THE DISTRIBUTION AND ABUNDANCE OF MUSKRATS (*Ondatra zibethicus*) IN RELATION TO VEGETATIVE TYPES IN LOUISIANA COASTAL MARSHES

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INTRODUCTION

Muskrats lead all other North American wild furbearers in numbers caught and the overall value of their pelts. The northern gulf coast marshes produce a major portion of the national catch and during peak years, approximately 50% of all muskrat skins produced in the United States come from these marshes (USDI, 1948). Since muskrats are widespread over practically all of the United States and Canada, they are obviously capable of adapting and thriving in many different environments. Even within a limited geographic area, however, subtle differences in habitats are important to muskrat distribution and abundance.

Although the coastal marshes appear as a single grassland community, interspersed to varying degrees with bays, lakes, ponds and bayous, a closer inspection reveals diversity of plant and animal life which can be grouped into communities generally related to salinity gradients. For many years the striking difference in muskrat abundance in the various types of coastal marshes was known to trappers and field workers (Arthur, 1928; Lay, 1945; Lay and O'Neil, 1942; O'Neil, 1949). They reported that muskrats reached their greatest abundance in brackish marshes containing vigorous stands of three-cornered sedge *(Scirpus olneyi)*. Muskrat catch in this marsh type was many times that of surrounding areas.

Recent interest in the estuarine environment has prompted a comprehensive evaluation of the wetland habitat in coastal Louisiana. This report is an outgrowth of that study and attempts to classify the marsh vegetative types and their potential role in the production of muskrats.

STUDY PROCEDURES

Sampling procedures utilized in this study were developed as part of a coastwide survey of the vegetation and soils conducted in August 1968 (Chabreck, 1970 and Palmisano, 1970). The system involved the establishment of a series of transect lines in a North-South direction spaced at 7.5 mile intervals across the Louisiana coast. For purposes of this study, the transects terminated at the Gulf of Mexico to the South and U. S. Highway 90 to the North. All non-marsh areas greater than one-quarter mile on a standard 1:62,500 scale quadrangle map, were excluded. The total length of the survey lines was 442.4 miles of marshland. A Cessna Model 210, aircraft flying at an altitude of 100 feet and an air speed of approximately 90 miles per hour, was used in the muskrat inventory. After careful inspection of known width areas it was decided that a sample strip 300 feet wide was best suited for recording muskrat houses. The total area within the transects was therefore calculated at 16,086 acres. Since this survey was included as part of the Louisiana Wild Life and Fisheries Commission routine waterfowl survey, the procedures outlined by Bateman (1970) were used. Transects were 7.5 miles apart in southwestern Louisiana and 15 miles in the southeast. The southwestern subdivision extended from Sabine Lake eastward to Atchafalaya Bay. Amazingly, the total area surveyed in this region was 8,043 acres, precisely one-half the total area. Southeastern Louisiana

included Atchafalaya Bay and extended eastward to the mouth of the Mississippi River. Inventory figures from these two regions were analyzed separately due to their distinct physiographic differences.

Information regarding muskrat production per house was obtained from cooperative trappers. Each trapper was assigned five to ten one quart plastic bleach bottles attached to a five foot long stake and containing 200 ml of 10% formalin. The trapper was instructed to place the bottle near an active muskrat house and trap as many of the animals as possible from the house. When an animal was collected, its entire tail was removed and placed in the one-quart container. When no more muskrats were taken from that house, the bottle was labeled, sealed and returned. The number and size of the muskrats per house was obtained by counting and measuring the tails.

