laboratory Procedure

After thawing the crop contents, the animal matter was removed and refrozen for later identification. The vegetative material was placed in shallow pans and dried at 47° C.

After drying, the seeds were sifted through a series of graduated sieves. The contents retained by each sieve were hand sorted, or in some cases where desirable, they were run through a forced-air seed cleaner in which items of different specific gravities were separated by varying the intensity of the air stream.

If a sieve contained a large number of small seeds of approximately equal size but of different species, a 10% sub-sample of the sieve contents was taken to reduce the laborious job of separating the seeds one by one.

Following separation, the seeds were identified to species and measured in a small graduated centrifuge tube. Seeds amounting to less than 0.1 cc in volume or .01 gram in weight were recorded as traces.

The animal material was processed in a manner similar to that followed for the seeds.

PINTAIL FOODS

Pecan Island (30 crops)

Vegetative material, almost exclusively seeds, made up 98.5% of the food of pintails at Pecan Island. The remaining 1.5% included gastropods, crustaceans and insects.

As shown in Table II, the most important food was fall panicum which made up 35% of the volume and 41% of the weight and occurred in all of the crops. Other important species in the Gramineae family were bag scale grass, *Paspalum acuminatum*, sprangletop, and Walter's millet with volume percentages of 21, 15, 9, and 6, respectively. The grass family made up 89% of the volume and weight of the crop contents, while the Polygonaceae family contributed 7%. The sedge family which was represented by 5 genera made up less than 2% of the crop contents. The Amaranthaceae, Rutaceae, Umbelliferae and Compositae families contributed minor amounts.

Creole (20 crops)

All food in the Creole area with the exception of one-fourth of 1% was composed of vegetative material. The Grass family, represented by 10 species, made up over 98% of the food. Brownseed paspalum which ranked first among the grasses, supplied 36% of the volume, 45% of the weight and occurred in 75% of the crops. Walter's millet was second and fall panicum third in importance. Other grasses, in order of importance, were barnyard millet, sprangletop, junglerice, domestic rice, paspalum, signal grass and bag scale grass.

All other plant families supplied only a minor part of the food.

Gueydan (15 crops)

Three plant families made up of 97% of the food of pintails at Gueydan. Seeds of brownseed paspalum, domestic rice, fall panicum, and barnyard millet were the major species eaten. The Cyperaceae and Compositae families although present, were unimportant.

All Areas (65 crops)

Vegetable material made up 98.6% of the contents of all pintail crops while animal material made up only 1.4%. The grass family provided 95% of the volume and 96% of the weight of all food; therefore, it was far more important than any other family. Important grass genera ranked in order of importance were (1) fall panicum, (2) brownseed paspalum, (3) Walter's millet, (4) bag scale grass, (5) barnyard millet, (6) *Paspalum acuminatum*, (7) domestic rice, and (8) sprangletop.

The smartweed family which was second in importance, was followed by the sedge family. The three remaining families were unimportant.

TEAL FOODS

Pecan Island (115 crops)

At Pecan Island 98.6 and 1.4% of the crop contents were vegetable and animal material, respectively. A review of Table III reveals that the Gramineae family provided more than 90% of the total food. Fall panicum was the most important plant, making up 78% of the volume and weight and occurring in 94% of the crops. Other important plants were sprangletop, Walter's millet and giant foxtail. They made up about 10% of the food and were widely distributed in the samples. Eight other grasses made up slightly over 2.5% of the food.

Six sedges contributed 3.5% of the food while 5 other families and a few unknown seeds comprised 3.5% of the crop contents.

