

Status and Recent Trends of Galveston Bay's Colonial Waterbirds - With Management Implications

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Introduction

Approximately 66 species belonging to the group popularly called "waterbirds" are known to regularly occur in Galveston Bay and its adjacent wetlands. These are the migrant waterfowl (approximately 31 species), regularly nesting waterfowl (2 species), migrant fish-eating birds (10 species), and colonial waterbirds (23 species). These numbers do not include vagrants or accidentals which irregularly occur along the upper Texas coast, the group (37 species) called shorebirds belonging to the plover and sandpiper families, or about 11 species of rails, cranes, the wood stork, and smaller wading birds generally considered aquatic but which do not fit into the above categories. Nor do they include wide-ranging pelagic birds which do not regularly breed on the Texas coast.

The 23-species subgroup called colonial waterbirds is composed of gulls, terns, skimmers, herons, egrets, cormorants, and pelicans. This subgroup lends itself to regular censusing because its members annually aggregate during the breeding season in large, well-defined, and easily censused colony sites. Primarily fish and aquatic invertebrate-eating birds, these birds are ideal to serve as monitors because they are resident and widespread over most of the bay for most of the year and they occupy the higher levels of the food chain. Also, they are susceptible to many of the factors affecting the bay ecosystem, such as fluctuations in populations of forage species, invasions of exotic pest species, human disturbance, erosion of intertidal and shoreline habitat, chemical contamination, and extreme climatic conditions. We believe that accurate and long-term counts of colonial waterbirds can be a sensitive tool to detect important biological changes to the estuary.

Census Techniques

The Texas Colonial Waterbird Census (TCWC) began on a formal basis in 1973 by the Texas Colonial Waterbird Society to census all known Texas waterbird colonies annually during the last week of May and first week of June. Early counts were done primarily by resource agency biologists. In subsequent years increasing numbers of volunteers have participated. Counts are reported on a standardized data sheet which has columns for species, reproductive stage, survey type, number of active nests, number of adults present, number of breeding pairs, site information, date of count, and observer names. Compilations of the data, including Galveston Bay, were published in 1982 (Texas Colonial Waterbird Society) and 1992 (Lange 1992). The 1990

(published in 1992) census summary of coastal colonies provided trend lines by species by coastal region. The U.S. Fish and Wildlife Service's Clear Lake Field Office recently assumed compilation responsibilities for the coastwide TCWC data since 1993. A summary of the coastwide data by colony site is expected to be available in printed and magnetic form by early 1997, to be followed by another report providing an updated atlas of coastal colonies and species trends.

For the current paper, we updated the coastwide data through the 1996 breeding season and separated out Galveston Bay colonies. We considered a colony as a Galveston Bay Colony if we had information that its residents normally foraged within the bay system. For 5 years within the 1973 - 1996 period, as shown in Table 1, we tabulated the total numbers of breeding pairs, colonies, and selected species and species guilds to identify any important trends over the last 24 years. Although there were apparent gaps in the data for certain years, the 5 years selected for analysis each represented count periods in which at least 85% of major colonies were reported.

Galveston Bay Waterbird Trends

Total numbers and numbers of active colonies --- Table 1 shows the comparison of total numbers of nesting pairs and total active Galveston Bay colonies (including Christmas, Drum, and Bastrop Bays) at 5 points in time over the previous 24 years. While total numbers have fluctuated over this period, no real trend in total numbers is evident from the 1973 estimate of 54,645 through the 1996 estimate of 48,126. Interestingly, the proportion of birds nesting in the lower (Christmas, Bastrop, and Drum Bays) portion of the estuary has steadily increased from an estimated 447 pairs in 1973 to 2,290 in 1996. A portion of this local increase is attributable to the artificial creation of a black skimmer colony in an abandoned parking lot at the Freeport Dow Chemical Company compound. This colony had 500 nesting pairs in 1996.

The number of active colonies has steadily increased from 1973 (22) to 1996 (36). It is possible this increase is related to increased observer effort over the years resulting in more smaller colonies being found. There were 9 small colonies (< 50 nesting pairs) reported in 1996, compared to only 2 in 1973. Alternatively, this apparent trend toward greater numbers of smaller colonies might be a baywide response to factors such as increasing amounts of human disturbance at larger colony sites or physical loss of some large colony sites. Examples of the latter are the loss of the 2 largest black skimmer colonies during the early 1970's in the bay (both 1,000+ pairs), at Tiki Island and Atkinson Island, being lost to development and erosion by 1980.

