# DISTRIBUTION AND RELATIVE ABUNDANCE OF THE ALLIGATOR IN LOUISIANA COASTAL MARSHES

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*Abstract*: Annual alligator (*Alligator mississipiensis*) nest counts were conducted in Louisiana coastal marshlands, 1970-1977. Alligator populations were projected from nest count transect data. Total estimated population ranged from a low of 135,000 to a high of 280,000. Highest population densities were located in the Chenier Plain Marsh Zone of southwest Louisiana. Alligator population density (1 alligaotr: 3.2 ha) was highest in the intermediate marsh type. The brackfish and fresh types were about equal with 1 alligator: 5.7 ha.

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The alligator inhabits Louisiana's river and bayou systems, lakes, swamps, and marshes. One and a quarter million ha of coastal marshland provide the best alligator habitat in the state and also contain the bulk of the statewide population. The marsh alligator population can be rather easily censused by aerial nest inventory (Chabreck 1966, Joanen and McNease 1972). This report indexes population levels and more importantly shows how the habitat types can be subdivided, quantified, and qualified relative to alligator abundance.

Our aerial census data formed the backbone for formulating guidelines governing recent closely regulated alligator harvests, 1972-1977.

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## METHODS AND MATERIALS

Aerial nest censuses were conducted annually in early July, 1970-1977 in the coastal marshes of the southernmost part of the state. Alligator nests were counted from a Bell Model G4A helicopter flying permanently established transect lines. The same lines as established for a 1968 vegetative type map-salinity study (Chabreck et al. 1968) were used for this investigation. Census lines, numbering 51 for the entire coast, were simply north-south transects (longitude lines) spaced at 3.8° intervals (28 lines) in 3 parishes in the southwest part and 7.5° intervals (23 lines) over the remainder of the coast. Each line extended from the marsh-swamp demarcation to a cutoff point in brackish marshes where nesting did not occur.

A flight speed of 100 km/h, altitude of 60 m, and transect line width of 105 m were chosen as optimum, considering sample size and nest perceptibility. In order to reduce sampling bias, 1 observer did all nest counting during the 8 year study.

The marsh zone and vegetative type classifications as described by Chabreck (1970) were used for ecological aspects of the project. This classification scheme formed the basis for qualitative and quantitative habitat-population density analyses.

The entire Louisiana coastal marshes include 1.7 million ha (Chabreck 1970). This vast area was sub-divided into three major sub-divisions according to origin; the Chenier Plain, Sub-Delta, and Active Delta Zones (Fig. 1). The Chenier Plain Zone makes up 0.5 million ha and is located in the southwest corner of the state. The Sub-Delta Marsh Zone contains 1.1 million ha (2/3 of total) and extends from the Vermilion Bay complex to the Mississippi-Louisiana border. The Active Delta comprises 0.1 million ha and consists of the present Mississippi River Delta.

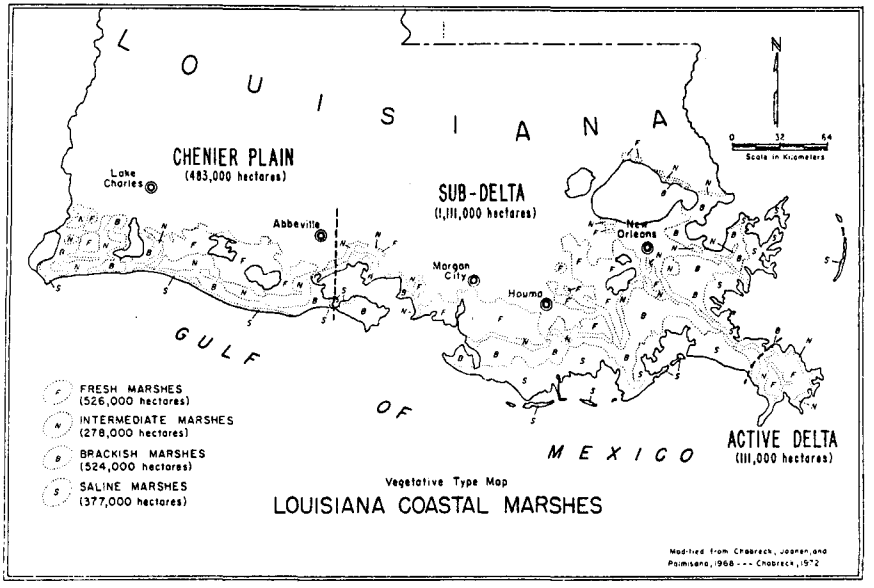


Fig. 1. Vegetative type map of the Louisiana coastal marshes.

