Breeding abundance of colonial waterbirds on the Louisiana-Mississippi-Alabama coast

A documentation of "the extraordinary frequency and abundance of colonial waterbirds breeding in this rich deltaic area."

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EXTENSIVE SWAMPS, MARSHES and estuaries of the Mississippi River alluvial fan provide a diverse and extremely productive array of feeding and nesting situations for the colonial waders and seabirds of the north coast of the Gulf of Mexico. Cypress-Tupelo *(Taxodium-Nyssa)* swamps, fresh, brackish and saline marshes, and coastal spoil and barrier islands all harbor large breeding colonies.

Before the late 1950s, numerical abundance was assessed infrequently on but a few well-known and accessible colonies. Although many early naturalists meticulously described the nesting of rarely breeders, more common species were mentioned incidentally, and were rarely censused.

More recently biologists and others have realized that it is the more abundant species that have the greatest effect on nutrient and energy cycling in swamps and estuaries. Thus, changes in status at geographic centers of breeding abundance may be more important than geographic limits of breeding distributions for indicating overall population trends and for evaluating the health of coastal ecosystems.

From 1958 to 1975, Alexander Sprunt IV and John Ogden of the National Audubon Society conducted aerial surveys of many Louisiana heronries west of the Mississippi River; these researchers tallied over 200,000 breeding waders in the colonies surveyed in 1975. Jacob Valentine, of the U.S. Fish and Wildlife Service, has studied seabird nesting on the Shell Keys, Isles Dernieres, and Chandeleur Islands of Louisiana from the early 1960s to the present. These efforts have been limited to single annual surveys of only a small portion of the available habitat. Results have necessarily omitted large segments of the overall coastal colonial bird population and are of limited value for discerning coast-wide population trends.

Therefore, as part of a U.S. Fish and Wildlife Service project to establish a complete data base of colonial bird abundance for all of the United States coast, the Louisiana Cooperative Wildlife Research Unit (LCWRU) was contracted to locate and census all colonies within the coastal wetlands and islands from Sabine Lake to Mobile Bay.

METHODS

WE LOCATED MOST COLONIES during approximately 100 flight hours of fixed wing aerial survey, conducted at 4-to 6-week intervals March 13-August 4, 1976. Although we concentrated efforts on the coastal marshes and islands south of the Intracoastal Waterway, we also searched swamps around Lake Maurepas and in the Atchafalaya basin.

To estimate abundance at such diverse nesting aggregations as treetop swamp heronries and barrier beach terneries, we drew from a battery of census and sampling techniques for each particular situation. Aerial photography was applied to conspicuous nesters in the open or atop shrubs or trees. Because individual incubating Great Egrets *(Casmerodius albus),* Sandwich Terns *(Sterna sandvicensis),* Royal Terns *(Sterna maximus),* and Caspian Terns *(Sterna caspia)* were easily distinguished and counted on developed prints, photography yielded highly accurate nest counts. Although we could not separate incubating adults from loafing birds on aerial photographs of Black Skimmer *(Rynchops niger)* colonies, we could count *total* adults present at each colony from photographs.

Total nest counts were applied to the rare nesters, Reddish Egret *(Dichromanassa rufescens),* Sooty Tern *(Sterna fuscata),* Gull-billed Tern *(Gelochelidon nilotica);* and to small and diffuse seabird colonies on bare ground: Least Tern *(Sterna albifrons),* Forster's Tern *(Sterna forsteri),* and some Black Skimmer colonies. We walked transects through shrub heronries, wherever the substrate would support our weight, and collected 10% samples of active nests on the huge, marsh island colonies in coastal bays. Confidence limits calculated from transect samples on mangrove island heronries indicated a high reliability for this method. We also used belt transects to sample Laughing Gull *(Larus atricilla)* nests concealed in vegetation.

Small herons, egrets, and ibises nesting in swamps or fresh marshes were visually estimated from fixed or rotary wing aircraft. This method was of limited reliability simply because dark-colored species, Black-crowned Night Heron *(Nycticorax nycticorax),* Louisiana Heron *(Hydranassa tricolor),* and White-faced Ibis *(Plegadis chihi),* and individuals nesting under vegetation, were difficult to see from aircraft. Also, as with any bird count, numbers were immediately affected by time of day, weather, and feeding conditions.

To document seasonal changes in abundance and to determine the peak of nesting for each colonial species, we surveyed most colonies at least three times during the nesting season. Between February and August 1976 we made a total of 476 colony visits. Most colonies were

found when adults were engaged in incubation, and surveillance continued until fledglings departed.

