1991 Great Blue Heron and Black-crowned Night Heron

Census for Naval Submarine Base, San Diego, California

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INTRODUCTION

The Great Blue Herons (*Ardea herodias*) and Black-crowned Night Herons (*Nycticorax nycticorax*) have occupied separate breeding colonies on the tip of Point Loma at Naval Submarine Base, San Diego (Subase), southern California, for many years (Platter-Rieger, 1981, Unit 1984). Great Blue Herons breed locally in scattered colonies (Table 1), then winter widely dispersed over the southwestern United States (Unitt 1984, Root 1988). The Great Blue Herons present in southern California appear to be resident year around (Palmer 1962, Brandman 1976), although most individuals leave the heronry area after the breeding season. Some of the southern California population probably moves into Mexico for the winter and, like all ardeids, the young disperse widely after the breeding season. Unitt (1984) and Root (1988) note that Black-crowned Night Herons are resident year around within this area. Indicating wide dispersal, Ryder (1979) reports recovery, in three different locations in Mexico, of three out of 83 Great Blue

Table 1. *Data on recent heron colonies near San Diego are from Unitt (1984) and Root (1988).*

Recent Heron Colonies Near San Diego

Species	Year	Nests	Location
Black crowned Night Heron	1934-1935		Sorrento
	1950's		Balboa Park
	1960's		Imperial Beach
	1979	many	Buena Vista Lagoon
	1979	53	North Island Naval Air Station
	1980	5	Library and Spreckles parks, Coronado
	1980	6 - 8	East of Old Mission Dam
Great Blue Heron	1972	15	Lake Henshaw
	1974	1	Sutherland Reservoir
	1977	5	Whispering Plams Golf Course
	1979	1	Del Mar
	1980	3	Whispering Palms Golf Course
	1981	1	Crown Point

Herons banded in Colorado from 1929 to 1976. Also 94 of 2,917+ Black-crowned Night Herons banded in Colorado from 1929 to 1977 were recovered from 12 separate locations in Mexico, Colorado, Missouri, Kansas, Oklahoma, Idaho, South Dakota, New Mexico, and Texas.

MATERIAL AND METHODS

All heron colonies were located on Subase, and observed with 40X binoculars from various vantage points on the ground. In March, when most pairs had settled and laid eggs, censuses began. Nests were counted and mapped in each colony unit from 4 March to 3 July 1991 (eight visits). The number of adult herons and their behavior (standing, incubating, feeding chicks, etc.) were noted, as well as the presence and approximate size of chicks. This information was used to estimate the number of young fledged. Lack of time, along with observational difficulties, prohibited collecting the behavioral data needed to estimate young fledged for Black-crowned Night Herons. A representative sample of Black-crowned Night Heron nests will be followed for these data during the 1992 censuses. Four colony visits, conducted from 17 April to 3 July 1991, completed their 1991 nest count.

RESULTS

Great Blue Herons began nesting at the end of January 1991, and had fledged most of the young in August. Figures 1, 2, and 3 show the locations of both Great Blue Heron and Black-crowned Night Heron breeding colonies on Subase for 1980, 1990, and 1991. It is now obvious that the major construction impact to the main Great Blue Heron colony in 1980 (Platter-Rieger 1981) first forced the herons to nest in high densities at the Old Colony site (then the only remaining nest trees at the historical heronry) and to form satellite colonies. These events provided the impetus and necessity for them to expand their nesting activities southward into Officer's Housing, displacing the Black-crowned Night Herons that had historically nested there, and eastward into trees at the Magnetic Silencing Facility. Although not shown on these maps, a small satellite colony has existed since 1990 in pine trees west of Rosecrans Street and Owens Street (private civilian residences). Six scattered nests were active during 1990, though not in 1991, in an area of private civilian residences near San Diego Bay. The nests were built in conifers and in eucalyptus trees east of Rosecrans Street and north of the Scripps Marine Physical Laboratory.

The numbers of Great Blue Heron active nests were down this year (Table 2, Figures 4 and 5), but are still higher than the numbers found in 1980 or earlier. The numbers of Black-crowned Night Heron nests also appear to be slightly lower than in 1990.

Table 3 presents Great Blue Heron productivity (number of young fledged) at Subase, while Tables 4 and 5 present information on Great Blue Herons from published data for other heronries. Table 6 presents productivity information on Black-crowned Night Herons. Insufficient data were collected this year to estimate their productivity at Subase. They began to breed in April 1991, and finished by the end of August. Black-crowned Night Herons build smaller nests, and place them in denser trees than do the Great Blue Herons. They also breed at Subase in higher numbers than do the Great Blue Herons.

