CLH 207
birds

K(1997a)

The New York City Audubon Society Harbor Ecosystem Study:

Nesting Population of Aquatic Birds of the New York Harbor, 1997

---

24 July, 1997

Prepared by:

Paul Kerlinger, Ph.D.
31 Jane Street, 14D
New York, NY 10014
(212) 691-4910, fax 989-3323
e-mail: pkerlinger@aol.com

ORIGINAL

Prepared for:

New York City Audubon Society
Peter Rhoades Mott, President
Marcia Fowle, Executive Director
71 West 23rd Street, Suite 606
New York, NY 10010
(212) 691-7483, fax 924-3870

Newark Bay Study Area
NBSA-00013

The New York/New Jersey Harbor supports one of the largest populations of nesting waterbirds in the eastern United States (Anon. 1990). As of 1995, more than 4,000 pairs of long-legged wading birds (herons, egrets, and ibis), seabirds (gulls and cormorants), and waterfowl (swans, ducks, and geese) nested on five uninhabited, and mostly protected islands: Shooters, Prall's, and Isle of Meadows in the lower New York Harbor and North and South Brother islands in the upper East River. Nesting populations of these birds have now been monitored for twelve consecutive years in an effort to establish baseline ecological information that can be used for determining long-term population status and trends among the various species involved. This is particularly important in light of recent petrochemical spills into New York City waterways, plans for dredging in the area, the establishment of a semi-permanent encampment on Shooters Island, and the imminent closing of the Fresh Kills landfill.

This report documents the findings of a population study of birds nesting on the five islands in New York/New Jersey Harbor during late May and early June 1997. In addition, notes on the establishment of colonies on two other islands are included. The results presented herein should be considered in context with population studies conducted by Dr. Katharine Parsons (Parsons 1986, Parsons and Wright 1995), who had served as principle investigator on the project since 1986. These studies have been a collaborative effort among New York City Audubon Society, Manomet Observatory, and City of New York Parks & Recreation. The 1997 monitoring season marks the second year in which NYCAS has directed the actual field monitoring using a New York City biologist and local, member volunteers. The use of volunteers is extremely important because it serves not only as an educational experience for members, but it also develops a cadre of New York City residents who have proprietary interest and first-hand knowledge of this rare, fragile, and valuable resource. These volunteers, through NYCAS, will become a voice for the harbor ecosystem.

Methods

The field and analytical protocols for this study follow Parsons (1986), Parsons and Wright (1995), and Kerlinger (1996a). The methods used by Kerlinger (1996a) were virtually identical with those used by Parsons and her cooperators, except for the fact that a rotating group of volunteers helped collect the field data. The harbor herons study was conducted on 6 days between 19 May and 1 June 1997. Nests were found via exhaustive searches on the islands by teams consisting of up to 5 people. After finding a nest, the contents were checked with the aid of a mirror on a pole, recording species and number of eggs and, or young. Nests were determined to be active if they contained eggs or nestlings, or if guano, fresh nest materials, or adults were present. Nests of seabirds and waterfowl were identified to species by egg size and presence of adults and, or young. Heron, egret, and ibis nests were identified to species via nest structure, egg size, shape, and color, and attendance of adults and, or young. Nests greater than 7m were recorded, but presence of eggs and, or young were only recorded for nests in which young were large enough to be seen. In a few locations where nest densities were extremely high,

a small number of nests was not checked for eggs or young. The reason for this was to reduce disturbance to large numbers of adults and young as the large number of nests would have required inordinate amounts of time to check. Field work was conducted by teams of between 2 and 5 persons consisting of the chief biologist (PK), a field biologist (Scott Barnes), and volunteers from the New York City Audubon Society. To minimize disturbance to breeding birds, the colonies were surveyed on only one occasion and as quickly as possible. On one day a survey was discontinued at noon or shortly thereafter so as not to heat stress young or eggs. On a few occasions during these very hot conditions, nests were simply counted and nest contents were not checked. This was done to minimize danger to young and eggs. The weather prior to the 1997 spring was cool, although nesting seems to have commenced at the same time as in previous years and hatching dates were not delayed.

Results of Surveys: Abundance of Nesting Birds

A total of 3,058 pairs of long-legged waders, cormorants, gulls, and waterfowl nested on the five islands during the 1997 breeding season (Table 1). Long-legged waders, including egrets, herons, and ibis were more numerous than the gulls, cormorants and waterfowl combined and made up 55.5% of all nesting pairs. Black-crowned Night-herons were the most numerous nesting species, followed by Double-crested Cormorant and Herring Gulls. Night-herons accounted for about one-quarter of all nesting birds (31.5%). Double-crested Cormorants accounted for one-quarter (25.2%) of all nesting birds, as did the two species of gulls (23.1%). The remaining one-quarter was unevenly divided among 7 species of long-legged waders and 5 species of waterfowl Snowy and Great egrets accounted for 14.0% of all nesting individuals, while Glossy Ibis accounted for 7.7%. Waterfowl accounted only 1.1% of all nesting pairs in this study. Species and island specific summaries follow.

Isle of Meadows and Shooters Island hosted eight species of nesting waders These two islands hosted the greatest diversity of nesting waders. Isle of Meadows clearly hosted the greatest number of nesting waders, while South Brother Island hosted the largest number of nesting Double-crested Cormorants. Pralls Island hosted the least diverse species of aquatic birds and had the lowest number of breeding pairs.

As compared with 1996 the total count of herons and egrets was down only 3.3%, although overall long-legged waders are down about 17.3% since 1995.

Species Accounts:

Black-crowned Night-Heron. Although the species increased in numbers since 1996, the number of nests counted in 1997 was only 84% of the number reported for 1995. The species experienced its large increase in 1997 over 1996 and 1995 on Isle of Meadows, although counts were off at South Brother, and Shooters Islands. At the latter there has been a 34.8% decline

since 1995.

Yellow-crowned Night-Heron. An overall decrease of about one-third (35.7%) was evident between 1995 and 1997, with nests being found only on Prall's Island in 1997. In 1995 and 1996 this species nested on Shooters, Prall's, and North Brother islands, albeit in small numbers. The absence of adults and nests on Shooter's Island in 1997, where more than a dozen adults and about 5 nests were found in 1996, may be explained by the presence of an encampment in the location where the birds nested. The encampment is described in the Discussion section below.

Great Egret. This species is the only species to increase in numbers since 1995, with an increase of nearly 68% since 1995; from 139 nests in 1995 to 228 nests in 1997. Increases were most evident on South Brother and Meadows. On the latter island the number jumped from 43 nesting pairs in 1995 to 109 in 1997. The increase on Shooters Island was more modest. Interestingly, no Great Egrets were found nesting on Prall's Island where they nested several years ago, or on North Brother where one nest was found in the two previous years Overall, more adults seemed to be present in the harbor in 1997 than in previous years.

Snowy Egret. An overall decline of one-third (33.4%) has occurred in the number of nests found for this species since 1995. Shooters Island experienced a decline of 25% (36 down to 27 nests) Overall, there seemed to be fewer adults on the various islands. Declines of 28 4% and 42.4% were noted on Meadows and South Brother, respectively, since 1995.

Little Blue Heron. Virtually no change in this species was noted, although the number of nests increased from 2 to 3 in the period 1995 to 1997. The presence of a nest with young on South Brother Island seems to be new.

Tricolored Heron. No Tricolored Herons were observed during the 1997 field season, whereas the species probably nested on Shooters Island in 1996.