TABLE II
PINTAIL FOODS BY PERCENT OCCURRENCE, VOLUME AND WEIGHT

	Pecan Island (30 Crops)			Creole (20 Crops)			Gueydan (15 Crops)			Total (65 Crops)		
	% Occ.	% Vol.	% Wt.	% Occ.	% Vol.	% Wt.	% Occ.	% Vol.	% Wt.	% Occ.	% Vol.	% Wt.
Gramineae	50.0	89.6	89.2	100.0	4.0	1.7	98.0	97.0	95.2	96.0	5.4	3.0
<i>Leptochloa fascicularis</i>	...	...	...	...	...	...	66.6	1.4	0.4	0.2	0.4	0.2
<i>Digitaria sanguinalis</i>	...	...	...	50.0	0.4	0.4	33.3	0.7	0.3	0.3	0.3	0.3
<i>Brachiaria extensa</i>	33.3	15.2	9.2	75.0	35.9	45.5	33.3	0.2	5.7	3.2	5.7	3.2
<i>Paspalum acuminatum</i>	...	...	...	50.0	0.7	1.0	100.0	31.0	21.9	29.6	31.0	40.3
<i>Paspalum plicatum</i>	...	...	...	50.0	19.8	19.3	66.6	6.7	1.3	1.2	6.7	4.7
<i>Paspalum</i> sp.	100.0	35.3	41.0	25.0	0.3	0.2	66.6	16.9	25.2	26.5	8.1	7.4
<i>Sacciolepis striata</i>	83.3	21.3	21.3	25.0	3.1	3.5	...	...	8.1	7.4	1.5	1.8
<i>Echinochloa colonum</i>	33.3	0.8	1.2	75.0	10.1	10.8	100.0	13.4	7.3	7.4	13.5	9.6
<i>Echinochloa crusgalli</i>	100.0	6.0	7.6	100.0	21.3	12.8	100.0	6.2	13.5	9.6	6.2	2.7
<i>Echinochloa walteri</i>	16.6	1.7	2.7	25.0	2.2	3.0	66.6	19.7	0.7	0.9	19.7	20.6
<i>Oryza sativa</i>	...	...	...	...	...	...	...	...	3.9	4.8	...	...
Cyperaceae	...	1.9	1.1	...	0.7	0.5	...	0.5	1.1	0.7	...	...
<i>Cyperus iria</i>	16.6	0.1	tr.	50.0	0.2	0.1	...	...	tr.	tr.	...	...
<i>Cyperus odoratus</i>	66.6	0.4	0.2	25.0	0.4	0.3	66.6	0.4	0.3	0.1	0.3	0.1
<i>Eleocharis quadrangulata</i>	...	...	...	25.0	tr.	tr.	...	...	0.2	0.2	0.2	0.2
<i>Scirpus californicus</i>	50.0	0.2	0.1	25.0	0.7	0.7	...	...	0.1	0.1	0.1	0.1
<i>Scirpus robustus</i>	16.6	0.7	0.7	50.0	0.1	0.1	...	...	0.2	0.2	0.2	0.2
<i>Cladium jamaicensis</i>	66.6	0.7	0.1	...	...	...	66.6	0.1	0.3	0.1	...	...
Polygonaceae	...	7.1	7.0	50.0	0.7	0.9	...	...	3.0	2.8	...	...
<i>Polygonum hydropiperoides</i>	66.6	7.1	7.0	50.0	0.7	0.9	...	...	3.0	2.8	...	...
Amaranthaceae	...	0.6	0.6	...	...	...	...	...	0.2	0.2	...	...
<i>Amaranthus</i> sp.	16.6	0.6	0.6	...	...	...	...	...	0.2	0.2	...	...

TABLE II—Continued
 PINTAIL FOODS BY PERCENT OCCURRENCE, VOLUME AND WEIGHT

	Pecan Island (30 Crops)			Creole (20 Crops)			Gneydon (15 Crops)			Total (65 Crops)		
	% Occ.	% Vol.	% Wt.	% Occ.	% Vol.	% Wt.	% Occ.	% Vol.	% Wt.	% Occ.	% Vol.	% Wt.
Rutaceae	..	tr.	tr.	..	..	..	..	..	..	..	tr.	tr.
<i>Sagittaria</i> sp.	16.6	tr.	tr.	..	..	..	..	..	..	..	tr.	tr.
Umbelliferae	..	0.6	0.3	..	..	..	..	..	..	..	0.2	0.1
<i>Hydrocotyle</i> sp.	16.6	0.6	0.3	..	..	..	..	..	..	..	0.2	0.1
Compositae	..	0.3	0.3	..	0.3	0.2	..	tr.	tr.	..	0.2	0.2
<i>Iva ciliata</i>	..	..	..	25.0	0.2	0.2	..	..	..	..	0.1	0.1
<i>Eclipta alba</i>	83.3	0.3	0.3	25.0	tr.	tr.	33.3	tr.	tr.	..	0.1	0.1
<i>Bidens</i> sp.	16.6	tr.	tr.	..	..	..	..	..	..	..	tr.	tr.
Unidentified seeds	..	..	..	..	0.1	tr.	..	..	..	..	tr.	tr.
A	..	..	..	25.0	0.1	tr.	..	..	..	..	tr.	tr.
B	..	..	..	25.0	tr.	tr.	..	..	..	..	tr.	tr.

