

SURVEY OF COLONIAL NESTING WATERBIRD SPECIES ON THE ATLANTIC COAST OF NEW JERSEY - 1989

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OBJECTIVE:

Determine population trends and distribution of 16 species of colonially nesting species on the Atlantic coast of New Jersey.

SUMMARY OF FINDINGS

Among herons and egrets the following species declined: black-crowned night heron, yellow-crowned night heron, and cattle egret. The following species increased: little blue heron, tricolored heron, snowy egret, and glossy ibis. Great egret numbers remained generally stable.

Among gulls and terns only gull-billed tern numbers declined. The following species increased: herring gull, great black-backed gull, laughing gull, common tern, and black skimmer. Forster's tern populations remained generally stable.

COLONY RENUMBERING

We developed and applied a new, more consistent, and less confusing system for identifying colonies using Universal Transverse Mercator coordinates.

SPECIES STATUS CHANGE RECOMMENDATIONS

As a result of this survey we recommend the following changes in NJDEP species status: black-crowned night heron from "declining" to "Threatened", common tern from "declining" to "stable."

RECOMMENDATIONS FOR FUTURE SURVEYS

We recommend that the colonial waterbird survey be performed again in 1991. Additional outside funding should be sought. Changes should be made in the flight services contract to provide for more experienced and skilled pilots and to provide for more efficient and less costly performance of the survey.

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INTRODUCTION:

Sixteen species of colonially nesting waterbirds nest in the marsh and barrier islands of the Atlantic coast of N.J. Eight species; yellow-crowned night-heron, black-crowned night-heron, tri-colored heron, little blue heron, snowy egret, cattle egret, great egret, and glossy ibis nest on shrubby or forested marsh islands, many of which are the result of dredge spoil operations. The laughing gull, herring gull, great black-backed gull, common tern, Forster's tern, gull-billed tern, and black skimmer nest on marsh islands. The black skimmer also nests on sandy beaches along with the least tern.

The Endangered Species Program has carried out surveys on these species since 1976. The surveys were performed in early June and covered the area from Cape May to Manasquan Inlet. The surveys were carried out in the first year through ground counting, but from 1977 on all counts were done from a helicopter. Since 1977 the counts have been carried out in exactly the same fashion to reduce bias in population estimates. Helicopter counts are the most accurate and fastest method of counting these species.

The regular survey of these species is necessary to insure the preservation of their populations in this state. Data on numbers of individuals and colonies permits an assessment of the species status and guides the process of official listing. Analysis of population trends is necessary to justify the current classification of listed species, the listing of new species, or the downgrading of species status. Prior to this survey, the last survey was performed in 1985, and there was a vital need to repeat the survey since populations of these species can fluctuate widely from year to year. Regular surveillance is necessary to recognize population declines before they become serious.

Additionally, the assessment of populations in the eastern United States depends on periodic statewide surveys. Region-wide surveys are conducted on a regular basis and the N.J. survey will supplement surveys performed in other eastern states. The data from the ENSP survey is the sole source of information on these species in N.J. and has been incorporated in the 1977 and 1986

federal review of these species (Erwin 1979, Andrews 1986). Since N.J. supports one of the largest populations of colonial waterbirds in the eastern U.S., completion of this survey is of vital importance to a regional assessment.

This study also provides the basis for sound assessment of impacts from coastal projects potentially affecting colonial waterbird species. The mapping of the nesting areas provides the most current boundaries of nesting colonies and the composite overlays from previous surveys will yield a valid estimate of potential nesting sites in the entire Atlantic coastal zone. Colony maps provide the basis for assessing impact by developments that require CAFRA, Waterfront Development, Wetlands, and other permits. Information on the status of nesting areas is also important to the Bureau of Coastal Engineering and the U.S. Army Corps of Engineers in locating dredge spoil disposal areas needed for regular maintenance of the Inner-coastal Waterway and other navigation channels. Current information is required to avoid unnecessary protection of sites which are no longer viable as well as to identify sites newly in need of protection.

METHODS:

Surveys were performed from a Bell Jet Ranger helicopter carrying two surveyors and one mapper. Using a set of U.S.G.S. 7.5 minute topographic maps marked with the locations of colonies from previous surveys, the main surveyor directed the pilot, and counted primary species. The second surveyor counted secondary species and recorded data. The mapper mapped the boundaries of all nesting groups on unmarked quad sheets.

Survey dates and locations

The 1989 survey was flown on the following dates: June 6 - Southern Cape May County - Ronson Aviation, June 10 - Central Cape May County - N.J. State Police, June 14 - Northern Cape May & Southern Atlantic Counties - Ronson Aviation, June 16 - Ocean County - Ocean County Mosquito Commission, June 19 - Northern Atlantic County - Ronson Aviation.

In contrast to previous surveys we did not survey nesting colonies located on the front beaches of the barrier islands. This change was made to avoid unnecessary disturbance to birds nesting there which include the federally threatened piping plover. In addition all barrier beach colonies are counted from the ground annually by ENSP. As a result of this change, least terns were not counted in the current survey. In addition, black skimmer and yellow-crowned night heron numbers are not directly comparable to previous years since a large number of skimmers nest on the sandy beach at Holgate and a small colony of yellow-crowned night herons is found on Avalon Dunes.

Regions are defined as tidal drainages numbered one to eleven south to north (Fig. 1).

Data were compiled and summarized using dBASE software running on IBM PC or AT computers or compatibles. Data were consolidated with previous surveys to qualitatively examine trends. Locations of 1989 nesting areas were plotted on fresh topographic sheets.

Species Surveyed

The following species were included in the survey: **Hérons & Egrets** - tri-colored heron (*Hydranassa tricolor*), little blue heron (*Florida caerulea*), black-crowned night heron (*Nycticorax nycticorax*), yellow-crowned night heron (*Nyctanassa violacea*), great egret (*Casmerodius albus*), snowy egret (*Leucophoyx thula*), cattle egret (*bubulcus ibis*); **Ibises** - glossy ibis (*Plegadis falcinellus*); **Gulls & Terns** - herring gull (*Larus argentatus*), great black-backed gull (*Larus marinus*), laughing gull (*Larus atricilla*), common tern (*Sterna hirundo*), Forster's tern (*Sterna foseteri*), gull-billed tern (*Gelochelidon nilotica*); **Skimmers** - black skimmer (*Rynchops nigra*)

Colony Renumbering

Over the 12 year period we have conducted this survey colony numbering has become confusing and inconsistent. Some colonies had been given only one identification number although they were spread over two or more islands while some single islands contained more than one colony identification number. In addition, new colony sites found on each survey had been identified with either an alphabetical suffix to an existing number of an adjacent or nearby colony, a new number, or an alphabetical identification. There had been no consistency to this identification scheme.

In an attempt to increase consistency and reduce confusion in identifying individual colonies we devised a new scheme for assigning identification numbers. We identified all nesting colonies by the 1000-meter Universal Transverse Mercator (UTM) grid coordinates lying within the colony boundaries as mapped on the survey flight. The identification number is comprised of the last two digits of the north-south (longitudinal) coordinate followed by the last two digits of the east-west (latitudinal) coordinate. When more than one 1000-meter coordinate exists within the boundaries, the colony is identified by the most northern and eastern coordinate. When no 1000-meter coordinate lies within the boundaries, the colony is identified by the coordinate closest to the boundary of the colony. Colonies lying on distinct islands are always identified uniquely. When applying these rules would result in the same identification to two adjacent disjunct colonies, a letter indicating the cardinal direction (N,S,E,W) a site lies from the identifying coordinate is suffixed to the i.d. number of the site lying furthest from

the coordinate. Or, if one of the colonies is a heronry, an "H" is suffixed to the identification number.

RESULTS:

A site by site accounting of the results of the 1989 survey are presented in Appendix I. Regional and county summaries, including data from surveys in 1977, 1978, 1979, 1983, and 1985, are presented in Tables 1-4.

Logistics

Although the technique we used to survey colonial waterbirds was to directly count individuals, for a variety of reasons, the numbers we obtained comprise a population index rather than a count or census.

The reasons for treating these count data as an index deal mostly with biases which are inherent in applying this technique with this group of birds. The number of birds present in the nesting colonies varies with the season, the time of day, and the tide cycle (Burger 1976). Consequently the timing of survey flights can influence the number of birds counted. In addition, the visibility of birds in nesting vegetation differs among species and locations. The observers counting the birds also influence the accuracy of the counts. For example, observers may differ in their ability to distinguish between similar species, such as common tern and Forster's tern or the three species of white egrets. This problem is exacerbated when the birds occur in large mixed assemblages.

Given the sources of variability which reduce the precision of count data, we have taken steps to increase the accuracy of the population index by attempting to remove as many sources of variability as feasible and by keeping the inherent biases as consistent as possible. The daily and seasonal timing of flights is similar from day to day and year to year. There has always been some overlap in observers from year to year. And, most importantly, the techniques used, i.e. using the same type of helicopter, three observers, etc. have remained the same since 1977.

Species accounts: Herons, Egrets, and Ibises

Tri-colored heron (*Hydranassa tricolor*) - The 1989 survey produced the highest count to date for tricolored herons (Table 1, Fig. 1). While the increase over 1985 estimates was moderate, it represents a continuation of a trend following the low count of 1983. The increase was greatest in Regions 3 & 7.

Little blue heron (*Florida caerulea*) - Little blue heron estimates for 1989 increased moderately over 1985 numbers, a

reversal in the declining trend apparent since the high count of 1979 (Table 1, Fig. 2). The increase was most apparent in Regions 3, 4, & 10.

Black-crowned night heron (*Nycticorax nycticorax*) - The 1989 survey revealed an alarming decline in the numbers of black-crowned night herons (Table 1, Fig. 3). The count of 206 birds for 1989 was the lowest to date and represents a precipitous decline from the 1978 count of 1470 birds and a greater than 50% decline from the most recent count in 1985. With the exception of Region 10, the decline was seen throughout the survey area.

Yellow-crowned night heron (*Nyctanassa violacea*) - The counts obtained for yellow-crowned night herons suggest a moderate decline in the numbers of this relatively scarce species (Table 1, Fig. 4). This trend is evident even when adding ground count estimates for the Avalon colony which was not included in our 1989 aerial survey. With Avalon ground counts included the decline was apparent in Regions 2, 6, 7, & 9, with Region 2 & 9 declining to zero. Region 8 showed a modest increase.

Great egret (*Casmerodius albus*) - Although we counted slightly more great egrets statewide than in the last (1985) count, the increase is probably not significant (Table 1, Fig. 5). The relatively small increase, however, masks an appreciable decrease in Region 3 coupled with increases in regions to the north, especially in Ocean County (Table 3). The substantial decline in great egret estimates in Region 3 can be traced to the Stone Harbor Sanctuary. Given the difficulty of counting birds in this large colony, we were probably unable to consistently distinguish all great egrets from the snowy egrets which predominate this colony, i.e., some great egrets may have been counted as snowy egrets. The fact that snowy egret numbers at this site substantially increased over 1985 estimates partially substantiates this speculation. Conversely, the colonies to the north are much smaller and thus less likely to be miscounted. The increases we observed in these regions are probably genuine.

Cattle egret (*bubulcus ibis*) - We counted substantially fewer cattle egrets than in 1985, representing a continuation of a general declining trend since 1978 (Table 1, Fig. 6). Significantly, the major portion of the decline in cattle egrets was also in Region 3. The decline may be partially attributed to our inability to consistently distinguish cattle egrets from the more numerous snowy egret. Since the Stone Harbor heronry has always contained the vast majority of the state's cattle egret population, any change in numbers at this site, real or erroneous, will substantially affect assessments of statewide trends. If cattle egret numbers are in fact declining, this represents a reversal in the expansion of its population since its relatively recent arrival in the U.S. around 1940 (Weber 1975).

Snowy egret (*Leucophoyx thula*) - Estimates of snowy egrets in 1989 increased substantially over 1985 levels (Table 1, Fig. 7). This represents a reversal in a declining trend beginning in 1979. Although, as described in the accounts for the cattle egret and great egret, snowy egrets may have been over counted, the increase we observed is too great to be explained by possible misidentification of egret species. In addition, although not apparent in every region, the increase, was not confined to Region 3 (Stone Harbor colony).

Glossy ibis (*Plegadis falcinellus*) - Although glossy ibis populations appear to have decreased dramatically over the past several years, this survey indicates a leveling off of that decline and a modest increase (Table 1, Fig. 8). The increase was evident primarily in Region 3 at the Stone Harbor and Sedge Island colonies which appear to have recovered to 1978 population levels. The previous population decrease was characterized by sharp declines and abandonment of several previously large colonies while many other sites declined only moderately. In contrast, the slight increase observed in 1989 resulted from increases at existing sites rather than the appearance of new sites.

Gulls, Terns, and Skimmers

Herring gull (*Larus argentatus*) - Herring gull estimates have increased in 1989 to levels near the peak numbers recorded in 1978 (Table 2., Fig.10) This represents a substantial increase over 1985 estimates which were the lowest since 1977, and an apparent reversal of a declining trend apparent since 1979. The increase was spread throughout the survey area, but most evident in the southern regions, especially Regions 4 & 6.

Great black-backed gull (*Larus marinus*) - Estimates of great black-backed gulls reached a peak in 1989. This continued a gradual increasing trend present since the first survey in 1977 (Table 2, Fig. 11). The greater part of the increase occurred in Region 10.

