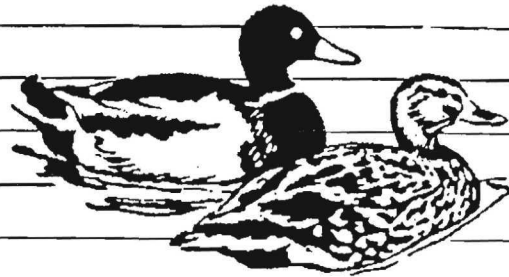


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## Intestinal Morphology Differs Between Gulf Coast Redhead Populations

Several studies have shown that diet quality and quantity can affect the size of a bird's digestive organs, and that organ size may be affected by osmoregulatory demands associated with reduced availability of fresh water. As part of a larger study on redheads (*Aythya americana*) wintering in Louisiana and Texas, we investigated the visceral morphology of two redhead populations for two consecutive winters. Our objective was to determine if the size of intestines varied by location, year, or time of year.

### Study Areas

The Chandeleur Islands are a 65-km long chain of barrier islands located about 40 km off the Louisiana coast in the Gulf of Mexico; the islands serve as wintering habitat for about 20,000 redheads. The Laguna Madre of Texas is a hypersaline lagoon system about 180 km long and is separated from the Gulf of Mexico along its

eastern side by Padre Island. Ponds along the mainland are available for use by redheads as a source of fresh water for drinking. About 300,000 redheads winter in the Laguna Madre area annually. The Louisiana and Texas study sites are vegetated with seagrasses and have salinities of 17–30 ppt and 40–65 ppt, respectively.

### Processing of Specimens

We collected redheads at the Chandeleur Islands ( $n = 150$ ) during the winter of 1988–89 (year 1), and at the Laguna Madre ( $n = 551$ ) during 1988–89 (year 1) and 1989–90 (year 2). Birds were cooled on ice within 5 h of collection, and frozen in the laboratory within 1–4 days. After the field season, carcasses were dissected and intestines were measured and weighed ingesta-free. For statistical analysis, time of year was treated as a continuous variable, whereas sex, age, location, and year were treated as discrete

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variables in an analysis of variance. Comparisons between locations were made within year 1, the only year of overlap between the two study sites. We set our alpha level at 0.01 to minimize Type I error for pairwise comparisons of means.

### Location Differences Found

Intestinal length and mass were greater ( $P = 0.0001$ ) in birds from Louisiana (mean = 174.4 cm, 25.4 g) than in birds from Texas (mean = 165.4 cm, 19.3 g) during year 1. We found no differences ( $P = 0.42$ ) in length between years for birds from Texas, but mass in year 1 was greater ( $P = 0.0004$ ) than in year 2 (Figure). Intestinal length did not change over winter. Intestinal mass for birds from Texas, however, decreased ( $P = 0.0001$ ) from early to late winter during both years, whereas intestinal mass for birds from Louisiana did not change ( $P = 0.91$ ; Figure).

### Organs May Be Adjusting to Water Availability

Redheads in Louisiana had consistently longer and heavier intestines than did birds from Texas, perhaps in response to lack of a freshwater source at the Chandeleur Islands and hence the greater need for water reabsorption through the intestinal wall. Similarly, the decrease in intestinal mass from early to late winter in birds from Texas may be associated with acclimation to hypersaline

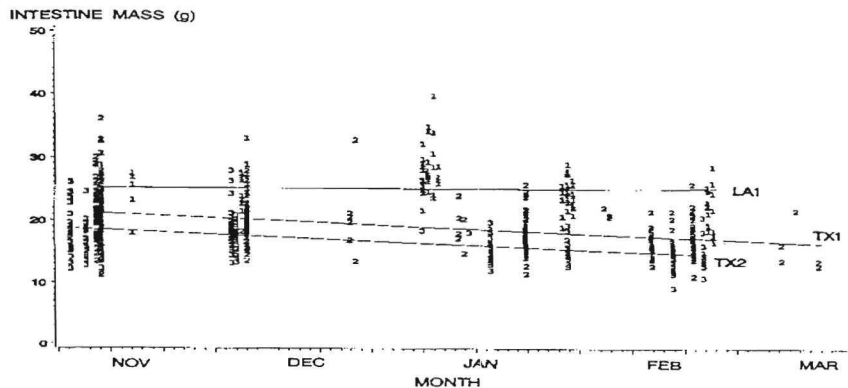
conditions there. Preliminary results from our study of redhead diets on the two areas suggest that redheads in Texas may ingest slightly more plant material than do redheads in Louisiana. A diet high in plants, however, usually results in greater intestinal length or mass, which is not what we found here. It seems, therefore, that the differences we found between the two wintering sites in intestinal length and mass are probably associated with differences in osmoregulatory needs between the two sites. Management implications include the preservation of freshwater wetlands adjacent to the Laguna Madre as a source of drinking water for redheads wintering in Texas.

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**Figure.** Intestine mass over winter (November–March) by state and collection year for redheads (*Aythya americana*) collected at the Chandeleur Islands, Louisiana, and the Laguna Madre, Texas. LA1 = regression line for birds collected in Louisiana during collection year 1 (1988–89); TX1 = regression line for birds collected in Texas during collection year 1 (1988–89); TX2 = regression line for birds collected in Texas during collection year 2 (1989–90). Individual observations: 1 = LA1; 2 = TX1; 3 = TX2. Slope of regression line was significant ( $P = 0.0001$ ) for TX1 and TX2. Significant difference between means: LA1 > TX1 ( $P = 0.0001$ ), TX1 > TX2 ( $P = 0.0004$ ).