DESCRIPTION OF THE COASTAL MARSHES

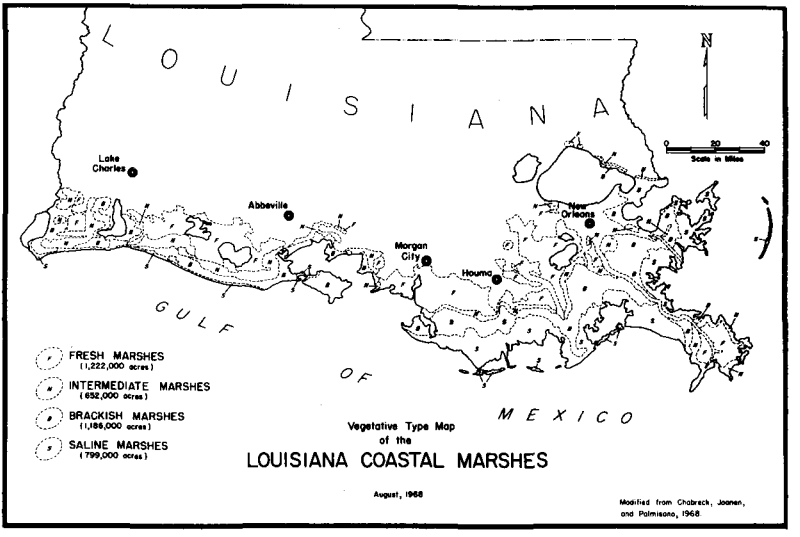
Coastal Louisiana is a broad flat plain which resulted from the deposition of Mississippi River sediments during the past 5,000 years. The Deltaic Plain, in the southeast, developed as the distributary systems overflowed their banks and deposited alluvial sediment directly into the marshes and estuaries. As distributary systems shifted deposition centers, they deprived the marshes of sediment and fresh water. Saline water gradually encroached inland converting the fresh marshes and swamps to brackish and saline types. Simultaneously, an imbalance of erosional forces caused an increase in the rate of landloss, resulting in the formation of a lacework of bays, lakes and ponds typical of the topography of southeastern Louisiana.

The Chenier Plain in the southwest, developed as a result of longshore deposition of sediment in the form of extensive mudflats. As a result, the coastline is relatively unbroken and the marshes are protected by a well developed beach rim. Topographic relief features tend to parallel the coastline in this region (Russell and Howe, 1935; Russell, 1940 and Gould and Morgan, 1962).

The marsh soils which developed as a result of the accretive process are generally classified as peats, mucks and organic clays. Peats are best developed in fresh marshes removed from sites of active deposition. Saline marsh soils are generally lower in organic content and composed of silts and clays (Lytle and Driskell, 1945 and Palmisano, 1970).

The vegetation of the coastal marshes is of particular interest because this report is an attempt to relate muskrat populations to vegetative types. Penfound and Hathaway (1938) and later O'Neil (1949) recognized four major marsh communities in coastal Louisiana. Saline marsh adjacent to the Gulf of Mexico was dominated by a relatively few salt tolerant species. The brackish type formed a broad zone of moderate salinity inland from the saline zone. Plant growth was vigorous as a result of high nutrient levels, reduced salinities and a dependable water source. Brackish marsh merged, almost imperceptibly, into fresh marsh across an ecotone described as a slightly brackish or intermediate type. Fresh marshes are well developed in both the Chenier and Deltatic Plains where salinities are not a factor in plant distribution.

More recent studies have described the boundaries of these vegetative types and quantified the plant species composition (Chabreck, Joanen and Plamisano, 1968; Chabreck, 1970; and Palmisano, 1970). Figure 1 is the recent vegetative type map of the Louisiana coastal marshes which was used to describe the distribution of muskrat populations in this report. Table 1 lists the major vascular plant species and their percent composition recorded in each vegetative type.



PREVIOUS STUDIES

The life history of the muskrat has been studied in detail by many investigators in practically all parts of its range. Its value as a commercial fur resource has been the principal factor responsible for this interest. Population estimates and evaluation of habitat preferences are fundamental to the implementation of a management program.

Dice (1941) briefly discussed the value of counting the number of "homes" as an index to mammal abundance. Lay and O'Neil (1942) counted muskrat houses or lodges in the Texas coastal marshes and determined that the number of adult or sub-adult muskrats varied from four to six per house. An aerial strip census was later adopted by Lay (1945) and was flown at an altitude of 400 feet. Strips were also counted by walking the marsh and counting every "live" house encountered within 33 feet either side of the course. He pointed out that a limited amount of error could be encountered by confusing active and inactive houses. In winter live houses always showed signs of activity and "dead" houses usually collapsed within one month of abandonment. In 1948, Dozier completed a detailed study of estimating muskrat populations by house counts. He stressed the importance of distinguishing between dwelling houses and feeding shelters. Feeding shelters are generally built under the constant frozen conditions of the northern states and need not be considered when dealing with the sub-tropical climates of the northern Gulf Coast. He pointed out the value of the aerial census technique when vast areas were involved. After a review of published reports from different regions of the United States, he concluded that an average of five muskrats per house is an acceptable conversion factor for estimating muskrat populations. O'Neil (1949) used the same figure to estimate the catch on good marshes in coastal Louisiana. House counts should not be undertaken prior to November on the Atlantic coast since the construction of new winter houses is not complete until that time (Dozier, 1953). When comparing ground house counts with aerial counts in Nebraska, Sather (1958) found aerial counts to be consistantly higher because of the difficulty of distinguishing between dwelling houses and feeding huts.