Laughing gull (*Larus atricilla*) - The 1989 survey indicated a relatively small increase in laughing gull numbers (Table 2, Fig. 12). Although the count is the highest to date, numbers appear to have stabilized around 55,000 since 1979, by far the most numerous species counted on this survey. Although numbers appear to have stabilized statewide, marked changes in populations have occurred within specific regions. While estimates in Regions 5, 6, and 7 increased substantially, Region 3, the region containing nearly half of the states laughing gull population saw a sizable decrease. Other regions have sustained more moderate changes.

Common tern (*Sterna hirundo*) - Estimates of common terns increased to their highest levels since surveys began; a substantial increase over 1985 levels which were the lowest since 1977

(Table 2, Fig. 13). Since a few common terns also nest on the barrier beaches our counts may slightly underestimate the numbers of this species, since barrier beaches were not surveyed. A wide area, Regions 4-10, accounted for the majority of the increase, with estimates in Regions 5-7 increasing five fold over 1985 numbers. One region (Region 11) saw a sizable decrease in common tern numbers.

Forster's tern (*Sterna fosesteri*) - We counted slightly fewer Forster's terns in 1989 than in 1985, however the decrease is so slight (4.5%) as to be insignificant (Table 2, Fig. 14). In addition, as with the white egrets, the potential exists to incorrectly count Forster's terns by counting them as the much more numerous common tern. We feel confident that we correctly identified single-species flocks of tern. However, when colonies were mixed or when birds mixed in flight (when flushed), we may have miscounted Forster's terns by counting them as common terns. Fortunately, except at the northern fringe of their range (southern Ocean County), Forster's terns occur almost entirely in single-species colonies which are separated from common tern colonies by a distance which makes mixing in flight unlikely.

Gull-billed tern (*Gelochelidon nilotica*) - We identified no gull-billed terns on this survey. A maximum of 25 birds was counted in 1985 and a minimum of two was counted in 1983. Given these low numbers, we may have missed this species during the 1989 survey.

Black skimmer (*Rynchops nigra*) - As described under METHODS, we did not count colonies located on barrier beaches. As a result, the largest colony of black skimmers (Holgate) was not counted. As with least terns, however, these colonies are ground counted annually. When ground count estimates from Holgate are added to our aerial survey numbers, the data suggest a substantial increase over 1985 numbers (Table 2, Fig. 15). Ground count data confirm a similar increase.

Colony Renumbering

We have revised all data from previous surveys to reflect the new renumbering scheme and have produced a cross reference table (Appendix II.) to equate new id-numbers with previous nomenclature. In the few instances where the new system has resulted in lumping colonies into one new site, we have calculated revised species totals for the site by simply adding the totals for the previously separate colonies which comprise the new site. In the more common case where the new identification resulted in splitting colonies, we cannot derive new species totals since we are unable to determine the proportion of the previous species total which occurred on each of the new components.

DISCUSSION and RECOMMENDATIONS:

Although both tri-colored heron and little blue heron numbers increased moderately, we do not recommend a change from their current status of "stable." If numbers from the next planned survey (1991) indicate another increase, reclassification to "increasing" may be warranted.

The decline observed in black-crowned night heron numbers is of sufficient magnitude to be of concern. We have not yet determined whether this decline is occurring throughout the Northeast. Downer and Liebalts (1989) report that numbers in New York have remained fairly stable. Data from Pea Patch Island (DNREC Delaware Div. of Fish & Wildlife) indicate a marked decline only in the last of five years. Based on the data collected in previous surveys the black-crowned night heron was reclassified from "stable" to "declining" in 1989. We recommend that the status again be changed to reflect the continued decline. Reclassification will require adding the black-crowned night heron to the Endangered & Threatened species list as a Threatened species.

Although the overall decline in yellow-crowned night heron numbers was not great, the fact that this species has declined to zero in two regions is cause for concern. Similar declines have occurred in New York (Downer & Liebalts). The yellow-crowned is the least colonial of the species surveyed however, and the decline in colonial nesting birds surveyed here may not be representative of the population as a whole. Consideration should be given to a separate survey of this species which would include solitary nesting birds. Depending on the findings of such a survey, we must also consider undertaking an investigation to determine the factors involved in the decline of this species.

We recommend no change in the status of any of the three white egret species at this time. As previously described, some of the changes in numbers we observed may be a result of confusion in identification of these species during the survey. In addition, a decline in the number of cattle egrets in Atlantic coast colonies, if real, may be a result of movement rather than population decrease. Data from Pea Patch Island in the Delaware River (DNREC Delaware Div. of Fish & Wildlife) indicate that numbers have increased considerably since 1985. In contrast, numbers in New York have declined over the same period as New Jersey populations have dropped (Downer & Liebalts 1989).

Although no glossy ibis colonies have been reported from the Delaware Bay shore, the possibility that previous declines along the Atlantic coast were the result of emigration to sites along the Delaware should be explored. Ongoing research by the Cape May Mosquito Commission (Jim McNally, pers. comm.) has found that young ibises are flying from Atlantic coast colonies to feeding locations on the Delaware Bay. Further, during the period 1985 - 1989 data from Pea Patch Island (DNREC Delaware Div. of Fish & Wildlife) suggest that glossy ibis numbers increased, albeit by a

much smaller magnitude than the concurrent decrease along the Atlantic coast of N.J. We recommend no change in the status of the glossy ibis until additional data can be obtained and evaluated.

For the common tern the high count obtained in 1989 represents a reversal of the declining trend seen over the past decade (Fig. 10) and suggests that we reclassify species from "declining" to "stable" now, and to "increasing" if the trend continues. Over the past two decades common terns have switched from nesting in sandy substrate on barrier beaches to wrack mats on back-bay islands (Burger & Lesser 1976). Presumably the switch has resulted from differential nesting success and recruitment with diminished productivity on barrier beaches associated with increased human pressures (Safina, et al. 1989). Initially, biologists were concerned that bay islands represented a secondary habitat and that numbers may decline as a result of diminished productivity. The results of this survey support the findings of Safina et al. (1989), that, although nest success may be lower on marsh islands, overall productivity, at least in the short term, is sufficient to maintain or even increase populations.

The fact that we obtained maximum counts for all three gull species (figs. 13-15) is particularly significant in light of recent speculation in the popular media that gulls are becoming more of a nuisance in shore resort areas. Although statewide numbers of laughing gull, by far the most numerous gull species, have increased relatively little, their numbers in northern Cape May County and Atlantic County (regions 5 - 8), appear to have virtually doubled since 1985. This area is probably the most popular destination for vacationers and day-trippers. Increased complaints about gulls may therefore be a result of increased gull numbers as well as increased habituation to people. Quite possibly, the reverse, that gull numbers have grown in response to human generated increases in food availability, is also true.

For the great black-backed gull and herring gull the increased estimates probably reflect a continuation of southward range and population expansion (Andrews 1988).

Both the laughing gull and herring gull are currently classified as "stable", while the great black-backed gull is listed as "increasing". We recommend no change in the status of these three species at this time. However, if numbers of laughing gulls and herring gulls increase in the next survey (1991) we will recommend reclassification to "increasing".

Recommendations For Future Surveys - We encountered considerable difficulty in scheduling survey flights due to weather and helicopter availability. This resulted in later completion of the survey than in previous years. While the effect of this was probably not significant, every attempt should be made to complete the survey during the same time period as previous years,

i.e. between May 24 - June 10. The flight services contract conditions should stipulate the availability of the required Bell Jet Ranger helicopter and pilot for full six hour flights between these dates in the years that the survey is scheduled.

The skill of pilots flying this survey varied widely. At the very least, the less skilled pilots affected the physical state of the observers and lengthened the time required to complete the survey. At the worst, the skill of the pilots influenced the counts. Contract conditions should stipulate that pilots be experienced at low level survey flights including the ability to safely execute quick and steep turns, slow and hovering flight, and rapid orientation to specific points of reference on the ground.

The contract must also stipulate that the helicopter be equipped with working headphone intercoms for all observers which allow all passengers to communicate with each other and with the pilot.

Finally, to reduce costs every attempt should be made to use county Mosquito Commission helicopters and pilots. Where this is not possible we should attempt to find contractors located closer to the area of the coast being surveyed to reduce unnecessary costs associated with reaching the survey area.

We currently plan to fly the survey again in 1991, especially if the U.S. Fish & Wildlife Service makes available Federal funding to coordinate a region-wide survey. We will also seek additional outside sources of funding such as from the U.S. Army Corps of Engineers and the Division of Coastal Resources.

Table 1. SUMMARY OF HERONS, EGRETS & GLOSSY IBIS BY REGION - 1977-1989

| | TRI-COLORED HERON | LITTLE BLUE HERON | BLACK-CROWNED NIGHT HERON | YELLOW-CROWNED NIGHT HERON | GREAT EGRET | SNOWY EGRET | CATTLE EGRET | GLOSSY IBIS |
|-------------|----------------------|-------------------------|---------------------------------|----------------------------------|----------------|----------------|-----------------|----------------|
| ** REGION 1 | | | | | | | | |
| * 1977 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| * 1978 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| * 1979 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| * 1983 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| * 1985 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| * 1989 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ** REGION 2 | | | | | | | | |
| * 1977 | 0 | 12 | 52 | 16 | 16 | 143 | 115 | 374 |
| * 1978 | 12 | 13 | 114 | 21 | 65 | 355 | 200 | 1176 |
| * 1979 | 0 | 4 | 87 | 22 | 45 | 96 | 90 | 370 |
| * 1983 | 0 | 0 | 19 | 16 | 50 | 95 | 0 | 85 |
| * 1985 | 0 | 0 | 32 | 19 | 0 | 0 | 0 | 12 |
| * 1989 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 3 |
| ** REGION 3 | | | | | | | | |
| * 1977 | 52 | 56 | 201 | 41 | 50 | 930 | 220 | 270 |
| * 1978 | 17 | 32 | 260 | 31 | 255 | 1150 | 200 | 599 |
| * 1979 | 75 | 120 | 254 | 86 | 300 | 1410 | 200 | 605 |
| * 1983 | 34 | 36 | 125 | 38 | 170 | 1023 | 270 | 655 |
| * 1985 | 25 | 17 | 59 | 41 | 227 | 710 | 200 | 330 |
| * 1989 | 66 | 33 | 46 | 20 | 88 | 1281 | 20 | 668 |
| ** REGION 4 | | | | | | | | |
| * 1977 | 16 | 15 | 45 | 4 | 73 | 250 | 0 | 65 |
| * 1978 | 10 | 4 | 113 | 7 | 2 | 250 | 0 | 35 |
| * 1979 | 25 | 25 | 34 | 0 | 2 | 310 | 0 | 23 |
| * 1983 | 19 | 10 | 29 | 0 | 10 | 154 | 0 | 32 |
| * 1985 | 47 | 29 | 71 | 0 | 23 | 155 | 0 | 8 |
| * 1989 | 49 | 88 | 21 | 0 | 64 | 537 | 0 | 0 |
| ** REGION 5 | | | | | | | | |
| * 1977 | 0 | 0 | 25 | 0 | 0 | 20 | 0 | 15 |
| * 1978 | 0 | 0 | 20 | 0 | 4 | 0 | 0 | 6 |
| * 1979 | 6 | 10 | 40 | 0 | 0 | 120 | 0 | 20 |
| * 1983 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| * 1985 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| * 1989 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ** REGION 6 | | | | | | | | |
| * 1977 | 6 | 6 | 36 | 28 | 28 | 308 | 50 | 280 |
| * 1978 | 12 | 33 | 203 | 17 | 44 | 251 | 75 | 480 |
| * 1979 | 6 | 44 | 101 | 18 | 21 | 265 | 0 | 94 |
| * 1983 | 12 | 6 | 33 | 7 | 53 | 114 | 0 | 116 |
| * 1985 | 12 | 16 | 59 | 21 | 20 | 160 | 4 | 119 |
| * 1989 | 12 | 10 | 28 | 5 | 56 | 173 | 2 | 139 |