Green Heron. A net decline of 4 nests, from 10 to 6, shows a slight decline in this species. Much of the decline is a result of the decline on Shooters Island.

Cattle Egret. A decline of 40 to 24 nests was noted from 1995 to 1997, which merits observation in the future. The declines were on both South Brother and Isle of Meadows.

Glossy Ibis. No change was evident between 1996 and 1997 nest counts, although the 1997 count is 12.9% below the 1995 count. The count on Shooters was 25% below the 1995 count, but the count on Meadows was only slightly down from 1995.

Double-crested Cormorant. Since 1995 this species has experienced a decline of 20.9%, although the counts in 1996 and 1997 were virtually the same. About 20 fewer nests were found on the wreckage at Shooters Island this year as opposed to 1996, although the numbers on South Brother Island were the same in these years. The major change has been the reduction in numbers

of this species on South Brother where the count plummeted from 855 to 772 between 1995 and 1997. However, a new colony was located on Belmont Island in the East River not far from the United Nations, downstream from Roosevelt Island. Birds have nested on the structures on that island.

Herring Gull. The largest decline for any species has occurred among Herring Gulls which plummeted from slightly fewer than 1,000 nests in 1995 to 517 nests in 1997, a decline of 47.8% All islands have experienced declines with the largest being that found for North Brother (>50%), although large declines on Shooters Island (44.9%) and Meadows (30.5%) are also significant. No gulls were breeding on Prall's during 1997.

Great Black-backed Gull. Black-backed Gulls also declined on several of the islands, but the declines were much less than noted for Herring Gulls. This means that the relative proportion of gulls nesting on the harbor islands has changed such that the percentage of Black-backed Gulls has increased Absolute decreases were noted Shooters, North Brother, and Meadows (where no Black-backed Gulls nested in 1997), although the number increased on South Brother. More than a dozen individuals of this species were observed on Mill Rock, an island that would be ideal for nesting. Several appeared to be incubating or brooding young.

Mute Swan. No Mute Swans were observed nesting on the islands. The pair that nested on South Brother in 1996 was not persent in 1997.

Canada Goose. This prolific species has experienced a small, perhaps insignificant decline.

Mallard. This, almost domestic, waterfowl experienced no changes in population.

American Black Duck. A few more Black Duck nests were found in 1997 than in 1995.

Gadwall. More Gadwall nests were found in 1997 than in previous years. A total of three Gadwall nests were found on Meadows and individual nests were found on Shooters and Prall's.

Shooters Island

Only 611 nests were located on this island this year: 272 (44.5%) were long-legged waders, 323 (52 9%) were gulls and Double-crested Cormorants, and 16 were waterfowl. This is a major decline from 1995 and 1996, although for the long-legged waders the number of nests present is still higher than in many of the years since this project's inception. This trend represents a 32.0% decline in waders and a 45/4% decline in gulls. The number of Double-crested Cormorants nesting on the derelict structures at the western end of this island was down 26 nests from 1995, or about 21.5%. Both Black-crowned Night-herons and Herring Gulls experienced declines on Shooters Island, as compared to the 1995 data set (Parsons and Wright 1995). There were also declines of these species since 1996, which is alarming. Black-crowned Night-herons

declined by 34.8% since 1995. Glossy Ibis experienced a 75% decline and Snowy Egrets experienced a 25% decline since 1995. Interestingly, Great Egrets increased on Shooters from 62 to 66 nests in the past two years. No adult Yellow-crowned Night-Herons were seen on the island and no nests were found in the area they occupied in 1996.

The decline in breeding waders, and perhaps gulls, is probably related to the presence of humans on the islands during the breeding season. An encampment was found on the section of the island closest to Staten Island. It consisted of an area cleared of understory vegetation and having rudimentary furniture, ropes from trees to hang a tarp, dozens of empty beer cans stacked neatly, and a full, sealed bottle of Rose. The encampment appears to have been established by young males. A trail was obvious from the gravel beach near the tug boat/shipworks area to the encampment. The area of the encampment had been recently occupied and it was near the area where the Yellow-crowned Night-Herons roosted and nested in 1996. Carl Alderson of New York City Parks and Recreation was informed of the situation.

The explanation of the gull decline may be different because most of the gulls nest on the northeastern end of the island, well away from the encampment and human activity. It is not evident what is responsible for this decline.

Pralls Island

Of the five (plus several new locations) islands included in the New York City Harbor Herons Project, Prall's Island has, for the past few years, the least number of nesting waders and gulls. Only 16 nests were located on the island in 1997, down from 47 in 1996 and 41 in 1995. Not one gull nest was found in 1997. Many other nests, presumably belonging mostly to Black-crowned Night-herons were empty. A group of Yellow-crowned Night-herons were found in about the center of the island near the west shore, the same area these birds nested in 1996. Nine nests, presumed to be Yellow-crowns were found in this area. Only seven other nests, presumed to be Black-crowns were found on the island, all at the downstream end of the island. It seems that Yellow-crowns outnumbered Black-crowns on this islands. Because of the decline of herons and egrets nesting on this island during the past five or more years, this island was chosen for a NYCAS habitat restoration project, which was implemented in spring of 1997. In addition to fewer herons and gulls, there were also far fewer waterfowl nesting on the island.

It should be noted that during the spring habitat restoration work muskrats and skunks were seen on the island. Mike Feller, NYC Parks and Recreation informed this author that skunks might be a recent colonization on the island.

Isle of Meadows

The Isle of Meadows hosts more than twice as many heron, ibis, and egret nests than any

island in the New York harbor. An increase of 53 nests was found in 1997 (861) over the 1996 total (808), with Black-crowned Night-herons predominating, followed by Glossy Ibis and Great Egret. More Glossy Ibis nested here than on all the other islands combined (97.8% of all ibis in the NY harbor). A slight increase in ibis nests was noted on this island over the 1996 survey, but still 13 less than found in 1995. Black-crowned Night-herons have increased slightly (5.2%) since 1995. Snowy Egrets decline from 148 in 1995 to 106 in 1997 (28.3%). Herring Gulls experienced a major decline after the minor decline observed in 1996. In two years the number of nests of this species has dropped from just under 200 to 137 (30.5%) and Great Black-backed Gulls were absent on Meadows, whereas in 1995 there were 2 nests present. No adults of this species were seen circling over the colony as observers searched for nests. Not one clutch of gull eggs were found on the western strip of the island along the salt marsh and fence, where in previous years some were present. Storms and high tides may have disrupted nesting in this area. Of interest are the three Gadwall nests found on Meadows. The roost of about 50-75+ crows was still present in an aspen grove at the southwest end of the island and some were seen in both gull and wader colonies

The productivity of both gulls and waders on this island seemed to be greater than on Shooter's Island as was evident from the number of nests with eggs and young. On Shooter's Island there were many nests without eggs or young.

South Brother Island

More than 1,100 nests were found on this island. The majority (677, 61.1%) were Double-crested Cormorant nests. Although cormorants are the most numerous of nesting birds, their population was down from 855 nests in 1995, but virtually the same as in 1996. Black-crowned Night-herons were also down from 1995, but the decline was only about 10.8%. No change occurred between 1996 and 1997. At least one adult Glossy Ibis was seen in the middle of the colony and a nest was found; in 1995 there were 4 nests present. Although a decline in Snowy Egret nests was noted, 118 in 1995 to 68 in 1997 (42.3%), Great Egrets increased in number (30 to 53 nests). Cattle Egrets have also declined. Rats continue to be present on the island.