RESULTS AND DISCUSSION

We located 168 seabird and wader colonies within the coastal wetlands of the North Gulf Coast; 88 of these were principally occupied by waders and 80 by seabirds. Especially important nesting areas were mapped by wetland habitat type (see Fig. 1).

Table 1 is a summary of nesting abundance by species and by habitat type. All nest counts were converted to bird counts by multiplying by two. Although multiple counts were collected for most species on most colonies, a single number, representing the highest adult bird count obtained using the most reliable census technique was totalled for each species on each colony. Table 1 gives the summation of these maximum counts for each colonial species.

Thirty-one percent of all swamp and marsh nesting occurred in cypress-tupelo swamps, 23% was in fresh marshes, 9% in brackish marshes, and 37% in salt marshes. These habitat types comprised roughly 29, 22, 23, and 16 percent, respectively, of total coastal wetlands, indicating a decided preference by colonially nesting birds for saline over brackish marshes. This preference probably reflected the scarcity of suitable wader nest sites, *i.e.*, woody vegetation, in the largely herbaceous brackish marsh. Nevertheless, the importance of the relatively small salt marsh, and as yet unmeasured but limited area of coastal beaches, was clearly indicated.

Notes on the nesting habits of each species are arranged in order of breeding abundance below. Waders and seabirds are treated separately.

Louisiana Heron. Although principally estuarine, this abundant waterbird also nested in large numbers in fresh water situations. Some black mangrove *(Avicennia germinans)* heronries contained over 5000 active nests in May.

Snowy Egret *(Egretta thula).* More a fresh marsh wader than the Louisiana Heron, this egret nested in shrubs and appeared to favor nest sites toward the center of mixed-species aggregations.

Cattle Egret *(Bubulcus ibis).* This "invader" species, which only began nesting in Louisiana in 1956, was present in most swamp, fresh marsh, and brackish marsh heronries. Somewhat surprising was the discovery of 200± pairs nesting among other waders in a black mangrove heronry of Black Bay, Louisiana.

White Ibis *(Eudocimus albus).* A traditional and very large colony of approximately 30,000 nests, in the cypress swamp north of Lake Maurepas was again active in 1976. We found smaller groups nesting within fresh and salt marsh heronries.

Little Blue Heron *(Florida caerulea).* This mainly freshwater species nested most abundantly among Snowy Egrets on shrubs in ponds in the cypress-tupelo swamps. A few small nesting groups were found in black mangrove heronries.

Great Egret. Always atop the canopy, this egret nested with about equal frequency in all salinity and habitat types. One swamp colony contained 5000± nests in March. Many mixed-species heronries began in March as Great Egret colonies (see Fig. 2).

Black-crowned Night Heron. Black-crowneds nested most commonly in the salt marsh and largest colonies occurred in black mangrove thickets on insular marsh fragments or behind barrier beaches. Several colonies comprised 1800+ active nests in May.

White-faced Ibis. Although Glossy Ibises *(Plegadis falcinellus)* were observed on several White-faced Ibis colonies from Timbalier Bay, Louisiana to Cat Island, Alabama, we could not distinguish nests of the two species during transect sampling and numbers were combined. (Only a few individual Glossy Ibises were definitely identified at each