| | TRI-COLORED HERON | LITTLE BLUE HERON | BLACK-CROWNED NIGHT HERON | YELLOW-CROWNED NIGHT HERON | GREAT EGRET | SNOWY EGRET | CATTLE EGRET | GLOSSY IBIS |
|----------------|-------------------|-------------------|---------------------------|----------------------------|-------------|-------------|--------------|-------------|
| ** REGION 7 | | | | | | | | |
| * 1977 | 29 | 36 | 64 | 10 | 27 | 285 | 25 | 336 |
| * 1978 | 56 | 45 | 376 | 10 | 27 | 486 | 8 | 828 |
| * 1979 | 31 | 83 | 146 | 21 | 14 | 375 | 1 | 603 |
| * 1983 | 29 | 38 | 48 | 14 | 21 | 290 | 1 | 130 |
| * 1985 | 40 | 28 | 118 | 16 | 21 | 290 | 0 | 140 |
| * 1989 | 74 | 33 | 22 | 1 | 39 | 445 | 15 | 62 |
| ** REGION 8 | | | | | | | | |
| * 1977 | 0 | 0 | 39 | 5 | 55 | 52 | 0 | 0 |
| * 1978 | 0 | 0 | 52 | 5 | 125 | 105 | 0 | 108 |
| * 1979 | 0 | 3 | 84 | 4 | 135 | 60 | 3 | 31 |
| * 1983 | 0 | 5 | 49 | 5 | 195 | 155 | 75 | 105 |
| * 1985 | 3 | 8 | 85 | 8 | 85 | 126 | 50 | 63 |
| * 1989 | 0 | 5 | 35 | 22 | 65 | 50 | 25 | 60 |
| ** REGION 9 | | | | | | | | |
| * 1977 | 17 | 14 | 216 | 46 | 30 | 377 | 0 | 90 |
| * 1978 | 46 | 57 | 291 | 5 | 63 | 413 | 0 | 517 |
| * 1979 | 48 | 51 | 142 | 3 | 51 | 244 | 1 | 203 |
| * 1983 | 31 | 24 | 49 | 20 | 84 | 212 | 0 | 71 |
| * 1985 | 49 | 11 | 81 | 4 | 21 | 168 | 0 | 64 |
| * 1989 | 30 | 12 | 27 | 0 | 90 | 133 | 0 | 60 |
| ** REGION 10 | | | | | | | | |
| * 1977 | 2 | 14 | 3 | 1 | 11 | 75 | 0 | 35 |
| * 1978 | 7 | 22 | 41 | 3 | 16 | 165 | 0 | 50 |
| * 1979 | 2 | 10 | 52 | 1 | 30 | 155 | 0 | 80 |
| * 1983 | 19 | 23 | 5 | 0 | 16 | 132 | 0 | 17 |
| * 1985 | 0 | 0 | 1 | 0 | 3 | 70 | 0 | 12 |
| * 1989 | 7 | 28 | 24 | 0 | 41 | 27 | 0 | 15 |
| ** REGION 11 | | | | | | | | |
| * 1977 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| * 1978 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| * 1979 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| * 1983 | 5 | 1 | 0 | 0 | 0 | 11 | 0 | 0 |
| * 1985 | 2 | 0 | 14 | 0 | 6 | 35 | 0 | 0 |
| * 1989 | 0 | 0 | 0 | 0 | 20 | 35 | 0 | 10 |
| *** TOTALS *** | | | | | | | | |
| * 1977 | 122 | 153 | 681 | 151 | 220 | 2440 | 410 | 1465 |
| * 1978 | 160 | 206 | 1470 | 99 | 601 | 3175 | 483 | 3799 |
| * 1979 | 193 | 350 | 940 | 155 | 598 | 3035 | 295 | 2029 |
| * 1983 | 149 | 143 | 359 | 100 | 598 | 2186 | 346 | 1211 |
| * 1985 | 178 | 109 | 520 | 109 | 406 | 1714 | 254 | 748 |
| * 1989 | 238 | 209 | 206 | 48 | 463 | 2681 | 62 | 1017 |

**Table 2. SUMMARY OF GULLS, TERNS & BLACK SKIMMER BY REGION
- 1977-1989**

| | HERRING GULL | GREAT BLACK- BACKED GULL | LAUGHING GULL | COMMON TERN | FORSTER'S TERN | BLACK SKIMMER |
|-------------|-----------------|-----------------------------------|------------------|----------------|-------------------|------------------|
| ** REGION 1 | | | | | | |
| * 1977 | 0 | 0 | 0 | 5 | 0 | 0 |
| * 1978 | 0 | 0 | 0 | 0 | 0 | 0 |
| * 1979 | 0 | 0 | 0 | 0 | 0 | 0 |
| * 1983 | 0 | 0 | 0 | 0 | 0 | 0 |
| * 1985 | 0 | 0 | 0 | 0 | 0 | 0 |
| ** REGION 2 | | | | | | |
| * 1977 | 3 | 0 | 265 | 1095 | 300 | 2 |
| * 1978 | 0 | 0 | 400 | 2000 | 385 | 0 |
| * 1979 | 8 | 0 | 689 | 1620 | 300 | 0 |
| * 1983 | 1 | 0 | 1295 | 1100 | 190 | 0 |
| * 1985 | 176 | 4 | 1406 | 600 | 235 | 0 |
| * 1989 | 31 | 2 | 1899 | 775 | 225 | 0 |
| ** REGION 3 | | | | | | |
| * 1977 | 458 | 29 | 19220 | 295 | 50 | 0 |
| * 1978 | 740 | 21 | 24314 | 305 | 65 | 0 |
| * 1979 | 695 | 19 | 29660 | 680 | 355 | 0 |
| * 1983 | 604 | 28 | 32880 | 488 | 570 | 240 |
| * 1985 | 540 | 44 | 30290 | 247 | 378 | 400 |
| * 1989 | 990 | 30 | 23579 | 208 | 627 | 252 |
| ** REGION 4 | | | | | | |
| * 1977 | 50 | 0 | 90 | 85 | 17 | 250 |
| * 1978 | 60 | 2 | 0 | 165 | 0 | 510 |
| * 1979 | 105 | 2 | 117 | 235 | 99 | 30 |
| * 1983 | 207 | 2 | 270 | 300 | 93 | 25 |
| * 1985 | 182 | 5 | 220 | 80 | 531 | 8 |
| * 1989 | 770 | 16 | 250 | 320 | 260 | 20 |
| ** REGION 5 | | | | | | |
| * 1977 | 0 | 0 | 55 | 80 | 40 | 900 |
| * 1978 | 0 | 0 | 155 | 110 | 35 | 650 |
| * 1979 | 1 | 1 | 293 | 369 | 75 | 900 |
| * 1983 | 0 | 0 | 960 | 107 | 127 | 265 |
| * 1985 | 2 | 0 | 770 | 18 | 57 | 102 |
| * 1989 | 8 | 0 | 1312 | 115 | 93 | 310 |
| ** REGION 6 | | | | | | |
| * 1977 | 235 | 9 | 2251 | 337 | 0 | 2 |
| * 1978 | 214 | 7 | 2733 | 155 | 0 | 0 |
| * 1979 | 202 | 15 | 3483 | 501 | 88 | 0 |
| * 1983 | 357 | 25 | 3001 | 312 | 85 | 0 |
| * 1985 | 455 | 17 | 3370 | 205 | 94 | 0 |
| * 1989 | 1241 | 28 | 5165 | 1124 | 109 | 0 |

| | HERRING GULL | GREAT BLACK- BACKED GULL | LAUGHING GULL | COMMON TERN | FORSTER'S TERN | BLACK SKIMMER |
|---------------|-----------------|-----------------------------------|------------------|----------------|-------------------|------------------|
| ** REGION 7 | | | | | | |
| * 1977 | 598 | 9 | 230 | 115 | 0 | 0 |
| * 1978 | 930 | 17 | 590 | 363 | 0 | 0 |
| * 1979 | 1068 | 20 | 3664 | 763 | 135 | 3 |
| * 1983 | 894 | 29 | 1831 | 594 | 184 | 0 |
| * 1985 | 661 | 35 | 3514 | 255 | 294 | 8 |
| * 1989 | 619 | 27 | 6268 | 1040 | 277 | 0 |
| ** REGION 8 | | | | | | |
| * 1977 | 100 | 5 | 5770 | 235 | 252 | 0 |
| * 1978 | 150 | 4 | 5671 | 490 | 208 | 30 |
| * 1979 | 181 | 7 | 7000 | 378 | 600 | 0 |
| * 1983 | 149 | 8 | 8308 | 419 | 375 | 0 |
| * 1985 | 61 | 4 | 6200 | 394 | 268 | 4 |
| * 1989 | 209 | 9 | 12167 | 968 | 234 | 0 |
| ** REGION 9 | | | | | | |
| * 1977 | 2029 | 35 | 49 | 692 | 0 | 735 |
| * 1978 | 3378 | 28 | 1485 | 793 | 0 | 671 |
| * 1979 | 1696 | 36 | 1413 | 1093 | 0 | 798 |
| * 1983 | 1575 | 64 | 1705 | 1126 | 0 | 559 |
| * 1985 | 1313 | 69 | 1449 | 1000 | 95 | 561 |
| * 1989 | 1463 | 61 | 1366 | 2415 | 38 | 257 |
| ** REGION 10 | | | | | | |
| * 1977 | 843 | 16 | 2800 | 753 | 0 | 89 |
| * 1978 | 2167 | 40 | 7300 | 900 | 0 | 44 |
| * 1979 | 1845 | 28 | 6595 | 1130 | 0 | 72 |
| * 1983 | 1355 | 100 | 8017 | 815 | 0 | 60 |
| * 1985 | 1275 | 42 | 7215 | 707 | 0 | 46 |
| * 1989 | 1468 | 116 | 6791 | 1188 | 0 | 31 |
| ** REGION 11 | | | | | | |
| * 1977 | 0 | 0 | 0 | 1800 | 0 | 0 |
| * 1978 | 0 | 0 | 1 | 1575 | 0 | 0 |
| * 1979 | 1 | 0 | 0 | 2740 | 0 | 0 |
| * 1983 | 95 | 4 | 0 | 1305 | 0 | 0 |
| * 1985 | 55 | 4 | 0 | 2275 | 0 | 0 |
| * 1989 | 298 | 4 | 0 | 1494 | 0 | 0 |
| *** TOTALS*** | | | | | | |
| * 1977 | 4316 | 103 | 30730 | 5492 | 659 | 1978 |
| * 1978 | 7639 | 119 | 42649 | 6856 | 693 | 1905 |
| * 1979 | 5802 | 128 | 52914 | 9509 | 1652 | 1803 |
| * 1983 | 5237 | 260 | 58267 | 6566 | 1624 | 1149 |
| * 1985 | 4720 | 226 | 54434 | 5781 | 1952 | 1129 |
| * 1989 | 7097 | 293 | 58797 | 9647 | 1863 | 870 |

Table 3. SUMMARY OF HERONS, EGRETS & GLOSSY COUNTY - 1977-1989

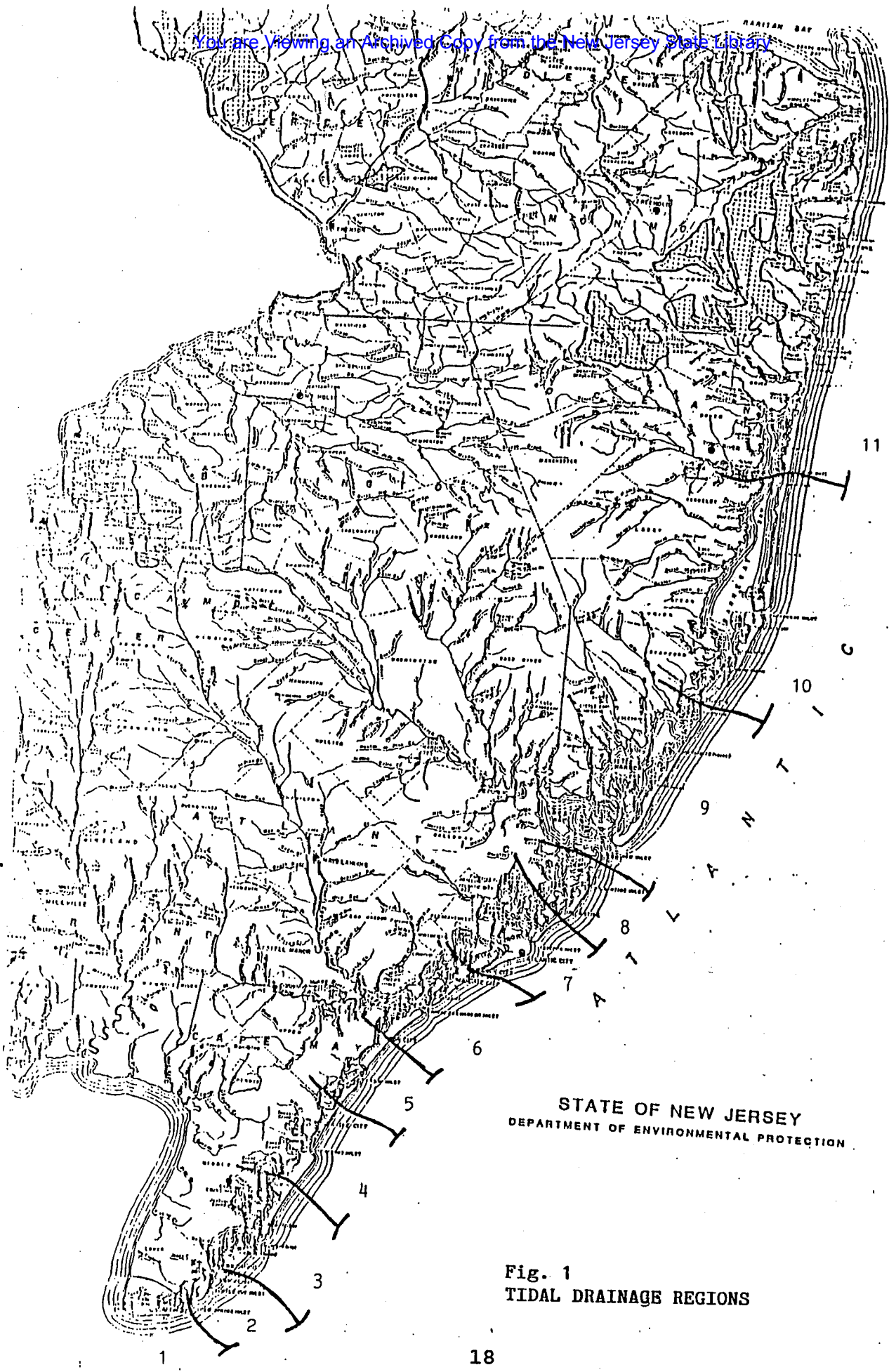
| | TRI- COLORED HERON | LITTLE BLUE HERON | BLACK- CROWNED NIGHT HERON | YELLOW- CROWNED NIGHT HERON | GREAT EGRET | SNOWY EGRET | CATTLE EGRET | GLOSSY IBIS |
|--------------------|--------------------------|-------------------------|-------------------------------------|--------------------------------------|----------------|----------------|-----------------|----------------|
| ** CAPE MAY | | | | | | | | |
| * 1977 | 74 | 85 | 343 | 81 | 97 | 1643 | 385 | 974 |
| * 1978 | 51 | 77 | 662 | 61 | 366 | 1955 | 475 | 2266 |
| * 1979 | 106 | 159 | 416 | 112 | 347 | 1941 | 290 | 1018 |
| * 1983 | 65 | 52 | 205 | 59 | 280 | 1382 | 270 | 887 |
| * 1985 | 79 | 54 | 187 | 69 | 265 | 940 | 204 | 390 |
| * 1989 | 127 | 131 | 98 | 25 | 208 | 1991 | 22 | 810 |
| ** ATLANTIC | | | | | | | | |
| * 1977 | 29 | 40 | 229 | 48 | 83 | 357 | 25 | 456 |
| * 1978 | 59 | 53 | 576 | 35 | 166 | 682 | 8 | 1096 |
| * 1979 | 37 | 130 | 330 | 42 | 171 | 695 | 4 | 763 |
| * 1983 | 30 | 43 | 120 | 41 | 222 | 449 | 76 | 258 |
| * 1985 | 48 | 44 | 237 | 40 | 111 | 501 | 50 | 282 |
| * 1989 | 74 | 38 | 57 | 23 | 104 | 495 | 40 | 122 |
| ** OCEAN | | | | | | | | |
| * 1977 | 19 | 28 | 109 | 22 | 40 | 440 | 0 | 35 |
| * 1978 | 50 | 76 | 232 | 3 | 69 | 538 | 0 | 437 |
| * 1979 | 50 | 61 | 194 | 1 | 80 | 399 | 1 | 248 |
| * 1983 | 54 | 48 | 34 | 0 | 96 | 355 | 0 | 66 |
| * 1985 | 51 | 11 | 96 | 0 | 30 | 273 | 0 | 76 |
| * 1989 | 37 | 40 | 51 | 0 | 151 | 195 | 0 | 85 |