North Brother Island

N. Brother Island had the lowest diversity of nesting waders of the five major islands in this study. Black-crowned Night-herons increased from 1996 counts (171 to 209), but are still below the 274 nests found in 1995. Both Herring (34%) and Black-backed (47%) gulls also declined. No Snowy Egret, Great Egret, or Yellow-crowned Night-heron nests were found on the island, whereas in 1996 one nest of each of these species was present. Gulls were down in numbers from previous years Only 104 nests or clutches were found in 1997 as opposed to 194 in 1996 and 302 in 1995.

Rikers Island

A survey of Canada Geese and gulls nesting on Riker's Island was not conducted during 1997. Though it would be interesting to know the status of the Canada Goose and gull populations of this restricted island, time did not allow a survey. The 1996 survey was done at the request of a biologist with the Port Authority of New York and New Jersey, but no request was made for 1997 information about the Riker's Island population.

Other East River Islands

In two trips up and down the East River in May and the first week of July, small numbers of adult Great Black-backed Gulls were seen roosting/loafing on several of the smaller islands. The behavior of a few of these individuals suggested that they might be sitting on nests or nests with eggs. About a dozen or more adult Great Black-backed Gulls were observed sitting on what appeared to be nests on a small island called Mill Rock just upstream from Roosevelt Island and downstream from Ward's Island. The island is very small and certainly is undisturbed by humans. What is more interesting was the presence of at least 6-8 new Double-crested Cormorant nests on Belmont Island, downstream from Roosevelt Island and not far from the United Nations building. The nests were situated on a pipelike structure, with cormorants actively incubating eggs and, or young. This island is also unoccupied by humans, although the navigational aids and pipelike structures suggest that humans occasionally land on the island. The presence of birds nesting on these small islands is not surprising as the populations of both these species has undergone an expansion in the past decade and these islands are easy to colonize.

Incidental Sightings

While conducting the heron and gull surveys, notes of dead gulls (Table 2) as well as migrants and unusual or rare birds were made (Table 3).

It came as no surprise that some of the islands host large numbers of migrating songbirds. During the visits of 19-20 May 1997, to Shooters and Prall's islands, and Isle of Meadows, hundreds of individuals of 15 species of warblers and 10 other species of songbirds were observed. All were Neotropical migrants, a group of birds many of whom are now considered to be in decline. Shooter's Island hosted the largest number of migrant species (16 species, 9 warbler species). Most birds were seen foraging. This variety of species and numbers of individuals confirms and reiterates the findings and conclusions of 1996, which indicated that these islands provide valuable stopover habitat for thousands of migrating songbirds during spring. It also mirrors the findings of a study by Kerlinger (1996b). It should be noted that these dates are late in the migratory period and it is likely that even larger numbers of species and individuals use the islands during the peak of migration that occurs one to three weeks earlier in the season.

Discussion

The decline of some species of nesting herons, egrets, ibis, cormorants, and gulls on the New York/New Jersey harbor islands observed between 1995 and 1996 (Kerlinger 1996a) continued only for a few species in 1997. More Black-crowned Night-herons and Great Egrets were found in 1997 than in 1996, although the numbers of the former species is still slightly below the large numbers found in 1995. Great Egrets have actually increased since 1995. The declines of Glossy Ibis, Cattle Egret, and Green Heron are real, but not yet critical.

Is the decline of some species cause for alarm? Natural population changes occur often and changes of many species on the order of 10-15% per year are not unusual, unless the change continues for several years. Also, the numbers of herons and egrets, and other species is much larger than it was decades ago. The decline in Snowy Egrets and Yellow-crowned Night-herons is alarming, although the population of the former is still substantial. Continued population surveys will determine if the declines are ongoing or only temporary

Although the numbers of Yellow-crowned Night-herons found nesting on the islands decreased between 1995 and 1997, it should be noted that these birds do, occasionally, change nesting areas from year to year. Factors contributing to such changes include changes in habitat suitability, past reproductive success, and disturbance. In addition, in some cases, researchers have not determined why such changes occur. In the case of the Yellow-crowns nesting on Shooter's Island, disturbance from the establishment of an encampment by young adults may explain why these birds did not nest in 1997. This disturbance may be responsible for declines of other species on Shooters Island. However, Carl Alderson and Scottie Jenkins have found at least two nests on the GATX facility on Staten Island, not far from the Con Edison plant. Such documentation, the first on mainland Staten Island, is encouraging because it demonstrates that these birds can nest successfully in other areas. With the availability of places like the one they discovered, it is possible that other nests are yet to be discovered.

The virtual abandonment of Prall's Island by the herons and egrets, as well as gulls, is cause for inquiry. The gradual exodus of these birds over several years seems to indicate causality that is ongoing. A similar abandonment of a large nesting site was observed in Stone Harbor, New Jersey, although at this site hundreds of birds abandoned the site in one year. Although habitat seems to be suitable on Prall's, there may be a lack of suitable nesting trees. This is speculation based on observations of many 15-25 foot tall gray birches falling to the ground. Because this tree is the favored tree among most night-herons, Snowy Egrets, and Glossy Ibis, these species may not find Prall's as suitable as it was 5-10 years ago. Many of these individuals seemed to have moved to Isle of Meadows, which 10 years ago was not as well occupied as today. The increase in numbers on Isle of Meadows over the past decade may be a result of succession of vegetation to a stage where many of the trees are now suitable for nesting. Many night-herons and egrets prefer intermediate sized gray birches that are now proliferating on Isle of Meadows.

A disappointment for 1997 was the absence of Tricolored Herons on Shooters Island, after they probably nested in 1996. The 1996 nest was the first recorded since the harbor herons project began. No adults were seen during the entire spring season. However, this species seems to be increasing its range northward and more dispersing individuals can be expected to take up residence on the islands in the future.

The enormous decline of gulls is of interest, mostly from a scientific and management perspective. It is not a conservation problem because neither Herring Gull or Great Black-backed Gull populations are experiencing difficulties in the United States or Canada. However, such large and continuing declines on the islands indicates something is operating on these species to reduce their nesting success. On Prall's and Meadows, and perhaps on North Brother, trees and shrubs are encroaching on the open areas where gulls have nested for many years. This could explain declines on these islands, although this process does not explain why numbers on South Brother and Shooters islands are declining. Perhaps this species has reached its maximum population size and gull carrying capacity has been met?

Volunteers

The use of volunteers in the 1996 field season demonstrated that there were numerous NYCAS members who were available and anxious to contribute one or more days to the project and that these volunteers can be very helpful in surveying the harbor herons population. The 1997 field season confirmed what was found in 1996. Volunteers performed admirably and their use was a success story. Fifteen volunteers, twice the number used in 1996, participated in the field on 6 days during the 1997 spring season. The response among volunteers was so great that some had to be told that the positions were already filled. This was the case with more than fifteen people who wished to volunteer. Those turned away in 1997 should be called first in 1998.

Management Recommendations

The long term success of the herons that nest on the islands will be determined by the availability of safe and suitable nesting sites on the islands, as well as an abundance of clean and productive places to forage. The latter cannot be controlled or managed with ease because the feeding area of the harbor herons encompasses more than two hundred square miles. However, the habitat on the islands can be managed to promote long-term availability of quality nesting habitat

Currently, much of the habitat on particular islands is marginal as wildlife habitat. Herons, egrets, and ibis nest on only a small portions of the islands because nesting trees and tall shrubs are limited to a small proportion of some islands. This includes Isle of Meadows and Prall's Islands in the Arthur Kill. In other places there are trees and shrubs, but the species and size are not suitable as nesting habitat. This is true for North Brother Island where Norway Maple is the

dominant tree. On this island Norway Maples make more than 50% of the island unsuitable for most wildlife. If suitable habitat were created in those areas that are now not used by nesting species, the population stability of these long-legged wading birds would be promoted and it is possible that populations would grow. The creation of additional and better habitat is even more important considering the fact that historically, herons, egrets, and ibis nesting colonies move from time to time as seems to be occurring in the Arthur Kill. In some years wholesale movement of individuals from one colony to another is evident. The following habitat management and research recommendations, if implemented will provide additional as well as alternate nesting habitat and information that will help manage the habitats more soundly.