TABLE III

TEAL FOODS BY PERCENT OCCURRENCE, VOLUME AND WEIGHT

	Pecan Island (115 Crops)			Creole (20 Crops)			Pass-A-Louvre (5 Crops)			Total (140 Crops)		
	% Occ.	% Vol.	% Wt.	% Occ.	% Vol.	% Wt.	% Occ.	% Vol.	% Wt.	% Occ.	% Vol.	% Wt.
Oscillatoriaceae												
<i>Lyngbya</i> sp.	5.7	tr.	tr.								tr.	tr.
Gamineae												
<i>Cyodon dactylon</i>		92.2	90.7		92.3	91.6		1.8	2.7		90.9	91.6
<i>Leptochloa fascicularis</i>	34.3	5.4	3.0	25.0	1.0	0.9					0.1	0.1
<i>Paspalum acuminatum</i>	2.8	tr.	tr.	50.0	1.8	1.4	100.0	tr.	0.7		4.8	2.8
<i>Paspalum plicatulum</i>				75.0	1.7	1.8					0.3	0.3
<i>Paspalum</i> sp.	2.8	0.1	tr.	50.0	17.6	18.9					2.5	2.8
<i>Panicum dichotomiflorum</i>	94.3	78.3	78.8	25.0	0.1	0.1					0.1	tr.
<i>Panicum</i> sp.	40.0	tr.	0.1	75.0	24.6	28.3					69.4	72.2
<i>Panicum</i> sp.	14.3	1.3	1.4	50.0	7.3	8.2					1.1	1.2
<i>Sacciolepis striata</i>	8.6	0.6	0.7	25.0	9.2	5.6					1.1	1.2
<i>Echinochloa crusgalli</i>	48.5	0.4	0.5	50.0	17.4	20.5					1.8	1.4
<i>Echinochloa walteri</i>	94.3	2.1	1.5	100.0	11.8	5.9	100.0	1.8	2.1		2.8	3.4
<i>Setaria magna</i>	85.7	3.9	4.6								3.5	2.1
<i>Oryza sativa</i>	2.8	tr.	tr.								3.3	4.0
Unknown Grass	11.8	0.1	0.1	25.0	tr.	tr.					tr.	tr.
Cyperaceae												
<i>Cyperus iria</i>		3.8	3.4		6.0	4.5					98.2	85.8
<i>Cyperus odoratus</i>	8.6	1.0	1.5								0.9	1.3
<i>Eleocharis parvula</i>	77.1	2.5	1.6	50.0	2.4	1.4	100.0				4.0	2.4
<i>Fimbristylis miliacea</i>		0.2	0.2								tr.	tr.
<i>Scirpus americanus</i>	2.8	0.2	0.2	25.0	3.5	3.1					0.7	0.6
<i>Scirpus californicus</i>				25.0	tr.	tr.					tr.	tr.
<i>Cladium jamaicensis</i>	68.6	0.1	0.1								0.1	0.1
	40.0	tr.	tr.								tr.	tr.

TABLE III—Continued

TEAL FOODS BY PERCENT OCCURRENCE, VOLUME AND WEIGHT

	Pecan Island (115 Crops)			Creole (20 Crops)			Pass-A-Loutre (5 Crops)			Total (140 Crops)		
	% Occ.	% Vol.	% Wt.	% Occ.	% Vol.	% Wt.	% Occ.	% Vol.	% Wt.	% Occ.	% Vol.	% Wt.
Polygonaceae		1.0	1.2			0.1					0.9	1.1
<i>Polygonum pensylvanicum</i>	5.7	tr.	tr.								tr.	tr.
<i>Polygonum hydrophoroides</i>	82.9	1.0	1.2	100.0	0.1	0.4					0.9	1.1
<i>Polygonum portoricense</i>	2.8	tr.	tr.	50.0	tr.	0.1					tr.	tr.
Amaranthaceae		1.5	1.9								1.2	1.7
<i>Amaranthus</i> sp.	48.6	1.5	1.9								1.2	1.7
Rutaceae		tr.	tr.		tr.	tr.					tr.	tr.
<i>Sagittaria</i> sp.	25.7	tr.	tr.	50.0	tr.	tr.					tr.	tr.
Umbelliferae		tr.	tr.								tr.	tr.
<i>Hydrocotyle</i> sp.	5.7	tr.	tr.				100.0	tr.	0.1		tr.	tr.
<i>Ptilimum</i> sp.	2.8	tr.	tr.						0.1		tr.	tr.
Compositae		1.0	0.7		1.6	1.5					1.1	1.1
<i>Iva ciliata</i>		0.2	0.2	25.0	1.6	1.4					0.2	0.2
<i>Eclipta alba</i>	74.3	0.2	0.2	50.0	tr.	tr.					0.2	0.2
Unknown compositae	5.7	0.8	0.4								0.7	0.4
Unknown seeds		0.5	0.6								0.5	0.5
A	8.6	0.1	0.2								0.1	0.1
B	5.7	0.3	0.4								0.3	0.3
C	2.8	0.1	0.1								0.1	0.1
D	2.8	tr.	tr.								tr.	tr.
E	2.8	tr.	tr.								tr.	tr.