Table 4. SUMMARY OF GULLS, TERNS & BLACK SKIMMER BY COUNTY - 1977-1989

| | HERRING GULL | GREAT BLACK- BACKED GULL | LAUGHING GULL | COMMON TERN | FORSTER'S TERN | BLACK SKIMMER |
|-------------|-----------------|-----------------------------------|------------------|----------------|-------------------|------------------|
| ** CAPE MAY | | | | | | |
| * 1977 | 636 | 34 | 19646 | 1695 | 407 | 1152 |
| * 1978 | 895 | 23 | 24877 | 2600 | 485 | 1160 |
| * 1979 | 825 | 24 | 31096 | 3136 | 829 | 930 |
| * 1983 | 973 | 33 | 35829 | 2200 | 980 | 530 |
| * 1985 | 1130 | 55 | 32811 | 1015 | 1201 | 510 |
| * 1989 | 3040 | 76 | 32205 | 2542 | 1314 | 582 |
| ** ATLANTIC | | | | | | |
| * 1977 | 840 | 18 | 8235 | 752 | 252 | 77 |
| * 1978 | 1199 | 28 | 8986 | 988 | 208 | 130 |
| * 1979 | 1435 | 40 | 13810 | 1495 | 823 | 453 |
| * 1983 | 1239 | 59 | 12716 | 1280 | 644 | 0 |
| * 1985 | 947 | 56 | 12959 | 786 | 656 | 18 |
| * 1989 | 828 | 36 | 18525 | 2008 | 511 | 0 |
| ** OCEAN | | | | | | |
| * 1977 | 2840 | 51 | 2849 | 3045 | 0 | 749 |
| * 1978 | 5545 | 68 | 8786 | 3268 | 0 | 615 |
| * 1979 | 3542 | 64 | 8008 | 4878 | 0 | 420 |
| * 1983 | 3025 | 168 | 9722 | 3086 | 0 | 619 |
| * 1985 | 2643 | 115 | 8664 | 3980 | 95 | 601 |
| * 1989 | 3229 | 181 | 8067 | 5097 | 38 | 288 |

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STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Fig. 1
TIDAL DRAINAGE REGIONS

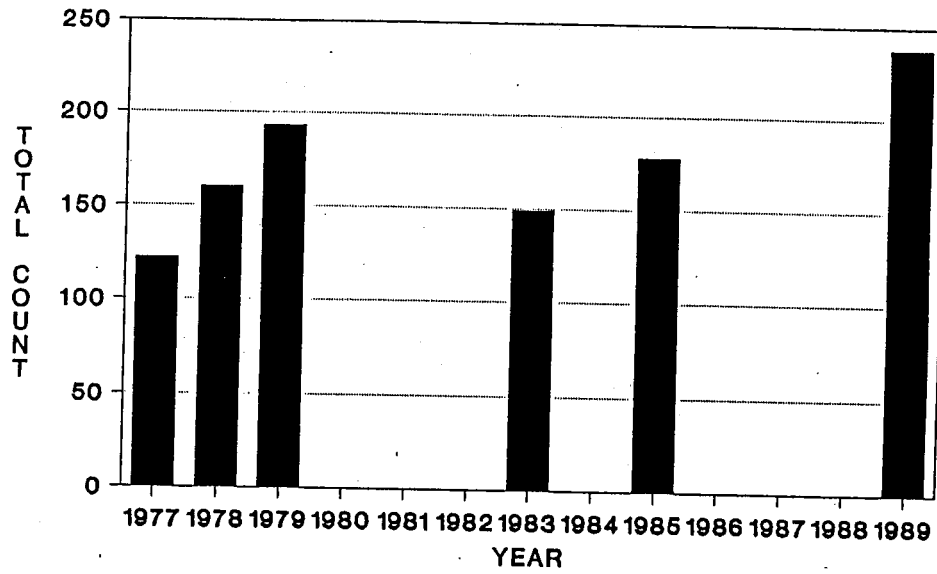


Fig. 2. Tri-colored heron counts 1977-1989.

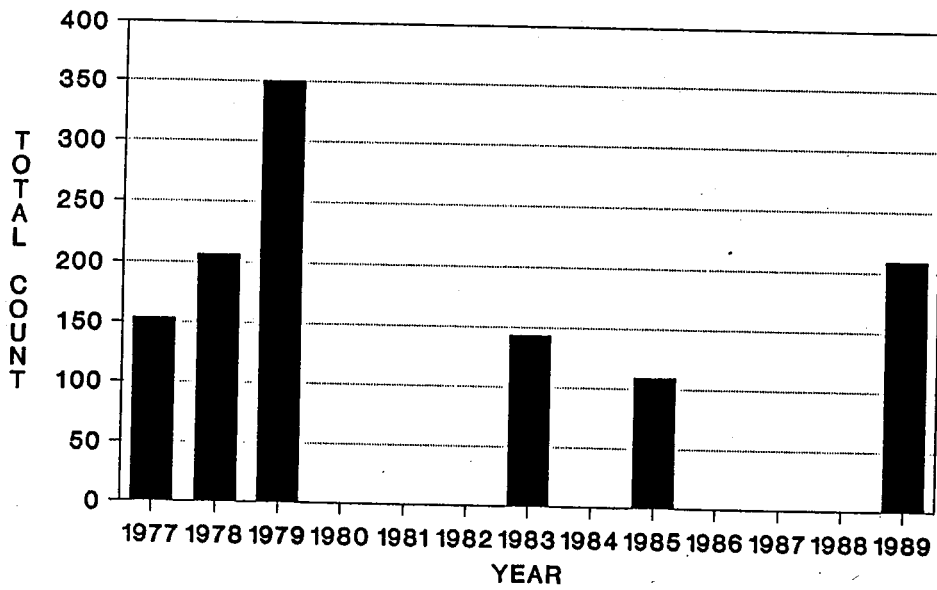


Fig. 3. Little blue heron counts 1977-1989.

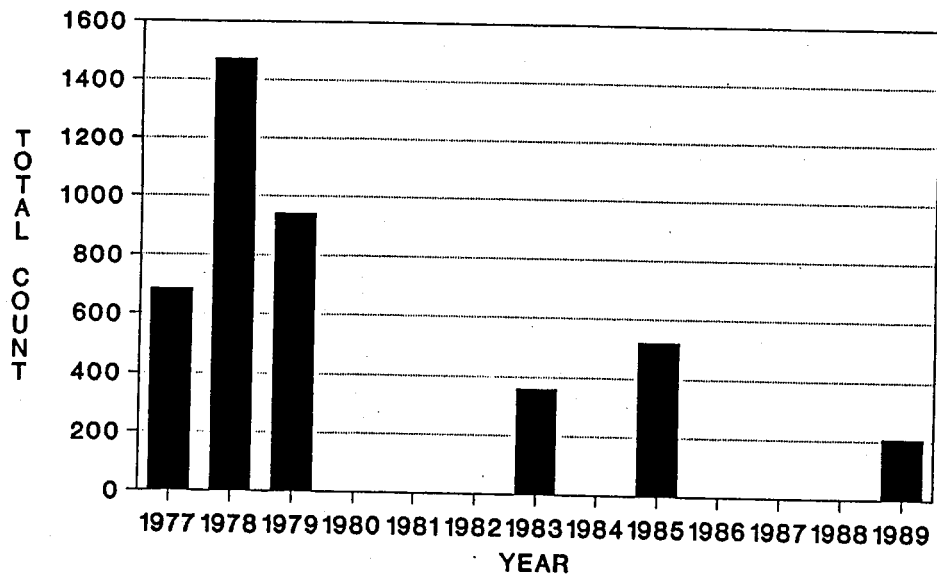


Fig. 4. Black-crowned night heron counts 1977-1989.

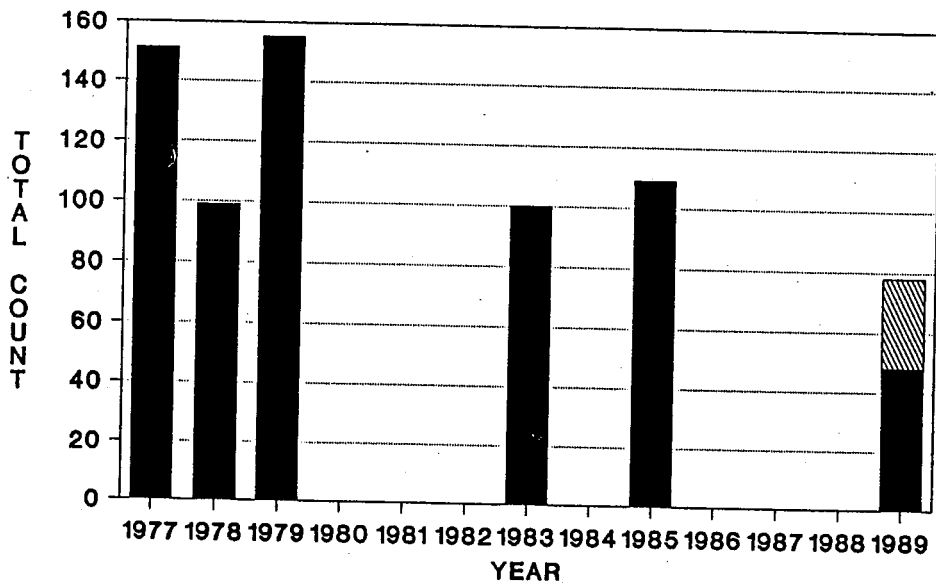


Fig. 5. Yellow-crowned night heron counts 1977-1989.
▨ = including ground count estimate from Avalon.

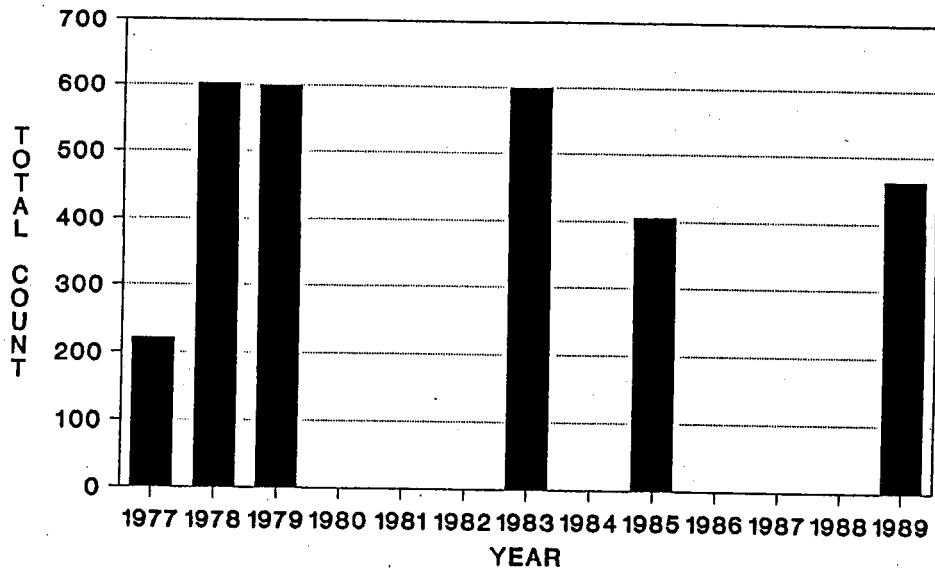


Fig. 6. Great egret counts 1977-1989.