The vegetative classification of brackish, intermediate, and fresh was used for purposes of marsh classification (Chabreck 1970). Generally the brackish marsh was located nearer the Gulf of Mexico and experienced higher salinity levels than did the other two types. The intermediate marsh generally was a band separating fresh from brackish. Fresh marshes lie farther inland and are not usually affected by tidal action. Alligators do not utilize the saline marsh type; hence, the 0.4 million ha of this type were disregarded.

The fresh marsh made up 41% of the area (0.53 million ha) included in our survey. The intermediate marsh comprised 22% of 0.28 million ha. The brackish marsh, minus marshes over 10 ppt salinity, comprised 37% or 0.48 million ha.

Data analysis was based primarily on Chabreck's (1966) figure of 5% for the percentage of nesting females in a population. The number of nests transected by marsh type and zone were converted to area (ha) per nest. The ha/nest figure was then divided into total size of each individual sample area to arrive at total nesting females. A simple 20X conversion converted to total population.

We expressed alligator numbers and available habitat as a percentage function to more graphically point out the quantity and quality of the different habitat types.

## RESULTS AND DISCUSSION

### Environmental Factors Affecting Nesting

Air temperatures affect the timing of nesting and egg laying activity (Joanen and McNease 1978). Nesting occurred in early June for the years with highest March-May temperatures and occurred as late as the first week in July when springtime temperatures were the lowest. This factor must be taken into account when setting up the time table for nest censusing.

Extremes in water levels—drought and flood conditions—adversely affect nesting of the aquatic-based alligator (Joanen and McNease 1972). This factor probably affects the degree of nesting more than any other environmental factor, and thereby may cause considerable bias in annual population estimates based on nest transects. This deserves

further study. Nevertheless, a reliable index of annual reproductive success can be achieved which will form the basis for long-term population dynamics study.

Nesting was not observed in areas characterized by moderate-high salinities. Prolonged exposure of waters of 10 ppt salinity and greater was lethal to newly hatched alligators (Joanen and McNease 1972). Salinity tolerance appears to increase with age.

Population Estimates by Year

Population estimates in coastal marshes varied from a low of 135,000 in the drought year of 1971 to a high of 282,000 in 1976 (Table 1). The annual increment of nesters, maiden females which breed for the first time, averaged 8% over the 8 year study. Overall, populations increased dramatically in the Chenier Plain and Sub-Delta Zones from 1970-1977. The Active Delta showed a decrease in alligator population and was adversely affected by drastic changes occurring to the marsh habitat; hurricane damage, marsh subsidence, and flooding.

Table 1. Louisiana coastal marsh alligator population based on nest surveys, 1970-77.

| *Year* | *Population Estimate* | *Percent change in comparison to 1970* |
|---|---|---|
| 1970 | 172,000 | |
| 1971 | 134,000 | -22 |
| 1972 | 182,000 | + 6 |
| 1973 | 153,000 | -11 |
| 1974 | 213,000 | +24 |
| 1975 | 272,000 | +58 |
| 1976 | 282,000 | +64 |
| 1977 | 274,000 | +59 |

Population Distribution by Zone

A comparison of 1977 alligator data by zone showed the Chenier Plain had the greatest population (Table 2). This zone occupied only 34.9% of the marshlands but housed 64.0% of the coastwide estimated alligator population. The Sub-Delta Marsh Zone comprised 57.2% of our coastal marshes and contained only 34.5% of the alligator population. The Active Delta Marshes provided habitat for 2.5% of the alligator population on a disproportionate 7.9% marsh area.

A comparison of alligator densities, expressed as hectares per alligator, dramatically shows the much higher population levels of the Chenier Plain Zone. The Chenier Plain averaged 1 alligator: 2.5 ha, the Sub-Delta 1:8 ha, and the Active Delta 1:14 ha.