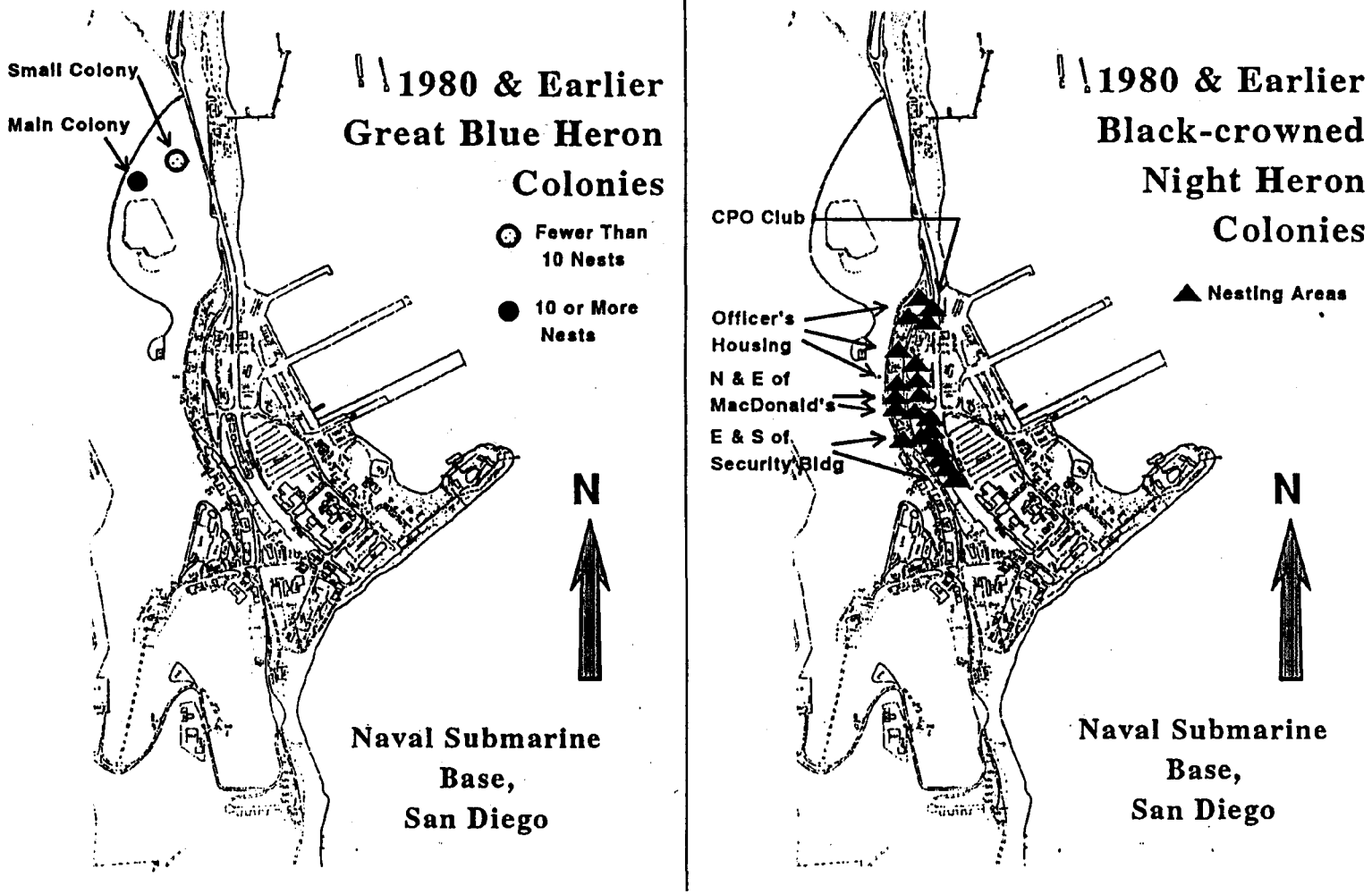


Figure 3. Location of heron nesting sites on Subase for 1980, and for years before 1980.