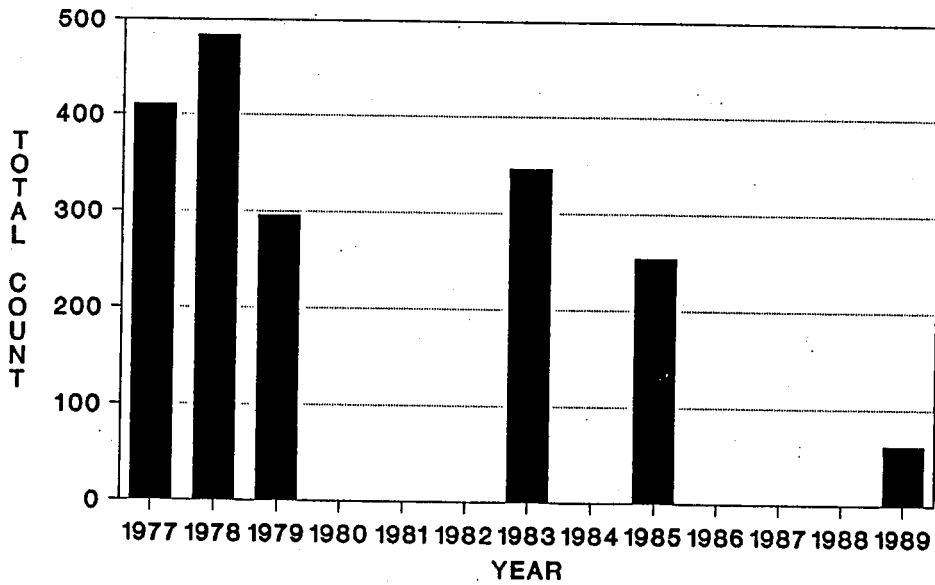


Fig. 7. Cattle egret counts 1977-1989.

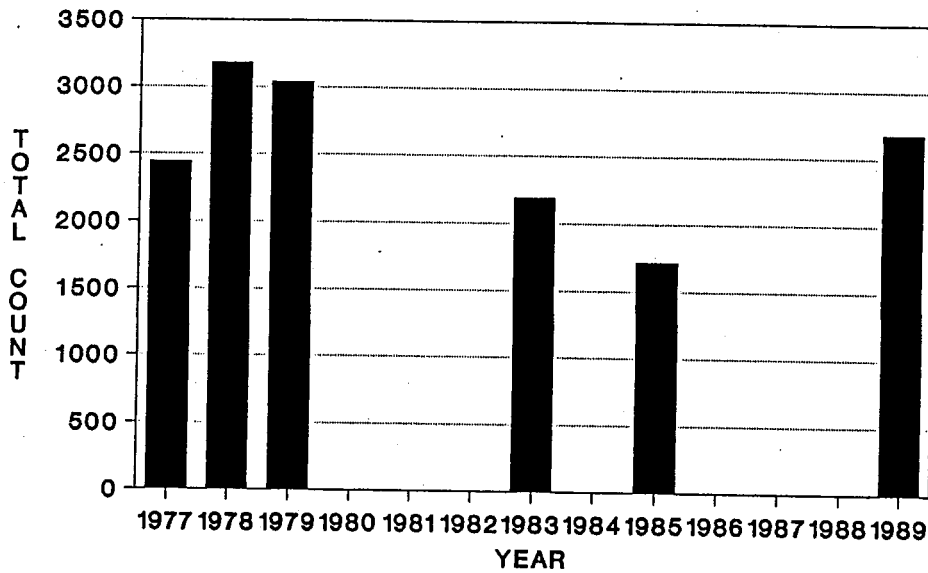


Fig. 8. Snowy egret counts 1977-1989.

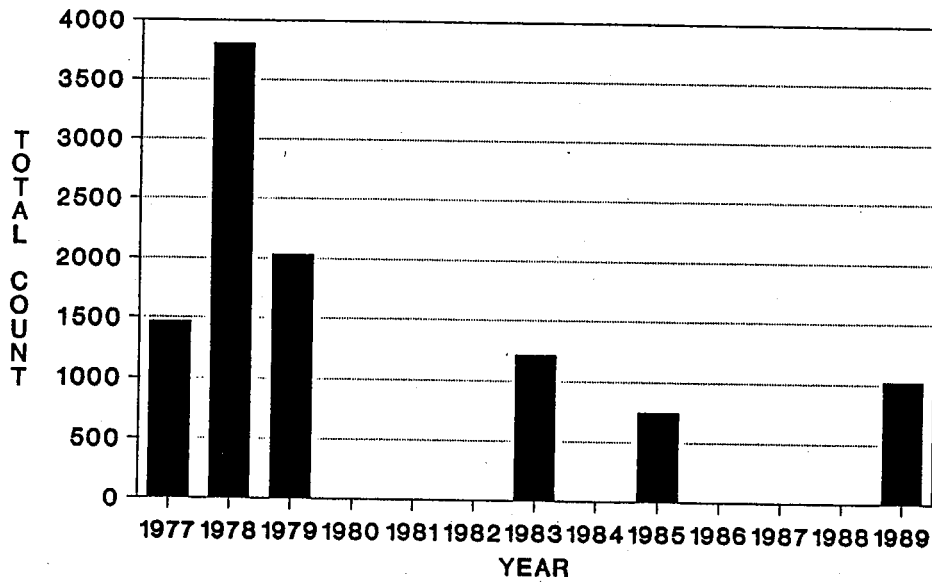


Fig. 9. Glossy ibis counts 1977-1989.

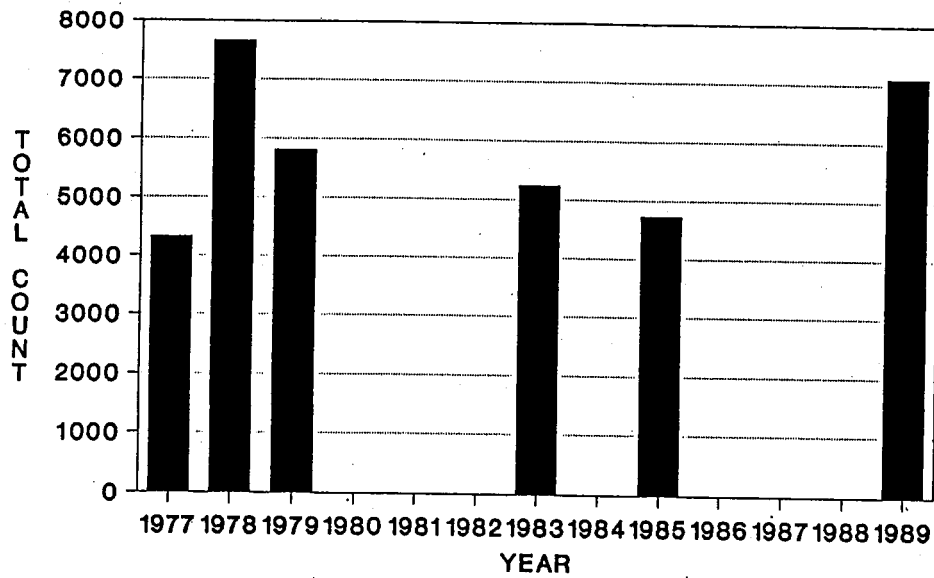


Fig. 10. Herring gull counts 1977-1989.

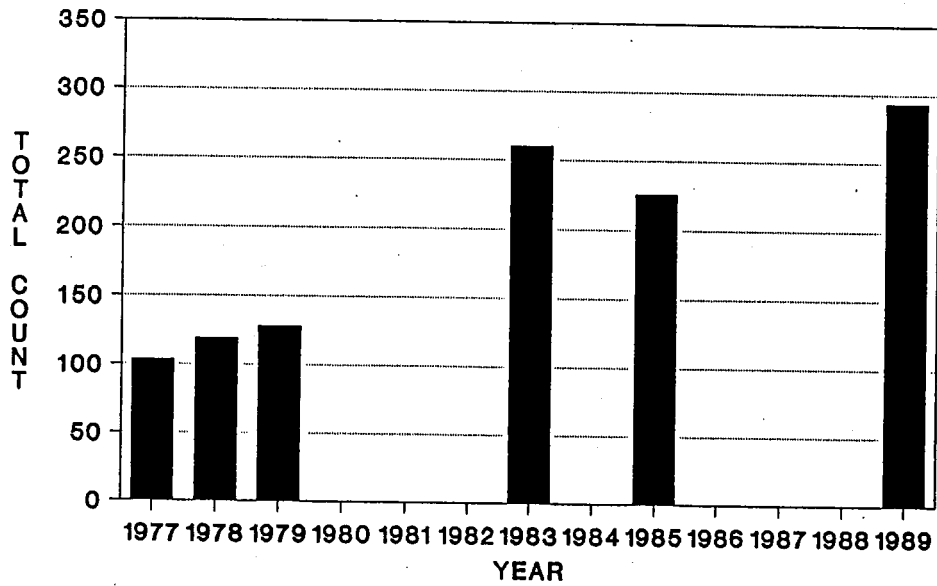


Fig. 11. Great black-backed gull counts 1977-1989.

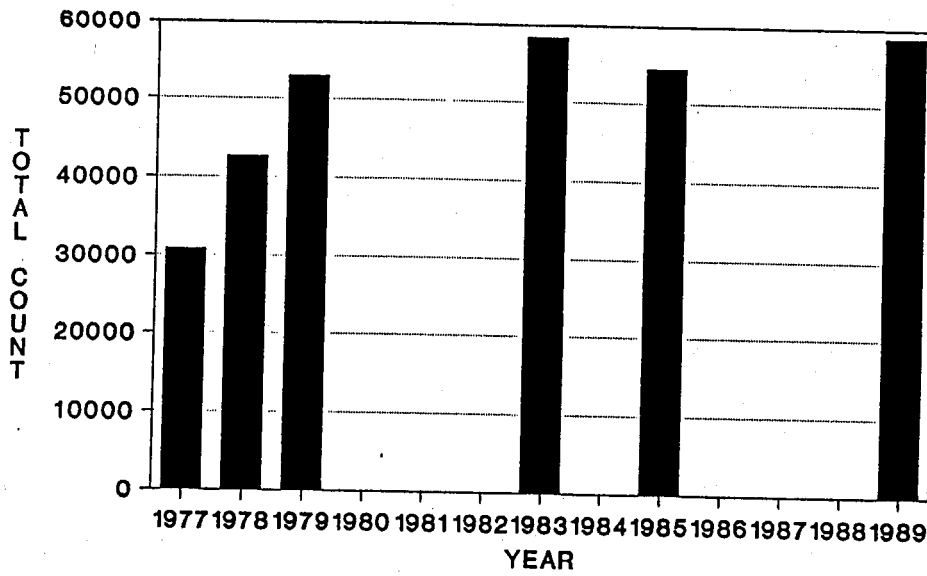


Fig. 12. Laughing gull counts 1977-1989.

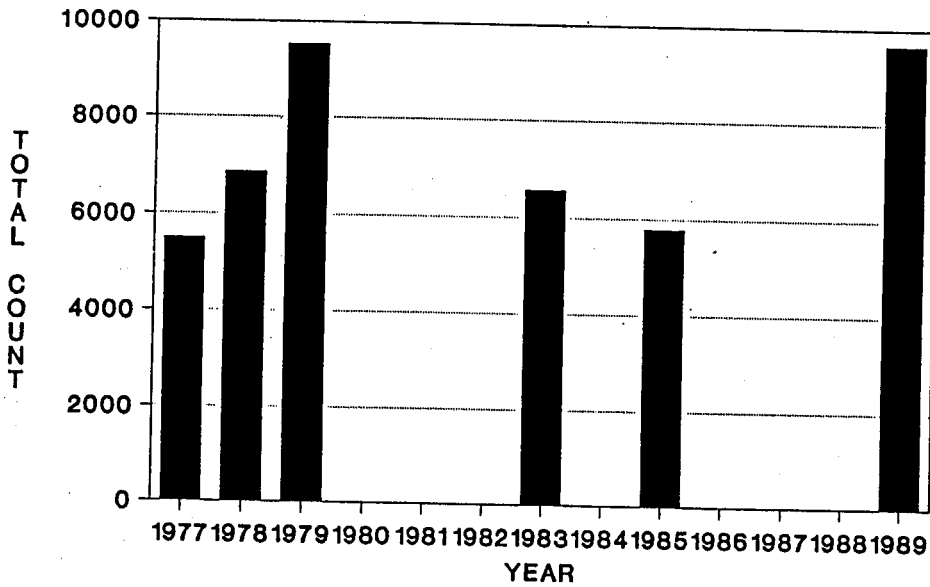


Fig. 13. Common tern counts 1977-1989.