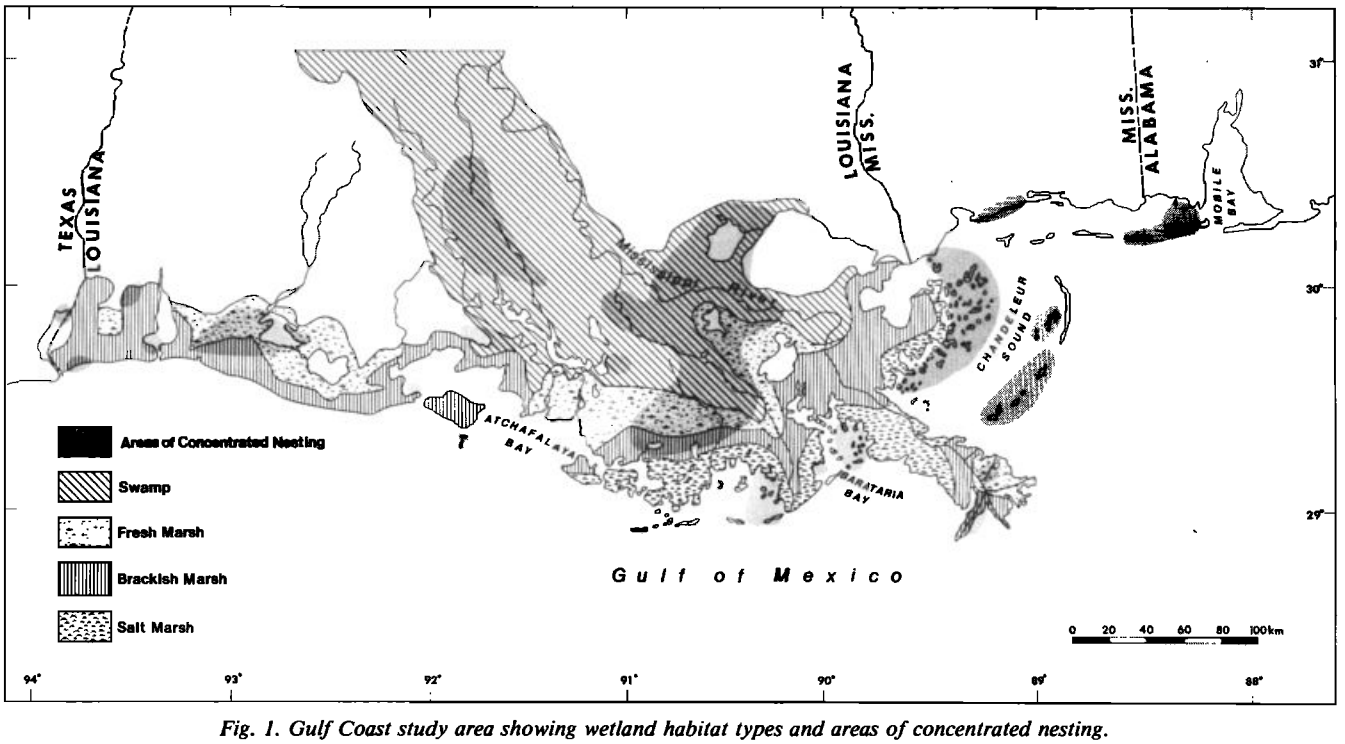

Fig. 1. Gulf Coast study area showing wetland habitat types and areas of concentrated nesting.

Table 1. Colonial waterbird nesting abundance by habitat type, Louisiana-Mississippi-Alabama Coasts, 1976. Numbers indicate breeding adults.

Species	*Swamp*	*Fresh marsh*	*Brackish marsh*	*Salt[a] marsh*	*Coastal[b] beach*	*Total*
Brown Pelican	0	0	0	48	0	48
Olivaceous Cormorant	1,092	5,780	788	0	0	7,660
Anhinga[c]	2,402	180	0	0	0	2,582
Great Blue Heron	9,258	860	0	0	0	10,118
Great Egret	22,956	18,286	15,138	20,564	0	76,944
Snowy Egret	8,074	39,463	15,932	53,018	0	116,487
Reddish Egret	0	0	0	299	0	299
Cattle Egret	56,300	30,474	2,400	2,212	0	91,386
Louisiana Heron	5,296	9,315	13,294	112,000	0	139,905
Little Blue Heron	45,288	33,594	250	2,206	0	81,338
Black-crowned Night Heron	51	1,030	4,604	14,729	0	20,414
Yellow-crowned Night Heron[c]	153	100	0	0	0	253
Plegadis spp. (mostly White-faced Ibis)	0	5,586	0	6,909	0	12,495
White Ibis	63,870	12,653	134	11,095	0	87,752
Roseate Spoonbill	0	1,275	1,346	0	0	2,621
Laughing Gull	0	0	0	14,318	41,768	56,086
Gull-billed Tern	0	0	0	20	159	179
Forster's Tern	0	100	6,718	12,196	202	19,216
Common Tern	0	0	0	0	12	12
Sooty Tern	0	0	0	0	20	20
Least Tern	0	0	0	14	14,290	14,304
Sandwich Tern	0	0	0	0	55,682	55,682
Caspian Tern	0	0	0	194	224	418
Royal Tern	0	0	0	584	20,742	21,326
Black Skimmer	0	0	50	4,303	25,627	29,980
Total	214,740	158,696	60,654	254,709	158,726	847,525

[a]includes *Spartina alterniflora-Avicennia germinans* marsh plus adjacent shell berms
[b]includes unvegetated coastal beaches and spoil areas
[c]grossly undersampled in their principal swamp nesting habitat

location.) *Plegadis* spp. ibises nested in fresh and salt marshes from Texas to Alabama; the White-faced always predominated, even as far east as Cat Island, Alabama, indicating a significant eastward range expansion for the species. In mangrove heronries *Plegadis* spp. nested more often upon oystergrass *(Spartina alterniflora)* than in shrubs.

