1992

Colonial Waterbird Investigations

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Virginia Department of Game and Inland Fisheries
PERFORMANCE REPORT (July 1, 1991 - June 30, 1992)

Project:	Nongame & Endangered Species Investigations	**No:**	EW-2-4
Study:	Colonial Waterbird Investigations	**No:**	VI
Job:	Colonial Waterbird Studies	**No.**	A-H
Personnel:	Ruth Beck, Karen Terwilliger, Dana Bradshaw	**Costs**	
		Total:	$27,750
		State:	$ 6,938
		Fed'l:	$20,812

Status/Recommendations: On schedule, continue study

A. Objective: To coordinate the protection and management of colonial birds in the state.

B. Objective: To conduct surveys of colonial breeding birds in Virginia in order to detect changes in population numbers and population shifts.

C. Objective: To sample nesting success in colonies of selected species each year.

D. Objective: To conduct preliminary studies on the effects and extent of predation on colonial breeders.

E. Objective: To locate, map, and describe all existing yellow-crowned night heron colonies and single nests in Tidewater Virginia.

F. Objective: To locate and map all appropriate or potential habitats for future observation and management.

G. Objective: To evaluate human impacts on heron populations in residential areas in Tidewater Virginia.

Summary:

Aerial and ground surveys were conducted for colonial waterbirds, including colonial and solitary beach nesting species along the Virginia barrier islands and the

Coastal plain and Piedmont region of Virginia. Management strategies for critical, large, or sensitive colonies were recommended. Management agreements were initiated with federal and state agencies and private landowners. Predation and disturbance factors were identified and investigated at select colonies with target species of common terns, least terns, black skimmers, piping plovers, and Wilson's plovers.

A. Objective: To coordinate the protection and management of colonial birds in the state.

To ensure and enhance the protection of colonial birds within the state, several major cooperative management agreements and strategies continued to be implemented from July 1, 1991 to June 30, 1992. The study areas include the Virginia barrier island chain of the Eastern Shore and diverse areas of the river systems of the western shore of the Chesapeake Bay region.

The cooperative agreement has continued among the U.S. Fish and Wildlife Service, Virginia Department of Game and Inland Fisheries, Hampton Parks, College of William and Mary, and the Living Museum to ensure the protection and management of Grandview Beach, Hampton, Virginia. This area is among the areas selected as critical habitat for piping plovers and has provided suitable habitat for a least tern colony for well over 100 years. This agreement includes protection through posting the area, monitoring the success of species utilizing the area, and educating the public to the sensitive nature of the area. The area was monitored 2 - 3 times weekly to determine the status of nesting birds and to determine the disturbance factors within the area. This monitoring was completed by Sandra Hayslette, a William and Mary undergraduate Honors student. J. W. Akers, J. W. Via, and S. Porter contributed extensively to the monitoring of this area. Andy Gurkin of Dandy Haven Marina assisted in transporting materials for posting the nesting areas.

A second management agreement continues the cooperation among the U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, College of William and Mary, and Virginia Department of Game and Inland Fisheries for Craney Island, Portsmouth, Virginia. The new agreement expands the efforts to protect and enhance available habitat and create additional suitable nesting areas. This agreement incorporates protection of all beach nesting species. This area was monitored twice weekly for colonial bird nesting species by S. Hayslette, J. Akers, J. Via, S. Porter, and R. Beck.

Protection of the barrier island chain is continued through the U.S. Fish and Wildlife Service, The Nature Conservancy, Virginia Heritage Program, Virginia Department of Game and Inland Fisheries, and private landowners. Project personnel assisted the Virginia Coast Reserve of The Nature Conservancy and the Virginia Department of Game and Inland Fisheries in posting selected barrier islands. Work continues with the Natural Heritage program to categorize critical habitat for select beach nesting species on four of the barrier islands.

Urban colonies of great egrets, great blue herons, and yellow-crowned night herons present challenging management problems due to their location within developed areas. Relocation and abandonment result from human disturbance. Management agreements with private landowners are a feasible step in protection of these species.

RECOMMENDATION:

Management agreements provide the key steps for protection of the habitat needed for the continuation and success of colonial nesting species. Establishment of such agreements is recommended for large and critical colonies throughout the state. The next target species for management agreements should involve the landowners of Great Blue Heron colonies within the state.

B. Ojective: To conduct surveys of colonial breeding birds in Virginia in order to detect changes in population number as well as population shifts.

Flights were conducted mainly on the Piedmont and Coastal Plain of Virginia and the Virginia barrier islands. Flight operations were conducted principally along the major river systems and adjacent forested areas; and the rivers, streams, and barrier islands of the Eastern Shore.

Areas of Greatest Activity - The primary areas frequently surveyed were as follows:

The James River from Goochland County to the James River Bridge including all tributaries and adjacent forest within ten miles of the shore line;

The Chickahominy River from the James River to Mechanicsville including all tributaries and adjacent forest within ten miles of the shore line;

The York River from the Town of West Point toYorktown including all tributaries and adjacent forest within ten miles of the shore line;

The Mattoponi River from the Town of West Point to Aylett including all tributaries and adjacent forest within ten miles of the shore line;

The Pamunkey River from the Town of West Point to Tunstall including all tributaries and adjacent forest within ten miles of the shore line;

The Piankatank River/Dragon Swamp from Deltaville to Ino including all tributaries and adjacent forest within ten miles of the shore line;

The Rappahannock River from Stingray Point to Fredericksburg including all tributaries and adjacent forest within ten miles of the shore line;

The Potomac River from Smith Point to Masons Neck including all tributaries and adjacent forest within ten miles of the shore line on the Virginia side of the River;

The North Landing River within the City of Virginia Beach including all tributaries within two miles of the River;

The Eastern Shore of Virginia including all shorelines, forests, and barrier islands;

Western shore line of the Chesapeake Bay from Smith Point to New Point Comfort including all inlets and adjacent forest within five miles of the shore;

Mobjack Bay and adjacent forest within five miles of the shore line.