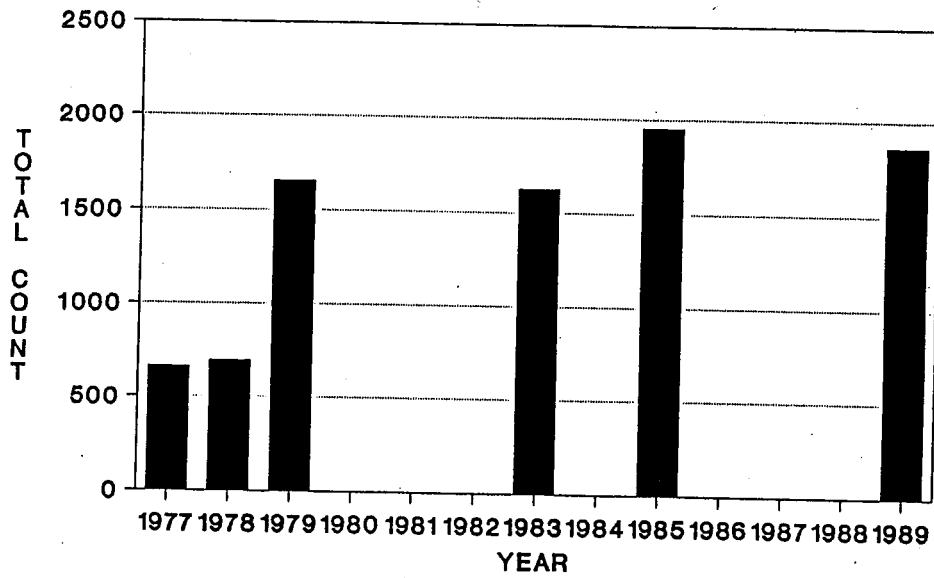


Fig. 14. Forster's tern counts 1977-1989.

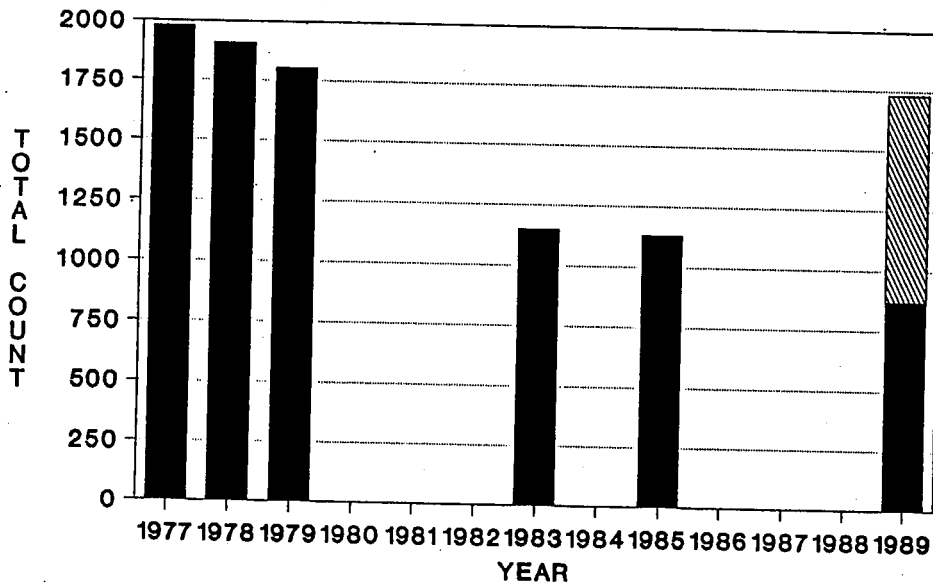


Fig. 15. Black skimmer counts 1977-1989.

▨ = including ground count estimates from Holgate.

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Notes on cattle egret breeding. Auk 92:111-117.

Appendix Ia. 1989 COLONIAL WATERBIRD SURVEY INDIVIDUAL SITE COUNTS -
HERONS GROUPED BY REGION

| COLONY NUMBER | NAME | LITTLE BLUE HERON | TRI- COLORED HERON | BLACK- CROWNED NIGHT HERON | YELLOW- CROWNED NIGHT HERON |
|------------------|-------------------------------|-------------------------|--------------------------|-------------------------------------|--------------------------------------|
| REGION 2 | | | | | |
| 1112 | COAST GUARD NORTH HERONRY | 0 | 0 | 3 | 0 |
| ** Subtotal ** | | 0 | 0 | 3 | 0 |
| ----- | | | | | |
| REGION 3 | | | | | |
| 1817H | ANGLESEA MARSH HERONRY | 1 | 0 | 0 | 0 |
| 2017 | GRASSY SOUND MEADOW | 0 | 0 | 4 | 0 |
| 2120 | SEDGE ISLAND | 7 | 47 | 0 | 0 |
| 2120H | STONE HARBOR COLONY | 25 | 17 | 40 | 20 |
| 2520 | STURGEON ISLAND | 0 | 2 | 0 | 0 |
| 2619 | GULL ISLAND NORTH | 0 | 0 | 2 | 0 |
| ** Subtotal ** | | 33 | 66 | 46 | 20 |
| ----- | | | | | |
| REGION 4 | | | | | |
| 2823 | AVALON N | 0 | 0 | 2 | 0 |
| 2924 | CORNELL HARBOR | 1 | 0 | 2 | 0 |
| 3124NH | MIDDLE THORO NORTH HERONRY | 42 | 4 | 7 | 0 |
| 3124SH | MIDDLE THORO SOUTH | 45 | 45 | 10 | 0 |
| ** Subtotal ** | | 88 | 49 | 21 | 0 |
| ----- | | | | | |
| REGION 6 | | | | | |
| 4734 | SHOOTING ISLAND | 0 | 0 | 2 | 0 |
| 4836H | COWPENS ISLAND HERONRY | 8 | 3 | 0 | 5 |
| 5341 | DUNE ISLAND | 2 | 0 | 21 | 0 |
| 5441H | PORK ISLAND HERONRY | 0 | 9 | 5 | 0 |
| ** Subtotal ** | | 10 | 12 | 28 | 5 |

| COLONY NUMBER | NAME | LITTLE BLUE HERON | TRI-COLORED HERON | BLACK-CROWNED NIGHT HERON | YELLOW-CROWNED NIGHT HERON |
|----------------|-----------------------------|-------------------|-------------------|---------------------------|----------------------------|
| REGION 7 | | | | | |
| 5643H | SHELTER ISLAND HERONRY | 0 | 0 | 2 | 0 |
| 5944H | GREAT THORO | 0 | 0 | 2 | 1 |
| 6249H | BIG FISH THORO HERONRY | 4 | 2 | 5 | 0 |
| 6251 | EAGLE BAY | 8 | 4 | 1 | 0 |
| 6351H | STAKE THORO HERONRY | 0 | 40 | 2 | 0 |
| 6352H | WADING THORO HERONRY | 21 | 28 | 10 | 0 |
| ** Subtotal ** | | 33 | 74 | 22 | 1 |
| ----- | | | | | |
| REGION 8 | | | | | |
| 6652 | BLACK POINT | 0 | 0 | 3 | 0 |
| 6958E | LITTLE BEACH | 5 | 0 | 32 | 22 |
| ** Subtotal ** | | 5 | 0 | 35 | 22 |
| ----- | | | | | |
| REGION 9 | | | | | |
| 7762 | GOOSEBAR SEDGE | 9 | 0 | 8 | 0 |
| 7959H | STORY ISLAND NORTH | 0 | 0 | 10 | 0 |
| 7961H | MIDDLE ISLAND HERONRY | 2 | 30 | 5 | 0 |
| 8265H | MARSHOLDER ISLAND HERONRY | 0 | 0 | 4 | 0 |
| 8869H | FLAT ISLAND | 1 | 0 | 0 | 0 |
| ** Subtotal ** | | 12 | 30 | 27 | 0 |
| ----- | | | | | |
| REGION 10 | | | | | |
| 0174EH | HIGHBAR ISLAND EAST HERONRY | 0 | 0 | 2 | 0 |
| 0174WH | HIGHBAR ISLAND WEST HERONRY | 1 | 5 | 0 | 0 |
| 0274S | SOUTH CLAM ISLAND | 0 | 0 | 3 | 0 |
| 0577 | SEDGE | 27 | 0 | 14 | 0 |
| 9372 | CARVEL EAST | 0 | 0 | 1 | 0 |
| 9573 | SANDY ISLAND | 0 | 0 | 4 | 0 |
| 9975H | VOL SEDGE WEST HERONRY | 0 | 2 | 0 | 0 |
| ** Subtotal ** | | 28 | 7 | 24 | 0 |
| *** Total *** | | 209 | 238 | 206 | 48 |

**Appendix Ib. 1989 COLONIAL WATERBIRD SURVEY INDIVIDUAL SITE COUNTS
 - EGRETS & GLOSSY IBIS GROUPED BY REGION**

| COLONY NUMBER | NAME | GREAT EGRET | SNOWY EGRET | CATTLE EGRET | GLOSSY IBIS |
|-----------------------|-------------------------------|-------------|-------------|--------------|-------------|
| REGION 2 | | | | | |
| 1112 | COAST GUARD NORTH HERONRY | 0 | 0 | 0 | 3 |
| ** Subtotal ** | | 0 | 0 | 0 | 3 |
| ----- | | | | | |
| REGION 3 | | | | | |
| 1817H | ANGLESEA MARSH HERONRY | 3 | 11 | 0 | 0 |
| 2120 | SEDGE ISLAND | 0 | 375 | 0 | 110 |
| 2120H | STONE HARBOR COLONY | 85 | 800 | 20 | 550 |
| 2520 | STURGEON ISLAND | 0 | 95 | 0 | 8 |
| ** Subtotal ** | | 88 | 1281 | 20 | 668 |
| ----- | | | | | |
| REGION 4 | | | | | |
| 2723 | AVALON | 1 | 0 | 0 | 0 |
| 2823 | AVALON N | 5 | 0 | 0 | 0 |
| 2924 | CORNELL HARBOR | 1 | 0 | 0 | 0 |
| 3124NH | MIDDLE THORO NORTH HERONRY | 2 | 220 | 0 | 0 |
| 3124SH | MIDDLE THORO SOUTH | 55 | 290 | 0 | 0 |
| 3425S | LUDLAM THORO | 0 | 27 | 0 | 0 |
| ** Subtotal ** | | 64 | 537 | 0 | 0 |
| ----- | | | | | |
| REGION 6 | | | | | |
| 4836H | COWPENS ISLAND HERONRY | 50 | 110 | 2 | 70 |
| 4935 | RAINBOW CHANNEL | 0 | 4 | 0 | 0 |
| 5341 | DUNE ISLAND | 0 | 4 | 0 | 65 |
| 5441H | PORK ISLAND HERONRY | 6 | 55 | 0 | 4 |
| ** Subtotal ** | | 56 | 173 | 2 | 139 |

| COLONY NUMBER | NAME | GREAT EGRET | SNOWY EGRET | CATTLE EGRET | GLOSSY IBIS |
|----------------|-----------------------------|-------------|-------------|--------------|-------------|
| REGION 7 | | | | | |
| 5643H | SHELTER ISLAND HERONRY | 8 | 30 | 0 | 10 |
| 5944H | GREAT THORO | 2 | 0 | 0 | 0 |
| 6045H | FLAT CREEK HERONRY | 9 | 105 | 0 | 0 |
| 6249H | BIG FISH THORO HERONRY | 0 | 70 | 0 | 7 |
| 6251 | EAGLE BAY | 0 | 45 | 0 | 0 |
| 6352H | WADING THORO HERONRY | 20 | 125 | 15 | 45 |
| ** Subtotal ** | | 39 | 445 | 15 | 62 |
| ----- | | | | | |
| REGION 8 | | | | | |
| 6958E | LITTLE BEACH | 65 | 50 | 25 | 60 |
| ** Subtotal ** | | 65 | 50 | 25 | 60 |
| ----- | | | | | |
| REGION 9 | | | | | |
| 7762 | GOOSEBAR SEDGE | 40 | 10 | 0 | 5 |
| 7862EH | BUNTING SEDGE HERONRY | 0 | 0 | 0 | 5 |
| 7961H | MIDDLE ISLAND HERONRY | 21 | 110 | 0 | 11 |
| 8265H | MARSHELDER ISLAND HERONRY | 4 | 3 | 0 | 2 |
| 8869H | FLAT ISLAND | 25 | 10 | 0 | 32 |
| 8969H | CEDAR BONNET HERONRY | 0 | 0 | 0 | 5 |
| ** Subtotal ** | | 90 | 133 | 0 | 60 |
| ----- | | | | | |
| REGION 10 | | | | | |
| 0174EH | HIGHBAR ISLAND EAST HERONRY | 0 | 3 | 0 | 0 |
| 0174WH | HIGHBAR ISLAND WEST HERONRY | 0 | 24 | 0 | 10 |
| 0577 | SEDE | 41 | 0 | 0 | 5 |
| ** Subtotal ** | | 41 | 27 | 0 | 15 |
| ----- | | | | | |
| REGION 11 | | | | | |
| 2778 | SOUTH CHADWICK | 20 | 35 | 0 | 10 |
| ** Subtotal ** | | 20 | 35 | 0 | 10 |
| *** Total *** | | 463 | 2681 | 62 | 1017 |