A major point of interest is the rapidly expanding population of the Chenier Plain, which has shown annual increments superior to the other two zones, and in conjunction with 5 years of state regulated harvest which resulted in the removal of 18,367 alligators.

Population Distribution by Marsh Type

On a coastwide basis, the intermediate marsh type contained highest alligator densities, 1 alligator to 3.2 ha. The brackish and fresh were about equal in area and population density, 1 alligator to 5.7 ha (Table 2). In 1977, the intermediate marsh comprised 22% of coastal marshlands and contained 34% of the population. The fresh marsh made up 41% of the area and contained 34% of the population. Brackish marshes of 10 ppt salinity and less occupied 37% of the area sampled and carried 32% of total population.

Table 2. Coastal alligator population estimates according to marsh zones and marsh types, 1970 and 1977.

| Marsh Type | Marsh Zones: Chenier Plain Population Estimate 1970 | Chenier Plain Population Estimate 1977 | Chenier Plain Size of Area | Sub-Delta Population Estimate 1970 | Sub-Delta Population Estimate 1977 | Sub-Delta Size of Area | Active Delta Population Estimate 1970 | Active Delta Population Estimate 1977 | Active Delta Size of Area | Population/ Marsh Type 1970 | Population/ Marsh Type 1977 | Size Area/ Marsh Type |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | In Percent | | | | | | |
| Fresh | 23.7 | 19.5 | 13.4 | 12.9 | 13.8 | 23.6 | 3.8 | 1.1 | 4.1 | 40.3 | 34.4 | 41.0 |
| Intermediate | 20.5 | 25.3 | 11.2 | 5.8 | 7.2 | 7.2 | 3.8 | 1.2 | 3.3 | 30.2 | 33.7 | 21.7 |
| Brackish | 13.1 | 19.2 | 10.3 | 15.7 | 12.5 | 26.4 | 0.7 | 0.2 | 0.5 | 29.5 | 31.9 | 37.3 |
| Population and Area/Marsh Zone | 57.3 | 64.0 | 34.9 | 34.5 | 33.5 | 57.2 | 8.3 | 2.5 | 7.9 | | | |
| | | | | | | In Thousands | | | | | | |
| Estimated Population and area (ha) zone | 97 | 175 | 450 | 59 | 92 | 737 | 14 | 7 | 101 | | | |

A comparison of percentage population to percentage area for the 3 marsh types in the Chenier Plain to total marshland showed all 3 types contained higher alligator populations than did comparative types in the other 2 zones (Table 2). In 1977, 20% of the total coastal population was located in 13% of the area for Chenier Plain fresh, 25% of alligators to 11% of area for intermediate and 19:10 for brackish.

While the Sub-Delta alligator population is rapidly expanding, the alligator density in each marsh type is far below that for the Chenier Plain. In 1977, 14% of the total coastal population was housed in 24% of the area for Sub-Delta fresh, 7:7 for intermediate, and 13:26 for brackish.

Alligator densities in Chenier Plain fresh and intermediate types were 2.5 times those in the Sub-Delta. Brackish was 4 times higher in the Chenier Plain.

Decreases in alligator populations were noted in all 3 marsh types in the Active Delta between 1970 and 1977. The reason for decline was habitat degradation of the entire marsh zone.

### Populations According to Land Ownership

Sixty-seven percent of the coastal alligator population was calculated to be on privately owned land in 1977 as compared to 60% in 1970. The 33-40% located on publicly owned lands were all on state and federal refuges, or state-owned wildlife management areas. Management implications inherent in Louisiana's coastal landownership scheme are obvious; private landowners control the majority of alligator habitat and alligators. Management programs must be designed with the private sector foremost in mind, as they hold the key to the well-being of our marsh resources.

## SUMMARY

Coastal marsh alligator population estimates generally showed progressive annual increases, ranging from a low of 135,000 in 1971 to a high of 282,000 in 1976. The Chenier Plain Marsh Zone in southwest Louisiana maintained much higher alligator densities than did the Sub-Delta or Active Delta. On a coastwide basis, the intermediate marsh type contained a greater density of alligators than the other marsh types. The brackish and fresh types were about equal in area and population density. Sixty-seven percent of the total coastal marsh alligator population was estimated to be on privately owned land in 1977.

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