Areas Surveyed Once Per Year:

Nottoway River;

Nansemond River.

For these areas, aerial observations were normally conducted within five miles of the shore line.

Infrequent Surveys - Occasionally, there were reports of colonial nesters and other species of interest in areas beyond their normal nesting range. If these reports were deemed credible, and the area was not readily accessible by surface transportation, the reported location was searched by air to confirm the sighting and to accurately locate the nest on the appropriate Topographical Chart for future

observations.

Recommendations:

Continue annual monitoring of known colonies. Search for new colonies as time and funds dictate.

COLONIAL BIRD SURVEYS ON THE EASTERN SHORE OF VIRGINIA:

Colonial bird surveys were flown over the barrier island chain in late May. The numbers of colonies and locations were recorded on 7 1/2 minute topographic maps. This information is on file at the Virginia Department of Game and Inland Fisheries. In addition, an annual comprehensive ground survey was conducted in mid-June by J. W. Williams, J. W. Akers, J. W. Via, and R. A. Beck through the coordination and support of the Virginia Coast Reserve of The Nature Conservancy. This census has been conducted for eighteen consecutive years by the same personnel using the same census techniques. Each barrier island was walked from north to south with all locations, numbers, and statuses recorded for avian colonial and solitary beach nesting species. Although the breeding population number of many species has fluctuated, certain species merit attention including the least tern, gull-billed tern, common tern, black skimmer, brown pelican, and great blue heron. All of these species merit attention because of the apparent decline or increase in number.

In 1992, the least tern population on the Eastern Shore of Virginia was recorded at a total of 543 adults. In comparison with the 1991 data, in which there was a recorded total of 837 adults, there appeared to be a reduction of 294 birds on the Eastern Shore. This reduction, however, was only somewhat counter-balanced by an increase of 116 birds on the Western Shore from 1991 to 1992. Refering to Graph 1, the total number of least terns on the Eastern Shore is compared with the total number on the Western Shore for the three breeding seasons between 1990 and 1992. The years 1990 and 1992 are similar in that the Western Shore had twice as many birds as the Eastern Shore, were as the year 1991 found an almost equal number on both shores. According the data, it is not clear whether these numbers overall represent a general population decline or simply a population shift. Further study with marking adult birds may reach a more definitive conclusion.

The gull-billed tern population was monitored combining two basic habitat types: a marsh/shell bank census and a barrier island census. The combined total

of individuals of the two habitat types in 1992 was 655. This compares with the 709 adults observed in 1991. According to Graph 2, the population did not significantly change, however, a shift from the marsh areas to the beach areas is suggested. The beach nesting colonies were observed to be successful for the first time in five years. A total of 73 fledged gull-billed terns were observed on Little Cobb Island in mid-July.

The common tern population on the Eastern Shore has fluctuated from 2,375 adults in 1990 to 1.304 adults in 1992. In comparison, on the Western Shore of the Chesapeake Bay (ie. Hampton Roads Tunnel Island), where the population has increased annually for the last ten years, the total number of common terns increased from 4,590 birds in 1990 to 6,112 birds in 1992. Graph 3 demonstrates this comparison.

There were a total of 3,091 black skimmers in Virginia in 1992; 78% of black skimmer adults nested in the barrier islands compared to 22% on the Hampton Roads Tunnel. Weekly monitoring on the Hampton Roads Tunnel and bimonthly monitoring on the Eastern Shore resulted in observing less than 40 fledged skimmer young. Combining all observed fledged black skimmers from 1990 through 1992, the total number was only 241. This continued lack of productivity is of major concern and requires further study.

Each area has different factors influencing productivity. The barrier island colonies were affected by severe flooding on three separate occasions, causing three different renesting attempts. The Hampton Roads Bridge Tunnel Island is not influenced by high water flooding. The tunnel area is, however, exposed to human and vehicular disturbance due to the construction crews and their heavy equipment as well as mammalian predators, such as rats and an occassional feral cat. Neither the Eastern Shore nor the Hampton Roads Tunnel is producing young at a level that will maintain a stable population.

The brown pelican population continues to expand. During the 1992 breeding season, Brown Pelicans were found nesting on two islands, Fishermans and Metompkin. In mid-June, 79 active nests were observed on Fishermans island. All stages of development from egg to large young were observed. The second pelican colony, observed on the south end of Metompkin island, included 846 birds. Only 23 nests were found, all of which were empty except one that contained two eggs. Both pelican nesting areas are surrounded by large gull colonies of comprised of Great black-backed gulls and herring gulls. This encroachment of gulls is of specific concern as the pelican colonies expand. Gull nesting may displace the pelicans, and gulls are potential predators of both pelican eggs and young.

The first breeding record of the great blue heron on Fishermans island was confirmed by Williams, et al. on June 18, 1992. Five adult great blue herons were observed in deciduous trees on Fishermans island. One nest was observed.