The current numbers of colonies and nesting pairs appear well within the known historic range for Galveston Bay. However, a closer look is necessary to determine if individual species are declining or if ratios between species or among species groups (guilds) show any patterns which could be related to habitat changes or environmental problems. Our 1997 report(s) will provide the data base to extend these comparisons for all Texas bay systems, and allow more extensive individual species and species-group analyses by bay system as well.

Table 1. Galveston Bay colonial waterbirds, total nesting pairs and nesting pairs of selected species and guilds at 5-6 year intervals from 1973 to 1996.

	<u>1973</u>	<u>1979</u>	<u>1985</u>	<u>1990</u>	<u>1996</u>
All species	54,645 (447)	50,160 (686)	39,008 (1,380)	46,813 (2,082)	48,126 (2,920)
# of species	22	22	22	22	23
# of colonies	22(1) 2<50	28(3) 5<50	34(4) 8<50	41(5) 11<50	36(3) 9<50
LAGU	35,860 (0) 66%	32,070 (0) 64%	22,698 (0) 58%	17,608 (0) 38%	19,052 (1,070) 40%
Marsh/open water guilds *	7,059/ 2,933 = 2.4	4,443/ 582 = 7.6	2,177/ 4,062 = .54	4,909/ 5,465 = .90	5,207/ 4,645 = 1.1
BLSK	1,873 (467)	2,284 (388)	2,699 (855)	1,874 (730)	2,161 (575)
SNEG-TCHE	6,850	2,472	1,101	1,900	2,640
OLCO	300	392	285	1,800	1,582
BRPE	0	0	0	0	79

() indicate subpopulations in Christmas, Bastrop, and Drum Bays

* Marsh-feeding guild is composed of great egret, snowy egret, tricolored heron, and roseate spoonbill.
Open water-feeding guild is composed of royal tern and Caspian tern.

Black skimmer --- The black skimmer is an intertidal marsh, lagoon, and marsh edge feeder which nests on open shell hash or sand beaches. It occasionally nests in barren disposal areas and even gravel rooftops, but success at these sites is usually low. Because of its specific nesting habitat and its requirement for a feeding habitat type showing bay-wide losses, we consider it an important indicator species.

Figure 1 shows its nesting population pattern since 1973. Numbers for the Brazoria County (including Christmas, Drum, and Bastrop Bays) population are separated out to determine the impact of recent artificial nesting habitat projects at Dow Chemical and San Bernard National Wildlife Refuge. Numbers range between a high of 4,700 pairs in 1974 and a low of 900 pairs in 1977, the 1996 nesting season estimate being 2,200 pairs. The 1995 population estimates for all species, while graphed, were not used in range estimates because sampling effort (percentage of colonies not counted) for 1995 was considered below acceptable limits.

Tricolored heron and snowy egret --- We consider this species pair an indicator guild for intertidal marsh-feeding and medium-height brush-nesting waterbirds. Figure 2 shows the population pattern since 1973. Numbers range from a high of 6,800 nesting pairs in 1974 down to 700 in 1992, with 1996 nesting season numbers at 2,700. The apparent trend for this species pair seems to be slightly declining. Our 1997 data compilation will allow us to improve our comparison between marsh-feeding and open water-feeding species.

Olivaceous cormorant --- We consider the olivaceous cormorant as typical of primarily open bay-feeding species which nest in trees. The general trend since 1973 seems to be upward (Figure 3), with the historic low of 200 in 1974 and the high of 1,800 in 1990. The 1996 estimate was near the historic high, at 1,600. The 1997 data compilation will allow us to better compare all open bay-feeders with all intertidal marsh-feeders to determine if changes in proportions of feeding habitat bay wide could be responsible for population trends.