Great Blue Heron *(Ardea herodias).* Almost exclusively a swamp nester, this heron was first to begin nesting of any colonial waterbird and built nests atop mature cypress or tupelo in company with Great Egrets. One swamp colony south of New Orleans comprised 2000+ active nests in March.

Olivaceous Cormorant *(Phalacrocorax olivaceus).* This was the only species of cormorant found nesting in the study area, with most nesting in fresh marsh heronries in extreme southwestern Louisiana. Colonies had up to 2000 nests in April, and nest sites were in the tallest woody vegetation available in heronries.

Roseate Spoonbill *(Ajaia ajaja).* This is another species that was restricted to southwestern Louisiana. On the four colonies where actual nesting was verified, breeding adult counts ranged from 375 to 1346. Loafing adults were seen on heronries as far east as Vermilion Bay (only adults associated with nests were included in Table 1). In the last decade, the breeding range of spoonbills has expanded from west to east across the southern Louisiana marshes.

Anhinga *(Anhinga anhinga).* Because Anhingas nested in small scattered colonies in swamps, we were unable to adequately search out and census this species in the time available. I therefore suspect that we grossly underestimated its overall abundance. Nests were placed high in shrubs or trees, and often among nesting Great Egrets.

Reddish Egret. At the northern limit of this egret's breeding range, the Louisiana salt marsh has historically received limited nesting activity. However, we found several small groups on insular mangrove heronries at the edge of Chandeleur Sound, and in coastal bays as far west as the Isles Dernieres. Earlier observers found greatest abundance on North Island of the Chandeleurs; however, we found a group of 100+ pairs in a mangrove heronry in Black Bay.

Yellow-crowned Night Heron *(Nyctanassa violacea).* Like the Anhinga, this species was grossly underestimated owing to its habit of nesting in small, inconspicuous colonies in the swamps. It also nested sparingly among other waders in the fresh marsh.

Brown Pelican *(Pelecanus occidentalis).* The only extant Louisiana colony consists of introduced Florida birds nesting on a shell berm at the edge of a mangrove heronry in Barataria Bay.

Laughing Gull. Most abundant among the seabirds, we found the largest colony which comprised 17,000+ nests, among the beach dunes of the Isles Dernieres. Smaller but more numerous colonies occurred at the seaward edge of the St. Bernard Parish, Louisiana, salt marsh. Two distinct colony types were apparent: those containing nests concealed under beachgrass on the barrier beaches, and those composed of nests built on top of oystergrass or shell on the salt marsh.

Sandwich Tern. By aerial photographic count, we censused 20,367 incubating adults (=nests) on Curlew Island, Chandeleurs May 19; this very likely represented the largest single Sandwich Tern colony in North America. We censused smaller colonies on spoil west of Petit Bois Island, on

Fig. 2. Typical black mangrove-oystergrass heronry in Louisiana's salt marsh. Great Egrets are visible as white spots on the darker vegetation (mangrove) in the background. Louisiana Herons, Snowy Egrets and Black-crowned Night Herons also nested in mangrove on this island; Forster's Terns nested in oystergrass (lighter-colored vegetation) in the foreground.

North Island, East Timbalier Island, and Shell Keys National Wildlife Refuge. This species always nested in dense groups in company with Royal Terns (see Figs. 3 and 4).

Black Skimmer. We found largest colonies, containing up to 4800 adults, on the barrier beaches of the Isles Dernieres, Timbalier, and Chandeleur chains, and on spoil areas in Atchafalaya Bay and near Southwest Pass of the Mississippi River. Of the 37 colonies located, nearly one third occurred on shell berms on salt marshes at the edge of Chandeleur Sound.

Royal Tern. This species nested either in huge colonies with its congener, the Sandwich Tern, on barrier beaches, or alone in smaller groups on salt marsh shell berms. The Curlew Island *Thalasseus* spp. colony included 7210 Royal Tern nests May 19.

Forster's Tern. A marsh dweller, this species characteristically nested on drifted material on the salt marsh, and often near mangrove heronries. Most colonies contained fewer than 300 nests, but Grassy Island, in Mississippi Sound, included 2750 incubating adults (=nests) in May. Although this was the first seabird to begin breeding (in April), tidal inundation and consequent nest failure prolonged nesting into July 1976.

Least Tern. Largest colonies, with up to 2000 nests in each, occurred on public bathing beaches in Pass Christian, Long Beach, and Gulfport, Mississippi, and on Dauphin Island, Alabama. Much smaller colonies, containing fewer than 500 nests, were quite common on Louisiana's barrier beaches and on unvegetated spoil areas. Approximately 14% of nesting Least Terns utilized spoil as a nest substrate.

