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Brian J. Wilsey
Louisiana State University

Robert H. Chabreck
Louisiana State University

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NUTRITIONAL QUALITY OF NUTRIA DIETS IN THREE LOUISIANA WETLAND HABITATS

Since the introduction of nutria (*Myocastor coypus*) into North America during the 1930's and 40's, researchers have focused on nutria as valuable furbearers (Nichols and Chabreck 1974), as pests (Blair and Langlinais 1960, Conner and Toliver 1986), and as possible competitors with native furbearers (Gainey 1949). Few studies have been devoted to obtaining information on the factors controlling nutria distribution and abundance.

Willner *et al.* (1979) found nutria body condition and reproductive characteristics to be negatively correlated with the severity of winter weather and concluded that Maryland was the northern distributional limit of nutria on the Atlantic coast.

Along the Gulf coast, where winters are less severe, nutrition could be one of the major factors controlling nutria abundance and distribution. Linscombe *et al.* (1981) noted that abundance of *Scirpus Olneyi*, a preferred food in brackish marshes (Willner *et al.* 1979, Chabreck *et al.* 1981), was correlated with nutria density and reproductive characteristics. When *Scirpus olneyi* was at its lowest density, nutria had lower mean litter sizes and a lower percentage of pregnant females. Moreover, Atwood (1950) reported that sexual maturity in nutria is attained at an earlier age under favorable food conditions. Gosling (1981) stated that the condition of pregnant nutria is affected by food supply and that if females cannot maintain sufficient fat reserves during pregnancy, they may resorb or abort partial or entire litters.

Nutria are strictly herbivorous (Ashbrook 1948, Atwood 1950, Swank and Petrides 1954, Shirley *et al.* 1981) in North America and must obtain their nutrients from plants. Plant tissue contains less protein and energy by weight than does animal tissue (Robbins 1983: 237, Mattson 1980). Therefore, forage quality is especially important, and a good diet is necessary to maintain vigorous, healthy populations.

Several researchers have described the food habits of nutria (Shirley *et al.* 1981, Chabreck *et al.* 1981, Wilsey 1988). However, with the exception of Garner (1962), little work has been done to determine the nutritional quality of nutria food plants. The objective of this paper is to compare the nutritional quality of nutria diets in three coastal wetland habitats of Louisiana.

MATERIALS AND METHODS

Major components of nutria diets were collected from forested wetlands (Wilsey 1988), and freshwater (Shirley *et al.* 1981) and brackish marshes (Chabreck *et al.* 1981). Brackish and freshwater marsh plants were collected from St. Tammany (August) and Lafourche Parishes (February), Louisiana, and forested wetland plants were collected from Ascension Parish (August and February), Louisiana. Each plant sample was a composite of 10–15 individuals for large plant species and >1000 individuals for smaller species (*e.g. Lemna*). Compositing individual plants enabled us to measure the nutritional quality of a greater number of plant species, but it masked among-individuals variation (Coley 1983). Samples were dried at 100°C to a constant weight, ground through a Wiley mill and sent to the Feed and Fertilizer Laboratory, Louisiana State University where proximate analysis was undertaken as described by Robbins (1983:245). Plant parts analyzed were intended to roughly correspond to parts consumed by nutria (based on Shirley *et al.* 1981, Chabreck *et al.* 1981, and Wilsey 1988). Percent crude protein was estimated by the Kjeldahl method (N × 6.25; Robbins 1983:245). In addition to proximate analysis, percent Ca and P were determined.

The nutritional quality of nutria diets within each habitat type was determined by weighting the nutrient composition of food plants with utilization estimates:

$$ND = \frac{NP \times U}{TU}$$

where ND is the nutrient content of the diet, NP is the nutrient concentration of the plant, U is the utilization of the plant by nutria (as a proportion: $0<U<1$), and TU is the sum of utilization estimates for all plant species. Plants from freshwater marshes were weighted with utilization estimates from nutria on Salvador Wildlife Management Area, St. Charles Parish, Louisiana (Shirley *et al.* 1981). Brackish marsh plants were weighted with utilization estimates from nutria on State Wildlife Refuge, Vermilion Parish, Louisiana (Chabreck *et al.* 1981). Plants from forested wetlands were weighted with utilization estimates from nutria in forested wetlands in Lafourche and Ascension Parishes, Louisiana (Wilsey 1988). Utilization estimates from January were used as indicators of winter diets, and utilization estimates from July were used as indicators of summer diets.

Estimates of nutrient content in nutria diets for winter and summer were combined and crude protein, fats, carbohydrates, crude fiber and ash were compared among habitats with analysis of variance. Scheffe's test was used to detect differences among means (Steel and Torrie 1980:183).