Recommendation 1. Identify areas on the islands where herons and egrets are not nesting and evaluate the habitat in those places for plantings of native trees and shrubs. These areas are primarily grassy fields (far too small for grassland breeding species) or sparsely vegetated brushlands, which, in some cases, are slowly succeeding to forest. In some areas native trees and large shrubs could be planted in groves that simulate the size, structure, and species composition of those groves in which herons and egrets nest. This recommendation is especially recommended for Prall's Island and Isle of Meadows. The rationale for this action is to create new groves of nesting trees for the herons, egrets, and ibis. Such action will also benefit other wildlife, including plants, insects, and other species of birds. In particular, the establishment of forests and brushland would benefit many nesting songbirds and migrating songbirds that stopover on some islands in large numbers.

The test plantings undertaken on Prall's Island in 1997 by NYCAS should provide some insight as to the feasibility of several species of trees as well as the difficulties associated with establishing those plantings. The plantings on Prall's should serve as a first learning experience, from which broader management can be achieved.

Recommendation 2. Within and around existing heron nest sites, eliminate selected *Ailanthus* and Norway maple trees, species that are of little use to wildlife and compete with native vegetation. Removal of Ailanthus trees in several places on Isle of Meadows would open the canopy thereby stimulating growth of more desirable tree species. After removal of "pest" trees, native trees and shrubs known to be used by nesting wading birds would be planted. The species to be used would be based on previous research, although the two species of trees that are most often used by nesting wading birds are gray birch and black cherry. These plantings should be done in groves that simulate the size, structure, and species composition of those groves in which herons and egrets now nest successfully.

Two specific projects that can be undertaken involving removal of Ailanthus and Norway maple could be implemented on Shooters Island and North Brother Island. On the former, specific Ailanthus and Norway maples could be removed from the heart of the nesting areas of the egrets and herons. Removal of only a dozen trees might make a difference. On North Brother Island Norway maples could be removed from the southwest corner of the island adjacent to where the largest number of Black-crowned Night-Herons nest. This would be between the dock

and the houses at the south end of the island, and inland from the chain-link fence. The transition zone between the apple trees and the maples could be extended toward the center of the island.

Recommendation 3. Because new nesting colonies were found on Belmont Island and, probably, Mill Rock, these colonies should be included in future NYCAS population surveys of seabirds and wading birds in the New York/New Jersey harbor. Though these islands are small, Belmont is ideal for nesting cormorants (Belmont) because of existing structures for nesting. Mill Rock is suitable for gulls because it lacks trees, shrubs and human presence.. Monitoring of these islands should be done from a boat because landing on the islands would be problematic and it would greatly disturb nesting birds.

Recommendation 4. The large number of Double-crested Cormorants that nest on South Brother Island is a relatively new situation. Interestingly, these birds have declined in numbers during the past two years. The decline may be a result of changes in vegetation on the island; specifically the increased number of dead and dying trees and trees that have fallen to the ground. Feces from the 2,000 plus cormorants, as well as 338 nesting pairs of long-legged waders add up to a staggering quantity. Trees and ground beneath the nest trees are covered with whitewash and new vegetation under the trees is nonexistent. In fact, in some areas shrubs have died beneath nest trees. Cormorant colonies frequently kill the trees in their colonies as feces make the soil and water unsuitable for the trees and shrubs that occur there. The decline of nest trees may make for fewer nesting opportunities for the cormorants and egrets, although the cormorants will nest on the ground.

It is recommended that a vegetation study be initiated to monitor changes in vegetation wrought by cormorant feces. Such changes will undoubtedly lead to abandonment of sections of the island by herons and egrets. The fate of the island as a nesting colony for egrets and herons depends, in large part, on the health of the shrubs and trees.

The above recommendations will have other positive effects on wildlife use of the islands. Because the islands are within the Atlantic migration corridor, where millions upon millions of songbirds, hawks, and owls migrate, habitat improvement would offer these birds safe havens. Research conducted along the Arthur Kill (Kane et al. 1991), Raritan Bay (Kane and Kerlinger 1993), on Staten Island (Kerlinger 1995, Aquila personal comm.), and observations made during the course of this study have demonstrated the importance of remnant forests in the region to migrating songbirds. In addition, the fabulous birding in New York City parks demonstrates that enormous numbers of bird species migrate through the area. With better habitat, the harbor islands could provide the critical stopover areas needed by tired and hungry migrants. They represent sanctuary in a sea of urban and industrial development. Their presence is completely compatible with the harbor herons.

Acknowledgements

Funding for The New York City Audubon Society's Harbor Herons program for 1997 came from a generous grants from the Hudson River Improvement Fund, the Staten Island Borough President Guy Molinari's Office, the National Fish and Wildlife Foundation, Tosco Corporation, Staten Island Savings Bank, and generous member contributions. Scott Barnes provided expertise as field biologist/technician. Without the field support of the following volunteers this project would not have been possible: Joseph Borker, Thomas Brown, Dr. Albert Burchsted, Jim Cleary, Charles Cooper, Michelle Deremer, John Muffler, Sue Ormsby, Minglee Prospero, Oscar Ruiz, Christopher Smith, Peary Stafford, Dr. Mark Stoekle, Leslie Taylor, and Dr. Richard Veit. Mike Feller, New York City Parks and Recreation, provided technical and logistical support for our efforts.. We also thank the staff of the Elizabeth City Marina (Barbara, Mark, Juan, and Henry) for their help with the Audubon boat. Finally, we acknowledge Dr. Katharine Parsons of Manomet Observatory whose technical support, knowledge, tireless effort, and enthusiasm during the previous decade has made this project so successful.

Literature Cited

Anon. 1990 The harbor herons report. A strategy for preserving a unique urban wildlife habitat and wetland resource in northwestern Staten Island. Trust for Public Land and New York City Audubon Society.

Kane, R., P. Kerlinger, and R. Radis. 1991. Birds of the Arthur Kill Tributaries. Rec. of NJ Birds 17:22-33.

Kane, R., and P. Kerlinger. 1994. Raritan Bay wildlife habitat report, with recommendations for conservation. New Jersey Audubon Society, Franklin Lakes, NJ, pp. 24.

Kerlinger, P. 1995. Biological survey of two sites adjacent to Conference House Park, Staten Island, New York (spring and autumn migration). Unpublished Report to the Conference House Park-Raritan Bay Conservancy..

Kerlinger, P. 1996a. The New York City Audubon Society Harbor Ecosystem Study: Nesting Population of Aquatic Birds of the New York Harbor, 1996. New York City Audubon Society, New York, NY .

Kerlinger, P. 1996b. The New York City Audubon Society Harbor Ecosystem Study: Autumn migration on three islands in the New York/New Jersey harbor. New York City Audubon Society, New York, NY .

Parsons, K. C., and B. E. Wright. 1995. Aquatic birds of New York Harbor: 1995 management

report. Unpublished report to the New York City Audubon Society.