Continuation of this project is recommended.

COLONIAL BIRD SURVEYS ON THE WESTERN SHORE OF THE CHESAPEAKE BAY:

Great Blue Herons

Great blue heron colonies were located by aerial surveying. In general, the great blue heron colonies were established early during the breeding season. The 1991-92 winter was mild and several colonies had nest construction by late February. A preliminary study of habitat characterization included five colonies in five different counties. Over 250 nest trees were marked and habitat parameters were recorded within the colony. Preliminary analysis of the data suggest that this type of information will be helpful in development of management recommendations for great blue heron colonies within the state.

The nesting success of the great blue heron is dependent on food supply, meteorological factors and human disturbance. The great blue heron population remains stable. The largest colony is located in Fairfax county at Mason's Neck National Wildlife Refuge where over 1100 nests were counted.

Information on land ownership was collected at county courthouses for known great blue heron colony locations.

Great Egrets

Although roughly the same as last year in total numbers of pairs, 836 vs 802, the great egret population this year once again underwent many changes. The Norfolk population of 54 pairs last year climbed to 128 pairs this year. This colony resides in a prominent waterfront residential community and has been highly controversial each year. Although the colony more than doubled in size this year, and now involves several more residences, there were surprisingly few complaints.

Probably the most stable colony from year to year now is the Hampton colony. At 307 pairs last year, this colony experienced only a modest increase to 323 pairs

making it the largest great egret colony in the state. Although it too is confined to a residential neighborhood, there were few complaints here this year. Of additional interest in Hampton, a small colony of 8 pairs was located further to the south, in an area heavily utilized by yellow-crowned night herons.

The Portsmouth colony was censused early this year thereby yielding only 135 pairs, down from 207 last year. Unfortunately, we feel this result is a serious underestimate, but we were not able to conduct a second survey to update our information.

Of most concern this year was the relocation of Virginia Beach's great egret colony. At 234 pairs last year, this colony created a problem for on-site homeowners prompting continual harassment at the start of nesting season. The birds attempted several relocation attempts facing constant harassment at each new site until settling approximately a half-mile away in Chesapeake. Unfortunately, this colony's new nesting site is still within a residential area and is subject to come under renewed attacks again next year. The colony contained 244 pairs this year, plus an additional 8 pairs that remained behind at one of the earlier relocation sites.

Least Terns

The least tern population on the Western shore totaled 1,006 adults for 1992. The colonies at Grandview beach, Craney Island, and Bethel Beach were checked at least twice weekly. The Grandview beach colony was the largest colony within the state, with 800 adult birds and a nest count of 384 before the peak hatching date, which generally is the first week of June. All areas supporting the tern colonies were posted. Dike roads were closed as necessary at Craney island. Full cooperation with the staff of U. S. Army Corps of Engineers under the direction of Bill Rawls and Ollie White was instrumental in creating and protecting the areas. Project personnel included: J. Akers, J. Via, S. Hayslette, and R. Beck, who visited these areas regularly.

Table 1. Least Tern Populations 1992

Area	Number of Adults	Colony Status
Grandview Beach Hampton, VA	800	Colony successful with many fledged young.

Craney Island Portsmouth, Va	125	Colony washed frequently
New Point Comfort	45	Colony abandoned by May 30.
Bethel Beach	30 (before May 20)	J. Bazuin and K. Clark
Sandy Island	0	Aerial data late May - no ground data
Willoughby Spit	6	
	Total: 1006	

For comparative purposes, the Eastern shore least tern population totaled 543 (excluding Assateague Island numbers). The Western shore least tern locations are important to the stability of the least tern population as a whole. The population as a whole is declining in the state of Virginia (Beck, *et. al.*, 1990).

Piping Plovers

The piping plover population on the Western shore of the Chesapeake Bay was concentrated at Craney Island. There were no active piping plover nests at Grandview beach in Hampton, Virginia. There were a total of 4 piping plover pairs at Craney Island; two pairs nested successfully on the first attempt, the other two pair failed initially and renested. At least five fledged young were observed by early August. The areas were visited biweekly by S. Hayslette, J. Akers, J. Via, M. and D. Campbell, and S. Porter.

In general, the Craney Island area provided a more protected habitat with less human disturbance than the Grandview beach area. Both areas were exposed to various types of vertebrate predation. Red fox, northern harrier, American kestrel, and peregrine falcon were predators at Craney. In addition to northern harrier, and black-back gull, boat-tail grackle were observed at both Craney and Grandview.

Grandview beach had the added pressure of extensive human activity. In 1991, an overall average of 63 people and 18 boats per hour were recorded at Grandview for the 1pm to 4pm period on weekend days. In 1992, the overall average jumped to 110 people and 28 boats for the same time period. In 1991,

the highest number of people observed on the beach was 109; in 1992, the high count was 190. Campers were observed on three occassions at Grandview beach during the breeding season. There were also recreational fishermen and beach-goers. A multi-agency cooperative effort was established to protect and preserve Grandview beach. The Virginia Department of Game and Inland Fisheries Game Wardens and the U.S. Fish and Wildlife staff enforced the protection of the sensitive nesting area. The city of Hampton Parks and Recreation and the Virginia Living Museum provided the sensitive area signs and the College of William and Mary Biology Department posted the bounderies of the colony.