RESULTS

Nutria diets varied among habitats in crude protein ($F = 39.95$, 2 and 3 d.f., $P < 0.01$), and were close to being significantly different in crude fiber ($P = 0.07$) (Tables 1, 2 and 3). We failed to find significant differences in nutria diets among habitats in fats ($P = 0.13$), carbohydrates ($P = 0.24$), and ash ($P = 0.35$). Crude protein levels in nutria diets in freshwater marshes were similar to those of forested wetlands. However, nutria diets from both of these freshwater habitats contained more crude protein than brackish marshes (Table 1). Nutria diets in freshwater marshes contained 100% more crude protein in summer and 79% more in winter than did diets in brackish marshes. Similarly, diets in forested wetlands contained 96% (summer) and 44% (winter) more crude protein than did diets from brackish marshes.

DISCUSSION

Freshwater marshes are generally considered better nutria habitat than brackish marshes. Although nutria pelt prices were similar among freshwater, intermediate, and brackish marshes for the 1970–71 season, trappers harvested

Table 1. Mean nutrient content (all values %) of nutria diets in three wetland habitats of Louisiana.

SEASON HABITAT TYPE	CRUDE PROTEIN	FATS	CRUDE FIBER	CARBOH.	ASH	Ca	P
Summer							
Freshwater Marsh	12.9	2.1	19.6	51.5	14.7	1.3	0.3
Forested Wetland	12.7	2.0	19.9	53.4	11.9	1.8	0.5
Brackish Marsh	6.1	1.6	30.2	53.7	8.3	0.4	0.2
Winter							
Freshwater Marsh	13.0	2.2	26.5	47.8	10.5	0.5	0.4
Forested Wetland	11.5	1.7	16.4	60.4	10.2	1.3	0.4
Brackish Marsh	7.4	1.9	29.8	51.9	9.9	0.2	0.3

a disproportionate number of nutria from freshwater marshes that year (Palmisano 1973). Linscombe and Kinler, 1985, also reported that nutria harvest rates were higher in freshwater marshes than they were in brackish marshes for the years 1972-73 to 1983-84 in the Chenier Plain and Inactive Delta regions of Louisiana.

Data from studies with direct estimates of nutria abundance (*i.e.* with mark-recapture techniques) also support the contention that nutria are more abundant

Table 2. Utilization by nutria (U)[a], and crude protein (CP), fats (F), crude fiber (CF), carbohydrates (C), ash (A), Ca, and P concentrations (all values % dry weight) of plants in August ($n = 1$ composite sample) from 3 wetland types in Louisiana.

WETLAND TYPE SPECIES (Part Analyzed)	U	CP	F	CF	C	A	Ca	P
Forested Wetland								
Lemna minor and *Spirodela polyrrhiza* (entire plant)	58.0	14.8	2.6	16.7	54.6	11.3	1.86	0.67
Alternanthera philoxeroides (leaves and stems)	14.9	8.8	1.0	21.5	56.0	12.7	0.84	0.21
Panicum gymnocarpon (culms and leaves)	11.6	5.0	0.8	29.8	54.3	10.1	1.58	0.25
Taxodium distichum (cambium)	6.5	6.1	0.7	38.0	44.6	10.6	3.62	0.06
Eichhornia crassipes (petioles and leaves)	6.5	12.9	1.6	19.7	49.4	16.4	1.97	0.49
Pontederia cordata (petioles and leaves)	0.7	12.4	0.7	22.8	51.9	12.2	1.50	0.35
Unidentified Pontederiaceae	3.7	12.6	1.2	21.2	50.6	14.3	1.74	0.21
Cyperus sp. (culms and leaves)	1.2	7.2	1.4	37.1	43.8	10.5	0.33	0.14
Bidens laevis (stems and leaves)	0.2	7.9	0.9	29.7	50.1	11.4	1.85	0.28
Freshwater Marsh								
Alternanthera philoxeroides (stems and leaves)	30.3	8.8	1.0	21.5	56.0	12.7	0.84	0.21
Hydrocotyle sp. (leaves)	30.3	20.8	5.0	10.0	49.5	14.7	1.45	0.53
Bidens laevis (stems and leaves)	19.2	7.9	0.9	29.7	50.1	11.4	1.85	0.28
Eleocharis palustris (culms)	12.8	11.8	2.4	18.9	43.0	24.0	1.03	0.23
Sacciolepis striata (culms and leaves)	1.4	5.6	1.3	37.0	49.4	6.7	0.13	0.20
Brackish Marsh								
Scirpus olneyi (culms)	26.6	6.9	1.3	28.5	54.5	8.8	0.34	0.16
Spartina patens (culms and leaves)	22.3	1.7	1.4	37.8	55.2	3.9	0.18	0.18
Solidago sempervirens (stems and leaves)	16.1	11.9	3.7	15.5	58.5	10.4	1.21	0.33
Scirpus robustus (culms)	10.1	4.9	1.4	31.7	54.2	7.8	0.25	0.15
Spartina cynosuroides (base of culms)	8.1	3.9	0.4	39.4	49.8	6.4	0.20	0.02
Eleocharis palustris (culms)	5.9	11.8	2.4	18.9	43.0	24.0	1.03	0.20