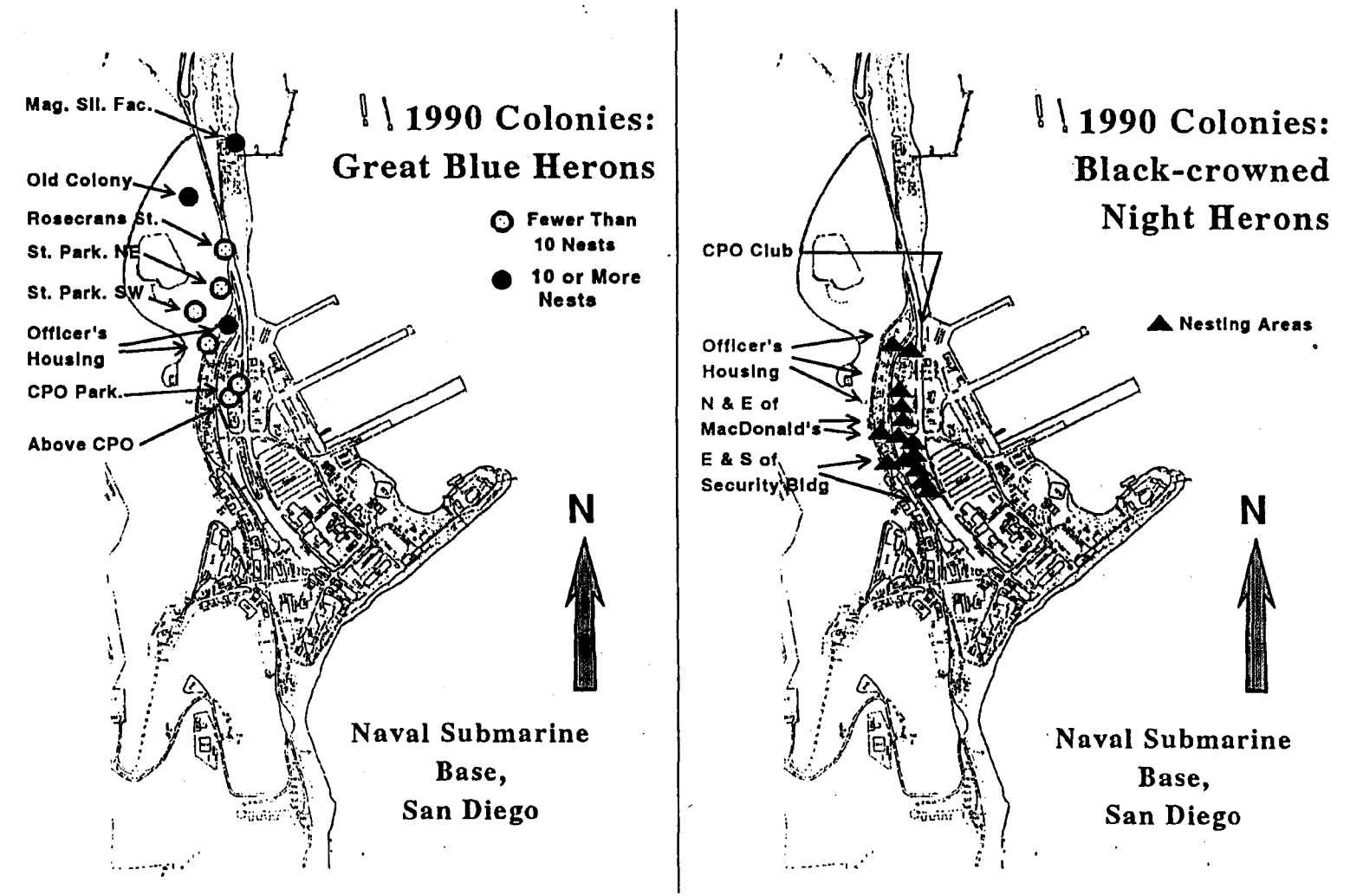
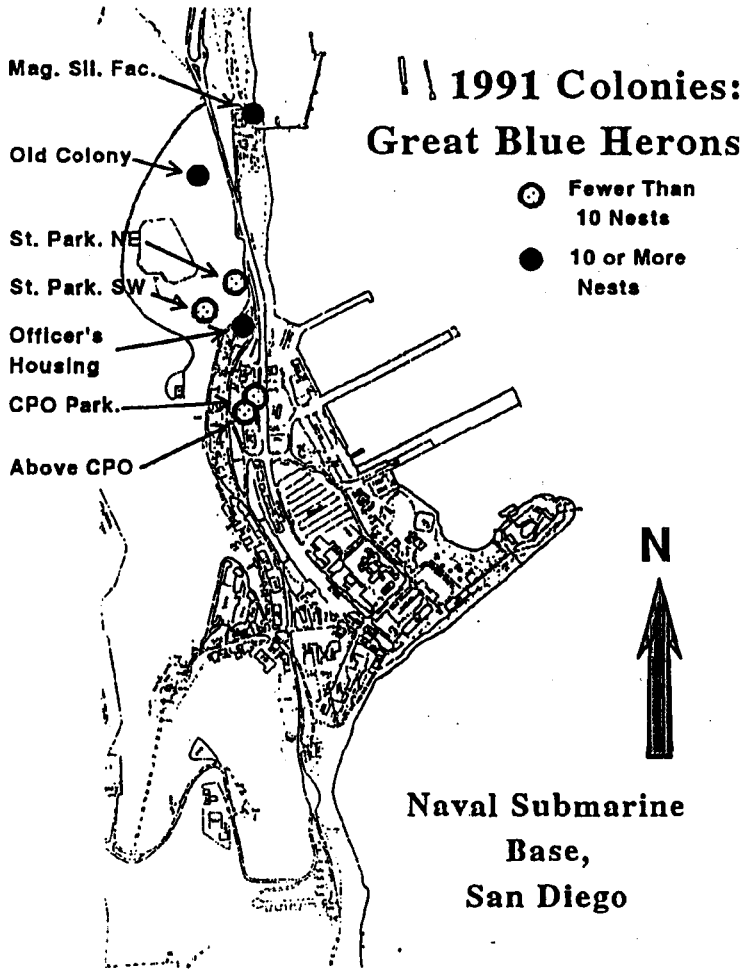