Problems

Human disturbance --- As the estimated population of the Houston metropolitan area has dramatically increased from 1970 to 1996, recreational use of Galveston Bay and its shorelines has also greatly increased. Improved and affordable small fishing boats and all-terrain vehicles have made accessible previously remote beaches, marshes, tidal flats, and islands. For example, three of the four major black skimmer nesting beaches in 1973, Tiki Island, San Luis Pass, and Big Reef, have been either developed as a residential project or, until recent protection efforts, overrun with recreational vehicles to the point that successful nesting was almost stopped. Although largely anecdotal, recent reports from field biologists and conservation groups indicate that these impacts are increasing in frequency and can seriously affect reproductive success of waterbird colonies. Recent efforts of the Service, Houston Audubon Society, and other groups, discussed later in this paper, have been directed toward increased protection of important nesting colonies from excessive human disturbance during the breeding season.

FIGURE 1.

BLACK SKIMMER NESTING PAIRS

Galveston Bay

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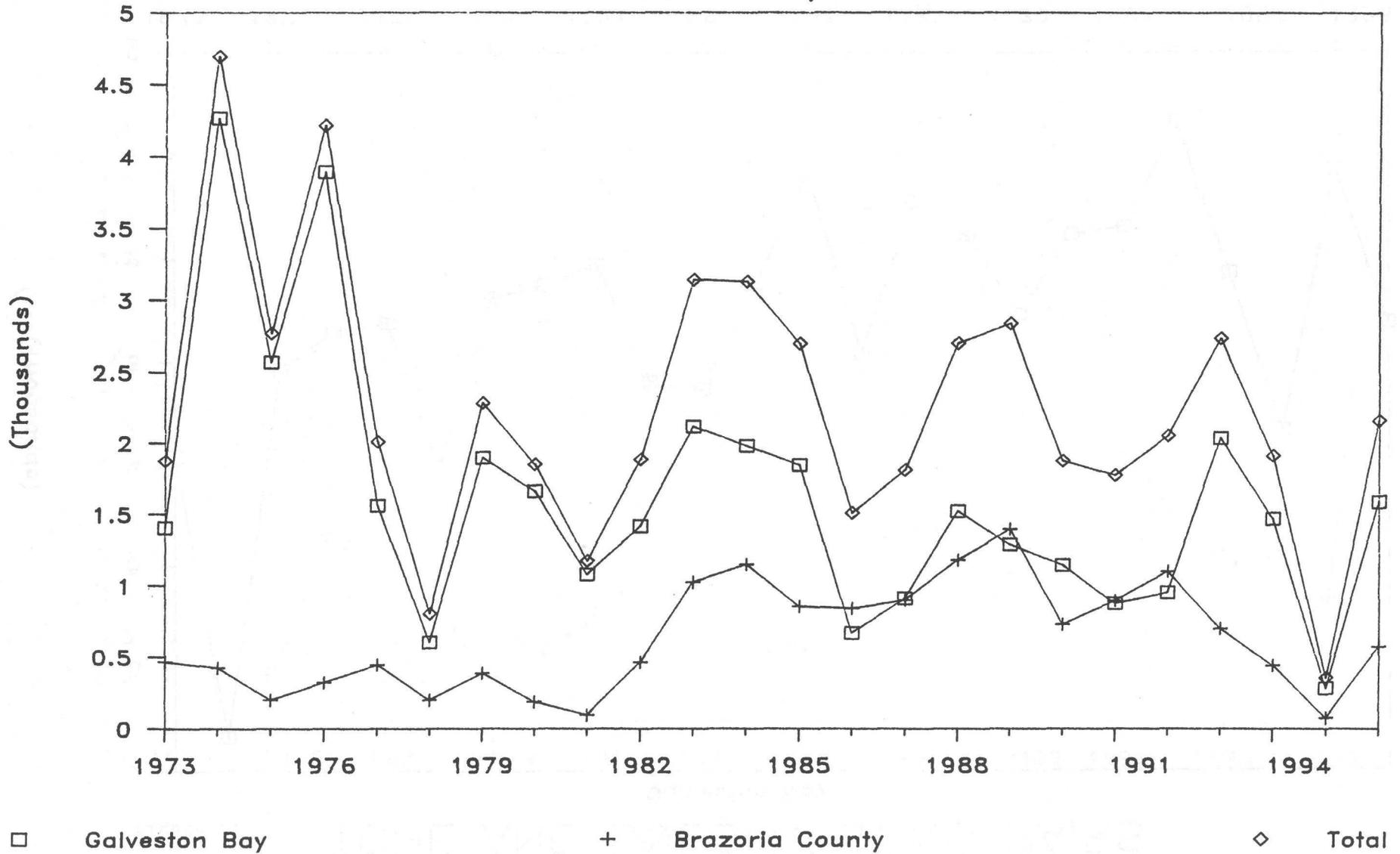


Figure 2.