Table 1. Plant Species Composition of the Vegetative Types in the Louisiana Coastal Marshes (Chabreck, 1970)

		Vegetative Type			
Scientific Name	Colloquial Name	Saline	Brackish	Intermediate	Fresh
Ratis maritima	Saltwort	4.41	0	0	0
Distichlis spicata	Saltgrass	14.27	13.32	.36	.13
Juncus roemerianus	Black Rush	10.10	3.93	.72	.60
Spartina alterniflora	Smooth cordgrass	62.14	4.77	.86	0
Eleocharis parvula	Dwarf spikerush	0	2.46	.49	.54
Ruppia maritima	Widgeongrass	0	3.83	.64	0
Scirpus olneyi	Olney bulrush	0	4.97	3.26	.45
Scirpus robustus	Saltmarsh bulrush	.66	1.78	.68	0
Spartina patens	Marshhay cordgrass	5.99	55.22	34.01	3.74
Bacopa monnieri	Waterhyssop	0	.92	4.75	1.44
Cyperus odoratus	Flatsedge	0	.84	2.18	1.56
Echinochloa walteri	Walter's millet	0	.36	2.72	.77
Paspalum vaginatum	Seashore paspalum	0	1.38	4.46	.35
Phragmites communis	Roseau cane	0	.31	6.63	2.54
Alternanthera philoxeroides	Alligator weed	0	0	2.47	5.34
Eleocharis sp.	Spikerush	0	.82	3.28	10.74
Hydrocotyle umbellata	Pennywort	0	0	0	1.93
Panicum hemitomon	Maidencane	0	0	.76	25.62
Sagittaria falcata	Bulltongue	0	0	6.47	15.15
Other Species		2.43	5.09	25.26	29.10
TOTAL		100.00	100.00	100.00	100.00

Table 2. Acreage of Marsh Vegetative Types in Coastal Louisiana*

	Southwestern Louisiana	Southeastern Louisiana	Total
Saline	45,507	753,130	798,637
Brackish	463,938	722,202	1,186,140
Intermediate	368,703	283,076	651,779
Fresh	390,757	830,769	1,221,526
Total	1,268,905	2,589,177	3,858,082

*-From Chabreck, Joanen and Palmisano, 1968.

RESULTS AND DISCUSSION

Muskrat House Inventories

Southeastern Louisiana

Figure 2 for southeastern Louisiana clearly shows that a major portion of the muskrat houses occurred in brackish marshes. In February 1970, 85.1 percent of the muskrat houses observed in southeastern Louisiana were in brackish marsh; in December 1971, the figure dropped to 49.5 percent. The overall average number of muskrat houses counted in brackish marsh in southeastern Louisiana was 70.0 percent. Brackish marsh comprised only 36.1 percent of the area surveyed in the southeastern subdivision, which indicated a significant preference for this vegetative type (Table 3).

Saline marshes in southeastern Louisiana had an average of 20.8 percent of the muskrat houses counted. A maximum of 30.6 percent was recorded in December 1971, and a minimum of 10.4 percent in February 1970. Very few nests were observed in the saline marshes east of the Mississippi River. Severe hurricanes in 1965 and again in 1969 may have been partially responsible for the low populations. Saline marsh constituted 22.2 percent of the area sampled, which is slightly greater than the overall percentage of the nests tallied. This would indicate that saline marsh contains slightly less than average muskrat populations.

Intermediate marsh occurrs in a narrow zone only a few miles wide in southeastern Louisiana. The average number of houses encountered in this zone was 3.7 percent. A maximum of 5.6 percent was recorded in December 1971. Since intermediate marsh accounted for only 7.2 percent of the habitat surveyed in this subdivision, the low figures are reasonable. This vegetative type was slightly below average as muskrat producing marsh, but since it is a transition zone, populations tend to be high in the southern portion adjacent to brackish marsh and low when adjacent to fresh marsh.