Figure 3. Location of heron nesting sites on Subase for 1990.



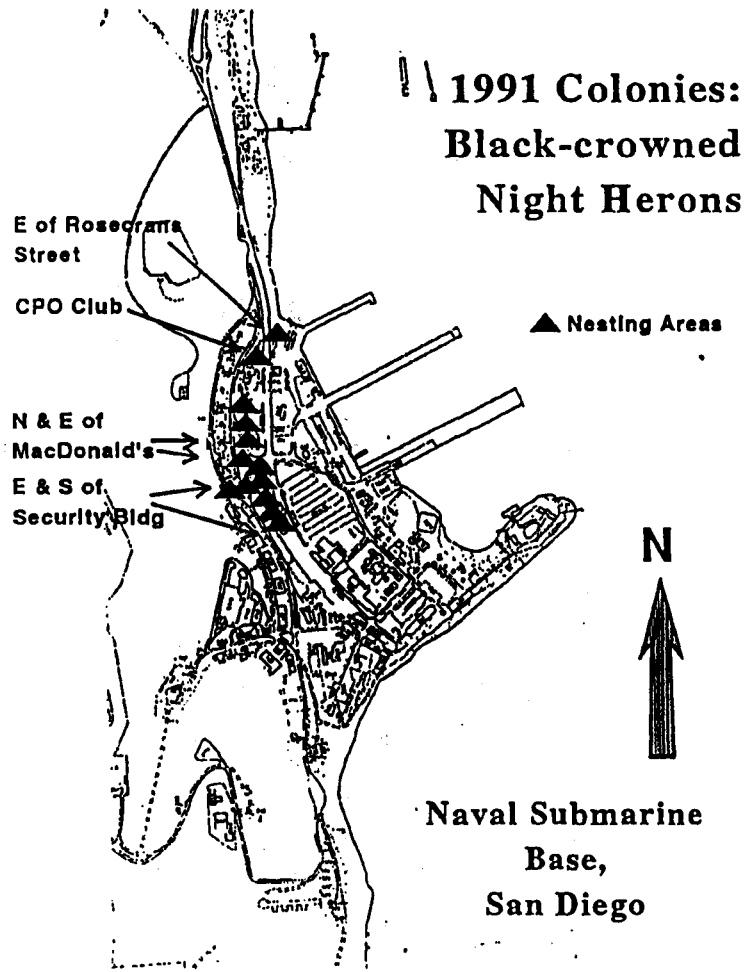


Figure 3. Location of heron nesting sites on Subase for 1991.

Table 2. *Data for both the Great Blue Heron and the Black-crowned Night Heron colonies located at Subase; the sources are listed at the bottom.*

Point Loma Heronries

Species	Year	Colony Visits	Active Nests	Inactive Nests	Total Nests
Great Blue Heron	✤ 1972	1	14		14
	✯ 1977	17	25	1	26
	✯ 1978	7	24	5	29
	✯ 1979	6	27	4	31
	✯ 1980	36	37	1	38
	✣ 1990	2	✓ 61	✓ 26	87
	1991	8	49	33	82
Black-Crowned Night Heron	✤ 1978	2	✓ 157		157
	✣ 1980	4	✓ 100	✓ 8	108
	✣ 1990	1	166	✓ 14	180
	1991	4	112	55	167

✤ Unitt (1984)

✯ Platter-Rieger (1981)

✣ Platter-Rieger (1990)