TCHE AND SNEG NESTING PAIRS

Galveston Bay

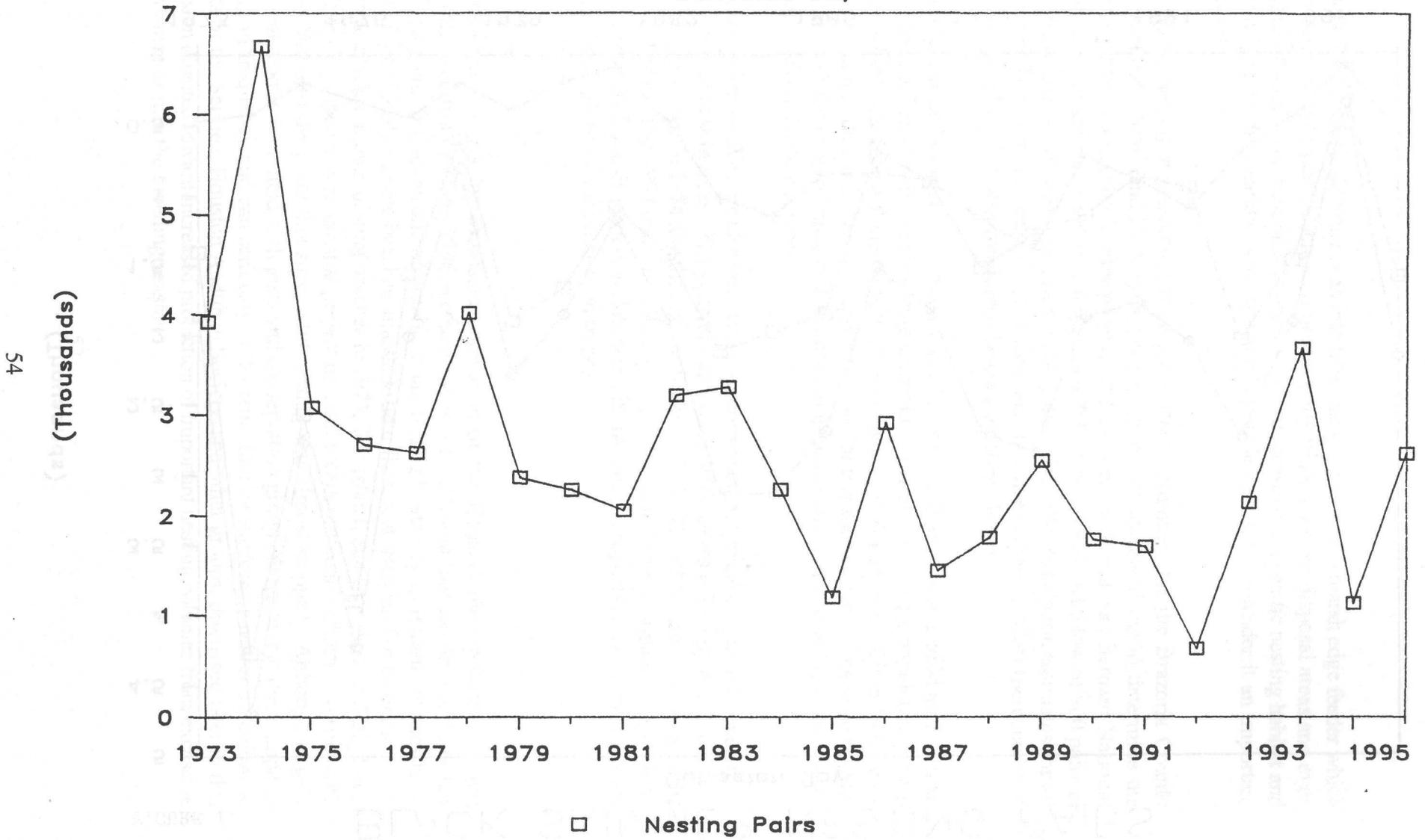
