Ring-necked ducks (*Aythya collaris*) use lipid reserves accumulated on wintering and spring stopover areas to meet their subsequent reproductive requirements (Hohman, 1986; Hohman et al., 1988; Alisauskas et al., 1990). In 1989 midwinter surveys, 75% of ring-necked ducks observed in the Mississippi Flyway and 56% observed throughout the United States were in Louisiana (U.S. Fish and Wildlife Service, unpubl. data). Because numbers of ring-necked ducks counted in midwinter surveys at Catahoula Lake and the adjacent Catahoula National Wildlife Refuge have averaged 34,000 in recent years (Louisiana Department of Wildlife and Fisheries, unpubl. data), habitat conditions there could have a significant influence on the continental population of this species.

We quantitatively describe diets of ring-necked ducks wintering on Catahoula Lake, a 12,000-ha wetland basin located in the Mississippi River floodplain of central Louisiana (31°30'N, 92°08'W). Historically, the lake basin filled during late fall, and water levels generally remained high through June and then receded in July, exposing about 6,000 ha of mud flats by the first week of August (Wills, 1971). The annual cycle of drying and reflooding stimulated growth of moist-soil plants that attracted large concentrations of wintering waterfowl. In the 1960s, a navigation project on the Red River necessitated construction of a diversion canal and a water-control structure adjacent to the lake to prevent permanent flooding. However, water-control capabilities are limited, and abrupt increases in water level result from heavy rainfall or back-flooding from local rivers (Woolington and Emfinger, 1989).

Water levels presently are managed to provide habitat for wintering waterfowl, to allow hunting opportunity, and to reduce availability of spent lead shot to foraging waterfowl (Peters, 1992). The lake is partially drained (approximately 2,000 ha remain flooded) in summer to stimulate growth of waterfowl food plants. In fall, water levels are not intentionally raised until 10 days before the waterfowl hunting season (i.e., mid to late November) so that areas with high lead shot densities remain dry, thus preventing birds from feeding in those areas. Water levels are raised after the end of duck hunting season (i.e., early January) to discourage dabbling ducks from feeding on the lake.

Waterelm (*Planera aquatica*) and swamp privet (*Forestiera acuminata*) grow in dense stands around the perimeter of the lake. Common plants of the lake bed include chufa flatsedge (*Cyperus esculentus*), spikerush (*Eleocharis sp.*), bearded sprawling (*Leptochloa fascicularis*), teal grass (*Eragrostis hypnoides*), millets (*Echinochloa spp.*), common arrowhead (*Sagittaria latifolia*), and roundleaf bacopa (*Bacopa rotundifolia*) (Wills, 1971).

We collected 54 ring-necked ducks by shooting from a boat at night with the aid of lights (hereafter, "random sample") between 31 November and 9 December 1990. We also collected 30 ring-necked ducks by shooting birds that approached decoys (hereafter, "hunter sample") from 1 January to 10 January 1991. Within 15 min of collection, 10% formalin was injected into the esophagus, and foods were removed later. Esophageal and proventricular contents were combined to maximize sample size (Sugden, 1973). Birds were sexed and aged as adult (>1 yr) or immature (<1 yr) using plumage and cloacal characteristics (Hochbaum, 1942; Carney, 1964; Hohman and Cypher, 1986).

Food items were identified, sorted, and dried to constant mass (±0.1 mg) at 55°C. Data were summarized by percent occurrence (Swanson et al., 1974) and aggregate percent dry mass (Prevett et al., 1979). Sample sizes were too small to
TABLE 1.—Percent occurrence and aggregate percent dry mass of foods consumed by ring-necked ducks (n = 21) at Catahoula Lake, Louisiana.

<table>
<thead>
<tr>
<th>Food item</th>
<th>% occurrence</th>
<th>Aggregate %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant</td>
<td>100</td>
<td>99.7</td>
</tr>
<tr>
<td>Tubers</td>
<td>81</td>
<td>69.7</td>
</tr>
<tr>
<td>Chufa flatsedge Cyperus esculentus&lt;sup&gt;1&lt;/sup&gt;</td>
<td>67</td>
<td>55.2</td>
</tr>
<tr>
<td>Common arrowhead Sagittaria latifolia&lt;sup&gt;1&lt;/sup&gt;</td>
<td>19</td>
<td>14.4</td>
</tr>
<tr>
<td>Seeds</td>
<td>90</td>
<td>29.7</td>
</tr>
<tr>
<td>Millet Echinochloa spp.&lt;sup&gt;1&lt;/sup&gt;</td>
<td>76</td>
<td>11.7</td>
</tr>
<tr>
<td>Bearded sprangletop Leptochloa fascicularis&lt;sup&gt;1&lt;/sup&gt;</td>
<td>67</td>
<td>17.6</td>
</tr>
<tr>
<td>Other plant&lt;sup&gt;1,2&lt;/sup&gt;</td>
<td>81</td>
<td>0.8</td>
</tr>
<tr>
<td>Animal&lt;sup&gt;1,3&lt;/sup&gt;</td>
<td>48</td>
<td>0.3</td>
</tr>
</tbody>
</table>

<sup>1</sup> Category used as response variable in MANOVA.
<sup>2</sup> Includes seeds of chufa flatsedge, common arrowhead, Eragrostis hypnoides, and Eleocharis sp. plus unidentified seeds and vegetation.
<sup>3</sup> Includes Pelecypoda, Isopoda, Physidae, Nematoda, Hemiptera, Zygoptera, Culicidae, and unidentified animal.

We compare collection methods. We used multivariate analysis of variance (MANOVA) to assess differences in overall diets (aggregate % dry mass) between sex and age classes (SAS Institute Inc. 1987). Food taxa used as response variables in the MANOVA are noted in Table 1. F-values reported from MANOVA are approximations based on Wilks' lambda (SAS Institute Inc., 1987). Angular transformations were applied to percent values to meet assumptions of homogeneity of variances (Sokal and Rohlf, 1969).

We obtained food samples from 19 (35%) randomly collected (8 adult males, 5 immature males, 2 adult females, 4 immature females) and 2 (7%) hunter-shot birds (1 adult male, 1 immature female). Overall diets did not differ between sex (F = 0.49; d.f. = 6, 12; P = 0.80) or age classes (F = 0.58, d.f. = 6, 12; P = 0.74), and the sex by age interaction was not significant (F = 0.29; d.f. = 6, 12; P = 0.93). Plant material comprised 99.7% of diets (Table 1). Chufa flatsedge tubers were the largest component of diets, but bearded sprangletop seeds, common arrowhead tubers, and millet seeds also were important foods (Table 1).

Similarly, diets of ring-necked ducks wintering in Florida and South Carolina comprise primarily plant material, especially seeds and tubers (Alexander, 1980; Hohman, 1984; Hoppe et al., 1986; Hohman et al., 1988). Chufa flatsedge tubers also are important foods of other waterfowl species wintering on Catahoula Lake (Wills 1971; Hohman et al. 1990). Chufa tubers are a high-energy food (4.26 kcal/g; Kelley and Fredrickson 1991) that may facilitate rapid weight gain throughout winter, which is important for spring migration and subsequent reproduction by ring-necked ducks (Hohman, 1986; Hohman et al., 1988; Alisauskas et al., 1990).

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**LITERATURE CITED**