✓ Estimated Numbers

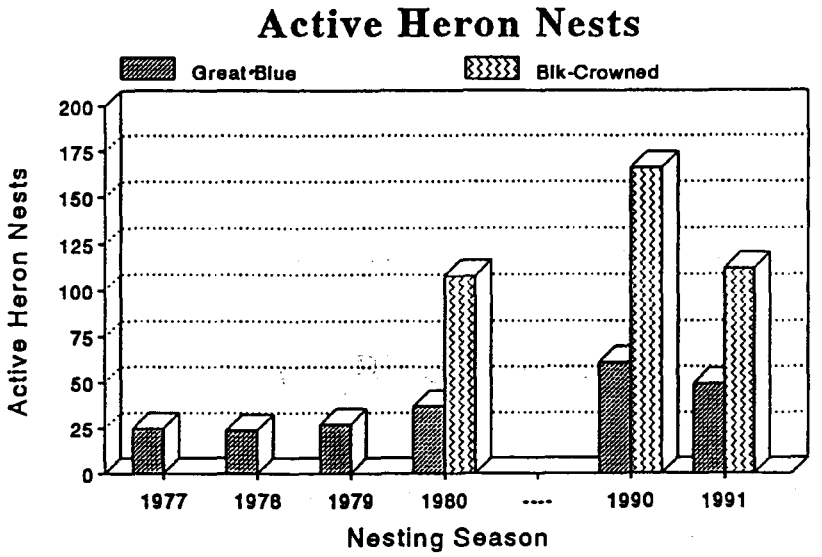


Figure 4. *Number of active Great Blue Heron and Black-crowned Night Heron nests at Subase from 1977 to 1991.*

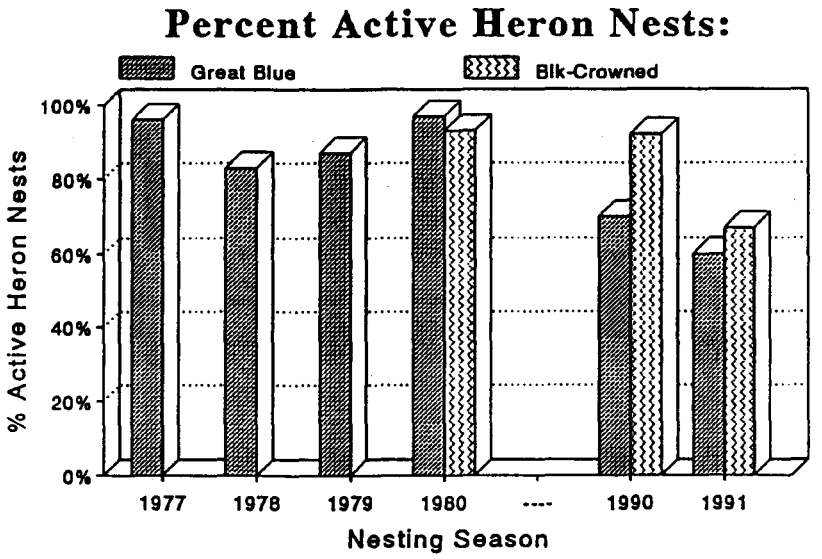


Figure 4. *Acitve heron nests, both Great Blue and Black-crowned Night Heron, as a percent of the total nests present during that nesting season.*

Table 3. *Nest data for the Great Blue Herons at Subase; sources are listed at the bottom.*

Great Blue Herons

Refer.	Year	Herons	Fledged	Fledged/ Active Nest	Fledged/ Successful Nest
✤	1972	28			
✳	1977	50	47	1.88	2.47
✳	1978	48	52	2.17	2.36
✳	1979	54	50	1.85	2.00
✳	1980	74	55	1.49	2.12
✣	1990	122			
	1991	98	71	1.45	1.87

✤ Unitt (1984)

✳ Platter-Rieger (1981)

✣ Platter-Rieger (1990)

Table 4. *Information from published studies of other Great Blue Heron colonies at Audubon Canyon Ranch, near San Francisco, California.*

Great Blue Herons: Other Data

Refer	Year	Herons	Fledg	Fledg/Act Nest	Fledg/Success Nest
✣	1967	100	25		2.2
"	1968	124	37		2.1
"	1969	110	57		2.3
"	1970	100	32		1.9
✠	1971	88	26	1.18	2.17
"	1972	96	35	2.06	2.50
"	1973	116	35	1.00	1.94
"	1974	96	41	1.86	2.16
"	1975	90	22	.85	2.2
"	1976	80	35	1.75	2.19
"	1977	82	21	1	1.91
"	1978	86	28	1.40	1.87
"	1979	70	37	2.06	2.64

✣ Pratt (1972); Audubon Canyon Ranch, California

✠ Pratt and Winkler (1985): Audubon Canyon Ranch, California

Table 5. *Information from the literature on other Great Blue Heron colonies from Ontario; British Columbia; and Morro Bay, California.*