Parsons, K.C. 1996. The harbor herons project 1986 interpretive report. Unpublished report to the New York City Audubon Society and Manomet Bird Observatory, Manomet, MA.

Table 1. Numbers of long-legged waders, seabirds, and waterfowl nesting in New York Harbor in 1997. Data represent the number of nesting pairs based on nest and adult counts taken during late May 1997. Not included are counts from Belmont Island and other islands.

	East River		Kill van Kull/Arthur Kill			
Species	N. Brother Island	S. Brother Island	Shooter's Isl.	Prall's Isl.	Isle of Meadows	Total
Wading Birds						
Black-crowned Night-Heron	209	223	159	7	385	963
Yellow-crowned Night-Heron	0	0	0	9	0	9
Great Egret	0	53	66	0	109	228
Snowy Egret	0	68	27	0	106	201
Little Blue Heron	0	1	0	0	2	3
Tricolored Heron	0	0	0	0	+	0
Green Heron	0	1	1	0	4	6
Cattle Egret	0	9	0	0	15	24
Glossy Ibis	0	1+	4	0	231	236
Unidentified wader nests	0	2	15	0	9	26
Total	**209**	**338**	**272**	**16**	**861**	**1,696**
Seabirds						
Double-crested Cormorant	0	677	95	0	0	772
Herring Gull	90	64	226	0	137	517
Great Black-backed Gull	14	21	2	0	0	37
Total	**104**	**762**	**323**	**0**	**137**	**1,326**
Waterfowl						
Mute Swan	0	0	0	0	0	0
Canada Goose	5	8	9	0	0	22
Mallard	0	0	3	1	2	6
Am. Black Duck	0	0	3	0	0	3
Gadwall	0	0	1	1	3	5
Total	**5**	**8**	**16**	**2**	**5**	**36**
Total	**318**	**1,108**	**611**	**18**	**1003**	**3,058**

Table 2. Summary of dead gulls found on the islands

	N. Brother Island	S. Brother Island	Shooters Island	Prall's Island	Isle of Meadows	Total
Herring Gull	3	5	3	?	4	**15**
Great Black-backed Gull	1	2	1	?	3	**7**
Total	**4**	**7**	**4**	**?**	**7**	**22**

Table 3. Incidental sightings of migrants and interesting birds during 1996 surveys of five islands

Shooter's Island - 19 May 1997

Songbird Migrants- 16 species of warblers and other Neotropical migrants

Wilson's Warbler
Black-throated Green Warbler - 2
Yellow Warbler - 5
Northern Waterthrush
Chestnut-sided Warbler
Magnolia Warbler
Baypoll sp. (Blackpoll/Baybreasted Warbler type - unidentified to species)
Northern Parula - 2
American Redstart - 6+
Common Yellowthroat
Swainson's Thrush
Wood Thrush
Baltimore Oriole
Warbling Vireo
Red-eyed Vireo
White-eyed Vireo
Great Crested Flycatcher
(Warblers numbered more than 100 indrviduals)

Prall's Island - 20 May 1997

Blackpoll - 7
Yellow Warbler - ##
Common Yellowthroat - ##
Yellow-rumped Warber - 6+
Chestnut-sided Warbler
Black-throated Blue Warbler
Blackburnian Warbler - 2
Magnolia Warbler - 4+
American Redstart - 2+
Nashville Warbler
Canada Warbler
(Warblers probably numbered more than 100 individuals)

Isle of Meadows - 20 May 1997

Songbird Migrants - Most are Neotropical migrants

Yellow Warbler
Northern Waterthrush
American Redstart
Rose-breasted Grosbeak
Orchard Oriole

Table 1. Abundance of aquatic birds nesting in New York Harbor, 1995. Data are presented as number of adult pairs based on nest and adult counts from late May, 1995.

	East River		Kill van Kull / Arthur Kill			
Species	N. Brother Isl.	S. Brother Isl.	Shooter's Isl.	Prall's Isl.	Isle of Meadows	Total
Wading Birds						
Black-crowned Night-Heron	274	250	244	13	366	1147
Yellow-crowned Night-Heron	0	0	4	6	4	14
Great Egret	1	30	62	0	43	136
Snowy Egret	0	118	36	0	148	302
Little Blue Heron	0	0	0	0	2	2
Green-backed Heron	0	0	8	1	1	10
Cattle Egret	0	15	1	0	24	40
Glossy Ibis	0	4	16	7	244	271
Unidentified wader nests	2	20	29	2	76	129
Total	277	437	400	29	908	2051
Seabirds						
Double-crested Cormorant	0	855	121	0	0	976
Herring Gull	259	115	410	12	197	993
Great Black-backed Gull	43	16	8	0	2	69
Total	302	986	539	12	199	2038
Waterfowl						
Mute Swan	0	1	0	0	0	1
Canada Goose	7	13	3	1	0	24
Mallard	0	0	5	2	0	7
Gadwall	0	0	0	1	0	1
Total	7	14	8	4	0	33
Total	586	1437	947	45	1107	4122