Common Terns and Black Skimmers

The south end of the Hampton Roads Bridge-Tunnel continues to support the largest common tern colony in Virginia. The estimated number of adult common terns for 1992 was 6,112 adults. Of the 7,416 common terns surveyed in Virginia, 82 percent were on the tunnel island. A definitive nest count of 3056 nests was conducted in early June, 1992. In general, the common terns are successful because this site is well protected from the influence of tidal action. The substrate also allows for efficient drainage of water resulting from heavy rains.

The black skimmer adult count was 669.

The population of Norway rats (Rattus norvegicus) has been reduced. Tunneling was minimal during 1991 throughout the nesting area and did not appear to any more of a problem in 1992. However, the Norway rat is capable of producing twelve litters per year with an average of eight to ten young per litter. The rat removal program must continue in order to control the rat population.

Vehicular traffic traveling through the tunnel reached a record high of 117,000 vehicles in one day in mid July. With this additional traffic, more disabled vehicles were brought through the access road of the nesting area in 1992. Construction vehicles, including heavy equipment and large trucks, utilize the area extensively. The posted speed limit was reduced to 5 mph since 1990, but the speed of the traffic has been observed in excess of 25 miles per hour. Rapidly moving trucks do not allow ample time for the young terns and skimmers to move out of the road. Dead young terns and skimmers totaled about 88 in a 14 day period..

The study of the nesting substrate preference and breeding success of the common terns and black skimmers on the Hampton Roads Tunnel island was completed by Greg Keller in January of 1992 and is on file at the College of William and Mary and the Virgina Department of Game and Inland Fisheries. A

follow-up study of habitat preference by terns and skimmers within this area was done by K. Callahan.

Continued cooperation between the Virginia Department of Transportation, Ruth Beck of the College of William and Mary (principle investigator), and the Virginia Department of Game and Inland Fisheries is expected and is necessary to protect this area for common terns and black skimmers.

Cattle Egrets and Double-crested Cormorants

Cattle egrets and cormorants continue to coexist in joint nesting colonies on the lower James River, just offshore from Hopewell, and still comprise the only known colony of nesting cattle egrets west of the Chesapeake Bay. The one change this year was the colonization of a second sunken barge island to accommodate the additional nesting habitat needs. Each of the two vegetated islands contained both cattle egrets and double-crested cormorants. The original island harbored approximately 150 pairs of cormorants and 70-80 pairs of cattle egrets. In addition, there is an increasing nesting population of great egrets consisting of approximately 15 pairs plus another several pairs of green-backed herons. The new island was dominated by cattle egrets with about 80-100 pairs, plus approximately 40 cormorant nests, and another few green-backed herons.

The species composition of these nesting colonies is largely determined by the habitat changes each year. Cattle egrets tend to nest in the densely clumped shrubs that predominate around the borders of these barge islands, and to a lesser extent in the saplings and small trees that form the canopy. The cormorants on the other hand depend on the bare branches and crowns of dead or dying trees, and will not nest in heavily vegetated areas. It was not until the highly acidic waste of the nesting cattle egret colony began to kill some of the trees and shrubs that the cormorants moved in in the mid-1980's. Since that time the waste from the nesting cormorants plus that of the cattle egrets has greatly altered the vegetation charateristics of the island, making most of it virtually uninhabitable by cattle egrets, while at the same time creating more cormorant habitat. Now the cattle egrets are colonizing a new island along with a few cormorants and we expect this cycle to repeat itself.

At what appears to be only the second known nesting colony of double-crested cormorants in the state, there were 55 nests this year in a colony that has almost exactly doubled in size since it began with a dozen nests in 1990. This colony is located on one of the transmission line towers that runs alongside the James River Bridge between Newport News and Isle of Wight County. Wintering cormorants have been a regular feature of these towers for years, but this recent nesting

population now guarantees the presence of these birds in the Hampton Roads area year round. Since nesting habitat at this location appears not to be a limiting factor, it is impossible to speculate on the potential of this colony.

RECOMMENDATIONS:

Monitoring the populations of colonial nesting species through aerial and ground surveying to determine trends and shifts should continue. Avian and mammalian predator control, limitation of human disturbance, and protection of the habitat for colonial beach nesting species should be included in management recommendations for each colony site. Recognition of the volunteers who donate hundreds of hours of field expertise to the collection of data and ultimately to the protection of the species should be instated.

C. Objective: To sample nesting success in colonies of selected species each year.

Least terns, common terns, gull-billed terns, and black skimmers were selected as the initial species to be monitored on Hog, Cobb, and Little Cobb, and Wreck islands on the Virginia Coast Reserve. A visit to the islands in early May provided an overview of potential habitat. In mid-May, the colony location, nest building initiation, and estimated number of adults were recorded. From late May to early June, the perimeter of each colony was defined. The contents and number of each active nest were recorded when feasible. Each area was visited weekly, and the number of young was recorded in each area. All observations were made from a distance greater than fifty meters to avoid disturbing the young. In late July, counts of fledged young and adults were made to establish an adult/young ratio.

Preliminary analysis of data collected indicates a reduced colony success predominately due to nest failure by flooding, predation, and human disturbance.

RECOMMENDATIONS:

The monitoring of select colonies for reproductive success is recommended to continue through at least another breeding season. Cooperation among the Virginia Department of Game and Inland Fisheries, Virginia Coast Reserve/The Nature Conservancy, Long-term Ecological Monitoring Program/University of Virginia, and the Heritage Program should continue. These agencies provide the necessary steps for the success of the project including boat transport to study

areas, gathering of data, comparison of meteorological data with nest failure sequences, and analysis of habitat perimeters.