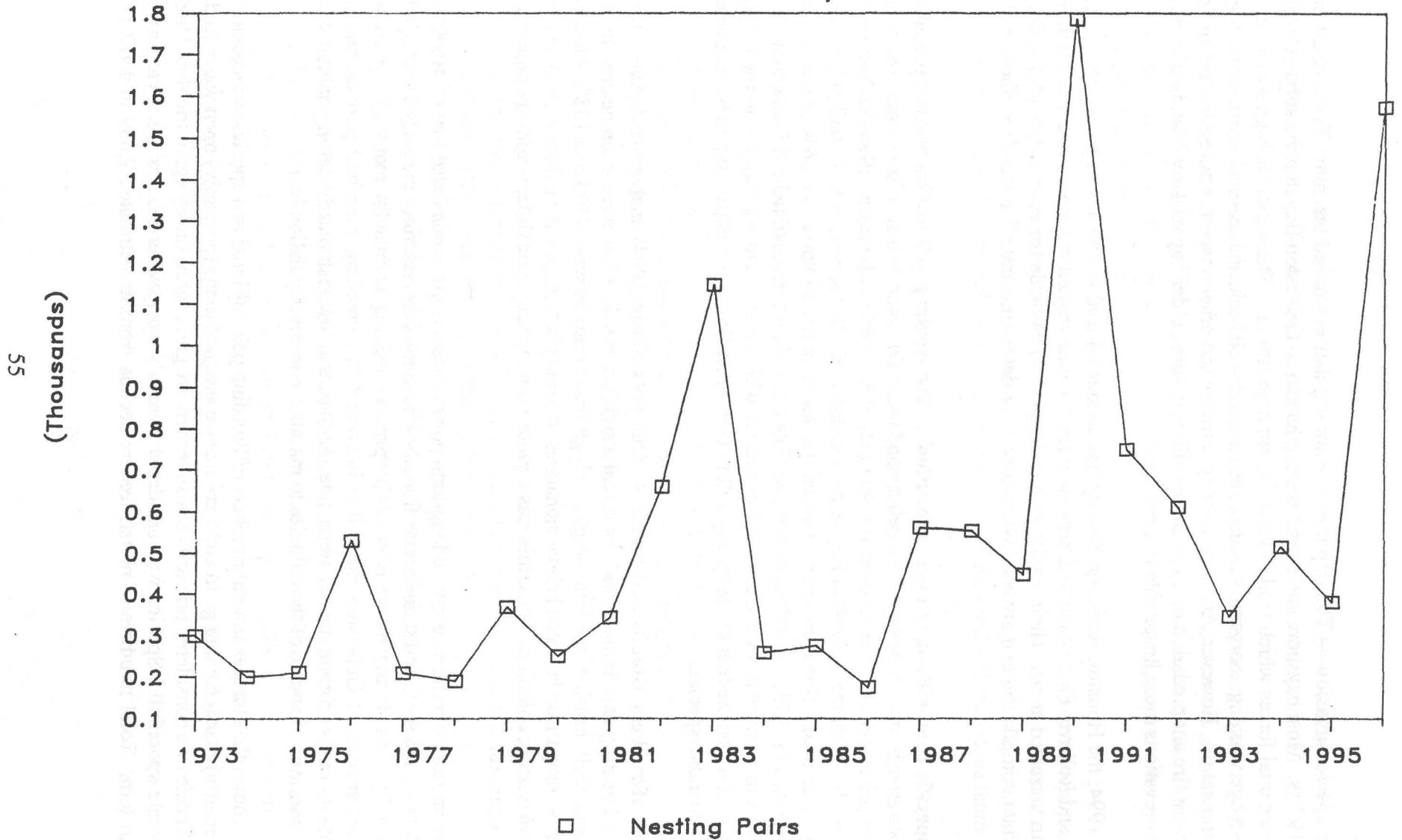


Figure 3.