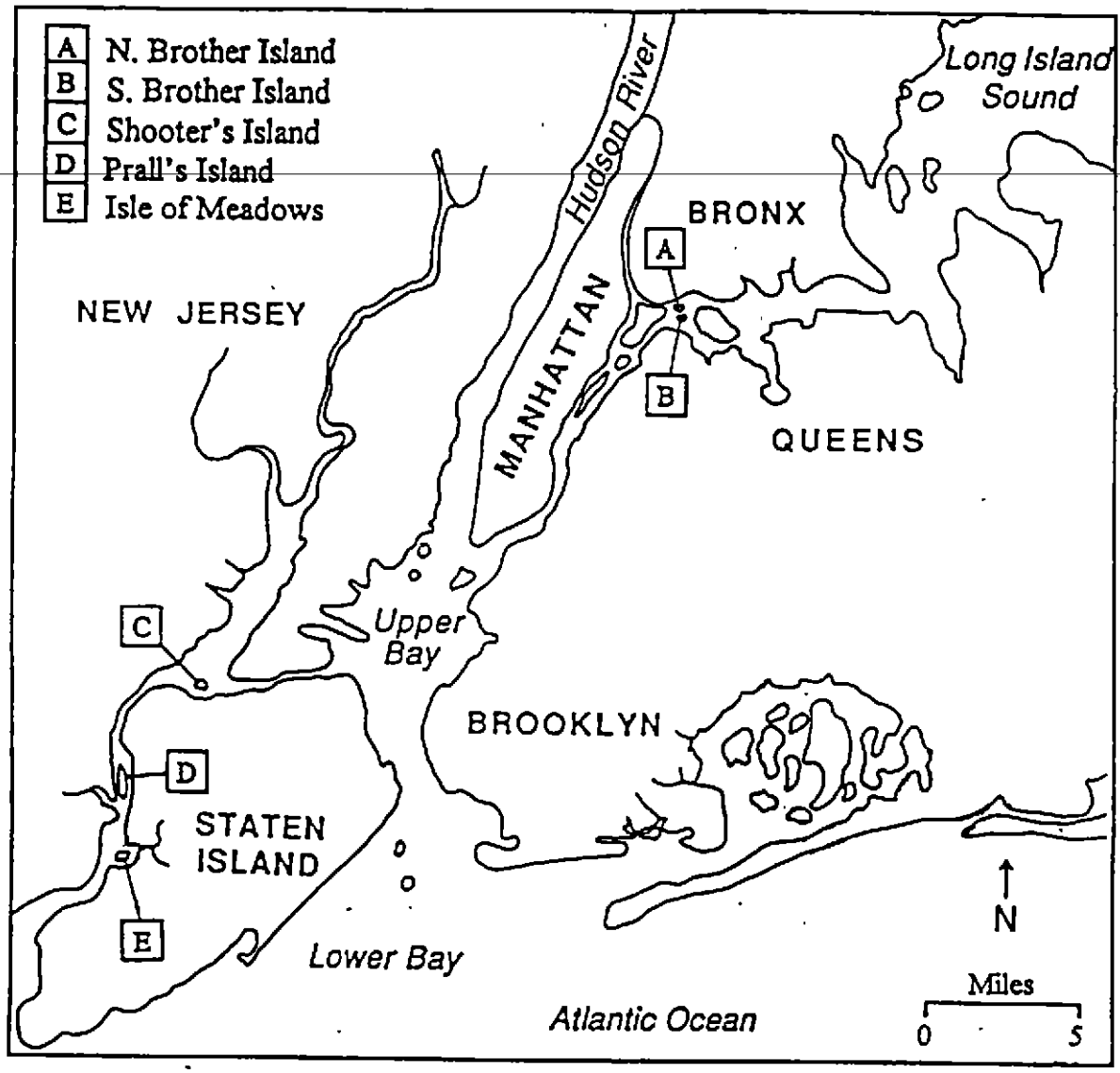


Figure 1. The New York Harbor estuary, showing the five-colony sites surveyed for nesting aquatic birds during late May, 1995.

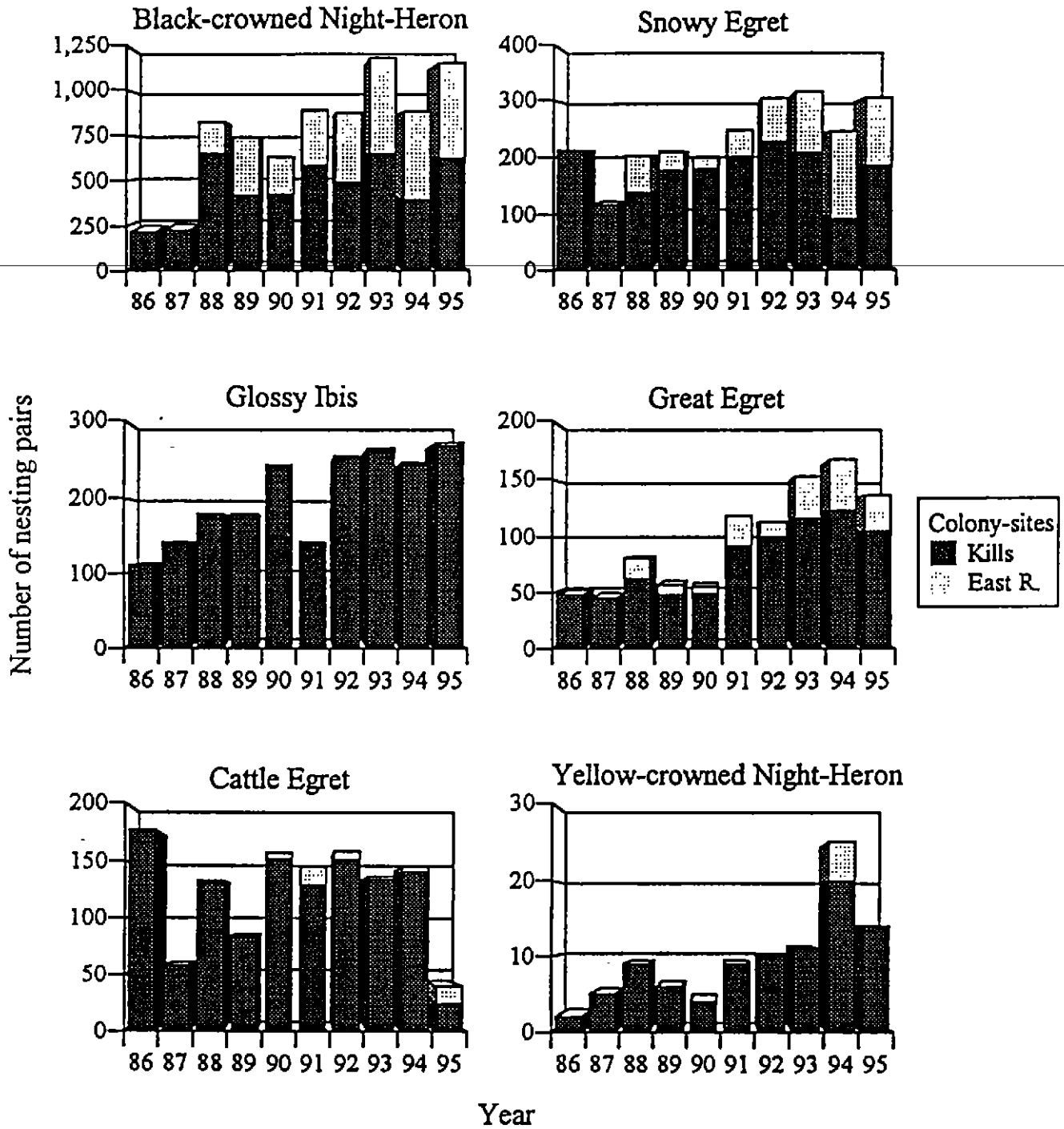


Figure 5. Abundance of selected wading birds nesting at colony-sites along Kill van Kull and Arthur Kill (Shooter's Island, Prall's Island, and Isle of Meadows), and the East River (North and South Brother Islands), New York Harbor, 1986-1995. Data in 1986 and 1987 from Shooter's and Prall's Islands only. (Note differing scales on Y axis.)