Great Blue Herons: Other Data

Refer	Year	Herons	Fledg	Fledg/Act Nest	Fledg/Success Nest
✻	1964	174	190	2.2	
"	1965	176	224	2.5	
"	1968	62	57	1.8	
"	1972	94	92	2.0	
"	1973	102	100	2.0	
"	1974	100	98	2.0	
"	1975	134	131	2.0	
"	1980	116	114	2.0	
"	1981	138	152	2.2	
✺	1971	138	111	1.61	2.18
"	1972	150	120	1.72	2.07
✱	1977-9	66			2.4

✻ Sullivan and Payne (1988); Ontario, Canada

✺ Brandman (1976); Morro Bay, California

✱ Kelsall and Simpson (1979); Stanley Park, British Columbia, Canada (average of three years)

Table 6. *Information from published studies of other Black-crowned Night Heron colonies located at Sapelo Island, Georgia; North Dakota; and Horicon and Mead Wildlife Areas, Wisconsin.*

Black-crowned Night Herons: Other Data

Refer	Year	Herons	Fledg	Fledg/ Act Nest	Fledg/ Success Nest
✶	1958	8	17	2.13	2.43
❄	1976	114	7	0.23	
❄	1978	118	99	2.20	
❄	1979	194	30	0.57	
✤	1978	50		1.44	2.12
✤	1979	60		2.50	2.50
✶	1978	20		1.50	3.00
✶	1979	34		2.12	2.40

✶ Teal (1965); Sapelo Island, Georgia

❄ Greenwood (1981); North Dakota

✤ Hoefler (1979); Horicon Wildlife Area, Wisconsin

✶ Hoefler (1979); Mead Wildlife Area, Wisconsin

DISCUSSION

Miller (1944) stated that an adequate food supply and suitable woods are essentials for Great Blue Heron nesting. He believed that the kind of tree available for nesting was less significant than height, it's distance from human activity, and natural barriers; isolation of the site could be the most important determinant in nesting site selection. Werschkul (1976) compared seven undisturbed Oregon Great Blue Heron colonies to five that were disturbed by logging, and found that nesting activity shifted away from the point of disturbance, and that in at least one case the fledging rate per successful nest in a disturbed colony was very low. The channel markers in the Columbia River used as nest sites by Great Blue Herons were isolated; herons did not nest on the land-based markers along the shoreline, or on markers closest to shore regardless of height (Henny 1978). Tremblay and Ellison (1979) found that visits to Black-crowned Night Heron colonies in the St. Lawrence estuary just before, or during, egg laying provoked abandonment of new nests and loss of eggs.

The Subase Great Blue Herons and Black-crowned Night Herons are unusual, being apparently accustomed to noise and frequent human activity near and directly underneath, though not within, their nesting trees. The Black-crowned Night Herons have always nested in roughly the same locations (Figures 1, 2, and 3) near Officer's Housing, the Security Building, and the Administration Building. Not until construction destroyed much of their original colony in 1980 (Platter-Rieger 1981) did most of the Great Blue Herons move closer to intense human activity. During the past ten years, they appear to have successfully adjusted to the 1980 impacts. There were 24 more active nests in 1990 than in 1980, and 12 more active nests in 1991 than there were in 1980 (Table 2). Two Great Blue Heron satellite colonies in particular are subject to intermittent loud noises, as one is located near large dumpster bins, and the other colony at the Magnetic Silencing Facility near a building that houses a loud generator. Three other successful Great Blue Heron colonies are documented in the literature as being located near or among high human activity. One is in tall eucalyptus trees around an inn parking lot in California (Brandman 1976). Another one is in a single row or western red cedars on Sea Island, British Columbia, sandwiched between the Delta River Inn and the heavily used road to the International Airport (Webb and Forbes 1982). The last one is in an urban setting at Stanley Park, Vancouver, British Columbia (Webb and Forbes 1982).

The phenomenon of high nesting densities caused by the lack, or a perceived lack, of suitable nesting habitat, as was seen at Subase following the 1980 construction impact on Great Blue Herons, has also been observed by Bayer and McMahon (1981) in the Pacific Northwest. They saw high nest densities in four heronries because they were unable to expand: two colonies were located in small groves of trees isolated by sand dunes, and two others were in small suburban groves nearly surrounded by houses. At the Coos-N heronry, Oregon, nest densities per tree nearly doubled in 1976 after a catastrophic wind storm blew down many old nesting trees (Bayer and McMahon 1981). Henny (1978) also describes how the first response of Great Blue Herons to nesting habitat loss was to crowd nests onto every available location on the remaining trees. Then they started nesting on channel markers in the Columbia River, between Washington and Oregon. Evidently responding to a severe lack of safe nesting sites, Great Blue Herons were also observed in 1975 to nest in one meter high sagebrush (*Artemisia tridentata*) on a small, rocky island in the middle of the Columbia River (Henny 1978). Kelsall and Simpson (1979) studied 12 Great Blue Heron colonies, most of them for three seasons, in western British

Columbia. They found that colonies within their study area were fewer, but larger, than in the historic past; probably because urban sprawl destroyed heron nesting habitat.