[a] Utilization estimates are from Shirley *et al.* (1981), Chabreck *et al.* (1981), and Wilsey (1988)

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Table 3. Utilization by nutria (U)[a], and crude protein (CP), fats (F), crude fiber (CF), carbohydrates (C), ash (A), Ca, and P concentrations (all values % dry weight) of plants in February ($n = 1$ composite sample) from 3 wetland types in Louisiana.

WETLAND TYPE SPECIES (Part Analyzed)	U	CP	F	CF	C	A	Ca	P
Forested Wetland								
Lemna minor and *Spirodela polyrrhiza* (entire plant)	52.7	10.3	1.8	12.8	65.8	9.4	1.32	0.38
Eichhornia crassipes (petioles and leaves)	12.7	17.3	1.3	14.0	53.8	13.6	1.08	0.59
Panicum gymnocarpon (culms and leaves)	11.6	12.3	1.9	20.4	56.0	9.6	0.32	0.34
Taxodium distichum (cambium)	5.4	4.5	2.4	41.2	41.3	10.6	3.49	0.08
Alternanthera philoxeroides (stems and leaves)	2.5	14.6	1.1	15.3	55.8	13.2	1.48	0.40
Juncus effusis (culms)	1.4	9.0	2.3	27.9	48.7	12.1	0.22	0.26
Cyperus sp. (culms and leaves)	0.8	9.5	1.3	23.6	57.0	8.6	0.50	0.26
Polygonum sp. (stems and leaves)	0.2	13.1	0.9	14.5	59.9	11.6	1.32	0.35
Freshwater Marsh								
Eleocharis palustris (culms)	53.6	12.6	1.8	25.6	49.6	10.4	0.49	9.36
Sacciolepis striata (culms and leaves)	24.0	7.7	1.7	37.6	45.4	7.6	0.11	0.16
Hydrocotyle sp. (leaves)	7.9	23.9	4.5	9.9	49.3	12.4	1.37	0.64
Sagittaria lancifolia (base of stems)	6.8	22.8	5.0	16.0	37.8	18.4	0.41	0.76
Alternanthera philoxeroides (stems and leaves)	2.8	14.9	1.2	13.4	55.2	13.4	1.48	0.40
Brackish Marsh								
Spartina cynosuroides (base of culms)	75.8	6.9	1.8	30.3	50.8	10.2	0.20	0.26
Spartina patens (culms and leaves)	11.9	5.9	1.8	31.5	55.4	5.4	0.24	0.18
Solidago sempervirens (stems and leaves)	3.2	19.1	3.2	13.9	49.6	14.2	1.19	0.33
Distichlis spicata (culms and leaves)	2.7	7.8	1.5	29.5	56.3	4.9	0.12	0.19
Scirpus olneyi (culms)	0.3	12.1	1.8	24.3	53.0	8.8	0.22	0.23
(roots)	0.8	8.4	1.2	18.3	62.0	10.1	0.12	0.26
Eleocharis palustris (culms)	0.2	12.6	1.8	25.6	49.6	10.4	0.49	0.36

[a] Utilization estimates are from Shirley *et al.* (1981), Chabreck *et al.* (1981), and Wilsey (1988)

in freshwater marshes than they are in brackish marshes. In Louisiana brackish marshes, winter nutria densities of 6.5/ha (Robicheaux 1978) and 24/ha (Linscombe *et al.* 1981) and summer densities of 1.3/ha (Linscombe *et al.* 1981) have been estimated. In floating freshwater marsh, nutria densities of 43.7/ha have been recorded (Kinler *et al.* 1988:331).

This study indicates that nutria diets in brackish marshes are lower in crude protein and are possibly higher in crude fiber than nutria diets in freshwater marshes. Ramsey *et al.* (unpublished data

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— see Kinler *et al.* 1988:332) also found that nutria in brackish marshes ate vegetation that was lower in protein. Proteins are major constituents of animal cells, and are important in animal metabolism and reproduction (Robbins 1983:11, 177). Many animals convert ingested food into biomass with greater efficiency on diets high in protein (Mattson 1980). We hypothesize that, if in fact the carrying capacity is lower in brackish marshes, it may be influenced by nutrition. Further research is needed to test this hypothesis and further clarify the role of nutrition in nutria ecology.

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Brian J. Wilsey and Robert H. Chabreck, School of Forestry, Wildlife, and Fisheries, Louisiana State University Agricultural Center, Baton Rouge, LA 70803.