Creole (20 crops)

In the Creole area teal consumed 98% vegetable matter and 2% animal material.

The grass family supplied over 90% of the food with approximately one-fourth being fall panicum. Brownseed paspalum, bagscale grass, an unknown panicum and millets were important grasses and contributed about 60% of the total food. Three sedges provided about 5% while three other plant families were represented by minor amounts of food.

Pass-A-Loutre (5 crops)

Only 5 teal crops were available from Pass-A-Loutre near the mouth of the Mississippi River. Animal matter, largely small clams, comprised 11% of the weight. *Cyperus odoratus* in the sedge family made up 98% of the volume and 85% of the weight of all foods. Two other plant families contributed insignificant quantities of food.

All Areas (140 crops)

Vegetable material made up 98.4% and animal material 1.6% of all food consumed by teals. The Gramineae family furnished 91%, the Cyperaceae family 5%, the Amaranthaceae family 1.5%, and the smartweed family 1.0% of the food. Major grasses ranked in order of importance were fall panicum, sprangletop, giant foxtail, Walter's millet, barnyard millet, and brownseed paspalum.

Cyperus odoratus, *cyperus iria* and *Fimbristylis miliacea* were important sedges. Other plants were of little importance.

GENERAL DISCUSSION

Table I shows that most previous waterfowl food-habits studies indicate that the sedge family is the most important contributor to duck diets on the Gulf Coast. Results of this study show that in the area sampled, the grass family is far more important than the sedge family, providing about 95% of the pintail food and 90% of the teal food. The sedge family was unimportant to pintails and was of minor importance to teals. Other plant families provided very small quantities of food.

The differences in importance of the grass and sedge family as shown by the studies, may be due to several factors. Of primary importance, is the use of gizzards vs. gullets for food-habits studies. Hard seeds tend to be retained in the gizzard and are therefore present in greater proportion to softer seed than the ratio in which both were ingested. As shown in Table I, several investigators examined only gizzards.

Another major reason may be that foods available to waterfowl have changed because of plant succession. It is well known that the marshes of south Louisiana have been subjected to much drainage. This would tend to permit plants to move toward climax and grasses are farther advanced in succession than sedges.

Other possible reasons for differences in results are that collections may have been made in different areas and in several earlier investigations other duck species were included in the studies.

SUMMARY

Based on the quantities of seed found in this study, duck food producing plants are ranked in the following order.

<i>Pintail</i>	<i>Teal</i>
1. Fall panicum	1. Fall panicum
2. Brownseed paspalum	2. Sprangletop
3. Walter's millet	3. Flatsedge, fragrant
4. Bag scale grass	4. Giant foxtail
5. Barnyard millet	5. Walter's millet
6. <i>Paspalum acuminatum</i>	6. Barnyard millet
7. Domestic rice	7. Brownseed paspalum
8. Sprangletop	8. Bag scale grass
9. Smartweed, Swamp	9. Amaranthus sp.
10. Junglerice	10. Unknown panicum

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FOOD UTILIZATION BY WATERFOWL IN GREEN TIMBER RESERVOIRS AT NOXUBEE NATIONAL WILDLIFE REFUGE

By DAVID L. HALL

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INTRODUCTION AND STATEMENT OF THE PROBLEM

Management of marshes, reservoirs, and other open and semi-open areas has been discussed at length by various investigators. Waterfowl food preferences are generally known, and the techniques of water manipulation favoring desired food species, whether natural or planted, are in current usage for many types of land, but such is not the case with forest lands. Many timbered areas normally flooded each year, may or may not be utilized by waterfowl, depending upon the time of flooding. The practice of artificially controlling the time and extent of flooding of green-timber areas primarily for waterfowl usage is relatively new and has received little study.

Mallards and wood ducks make extensive use of flooded woodlands provided adequate food is present. Timber stand improvement practices designed to furnish multiple benefits cannot be formulated until further study is made of waterfowl food preferences and utilization in green-timber reservoirs. The value of artificial plantings to supplement natural food in green-timber reservoirs also requires investigation.