Bayer and McMahon (1981) also documented cases in which there was an abundance of suitable nesting trees. In these heronries, an average of 26% +/- 15% (range 7-47%) for five years, of a particular year's nest trees were not reused in subsequent years. Abandoned trees did not appear different from the previous year, and subsequent use verified their suitability. For example, eight trees that had been used for at least one year were abandoned for two to three consecutive years before being used again. During this year, previously successful Great Blue Heron nests at the Old Colony, Steamplant Parking Lot 2, Officer's Housing, and the CPO Club Parking Lot went unused.

Great Blue Heron colonies are more dynamic than previous thought. Kelsall and Simpson (1979) found that within the 12 colonies studied, colonies frequently changed location, joined others, split into smaller groups, and perhaps interchanged birds between colonies. Interchange of members between colonies may sometimes account for observed annual variability in nest numbers. Simpson et al. (1987) documented movements of some banded and color marked Great Blue Herons between several colonies. Five individuals moved 24 km to another colony; one individual moved through three colonies within 33 days, while yet two others were seen in one colony during 1978 and another one during 1979. King (1976), in discussing colonial wading bird survey and census techniques, found that annual fluctuations of 50% or more commonly occur in heron populations. Long term studies are necessary to tell if a large change in heron population is permanent, or just a temporary fluctuation. Pratt and Winkler (1985) summarized 13 years of data from a central California Great Blue Heron and Great Egret (*Casmerodius albus*) mixed heronry. They found that the Great Blue Heron breeding population declined from 1973 onward, a decline not matched by a similar decline in reproductive success. There was no relationship between heron population fluctuations (breeding adults) and reproductive biology (number of young fledged, or number of successful nests) in the same, or in preceding years. The two major causes of chick mortality during this 13 year period were starvation and predation; in a sample of 672 heron chicks: 65% fledged, 20% starved, 7% were eaten by predators, and 7% were lost to other causes. The age at which most chicks died varied greatly between years.

Several factors could cause the observed lack of coupling between population numbers and productivity. They include: suspected wide post-fledging dispersal of young; documented exchange of individual herons between colonies both within and between years; and the fact that Great Blue Herons take three years to fully achieve adult plumage and breeding status. All of these circumstances provide a built-in delay between a successful year and next year's breeding population. Although some individuals have been observed breeding in their first or second year (Pratt 1972, Platter-Rieger 1981), few do so, and they are not as successful as adults.

Black-crowned Night Herons also take three years to achieve full adult plumage and breeding status, and have records of juvenile breeding (Gross 1923), although it is rare. Hoefler (1979) found that 13% of Black-crowned Night Heron colonies in Wisconsin were immature birds, and that they did not appear to be nesting. Wisconsin colonies varied in size from one to 702 pairs; the larger colonies were more productive. Colonies smaller than 15 pairs produced few young, and Hoefler (1979) suggests that they may not receive enough social stimulation to complete a nesting cycle, or renest after nest loss. Hoefler (1979) also documented a large population fluctuation; one colony, for no apparent reason, increased from 204 pairs in 1978 to

702 pairs in 1979. Black-crowns, although associated with a single type of wetland, were not restricted to that one only. They preferred wetlands in which the proportion of open water and vegetation were approximately equal and interspersed. Subase Black-crowned Night Herons most probably use San Diego Bay and the San Diego River Flood Control Channel mudflats and any other wetland, as well as the commercial bait-barges, for feeding areas. Unlike southern California, Black-crowned Night Heron nesting success in prairie marshes on the northern great plains is strongly influenced by predation, unstable wetland conditions, and violent storms. For two of five years, dry conditions and/or hot weather prevented nesting. In the two years that nesting occurred, both predation and violent storms caused high nestling mortality. Only in 1978 were most of the nestlings fledged (Greenwood 1981). The weather in San Diego is usually mild, violent storms are rare, and no predation has been observed in the heronery. The censuses for Black-crowned Night Herons at Subase during both 1980 and 1990 are rough counts, and as the numbers of inactive nests were only estimated, it is difficult to attribute any significance to this lower number.