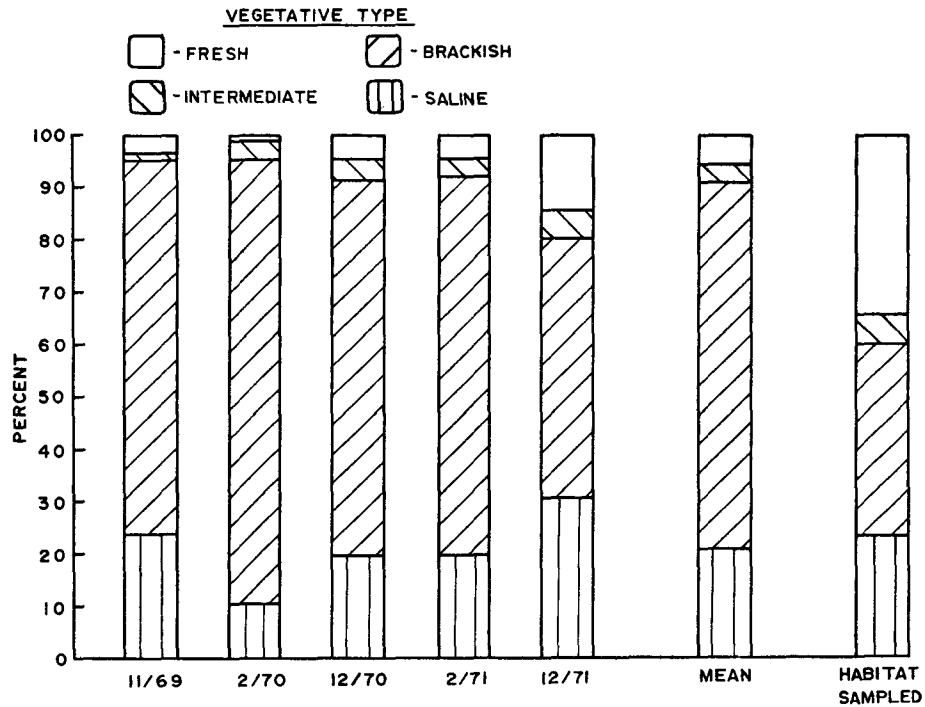


Figure 2. Percentage of Muskrat houses recorded in the major marsh habitats in southeastern Louisiana

Table 3. Louisiana Coastal Marsh Area* Included in Muskrat Survey

	Southeastern Louisiana			Southwestern Louisiana			Entire Coast		
Vegetative Type	Miles	Acres	Percent	Miles	Acres	Percent	Miles	Acres	Percent
Saline	49.2	1789	22.2	5.8	211	2.6	55.0	2000	12.4
Brackish	70.7	2898	36.1	83.0	3018	37.5	162.7	5916	36.8
Intermediate	16.0	582	7.2	69.9	2531	31.5	85.6	3112	19.4
Fresh	76.3	2774	34.5	62.8	2283	28.4	139.1	5058	31.4
Total	221.2	8043	100.0	221.2	8043	100.0	442.4	16,086	100.0

*South of U. S. Highway 90

Results of the aerial surveys indicate that fresh marshes in southeastern Louisiana contain very low muskrat populations. Only 1.0 percent of the houses counted in southeastern Louisiana, in February 1970, occurred in fresh marshes. The highest percentage occurred in December 1971, when 14.3 percent were recorded. Fresh marsh constitutes a major vegetative type in southeastern Louisiana and 34.5 percent of the area surveyed was in this type. A mean of only 5.5 percent of the houses was recorded in the resh marsh which indicates a population level far below average.

The most striking change in the distribution of muskrat populations occurred in December 1971 when the brackish marsh house count declined from 72.5 to 49.5 percent. Both saline and fresh types, on the otherhand, exhibited sharp percentage increases. Actually populations remained essentially stable in these types but a drastic decline in the number of houses recorded in the brackish type tended to inflate percentage values in the other types. In February 1971, 1,426 houses were recorded in the brackish marshes, the following December, the number dropped to only 392. Insignificant declines were noted in saline and intermediate types and a slight increase in the fresh marsh type (Table 4).