OLIVACEOUS CORMORANT NESTING PAIRS

Galveston Bay



Exotic species invasion --- The imported fire ant infestation reached the upper Texas coast in the early 1970's. Most bayshore and island nesting habitat in Galveston Bay may be subject to harsh environmental forces which tend to limit fire ant populations. These include high soil salinities, frequent overwashing, inorganic substrate such as sand/shell hash, and seasonal extremes of dryness and temperature. However, Audubon Society wardens and other observers have reported periodic but severe fire ant predation on eggs and nestlings at some older bay rookery islands which have higher elevations more hospitable to fire ants.

Since 1994, the Houston Audubon Society has conducted trial treatments of plots at North Deer Island and Rollover Pass Island to determine if nests within treated areas are more successful than nests in untreated areas. Their results are pending. On a baywide (or even coastwide) scale, our 1997 data compilation and analysis will allow us to determine any clear trends of those nesting guilds most susceptible to fire ants.

Interspecific competition and nest predation --- The laughing gull is a known nest predator of other waterbirds, including the brown pelican and black skimmer, two species of concern. It nests in close proximity to other species at many (15 of 38 active colonies in 1996) Galveston Bay colonies. In 1996, the Galveston Bay-wide population for this species was 19,052 pairs, 40% of the bay-wide total. This represents an actual decline from the 35,860 pairs (66% of the bay-wide total) reported in 1973, rather than an increase (Table 1). Therefore, until the 1997 data compilation enables us to identify any declines of other species which nest in close proximity to the laughing gull, we must assume that the laughing gull in Galveston Bay is not expanding at the expense of other vulnerable species.

Erosion of rookery islands and marsh --- Our 1994 (Glass 1994) analysis of Galveston Bay waterbird nesting requirements did not reveal a significant loss of the three main nesting habitats (bare sand/shell; brush of medium height; or high brush/tree) between 1973 and 1989. However, this was a comparison between habitat signatures of aerial photography done during 1973 and 1989 at known nesting colonies. Thus, this was a gross estimate only, and did not address more subtle habitat changes.

Of perhaps more significance from a long-term point of view is the documented loss of 40,000+ ac of freshwater, brackish, and saline marsh from the Galveston Bay area since the early 1950's (White et al. 1993). Marsh and marsh edge is the primary feeding habitat for many of the colonial waterbird species of Galveston Bay. It is important that breeding waterbird populations have adequate amounts of good quality fresh, intermediate, and brackish marsh feeding habitat within daily commuting distance of the colonies to maintain current population levels.

Table 1 shows the changes in total numbers of breeding pairs of birds in 4 species we assigned to the (primarily) marsh feeding guild and 2 species we assigned to the (primarily) open water feeding guild. Species we considered primarily marsh feeders are great egret, snowy egret, tricolored heron, and roseate spoonbill. Species we considered primarily open water feeders are royal tern and Caspian tern. Total numbers of marsh feeders decline from an estimated 7,059 in 1973 to an

estimated 5,207 in 1996; while open water feeders increased from 2,933 to 4,645. When the two guilds are directly compared, the ratio of marsh to open water feeders declines from 2.4:1 to 1.1:1.

However, yearly fluctuations are evident in this pattern, as evidenced by the drop in open water feeders to an estimated 582 breeding pairs in 1979. Again, while some of the yearly fluctuations in numbers could be due to sampling difficulties, we feel the 5 sample years selected minimize this possibility. The more complete data set which will be available in 1997 will enable us to better determine if this suspected trend is significant.

Slack's (1993) study using yearly population estimates from TCWC, Audubon Christmas count data, and other data sets showed a probable decline in marsh/marsh interface feeders also. Slack's study included 7 colonial waterbird species in the marsh/marsh interface-feeding guild. We felt that the four species we chose used this habitat type more exclusively.

We believe erosion and loss of intertidal marsh feeding habitats, along with the effects of direct human disturbance at major colony sites during the breeding season, may be the two most important limiting factors for Galveston Bay's colonial waterbird population.