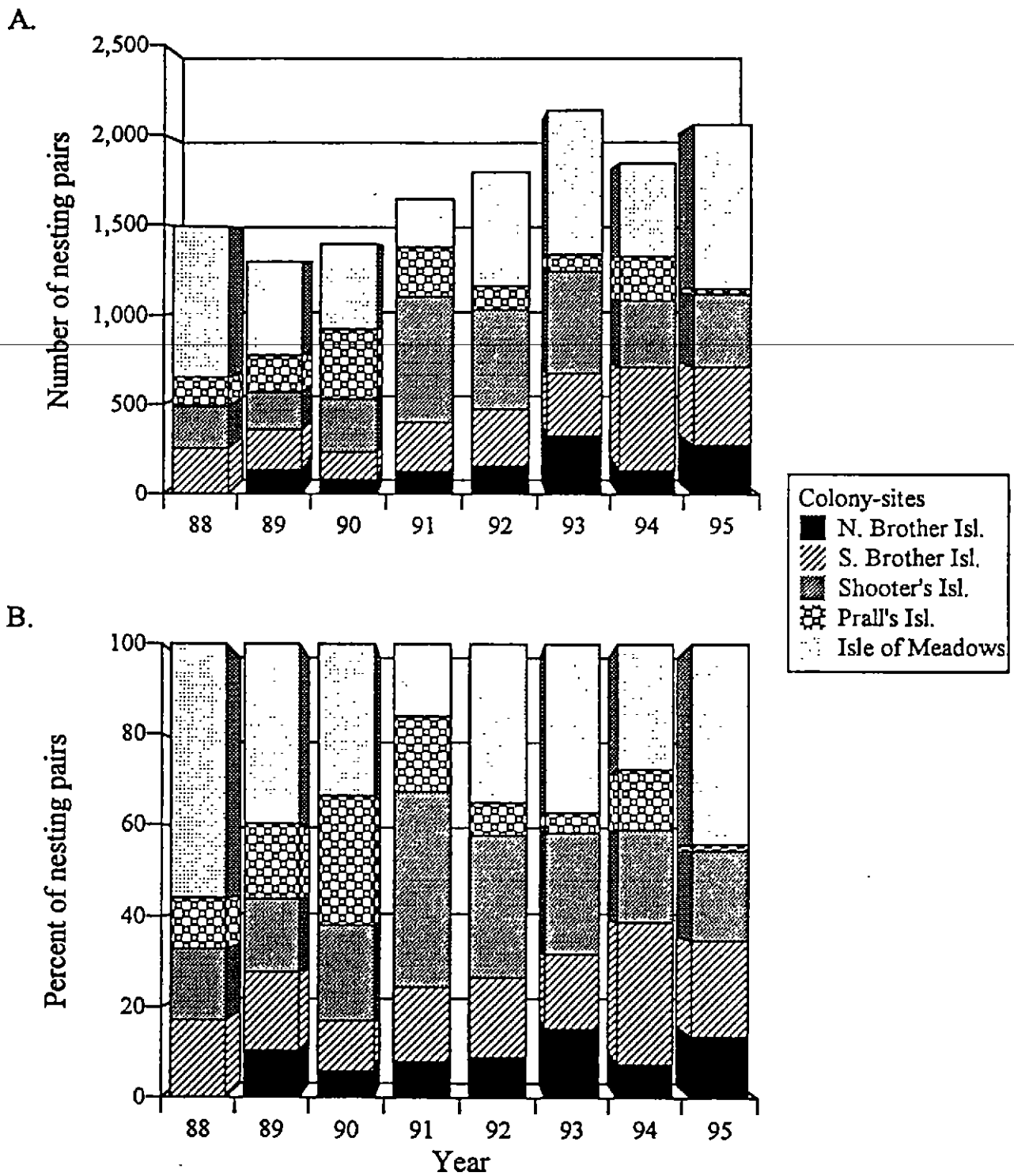


Figure 2. Absolute abundance (A) and percent relative abundance (B) of wading birds nesting at five colony-sites in New York Harbor, 1988-1995. The following species comprisied the yearly totals (order based on relative abundance in 1995): Black-crowned Night-Heron, Snowy Egret, Glossy Ibis, Great Egret, Cattle Egret, Yellow-crowned Night-Heron, Green-backed Heron, and Little Blue Heron. (Unidentified wading bird nests also included in totals.)

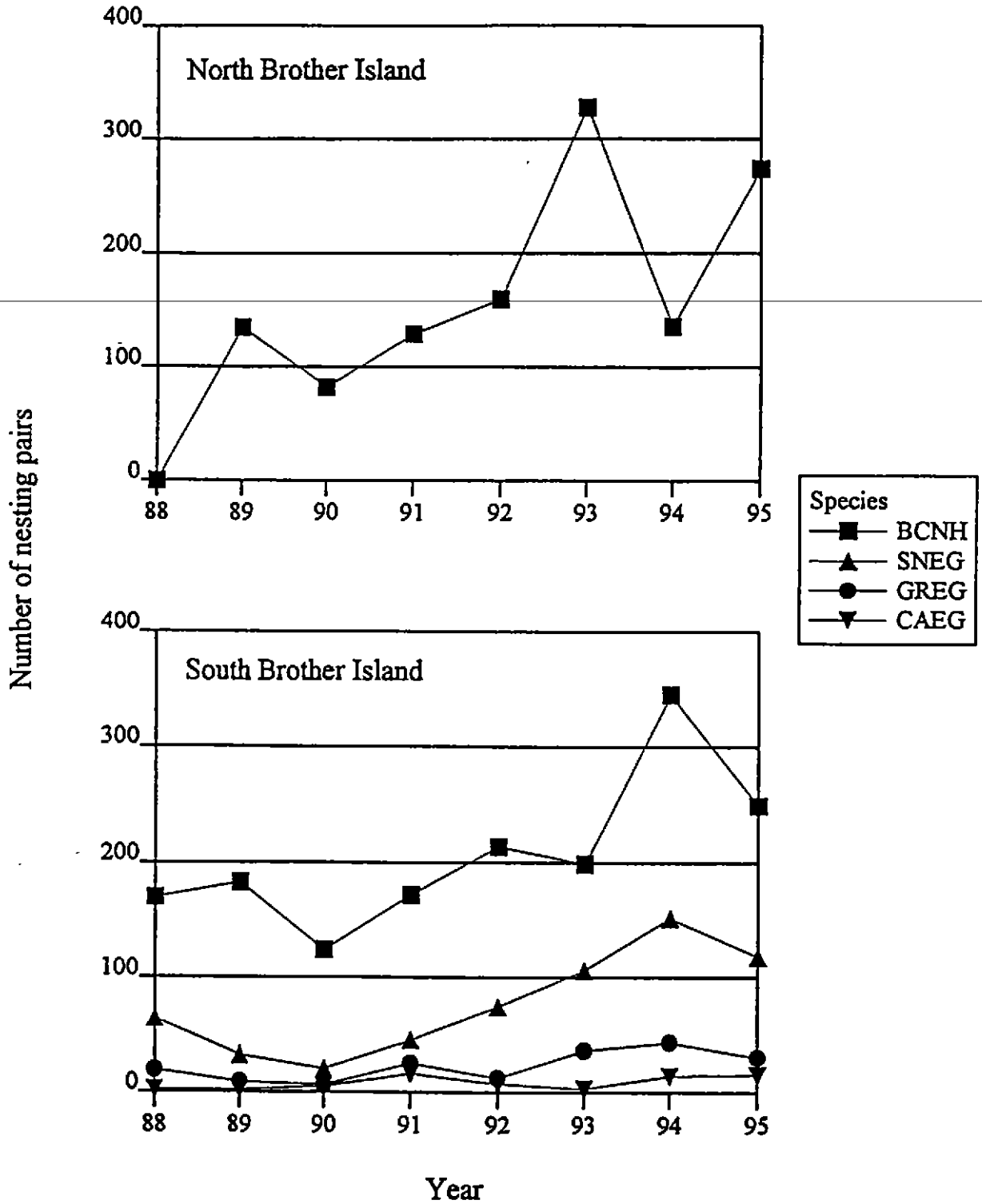


Figure 3. Abundance of selected wading birds nesting at colony-sites along the East River, New York Harbor, 1988-1995. Species denoted by acronyms in legend are as follows: BCNH (Black-crowned Night-Heron), SNEG (Snowy Egret), GREG (Great Egret), and CAEG (Cattle Egret).