Table 4. Muskrat Abundance by Inventory Period and Vegetative Types in Coastal Louisiana

Vegetative Type	Southeastern Louisiana				Southwestern Louisiana			Entire Coast		
	No. Houses	Houses 100A	Percent Houses		No. Houses	Houses 100A	Percent Houses	No. Houses	Houses 100A	Percent Houses
Saline	241	13.5	23.9	Nov.	0	0	0	241	12.1	18.0
Brackish	720	24.8	71.2	69	259	8.6	79.5	974	16.6	73.3
Intermediate	16	2.8	1.6		60	2.4	18.4	76	2.4	5.7
Fresh	33	1.2	3.3		7	.3	2.1	40	.8	3.0
	1010	12.6	100.0		326	4.1	100.0	1336	8.3	100.0
Saline	191	10.7	10.4	Feb.	0	0	0	191	9.6	8.5
Brackish	1567	54.1	85.1	70	318	10.5	80.3	1885	31.9	84.3
Intermediate	65	11.2	3.5		78	3.1	19.7	143	4.6	6.4
Fresh	18	.7	1.0		0	0	0	18	.4	.8
	1841	22.9	100.0		396	4.9	100.0	2237	13.9	100.0
Saline	276	15.4	19.5	Dec.	0	0	0	276	13.8	12.6
Brackish	1016	35.1	71.8	70	591	19.6	76.3	1607	27.2	73.4
Intermediate	60	10.3	4.2		156	6.2	20.1	216	6.9	9.9
Fresh	63	2.3	4.5		28	1.2	3.6	91	1.8	4.1
	1415	17.6	100.0		775	9.6	100.0	2190	13.6	100.0
Saline	388	21.7	19.7	Feb.	44	20.9	4.4	432	21.6	14.5
Brackish	1426	49.2	72.5	71	697	23.1	69.2	2123	35.9	71.4
Intermediate	66	11.3	3.4		241	9.5	23.9	307	9.9	10.3
Fresh	87	3.1	4.4		25	1.1	2.5	112	2.2	3.8
	1967	24.5	100.0		1007	12.5	100.0	2974	18.5	100.0

Vegetative Type	Southeastern Louisiana				Southwestern Louisiana			Entire Coast		
	No. Houses	Houses 100A	Percent Houses		No. Houses	Houses 100A	Percent Houses	No. Houses	Houses 100A	Percent Houses
Saline	242	13.5	30.6	Dec.	2	1.0	.8	244	12.2	23.4
Brackish	392	13.5	49.5	71	116	3.8	46.4	508	8.4	48.8
Intermediate	44	7.6	5.6		107	4.2	42.8	151	4.9	14.5
Fresh	113	4.1	14.3		25	1.1	10.0	138	2.7	13.3
	791	9.8	100.0		250	3.1	100.0	1041	6.5	100.0
Saline	268	15.0	20.8		5	2.4	1.0	277	13.9	14.2
Brackish	1026	35.4	70.0		396	13.1	70.3	1420	24.0	72.6
Intermediate	50	8.6	3.7		113	4.5	25.0	179	5.8	9.1
Fresh	63	2.3	5.5		17	.7	3.7	80	1.6	4.1
	1407	17.5	100.0		531	6.6	100.0	1956	12.2	100.0

Both survey dates in February indicated an increase over the previous sampling period. The reasons for the increase could be due to increased water levels in the marshes and lower temperatures during February. This would cause animals, which might be living in peat burrows, to construct houses. O'Neil (1949) stated that a peak of reproductive activity, as determined by embryo counts, occurred in March. As animals produced the previous spring mature, they leave the houses of their parents and construct their own houses nearby. This preparation for the spring breeding season could account for part of the consistant increase in houses observed in February.

Southwestern Louisiana

The difference between the plant communities of southeastern and southwestern Louisiana results from the almost continuous beach barrier fringing the coastline in the southwest. This barrier restricts water movement to and from the marshes greatly modifying salinity patterns and water levels.

Extensive saline marshes, which were prevalent in the southeast, are absent from the Chenier plain. A narrow zone, of saline marsh usually less than one-half mile wide, lies immediately behind the beach. Intermediate marshes are well developed and, unlike the southeastern marshes, are a major vegetative type in the southwest. Brackish marsh, fringing large water bodies such as Vermilion Bay, Calcasieu Lake and Sabine Lake, contain plant communities very similar to those in the southeast. Where brackish marshes lie behind the beach barriers, the flora is somewhat different and this difference plays an important role in the production of muskrats.

As was the case in southeastern Louisiana, brackish marsh was the preferred type in the southwest. Percentage values indicate that in February 1970, 80.3 percent of the muskrats houses were recorded in brackish marsh. This figure dropped to 46.4 percent in December 1971. The average for the five inventory dates was 70.3 percent, only 0.3 percent over the figure for southeastern Louisiana. Brackish marsh comprised 37.5 percent of the area surveyed in the Chenier Plain indicating muskrats exhibit a definite preference for this type of habitat.