D. Objective: To conduct preliminary studies on the effects and extent of predation on colonial breeders.

During the 1991 breeding season, a concentrated effort was initiated to observe the effects of predation on colonial breeders. The study areas on the barrier islands of the Eastern Shore and the study areas on the western shore of the Chesapeake Bay were censused for potential predators of colonial nesters. Each area had a combined set of confirmed predators. The Eastern Shore colonial bird populations were subjected to avian and mammalian predators. Avian species observed taking and harassing various tern species included the northern harrier, peregrine falcon, boat-tailed grackle, fish crow, great black-backed gull and herring gull. Mammalian predators included red foxes, raccoons, and rats which are prevalent on many of the barrier islands. The Norway rat is predominantly found at the Hampton Roads Bridge-Tunnel site. Due to removal activity by the Hampton Roads Bridge Tunnel personnel of the Virginia Department of Transportation, the rats are currently under control. This breeding season, there has been a drastic reduction of rat predation at the Hampton Roads Bridge Tunnel Island colony. Of the three barrier islands surveyed weekly, the north end of Cobb Island had evidence of red foxes and rats going into the colonies regularly. Raccoon tracks were observed in the colonies on both Hog and Cobb islands. Little Cobb was the only island free of mammalian predators. The future of these colonial nesters will be dependent upon control of these predators.

A study involving the effects of gull predation on the reproductive success of nesting terns and skimmers is in progress, by William and Mary graduate student Timothy J. O'Connell. Specific tern and skimmer colonies were selected based on the presence or absence of gull nesting activity. Over the course of two years, approximately 400 nests have been monitored and observed. Data analysis should complete by September, 1992.

Ruddy Turnstones (Arenaria interpres), which are known predators on tern eggs, were observed piercing common tern eggs on Hampton Roads Tunnel in early June. This is documented on film, available at the College of William and Mary Biology Department library.

RECOMMENDATION:

Continue to target select colonial nesters, i.e. common terns, gull-billed terns, and black skimmers, and determine the effect and extent of predation. Removal of predation at specific sites in cooperation with the Department of Game and Inland Fisheries and various land owners.

E. Objective: To locate, map, and describe all existing yellow-cowned night heron colonies and single nests in Tidewater Virginia.

A more comprehensive survey of yellow-crowned night heron locations was undertaken this year yielding a much more complete picture of this species status in the Hampton Roads area. This year's survey recorded 253 active nests located as follows: 119 in Norfolk, 100 in Hampton, and 34 in Portsmouth. Nest locations for each were mapped and are on file for future monitoring efforts. Virginia Beach was not surveyed extensively this year, and has not yielded substantial numbers of yellow-crowned's in the past.

F. Objective: To locate and map all appropriate or potential habitats for future observation and management.

This job is ongoing as more habitat is being censused and characterized for future reference each year.

G. Objective: To evaluate human impacts on heron populations in residential areas in Tidewater Virginia

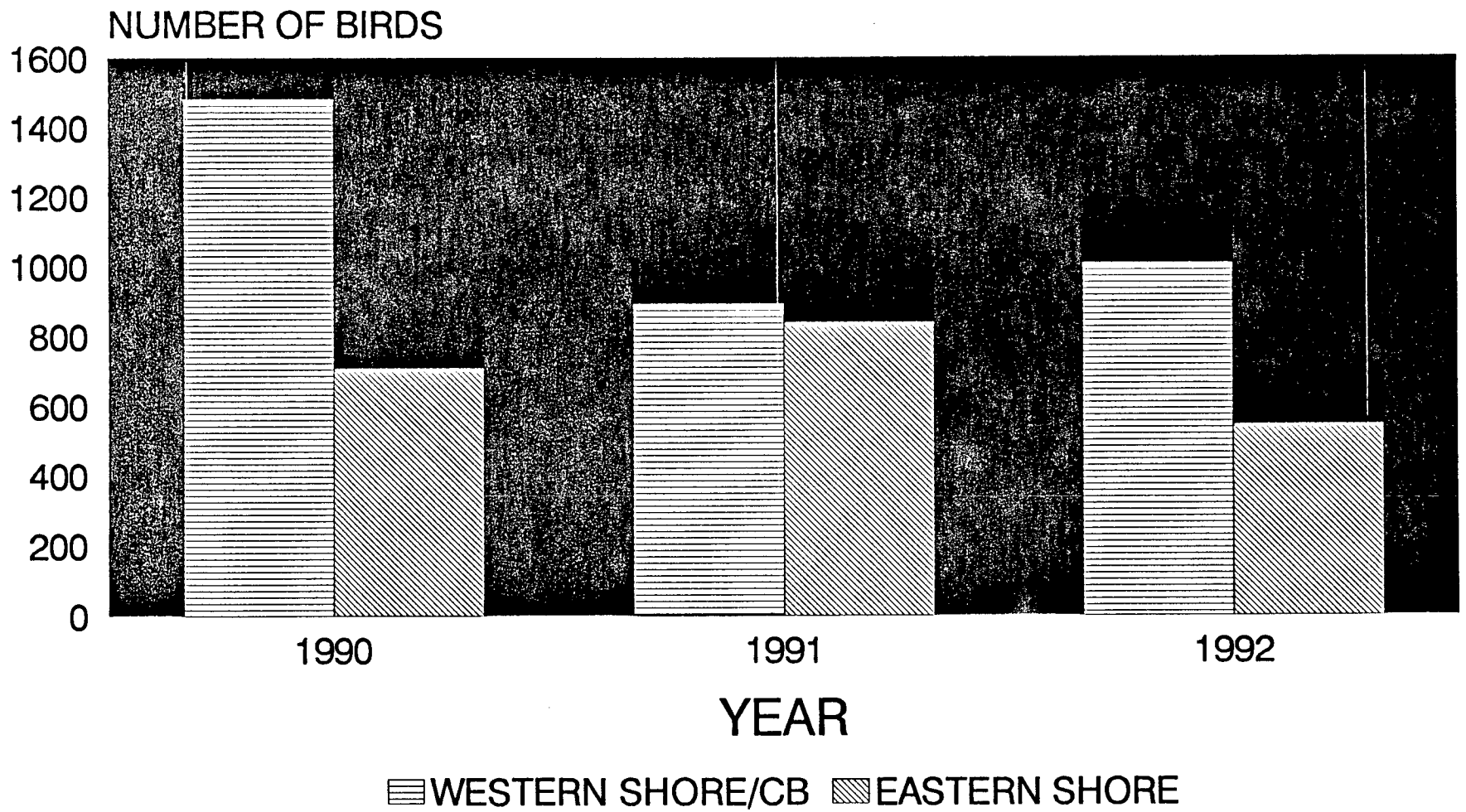
Project personnel monitored a sample of yellow-crowned night heron nests this year for productivity information. Although productivity results can be affected by numerous external conditions, it is thought that human disturbance accounts for many nesting failures each year. In addition, mammalian and avian predation on nests is also suspected to be a significant factor affecting success. Table 2 presents summary information from yellow-crown productivity surveys.