Management, Protection, Restoration

Signage/patrol of key nesting sites --- Since at least the 1930's (Allen 1952), efforts by conservation groups, primarily the Houston Audubon Society, have been directed toward protecting important Galveston Bay rookery sites from disturbance during the breeding season. Important rookery sites at Vingt-et-un Islands, Smith Point Island, Rollover Pass, North Deer Island, and West Bay Bird Island have been declared off limits by signs placed by Houston Audubon Society wardens since at least 1985, some much earlier.

As of 1993, when brown pelicans first attempted to nest at Little Pelican Island, the Service has maintained 3 large signs which declare this island off-limits from February 15 through September 15 and reference Endangered Species Act and Migratory Bird Treaty Act authority for doing so. Since 1992, the colony at Little Pelican Island has grown to an estimated peak of 37,781 breeding pairs of 16 species, one of the largest breeding colonies along the United States Gulf coast (Table 2). We feel the signage and increased patrol efforts have helped this increase.

Special protection status for key estuarine habitat --- Many waterbird feeding and resting sites along the upper Texas Gulf Coast have been indirectly affected by the aforementioned human population increase. The frequency of direct human disturbance by recreationists to formerly undisturbed beaches, backdune flats, marsh flats, and tidal deltas has increased dramatically since 1980. The proliferation of pleasure craft and all-terrain vehicles seem to be the main culprits.

By giving financial and technical assistance to local entities such as the Park Board of Trustees of the City of Galveston, the Service has been able to aid in the physical protection of select beach,

marsh, sheltered lagoon, and flats habitat through getting it designated as a "nature park" and limiting or curtailing vehicular traffic. Big Reef tidal delta at the easternmost end of Galveston Island has been protected since 1994, and San Luis Pass Nature Park is expected to be officially designated in mid 1997. The Houston Audubon Society's Bolivar Flats Sanctuary has provided protection for the vast mudflats at the base of Galveston's North Jetty since 1991.

Native aquatic and wetland habitat restoration --- As we have become more aware of the ongoing loss of Galveston Bay's peripheral wetlands, increased efforts have been directed toward slowing and repairing these losses. Major marsh protection and restoration projects during the 1990's include the Bayport Demonstration Marsh (Port of Houston and Corps of Engineers), Clear Lake Entrance Demonstration Marsh (Corps of Engineers), Swan Lake Protection and Marsh Creation (Amoco Oil Company), Little Pelican Island Marsh Creation (National Marine Fisheries Service and Corps of Engineers), and West Bay Demonstration Marsh (Corps of Engineers). Important marsh creation projects in the planning stage include Galveston Island State Park Shoreline and Marsh Restoration (Texas Parks and Wildlife and U.S. Fish and Wildlife Service) and the massive (4,250-ac) marsh creation effort planned in conjunction with the federal Houston-Galveston Navigation Channels Project.

It is projects such as these, which require the cooperative efforts of many public and private entities, which hold the greatest promise for reversing the trend begun in the 1850's of losing our most productive avian habitat to dredging, filling, erosion, and subsidence.

Table 2. Little Pelican Island - Estimated Nesting Pairs

SPECIES	1989	1990	1991	1992	SIGNS	INSTALLED	1995
					1993	1994	
Cormorant, Olivaceous	10	20	60	-	10	15	30
Egret, Cattle	50	-	-	50	10	50	20
Egret, Great	100	75	200	10	50	60	20
Egret, Reddish	2	4	1	1	2	2	1
Egret, Snowy	20	70	50	20	100	75	30
Gull, Laughing	1500	2000	2000	2200	5000	7000	10000
Heron, Black-Crown Night	250	150	150	100	75	35	30
Heron, Great Blue	-	40	40	20	25	30	20
Heron, Tri-Colored	100	200	150	40	100	150	200
Ibis, White	50	100	75	10	20	25	40
Ibis, White-Faced	300	200	150	30	100	100	150
Pelican, Brown	-	-	1	-	125	-	200
Skimmer, Black	500	90	12	250	200	290	-
Spoonbill, Roseate	50	75	40	20	50	30	10
Tern, Forster's	100	400	100	30	100	100	50
Tern, Royal	4000	5000	7040	11000	12900	13000	18000
Tern, Sandwich	3000	7150	2100	5600	7600	6500	9000
TOTAL	10032	15574	12168	19388	26342	27603	37781

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