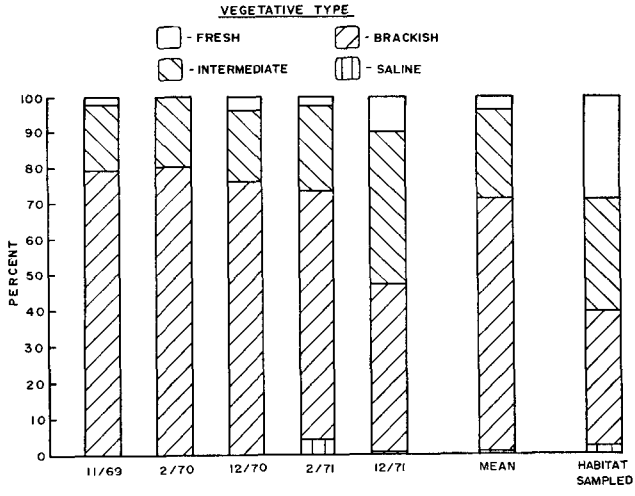


Figure 3. Percentage of muskrat houses recorded in the major marsh habitats in southwestern Louisiana

A drastic decline in the number of houses was recorded in brackish marsh in December 1971. In February of that year 697 nests were recorded; the following December the number counted was only 116. This was the same trend exhibited in the southeastern marshes.

Intermediate type marshes comprised 31.5 percent of the area sampled in southwestern Louisiana which is approximately five times the sampling rate in the southeast. Twenty-five percent of the nests were located in the intermediate zone. The highest proportion was 42.8 percent recorded in December 1971. Nest densities were slightly below the overall average for all vegetative types.

Saline marshes are poorly represented in southwestern Louisiana and only 2.6 percent of the transect area was located in this type. Muskrat populations were low averaging 1.0 percent for all surveys and ranging from 0.0 to 4.4 percent. The maximum value resulted from a very localized population increase which was within the sample area.

One of the fundamental differences in the distribution of muskrats in coastal Louisiana is that, other than the brackish marshes, the saline marsh is a preferred type in the southeast and intermediate in the southwest. The well drained saline marshes typical of the Chenier Plain supported very low muskrat populations.

Muskrat populations in the fresh marsh area of southwestern Louisiana were generally well below the overall average. Of the total number of nests observed, only 3.7 percent were recorded in the fresh marshes. The area surveyed in fresh marsh was 28.4 percent, indicating that muskrat populations in the fresh marshes of southwestern Louisiana were essentially the same as the southeast. Trends also appeared the same with an increase in the percentage of houses observed in fresh and intermediate marshes as populations decreased in the brackish marshes.

Summary of Muskrat Habitat Preference

Muskrats occur in all of the coastal marshes examined, however, population densities varied greatly. Brackish marshes composed of a mixed community of *Scirpus olneyi* and *Spartina patens* was the preferred habitat. Localized populations were often very high but exhibited drastic fluctuations during the

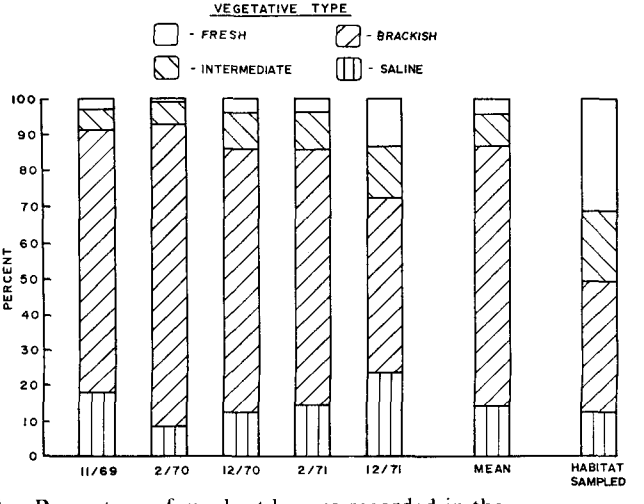


Figure 4. Percentage of muskrat houses recorded in the major marsh habitats in coastal Louisiana

course of the study. Ground surveys revealed that muskrat populations often increased rapidly for a period of three to four years then rapidly declined to practically zero in only a few months. A sharp general decline was observed throughout the brackish marshes of coastal Louisiana in December 1971. following two abnormally dry summers. Saline, intermediate and fresh marshes were not as severely affected by the drought as the brackish type. In some instances, populations in these areas actually increased. The value of these types to muskrats is important during periods of stress in the brackish zone. In December 1971, when populations were well below normal, nonbrackish marshes accounted for over 50 percent of the houses recorded. In normal years, less than 20 percent of the houses were recorded outside of the brackish zone.