Table 2. Yellow-crowned Night Heron Nesting Success - 1992

	# Nests	#/% Successful	Young Produced	#Young/Nest
Hampton	100	63 (63%)	162	1.62
Norfolk	108	69 (64%)	199	1.84

LEAST TERN COLONIES

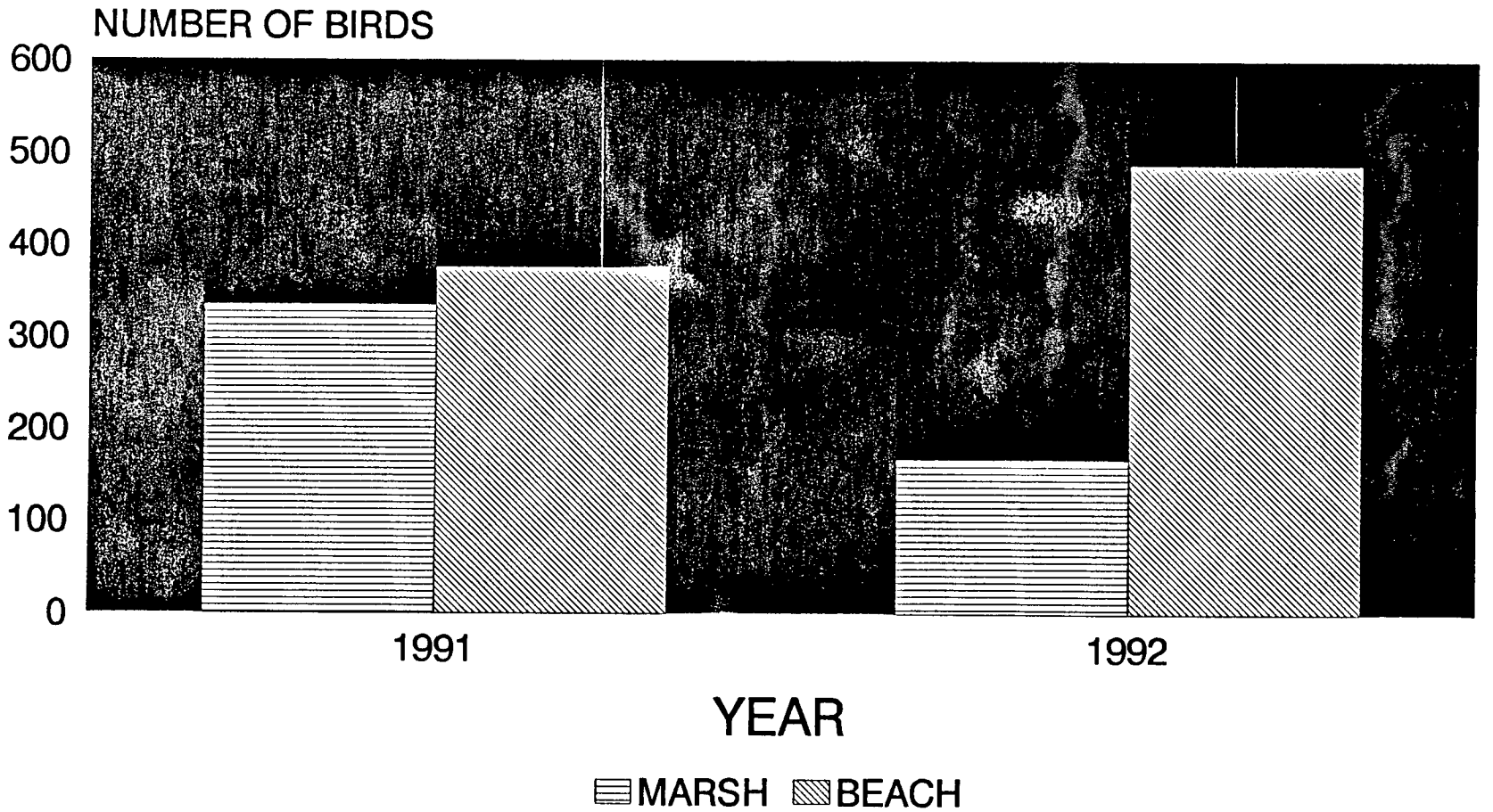
SUMMARY 1990-1992



Graph 1/RAB 92

GULL-BILLED TERNS

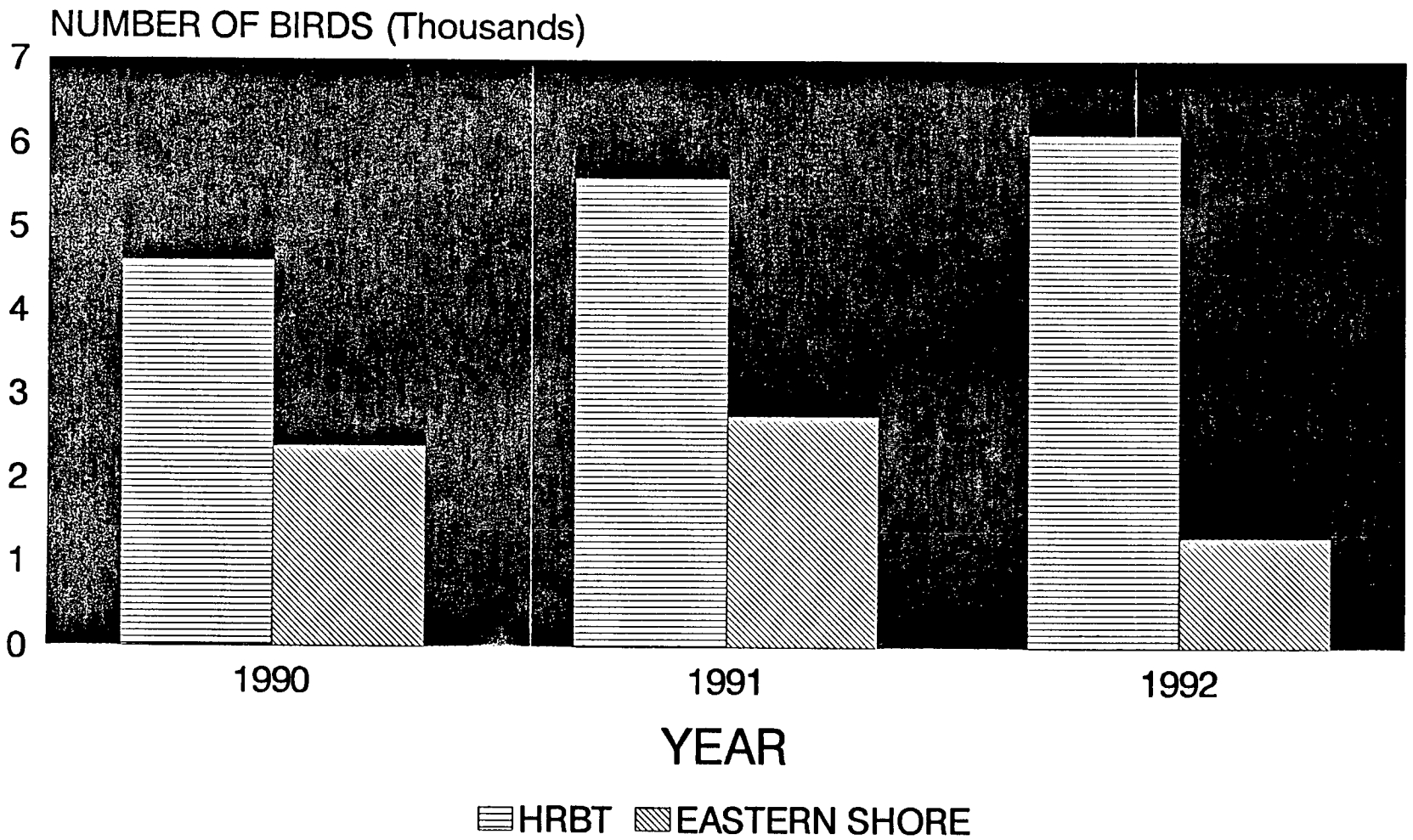
SUMMARY 1991-1992



Graph 2/RAB 92

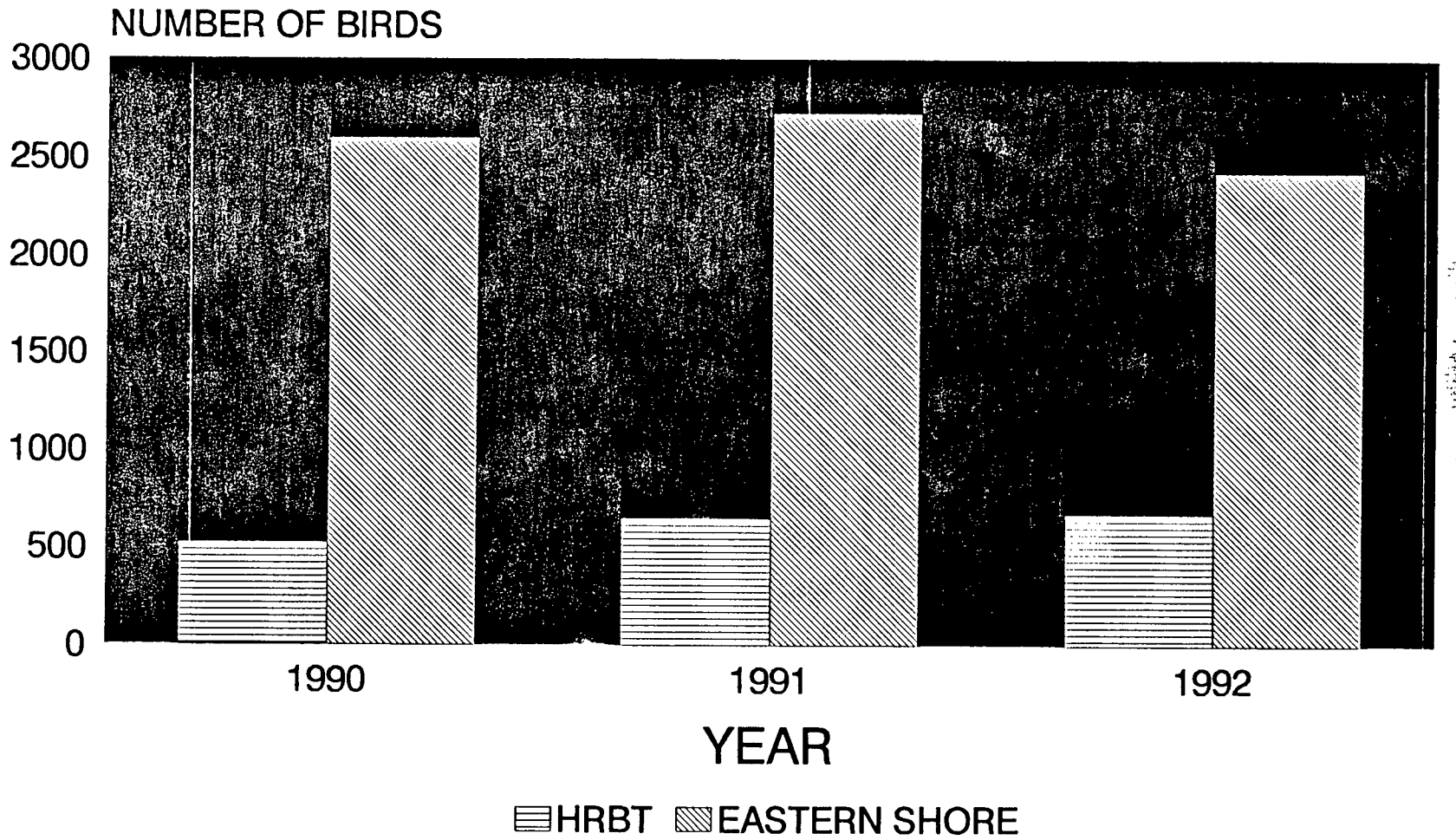
COMMON TERN COLONIES

SUMMARY 1990 - 1992



Graph 3/RAB 92

BLACK SKIMMER COLONIES
SUMMARY 1990-1992



Graph 4/RAB 92

1992 · TAL NO. ADULTS JE 21-24	ASSAWOMAN	METOMPKIN	CEDAR	DAWSON SHOAL	PARRAMORE	SANDY	CHIMNEY POLE	HOG	ROGUE	COBB	L. COBB	WRECK	SHIP SHOAL	GODWIN	MINK	MYRTLE	SMITH	SHERMAN	TOTALS	[illegible] SURVEY