Caspian Tern. Small colonies were active throughout the summer either at the periphery of Sandwich-Royal Tern colonies on barrier beaches, or on shell berms in the St. Bernard Parish salt marsh.

Gull-billed Tern. Small colonies were previously reported on the Chandeleurs, Isles au Pitre in St. Bernard Parish, and near Pascagoula, Mississippi. Besides the Chandeleur and Isle au Pitre groups, we noted colonies on spoil west of Petit Bois Island,and as far west as Atchafalaya Bay, Louisiana. One of the Atchafalaya Bay colonies contained 66 nests in June. Gull-billeds always nested among Black Skimmers and commonly dug a nest scrape against chunks of driftwood.

Sooty Tern. A few pairs of this species have traditionally nested on the Chandeleur Islands; we found 20 adults nesting in this area in 1976. Interestingly, a single adult Sooty Tern was observed at a tern and skimmer colony near Petit Bois Island June 10.

Common Tern *(Sterna hirundo).* Our most uncommon breeding tern nested only on Dauphin Island Beach. There we found two clutches of eggs and several adults in breeding plumage June 15.

CONCLUSIONS

EXTENSIVE AND INTENSIVE coastwide aerial search, and intensive aerial photographic censusing and ground sampling, enabled us to document the extraordinary frequency and abundance of colonial waterbirds breeding in this rich deltaic area. Species abundance was estimated on most colonies in 1976 using methods that representatively sampled both conspicuous and cryptic species. Repeatability was emphasized by avoiding highly subjective and biased

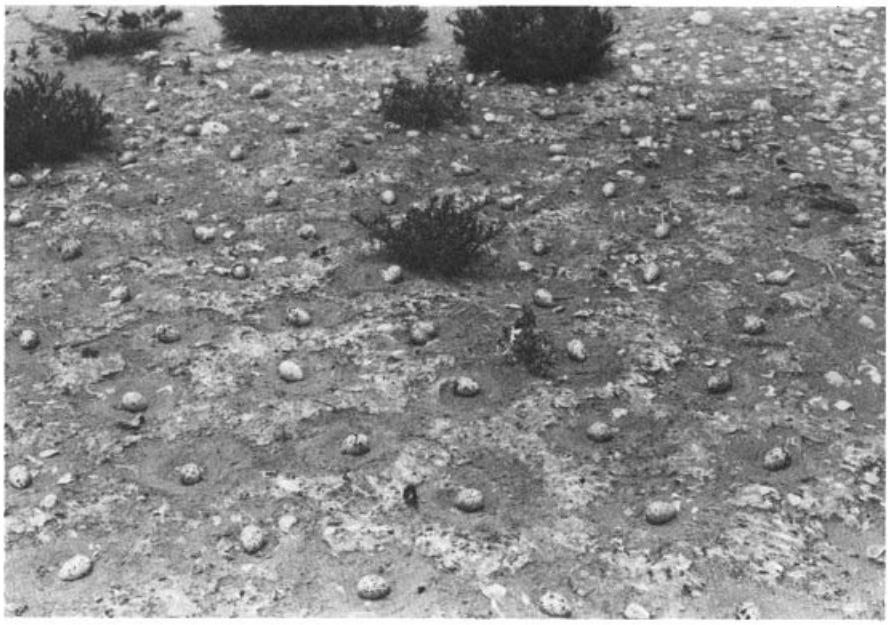

Fig. 3. Close up of Sandwich Tern colony on Curlew Island, Chandeleurs, showing uniform nest spacing. Eggs are approximately 30 cm apart.

Fig. 4. Incubating Royal, Sandwich and Caspian terns, and Black Skimmers on East Timbalier Island, Louisiana June 26, 1976. Royal and Sandwich terns are uniformly and densely spaced at the center of the photo. Black Skimmers are apparent around the periphery, and Caspian Terns are located at "A".

visual estimates whenever possible. Thus, a more complete and reliable data base was established for comparison with future inventories.

We believe this research takes an important first step toward monitoring the effects of increased human technology on colonial birds in this coastal region. The colonial waterbirds in general, and the easily censused Great Egrets, Royal Terns, and Sandwich Terns in particular, represent sensitive and useful biotic indicators of habitat degradation; their importance as indicator species should increase along with ever-expanding coastal technology. Hopefully comparable inventories can be repeated in the near future to improve census techniques and to determine important population trends on this ecologically unique and immensely productive coast.

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