Muskrat Production Per House

Studies were undertaken to determine the estimated production of muskrats using house count information. Since the information was to be used primarily for harvest management, it was decided to use actual catch figures rather than total population estimates. Active houses were selected by professional trappers and the number and size of the animals taken from each house was determined by tail collections. Other studies indicated that kits and mice had a total tail length of less than 16.0 cm. For purposes of estimating muskrat production, only tails greater than 16.0 cm. were used in calculating the number of trappable muskrats per house.

Table 5 presents the results of catch information obtained from 37 muskrat houses from three areas of coastal Louisiana. Sabine National Wildlife Refuge, located in extreme southwestern Louisiana, provided information from 22 houses during the 1970-71 trapping season. The vegetative types from which the data were taken were generally brackish marsh although a few samples were taken from the intermediate type.

The average take was 3.41 muskrats per house and ranged from a minimum of one to a high of seven per house. Some variation was noted between trappers, some of which took only a few of the largest sizes and others who trapped until no longer successful. This source of variation is partially responsible for the high frequency (6) recorded in the category of two muskrats per house. The instructions were to trap the nest until trapping success fell off sharply.

Another collection was taken from the Pointe Au Chien Wildlife Management Area located in brackish and intermediate marshes in southeastern Louisiana. The average number of muskrats produced, from the nine nests located in this area, was 3.0 per nest. Six other nests were examined in the southeastern marshes from the lower part of Terrebonne Parish in saline and brackish marshes. The average catch was 2.67 animals per house. Only one of the houses yielded more than three muskrats.

Overall average production was 3.19 muskrats per house. The median value was three per house. It is felt that a rate of harvest of three muskrats per house, under normal conditions, would be a reasonable estimate of the potential catch. O'Neil (1949) presented a figure of 5 per house in the best marshes. Based on similar studies in the Texas coastal marshes, Lay (1945) determined that 2.5 muskrats per house was a proper harvest level and that 2.0 is conservative. From the results of my recent studies, I would recommend a rate of harvest between 2.5 and 3.0 muskrats per house under stabilized population conditions.

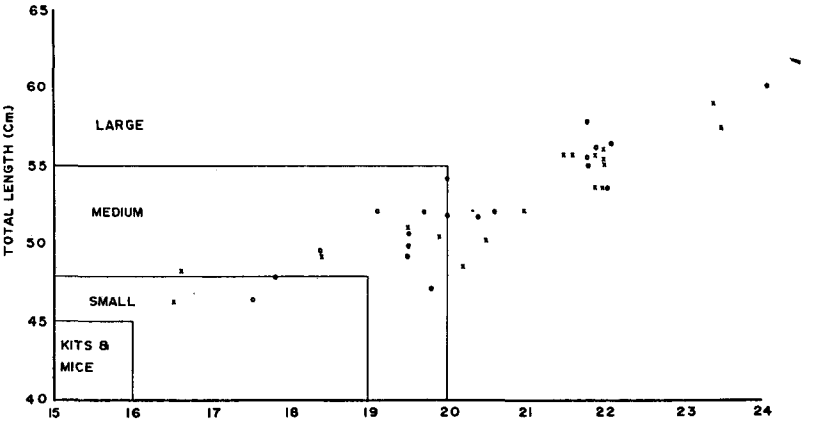


Figure 5. The relationship of tail and total length of muskrats to pelt size classes (X - Males; O - Females).

Muskrat measurements in Relation to Pelt Size

Since muskrat tails were to be used to determine the number and size of the animals produced by each house, it was necessary to relate tail length and weight to other body measurements and the size of the pelt. A series of 38 freshly caught muskrats taken in southwestern Louisiana were used to determine interrelationships of body measurements. The animals were measured and graded by an experienced fur buyer into four pelt size categories: large, medium, small and kits and mice. Although no kits or mice were measured, some of the animals graded as small could have been considered as large kits and the point of separation was just below the measurements of the smallest animals sampled.