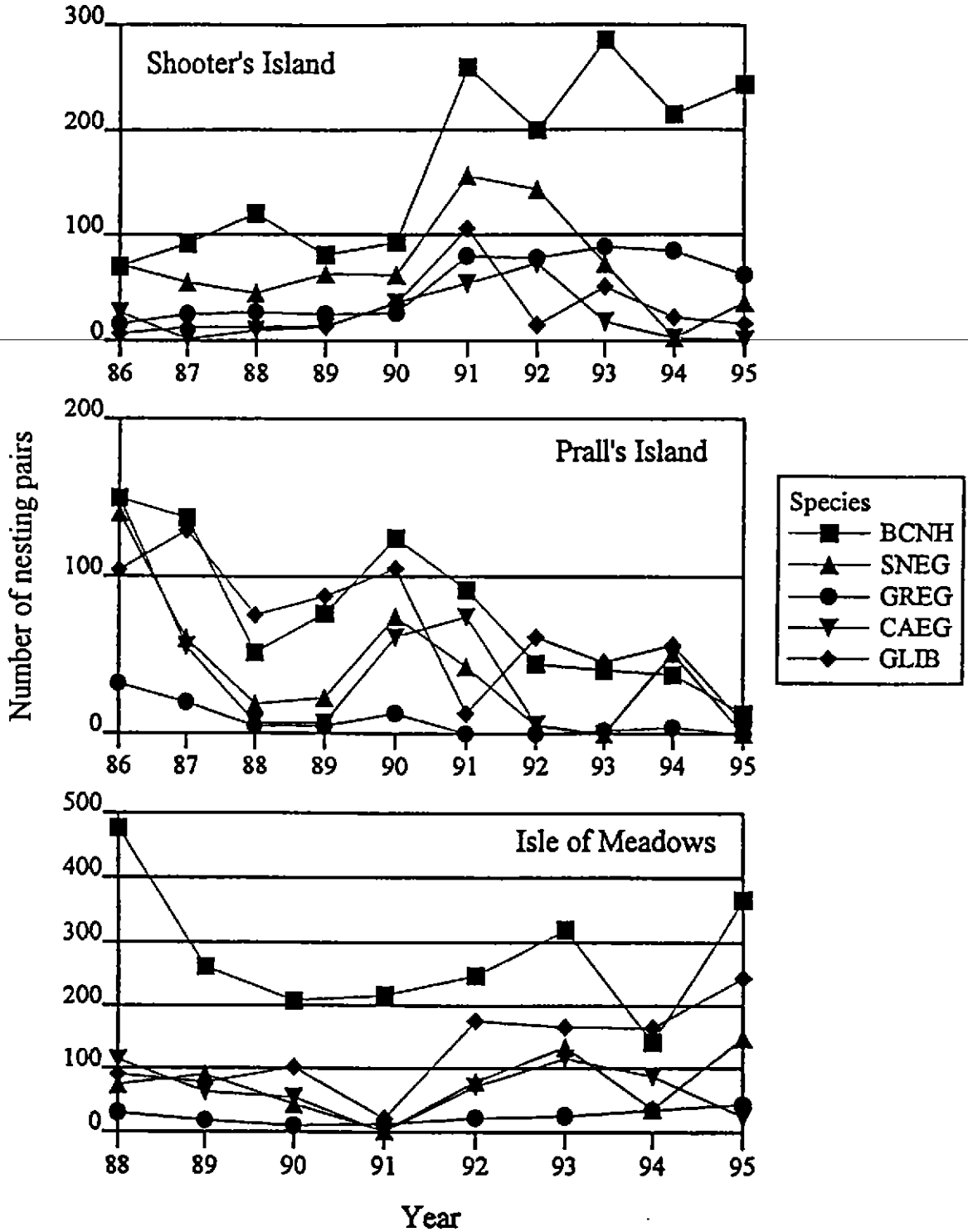


Figure 4. Abundance of selected wading birds nesting at colony-sites along Kill van Kull and Arthur Kill, New York Harbor, 1986-1995. Species denoted by acronyms in legend are as follows: BCNH (Black-crowned Night-Heron), SNEG (Snowy Egret), GREG (Great Egret), CAEG (Cattle Egret), and GLIB (Glossy Ibis). (Note differing scales on X and Y axes.)

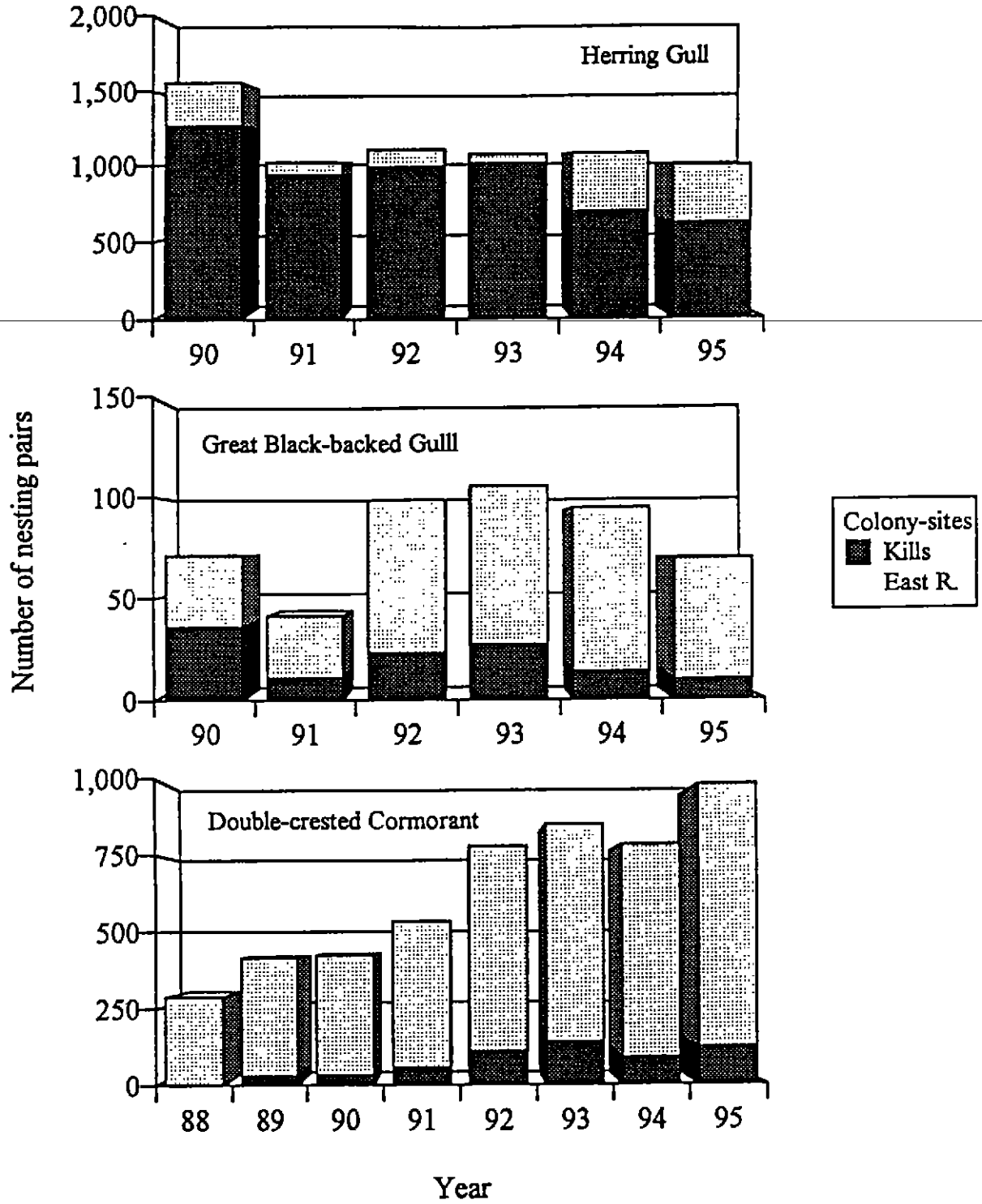


Figure 6. Abundance of seabirds nesting at colony-sites along Kill van Kull and Arthur Kill (Shooter's Island, Prall's Island, and Isle of Meadows), and the East River (North and South Brother Islands), New York Harbor, 1988-1995. (Note differing scales on X and Y axes.)