G. BLUE HERON																		5	5	5
L.BK. HERON		2					4					10							16	33
TLE BLUE HER.							8			80		24						8	120	147
TTLE EGRET							5					41						3	49	213
REAT EGRET							61			120		125						248	554	894
NOWY EGRET		1					76			180		232						64	553	667
TRI-COLOR HER.							56			160		251						78	545	545
K.CRN.N.HER.		4								36		41						260	341	955
Y.CRN.N.HER.																		3	3	62
LOSSY IBIS							16			96		64						57	233	605
WHITE IBIS																		3	3	3
ROWN PEL.		46 NESTING (200 PRESENT)																158	204	[illegible]
RRING GULL		644	19			152	595			746		1346						866	4368	3125
UGHING GULL												8056						350	8406	12,80[illegible]
.BLK-BK GULL						5	101			26		154						70	356	160
LL-BILLED TERN		175	70								170	72				1			488	793
MMON TERN	2	94	230	227		20		2			355	167	4			3			1104	383
AST TERN	18	77	285					34		51		22	56						543	865
OYAL TERN											280							3380	3660	551
NDWICH TERN											7							6	13	37
SPIAN TERN													2						2	4
ACK SKIMMER		182	328	173		44		88			879	444	84						2422	542
ESTER'S TERN		18																	18	131
STERCATCHER	16	194	72	4		22	16	72	3	79	12	48	59			22	62	54	735	88
PING PLOVER	19	30	6					8		7	2	4	2			7	9	3	97	97
LSON'S PLOVER	12	7	8							5			3			2		1	38	49
GHTHAWK													1						1	
ORNED LARK										1						3			4	