Figure 5 presents the relationship between tail length and total length and the pelt grade. An excellent correlation was established between the linear measurements and no difference was detected in the relationship between male and female muskrats. No animals were measured with a tail length less than 16.0 cm. and this is considered the point of separation between the small grade and kits and mice (Table 6). Tail lengths of small animals ranged from 16.5 to 19.8 cm. Smalls could generally be distinguished from the next larger size class by using a maximum tail length of 19.0 cm. Medium muskrats had tail lengths which ranged from 18.3 to 20.5 cm. A separation point of 20.0 cm. was used to distinguish large from medium muskrats. Tails of large animals ranged from 19.5 to 24.1 cm. Although some overlap was encountered in body measurements between size classes, tail length appears to be the most reliable and simple means of separation.

Table 5. Number of Trappable Muskrats* Collected Per House

Number per house	AREA OF COLLECTION: Sabine Refuge	Pointe Au Chien Management Area	Terrebonne Parish	Total
		Frequency		
1	2	2	1	5
2	6	1	1	8
3	3	2	3	8
4	5	3	1	9
5	5	1	0	6
6	0	0	0	0
7	1	0	0	1
Mean/house	3.41	3.0	2.47	3.19

*Tail length > 16.0 cm.

Table 6. The Range of Body Measurements Recorded From 38 Muskrats Collected in Southwest Louisiana

	MALES				FEMALES			
Pelt Size Class	Total Weight (g)	Total Length (cm)	Tail Weight (g)	Tail Length (cm)	Total Weight (g)	Total Length (cm)	Tail Weight (g)	Tail Length (cm)
Large	935-1389	51-59	23-37	19.5-23.5	935-1446	50-60	20-33	19.5-24.1
Medium	623-1020	48-54	17-20	18.3-20.5	625-1020	51-52	17.20	19.5-19.7
Small	567-623	46-49	15-16	16.5-19.5	567-595	46-49	14-16	17.5-19.8
Kits and Mice	Less Than 567	Less Than 46	Less Than 15	Less Than 16.5	Less Than 567	Less Than 46	Less Than 14	Less Than 17.5

SUMMARY

Muskrat populations were significantly higher in brackish marshes than in the other types surveyed. An average of 72.6 percent of the total muskrat houses counted were located in brackish marsh. Although the percentage values were approximately equal for southeastern and southwestern Louisiana, population densities were much higher in the southeast. Saline marshes in the southeast contained populations approximately equal to the overall average density. In the southwest, however, saline marshes appeared to be very poor muskrat habitat possibly because of their well drained nature. Intermediate transition marshes had below average population densities but were average or high in restricted areas adjacent to the brackish type. Fresh marshes exhibited the lowest muskrat population densities of any of the types surveyed. Although they comprised 31.4 percent of the total area studied, they averaged only 4.1 percent of the muskrat houses counted.

Highest house counts occurred in February when water levels were generally high, temperature low and the spring breeding season begins. These factors are undoubtedly responsible for the increase in the number of muskrat houses observed at this time.

Tunneling, either in spoil levees or in the peat soils, was not considered a significant factor in calculating muskrat populations in the coastal marsh area. In other situations, however, this factor could significantly alter population estimates.

A severe reduction in the muskrat population occurred in the summer and fall of 1971. This decline is reflected in the survey conducted in December of 1971 when the number of houses declined from 2190 to 1041. Brackish marshes exhibited drastic reductions in both the southeastern and southwestern portions of the state. The other vegetative types remained either unchanged or exhibited insignificant declines. A moderate drought was experienced in May and June of 1971 which was believed responsible for the population decline. Dozier (1947) described the decline of muskrats on the Atlantic coast during the early 1940's and identified low precipitation and the resulting increase in salinity as the cause of the decline. This conclusion was further strengthened by observations of captive muskrats which responded well to introductions of fresh water during periods of high salinity. Adams (1961) demonstrated a positive relationship between muskrat populations and the availability of water areas. Population peaks coincided with periods of high precipitation. Other authors have observed similar trends (O'Neil, 1949; Dozier, 1953, and Artimo, 1960).

Catch figures indicate that the average production of muskrats can be estimated by multiplying the number of active houses by three. The average catch ranged from 2.67 to 3.41 muskrats per house and averaged 3.19. Earlier studies using quotas of estimated total muskrat populations yielded similar results.

Body measurements revealed that tail length was closely correlated with the size of the muskrat and that tails alone could be used to estimate the size composition of a given muskrat population.

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