Appendix Ic. 1989 COLONIAL WATERBIRD SURVEY INDIVIDUAL SITE COUNTS
 - GULLS GROUPED BY REGION

| COLONY NUMBER | NAME | HERRING GULL | GREAT BLACK-BACKED GULL | LAUGHING GULL |
|----------------|------------------------------|--------------|-------------------------|---------------|
| REGION 2 | | | | |
| 1211 | THOROFARE ISLAND | 0 | 0 | 25 |
| 1310 | SOUTH WEST COVE | 1 | 0 | 4 |
| 1412 | SWAIN CHANNEL | 25 | 1 | 1840 |
| 1514 | SHAW ISLAND | 3 | 0 | 0 |
| 1714S | PHILLIP SHIELDS ISLAND SOUTH | 2 | 1 | 30 |
| ** Subtotal ** | | 31 | 2 | 1899 |
| ----- | | | | |
| REGION 3 | | | | |
| 1713 | HILDRETH MEADOWS (SITES CRK) | 1 | 0 | 25 |
| 1715 | DRUM CREEK | 2 | 0 | 5 |
| 1716 | MUD CREEK | 0 | 0 | 42 |
| 1717 | OTTENS BASIN | 203 | 10 | 0 |
| 1816 | NO MAN'S ISLAND | 0 | 0 | 265 |
| 1817 | ANGLESEA MARSH | 203 | 10 | 0 |
| 1916N | TAUGH CREEK | 1 | 0 | 26 |
| 1916S | NO MAN'S ISLAND NORTH | 3 | 0 | 6 |
| 2018 | NUMMY ISLAND SOUTH | 71 | 3 | 1350 |
| 2117 | GREAT FLAT | 15 | 2 | 4540 |
| 2120 | SEDGE ISLAND | 350 | 5 | 0 |
| 2217S | LITTLE SOUND MEADOW | 0 | 0 | 45 |
| 2318 | WHITE ISLAND | 3 | 1 | 1370 |
| 2319 | RING ISLAND | 2 | 0 | 6905 |
| 2420E | MUDDY HOLE ISLAND | 5 | 0 | 3600 |
| 2420W | GOTH CREEK | 2 | 0 | 700 |
| 2519 | GULL ISLAND | 40 | 0 | 1395 |
| 2520 | STURGEON ISLAND | 195 | 5 | 5 |
| 2619 | GULL ISLAND NORTH | 81 | 0 | 0 |
| 2621 | OLD MAN MEADOW | 7 | 0 | 2970 |
| 2721 | OLD TURTLE REACH | 9 | 4 | 255 |
| ** Subtotal ** | | 1193 | 40 | 23504 |

| COLONY NUMBER | NAME | HERRING GULL | GREAT BLACK-BACKED GULL | LAUGHING GULL |
|----------------|-------------------|--------------|-------------------------|---------------|
| REGION 4 | | | | |
| 3024 | NORTH CHANNEL | 0 | 0 | 190 |
| 3122 | KITTS THORO | 220 | 5 | 0 |
| 3124SH | MIDDLE THORO | 350 | 10 | 0 |
| | SOUTH | | | |
| 3224 | GRANNY CREEK | 0 | 0 | 15 |
| 3323 | MILL THOROFARE | 0 | 0 | 8 |
| 3324 | GULL ISLAND | 200 | 1 | 0 |
| 3325N | MILL CREEK | 0 | 0 | 25 |
| 3325S | WARE THORO | 0 | 0 | 12 |
| ** Subtotal ** | | 770 | 16 | 250 |
| ----- | | | | |
| REGION 5 | | | | |
| 3727 | FLAT CREEK | 0 | 0 | 35 |
| 3828 | BURROUGHS HOLE | 0 | 0 | 1185 |
| 3928 | MAIN CHANNEL | 0 | 0 | 82 |
| 3929 | STRATHMERE BAY | 8 | 0 | 10 |
| ** Subtotal ** | | 8 | 0 | 1312 |
| ----- | | | | |
| REGION 6 | | | | |
| 4633 | GARRETT THOROFARE | 1 | 0 | 0 |
| 4733 | BULL THOROFARE | 2 | 0 | 0 |
| 4734 | SHOOTING ISLAND | 41 | 0 | 0 |
| 4836 | COWPENS ISLAND | 427 | 11 | 0 |
| 4935 | RAINBOW CHANNEL | 180 | 0 | 0 |
| 4936 | RAINBOW THORO | 0 | 0 | 120 |
| 5240 | HOSPITALITY CREEK | 110 | 10 | 870 |
| 5339 | RISLEY CHANNEL | 0 | 1 | 860 |
| 5341 | DUNE ISLAND | 62 | 0 | 0 |
| 5440 | LONE CEDAR ISLAND | 2 | 0 | 385 |
| 5441 | PORK ISLAND | 415 | 5 | 0 |
| 5540 | MULBERRY THORO | 0 | 0 | 5 |
| 5540 | TOMS ISLAND | 0 | 0 | 35 |
| 5642 | WHIRLPOOL ISLAND | 0 | 1 | 1720 |
| 5742E | EAST ALEX ISLAND | 0 | 0 | 440 |
| 5742W | ALEX ISLAND | 1 | 0 | 730 |
| ** Subtotal ** | | 1241 | 28 | 5165 |

| COLONY NUMBER | NAME | HERRING GULL | GREAT BLACK-BACKED GULL | LAUGHING GULL |
|----------------|------------------------|--------------|-------------------------|---------------|
| REGION 7 | | | | |
| 5643 | SHELTER ISLAND | 0 | 0 | 60 |
| 5644 | GREAT ISLAND | 2 | 0 | 70 |
| 5844 | LAKES BAY | 0 | 0 | 25 |
| 6045 | FLAT CREEK NORTH | 87 | 4 | 0 |
| 6047 | DUCK THORO | 0 | 0 | 95 |
| 6048 | POINT BAR THORO | 3 | 1 | 375 |
| 6049 | MANKILLER ISLAND | 0 | 0 | 65 |
| 6146 | NEWFOUND THORO | 107 | 11 | 720 |
| 6146N | NEWFOUND THORO NORTH | 0 | 0 | 15 |
| 6146W | NEWFOUND THORO WEST | 0 | 0 | 220 |
| 6147 | ABSECON CHANNEL | 2 | 0 | 940 |
| 6148 | DOLES POINT | 9 | 0 | 700 |
| 6149 | MANKILLER BAY | 0 | 0 | 85 |
| 6150 | LOW WATER | 1 | 1 | 190 |
| 6151 | BOOT ISLAND | 28 | 1 | 0 |
| 6247 | WILLS THORO-S | 1 | 0 | 880 |
| 6248 | WILLS THORO-N | 3 | 0 | 670 |
| 6249 | BIG FISH THORO | 13 | 0 | 0 |
| 6251 | EAGLE BAY | 29 | 1 | 240 |
| 6252 | SAND THORO | 0 | 0 | 55 |
| 6348 | STEELMAN THORO | 0 | 0 | 55 |
| 6349 | SHEEPHANK THORO | 63 | 0 | 270 |
| 6351 | STAKE THORO | 99 | 3 | 85 |
| 6352 | WADING THORO | 160 | 4 | 0 |
| 6449S | EAST POINT CHANNEL N&S | 2 | 0 | 363 |
| 6450 | FLAT THORO | 2 | 0 | 0 |
| 6451N | OYSTER THORO | 1 | 0 | 10 |
| 6451S | ROUNDAABOUT THORO | 7 | 1 | 65 |
| 6547 | CONOVER CHANNEL | 0 | 0 | 15 |
| ** Subtotal ** | | 619 | 27 | 6268 |
| ----- | | | | |
| REGION 8 | | | | |
| 6453 | OBES THORO | 0 | 3 | 295 |
| 6555 | WEAKFISH THORO | 0 | 1 | 210 |
| 6652 | BLACK POINT | 2 | 0 | 0 |
| 6653 | ELDER ISLAND EAST | 3 | 0 | 255 |
| 6654 | BETSEY CHANNEL | 1 | 0 | 65 |

| COLONY NUMBER | NAME | HERRING GULL | GREAT BLACK-BACKED GULL | LAUGHING GULL |
|-----------------------|-------------------------|--------------|-------------------------|---------------|
| 6655 | BRIGANTINE CHANNEL | 0 | 0 | 682 |
| 6756 | ELDER ISLAND WEST | 193 | 4 | 410 |
| 6856 | LITTLE CROOKED THORO | 1 | 0 | 3690 |
| 6954 | SIMKINS THORO | 3 | 1 | 1730 |
| 7056 | SALT ISLAND | 6 | 0 | 4830 |
| ** Subtotal ** | | 209 | 9 | 12167 |
| ----- | | | | |
| REGION | 9 | | | |
| 6554 | SOMERS BAY NORTH | 0 | 0 | 90 |
| 7356E | SLOOP THORO | 0 | 0 | 160 |
| 7356W | FISH ISLAND | 14 | 0 | 0 |
| 7359 | POINT CREEK | 0 | 0 | 2 |
| 7760 | FOXBORO POINT | 1 | 0 | 0 |
| 7761 | GOODLUCK SEDGE | 2 | 0 | 4 |
| 7762 | GOOSEBAR SEDGE | 36 | 3 | 0 |
| 7860 | STORY ISLAND | 648 | 12 | 63 |
| 7862W | BUNTING SEDGE WEST | 10 | 0 | 0 |
| 7959 | DRAG SEDGE | 0 | 0 | 55 |
| 7960 | HITHER ISLAND | 0 | 0 | 15 |
| 7961 | MIDDLE ISLAND | 290 | 14 | 0 |
| 8060 | HESTER SEDGE | 209 | 7 | 0 |
| 8062W | WEST SEDGE (105,ZZ,102) | 19 | 2 | 17 |
| 8164 | LITTLE ISLAND | 0 | 1 | 95 |
| 8264 | SHELTER ISLAND | 6 | 0 | 620 |
| 8265 | MARSHELDER ISLAND WEST | 43 | 0 | 35 |
| 8367 | HAM ISLAND EAST | 0 | 0 | 10 |
| 8466 | HAM ISLAND WEST | 21 | 0 | 190 |
| 8668 | HIGH ISLAND | 22 | 0 | 0 |
| 8868 | EGG ISLAND | 124 | 20 | 10 |
| 8869H | FLAT ISLAND | 2 | 0 | 0 |
| 8969W | CEDAR BONNET WEST | 16 | 2 | 0 |
| ** Subtotal ** | | 1463 | 61 | 1366 |

| COLONY NUMBER | NAME | HERRING GULL | GREAT BLACK-BACKED GULL | LAUGHING GULL |
|----------------|----------------------|--------------|-------------------------|---------------|
| REGION 10 | | | | |
| 0074 | HIGHBAR ISLAND SOUTH | 19 | 1 | 35 |
| 0174E | HIGHBAR ISLAND EAST | 154 | 0 | 3420 |
| 0174W | HIGHBAR ISLAND WEST | 44 | 4 | 1710 |
| 0274N | NORTH CLAM ISLAND | 24 | 2 | 710 |
| 0274S | SOUTH CLAM ISLAND | 380 | 7 | 838 |
| 9371 | CARVEL WEST | 60 | 3 | 0 |
| 9372 | CARVEL EAST | 2 | 1 | 0 |
| 9471 | HARVEY SEDGES WEST | 95 | 10 | 0 |
| 9472 | HARVEY SEDGES EAST | 255 | 32 | 0 |
| 9773E | SLOOP SEDGE EAST | 15 | 8 | 0 |
| 9773W | SLOOP SEDGE WEST | 101 | 17 | 0 |
| 9975 | VOL SEDGE WEST | 319 | 31 | 78 |
| ** Subtotal ** | | 1468 | 116 | 6791 |
| ----- | | | | |
| REGION 11 | | | | |
| 2679 | LAVALLETTE NORTH | 9 | 0 | 0 |
| 2778 | SOUTH CHADWICK | 277 | 4 | 0 |
| 2879 | NORTH CHADWICK | 12 | 0 | 0 |
| ** Subtotal ** | | 298 | 4 | 0 |
| *** Total *** | | 7300 | 303 | 58722 |