Great Blue Heron nesting in coniferous trees in the Pacific northwest and elsewhere (Julin 1986) damages them to the point of death with heavy nesting use. The main damage occurs through low foliage tolerance to coatings of heron excrement. Needles below the nest are covered with excrement, which causes osmotic burns (chemical damage), and reduces the amount of sunlight available for photosynthesis. It also interferes with gas exchange by plugging the stomata, which are openings on leaves through which gases are interchanged. Nutrient additions to the soil beneath the trees probably acted as a positive influence on tree growth. Long term heron nesting in coniferous forests tends to enhance plant diversity through localized disturbances that allow species occurring earlier in ecological succession to reestablish.

CONCLUSIONS

Both Great Blue Heron and Black-crowned Night Heron nesting populations on Subase appear to be stable and healthy, although more censuses over greater numbers of years need to be done before stability can be claimed with confidence. The numbers of breeding pairs were down from 1990 for both species (Figures 4 and 5). The Great Blue Herons showed the largest decrease. However, the Subase heron population is well within the ranges found for other Great Blue Heron colonies. New information regarding the dynamic and fluctuating nature of many heron colonies, formerly regarded as "stable and fixed," reveals that population numbers commonly change from year to year. These changes are apparently unrelated to the previous season's population of fledged young.

The eucalyptus trees on Subase are physically quite different from Douglas fir trees. Eucalyptus trees tend to have open, umbrella shaped canopies, with few large clusters of leaves below heron nests to catch excrement. On the basis of these structural differences, and my general observations of the overall health of nesting trees at Subase, I conclude that herons do not significantly damage Subase trees.

Suitable nesting habitat is not scarce at Subase, judging from the number of Great Blue Heron nests unused during 1991. Artificial nesting structures, when installed, might be used lightly, or not at all, while unused nests indicate that available nesting habitat is present. Also, given the latest information on the dynamic nature of both Great Blue Heron and Black-crowned Night Heron colonies, artificial nesting structures, if accepted by the herons, may be used intermittently.

They may also need to be in place for some time before herons accept them; Kelsall and Simpson (1979) found an amazing fidelity within each colony to the choice of a single tree species for nesting. This fact held true even in mixed forest when other suitable tree species were readily available. Interestingly enough, the species of choice varied between Great Blue Heron colonies. I also think that designing acceptable structures for Great Blue Herons may be easier than designing them for Black-crowned Night Herons. There appear to be many appropriately dense trees already at Subase not used by Black-crowns. There are no references in the literature to Black-crowns nesting in unusual places, although that is not to say that they are incapable of doing so. Great Blue Herons have successfully nested on duck blinds in Texas (Palmer 1962); an abandoned windmill platform in the St. Lawrence estuary, Quebec (Des Granges 1979); channel markers in the Columbia River, Oregon (Henny 1978); and a transmission line tower in Tennessee (Pullin 1983). A close relative, the White-faced Heron (*Ardea novaehollandiae*), nested for two years on the steel tower housing an outlet valve in Risdon Brook Reservoir, near Hobart, Australia (Wall 1986).

SUMMARY

Both Great Blue Heron and Black-crowned Night Heron populations at Subase appear to be stable and healthy, based on data from this year, previous years, and studies published in the literature. The significance of this year's decline in numbers of Great Blue Heron nests, and especially in the number of young fledged per active nest, can be evaluated only with additional data from future monitoring studies. Heron colonies are dynamic, and long-term monitoring is required to determine significant changes in population trends.

Design and installation of artificial nesting platforms for Great Blue Herons near the Old Colony to compensate for nesting trees destroyed by construction ten years ago, and for those trees more recently damaged by bark beetles, is a worthwhile endeavor. Information in the literature indicates that Great Blue Herons are capable and willing to nest, under certain circumstances, on human-built structures. However, current indications are that available and suitable nesting habitat went unused in 1991. Heron use of artificial nesting structures, and to what extent, under these conditions remains to be seen. The heron excrement problem at Subase is worse during the nesting season for Black-crowned Night Herons, as their major colonies are near roads and parking lots. I doubt that artificial nesting structures can be used to decoy Black-crowned Night Herons into nesting habitat away from their historical spots. They prefer denser foliage for nesting than the Great Blue Herons, which might present design difficulties, and there are no published records that report nesting in unusual places or upon human-built structures. This lack of information does not mean that they are incapable of doing so, or that it should not be tried. However, like the Great Blue Herons, there already appears to be several areas of suitable and unused nesting habitat at Subase for Black-crowned Night Herons. I suggest that accommodation between human activity and Black-crowned Night Heron nesting be done through careful tree trimming and landscape planning to direct future colonies away from roads and parking lots. I suggest temporary or permanent parking lot and walkway covers during the breeding seasons for problem areas where colonies are already established. As both of these herons are federally protected under the Migratory Bird Treaty Act, all plans for artificial nesting structures, or other habitat modifications, must be discussed with U. S. Fish and Wildlife Service before implementation.

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