**Appendix Id. 1989 COLONIAL WATERBIRD SURVEY INDIVIDUAL SITE COUNTS
 - TERNS & BLACK SKIMMER GROUPED BY REGION**

| COLONY NUMBER | NAME | COMMON TERN | FORSTER'S TERN | BLACK SKIMMER |
|-----------------------|------------------------------|-------------|----------------|---------------|
| REGION 2 | | | | |
| 1211 | THOROFARE ISLAND | 680 | 0 | 0 |
| 1310 | SOUTH WEST COVE | 60 | 0 | 0 |
| 1412 | SWAIN CHANNEL | 0 | 225 | 0 |
| 1714N | PHILLIP SHIELDS ISLAND NORTH | 35 | 0 | 0 |
| ** Subtotal ** | | 775 | 225 | 0 |
| <hr/> | | | | |
| REGION 3 | | | | |
| 1716 | MUD CREEK | 65 | 0 | 2 |
| 1918 | CHAMPAGNE ISLAND | 0 | 0 | 250 |
| 2015 | TURTLE THOROFARE | 26 | 0 | 0 |
| 2018 | NUMMY ISLAND SOUTH | 59 | 0 | 0 |
| 2318 | WHITE ISLAND | 0 | 18 | 0 |
| 2319 | RING ISLAND | 16 | 26 | 0 |
| 2420W | GOTH CREEK | 0 | 105 | 0 |
| 2519 | GULL ISLAND | 15 | 180 | 0 |
| 2621 | OLD MAN MEADOW | 0 | 253 | 0 |
| 2721 | OLD TURTLE REACH | 0 | 45 | 0 |
| ** Subtotal ** | | 181 | 627 | 252 |
| <hr/> | | | | |
| REGION 4 | | | | |
| 2923N | SOUTH CHANNEL | 220 | 40 | 20 |
| 2923S | INGRAM THOROFARE | 55 | 0 | 0 |
| 3024 | NORTH CHANNEL | 0 | 77 | 0 |
| 3224 | GRANNY CREEK | 0 | 60 | 0 |
| 3323 | MILL THOROFARE | 0 | 50 | 0 |
| 3324 | GULL ISLAND | 0 | 10 | 0 |
| 3325S | WARE THORO | 0 | 15 | 0 |
| 3425 | SUNKS CREEK | 45 | 0 | 0 |
| 3625 | BIG ELDER CREEK | 0 | 8 | 0 |
| ** Subtotal ** | | 320 | 260 | 20 |
| <hr/> | | | | |
| REGION 5 | | | | |
| 3727 | FLAT CREEK | 56 | 0 | 0 |
| 3828 | BURROUGHS HOLE | 0 | 85 | 0 |
| 3929 | STRATHMERE BAY | 0 | 0 | 310 |

| COLONY NUMBER | NAME | COMMON TERN | FORSTER'S TERN | BLACK SKIMMER |
|----------------|------------------------|-------------|----------------|---------------|
| 4029N | CORSON SOUND | 13 | 0 | 0 |
| 4029S | DEVILS ISLAND SOUTH | 46 | 0 | 0 |
| 4229 | DEVILS ISLAND NORTH | 0 | 8 | 0 |
| ** Subtotal ** | | 115 | 93 | 310 |
| ----- | | | | |
| REGION | 6 | | | |
| 4633 | GARRETT THOROFARE | 1 | 0 | 0 |
| 4734 | SHOOTING ISLAND | 72 | 0 | 0 |
| 4835 | BEACH THORO | 18 | 0 | 0 |
| 5238 | BROAD THORO | 0 | 17 | 0 |
| 5240 | HOSPITALITY CREEK | 614 | 0 | 0 |
| 5339 | RISLEY CHANNEL | 300 | 12 | 0 |
| 5440 | LONE CEDAR ISLAND | 62 | 0 | 0 |
| 5540 | MULBERRY THORO | 5 | 45 | 0 |
| 5540 | TOMS ISLAND | 4 | 0 | 0 |
| 5642 | WHIRLPOOL ISLAND | 48 | 35 | 0 |
| ** Subtotal ** | | 1124 | 109 | 0 |
| ----- | | | | |
| REGION | 7 | | | |
| 5643 | SHELTER ISLAND | 38 | 0 | 0 |
| 5644 | GREAT ISLAND | 2 | 0 | 0 |
| 5844 | LAKES BAY | 22 | 0 | 0 |
| 6047 | DUCK THORO | 68 | 0 | 0 |
| 6048 | POINT BAR THORO | 42 | 0 | 0 |
| 6147 | ABSECON CHANNEL | 2 | 15 | 0 |
| 6148 | DOLES POINT | 26 | 0 | 0 |
| 6149 | MANKILLER BAY | 0 | 15 | 0 |
| 6150 | LOW WATER | 455 | 41 | 0 |
| 6247 | WILLS THORO-S | 2 | 25 | 0 |
| 6248 | WILLS THORO-N | 140 | 42 | 0 |
| 6251 | EAGLE BAY | 12 | 0 | 0 |
| 6253 | BONITA TIDEWAY | 95 | 0 | 0 |
| 6348 | STEELMAN THORO | 0 | 55 | 0 |
| 6349 | SHEEPSHANK THORO | 0 | 56 | 0 |
| 6449S | EAST POINT CHANNEL N&S | 80 | 28 | 0 |
| 6451N | OYSTER THORO | 19 | 0 | 0 |
| 6451S | ROUNDAABOUT THORO | 37 | 0 | 0 |
| ** Subtotal ** | | 1040 | 277 | 0 |

| COLONY NUMBER | NAME | COMMON TERN | FORSTER'S TERN | BLACK SKIMMER |
|----------------|---------------------------|-------------|----------------|---------------|
| REGION 8 | | | | |
| 6453 | OBES THORO | 243 | 0 | 0 |
| 6552 | GRASSY BAY | 8 | 0 | 0 |
| 6555 | WEAKFISH THORO | 85 | 0 | 0 |
| 6653 | ELDER ISLAND EAST | 89 | 0 | 0 |
| 6654 | BETSEY CHANNEL | 44 | 0 | 0 |
| 6655 | BRIGANTINE CHANNEL | 80 | 0 | 0 |
| 6756 | ELDER ISLAND WEST | 187 | 30 | 0 |
| 6856 | LITTLE CROOKED THORO | 176 | 24 | 0 |
| 6954 | SIMKINS THORO | 34 | 180 | 0 |
| 7056 | SALT ISLAND | 22 | 0 | 0 |
| ** Subtotal ** | | 968 | 234 | 0 |
| ----- | | | | |
| REGION 9 | | | | |
| 7356W | FISH ISLAND | 51 | 0 | 0 |
| 7357 | TOW ISLAND | 165 | 0 | 220 |
| 7358 | HATFIELD CREEK | 96 | 0 | 0 |
| 7359 | POINT CREEK | 5 | 0 | 0 |
| 7456 | SEVEN ISLAND SOUTH | 28 | 0 | 0 |
| 7759 | MARSHELDER CHANNEL | 30 | 0 | 0 |
| 7760 | FOXBORO POINT | 34 | 0 | 0 |
| 7761 | GOODLUCK SEDGE | 295 | 0 | 0 |
| 7762 | GOOSEBAR SEDGE | 5 | 0 | 0 |
| 7860 | STORY ISLAND | 35 | 38 | 0 |
| 7964 | MORDECAI ISLAND | 2 | 0 | 2 |
| 8060 | HESTER SEDGE | 88 | 0 | 0 |
| 8062W | WEST SEDGE (105, ZZ, 102) | 406 | 0 | 0 |
| 8164 | LITTLE ISLAND | 32 | 0 | 0 |
| 8166 | MARSHELDER ISLAND EAST | 79 | 0 | 0 |
| 8264 | SHELTER ISLAND | 185 | 0 | 7 |
| 8265 | MARSHELDER ISLAND WEST | 330 | 0 | 0 |
| 8367 | HAM ISLAND EAST | 210 | 0 | 23 |
| 8466 | HAM ISLAND WEST | 35 | 0 | 0 |
| 8868 | EGG ISLAND | 244 | 0 | 5 |
| 8869E | CEDAR BONNET EAST | 60 | 0 | 0 |
| ** Subtotal ** | | 2415 | 38 | 257 |

| COLONY NUMBER | NAME | COMMON TERN | FORSTER'S TERN | BLACK SKIMMER |
|----------------|-----------------------------|-------------|----------------|---------------|
| REGION 10 | | | | |
| 0274N | NORTH CLAM ISLAND | 250 | 0 | 0 |
| 0274S | SOUTH CLAM ISLAND | 98 | 0 | 12 |
| 9168 | CEDAR CREEK | 180 | 0 | 0 |
| 9170 | PETTIT ISLAND | 430 | 0 | 19 |
| 9370 | LOG CREEK | 90 | 0 | 0 |
| 9975 | VOL SEDGE WEST | 140 | 0 | 0 |
| ** Subtotal ** | | 1188 | 0 | 31 |
| ----- | | | | |
| REGION 11 | | | | |
| 2378 | PELICAN (MIKES) ISLAND EAST | 39 | 0 | 0 |
| 2579 | LAVALLETTE SOUTH | 335 | 0 | 0 |
| 2679 | LAVALLETTE NORTH | 210 | 0 | 0 |
| 2778 | SOUTH CHADWICK | 420 | 0 | 0 |
| 2879 | NORTH CHADWICK | 490 | 0 | 0 |
| ** Subtotal ** | | 1494 | 0 | 0 |
| *** Total *** | | 9620 | 1863 | 870 |

APPENDIX II. Colony identification cross-reference.

| OLD COLONY IDENTIFICATION | NEW COLONY IDENTIFICATION | OLD COLONY IDENTIFICATION | NEW COLONY IDENTIFICATION |
|---------------------------|---------------------------|---------------------------|---------------------------|
| 7 | 1310 | 45A | 4229 |
| 14 | 1514 | 45B | 4029N |
| 15 | 1412N | 47 | 4633W |
| 2 | 1211 | T | 4733 |
| 16C | 1713 | 48 | 4734 |
| N2 | 1714S | 51 | 4835 |
| N2 | 1714N | 49B | 4935 |
| 18C | 1916S | 49 | 4836 |
| 22 | 2117 | 49 | 4836H |
| 16A | 1817 | 53A | 5339 |
| 16A | 1817H | 53 | 5240 |
| 16A | 1717 | 55 | 5441 |
| 18 | 1916N | 55 | 5441H |
| 18A | 1816W | 56A | 5440 |
| X | 1716 | 54 | 5540 |
| N4 | 2015 | 58B | 5541 |
| N5 | 2017 | 58 | 5642 |
| 24 | 2018 | 60 | 5742W |
| 24 | 2118 | U | 5742E |
| Q | 2318 | N12X | 5643 |
| 23 | 2319 | N12X | 5643H |
| 25A | 2120 | 60B | 5644 |
| 26 | 2120H | 60A | 5844 |
| 27 | 2420E | 60C | 5944H |
| 27A | 2420W | 62A | 6045 |
| 29 | 2619 | 62A | 6045H |
| 30 | 2619 | 64D | 6146 |
| S | 2519 | 64AW | 6146W |
| 31 | 2520 | 64AN | 6146N |
| 31A | 2621 | 64E | 6147 |
| 31A1 | 2721 | 64 | 6048 |
| 35 | 2924 | N12 | 6049 |
| 34 | 2923S | 65A | 6150 |
| 36 | 2923N | N13 | 6149 |
| 36A | 3024 | 64BS | 6247 |
| 38A | 3122 | 64BS | 6246 |
| 38A | 3124NH | 64BN | 6248 |
| 38A | 3124 | 64F | 6348 |
| 37 | 3124SH | 74AD | 6449S |
| 38B | 3224 | 74AD | 6449N |
| 40B | 3323 | 70A | 6151 |
| 40G | 3223 | 67 | 6251 |
| 40 | 3324 | 72 | 6249 |
| 40E | 3425 | 72 | 6249H |
| 40D | 3425S | 72A | 6450 |
| 42 | 3727 | 74C | 6349 |
| 43 | 3828 | 74B | 6451N |
| 44 | 3929 | N14 | 6552 |
| V | 4029S | N15 | 6652 |
| 45A | 4129 | P | 6451S |

| OLD COLONY IDENTIFICATION | NEW COLONY IDENTIFICATION | OLD COLONY IDENTIFICATION | NEW COLONY IDENTIFICATION |
|---------------------------|---------------------------|---------------------------|---------------------------|
| 77 | 6352 | 112A | 8969W |
| 77 | 6352H | 112A | 8969H |
| N | 6351 | 112A | 8969E |
| N | 6351H | 112A | 8970 |
| 76 | 6252 | 113A | 9170 |
| 76 | 6253 | 115 | 9168 |
| 92 | 7356W | 116 | 9370 |
| 92 | 7356E | 118 | 9371 |
| 86 | 6653 | 117 | 9372 |
| 81 | 6654 | 118A | 9471 |
| 88D | 6655 | 118B | 9472 |
| 88C | 6756 | 120 | 9573 |
| 88B | 6856 | 121A | 9773W |
| 88B | 6957 | 121B | 9773E |
| 88 | 6954 | 112A | 9975 |
| 90 | 6958E | 112A | 9975H |
| 90 | 6958W | 123C | 0174W |
| 90 | 6858 | 123C | 0174WH |
| 90 | 7058 | 123C | 0174E |
| 88A | 7056 | 123C | 0174EH |
| N17 | 7358 | 123C | 0174 |
| 92A | 7357 | 123A | 0274S |
| 92D | 7456 | 124 | 0274N |
| 92B | 7359 | 127H | 0577 |
| N18 | 7860 | 131B | 2778 |
| N18 | 7959 | 131A | 2879 |
| N19 | 7761 | 129E | 2378 |
| 105D | 7960 | 130A | 2679 |
| 98A | 7959 | 130B | 2579 |
| 104 | 8060 | | |
| 103 | 7961 | | |
| 103 | 7961H | | |
| 105A | 8062W | | |
| ZZ | 8062E | | |
| 105 | 8062S | | |
| 102 | 7962 | | |
| 100 | 7862W | | |
| 100 | 7862EH | | |
| 99 | 7762 | | |
| 106 | 7964 | | |
| 107A | 8164 | | |
| 109B | 8264 | | |
| 108A | 8265 | | |
| 108A | 8265H | | |
| 108 | 8166 | | |
| 109 | 8367 | | |
| 109A | 8466 | | |
| 111 | 8668 | | |
| 112 | 8868 | | |
| 113 | 8869H | | |

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