Condor 84:184–187

HUMAN DISTURBANCE AND NESTLING BEHAVIOR IN BLACK-CROWNED NIGHT HERONS

KATHARINE C. PARSONS

AND

JOANNA BURGER

ABSTRACT.—The effects of human disturbance on Black-crowned Night Heron (*Nycticorax nycticorax*) nestling behavior were studied at the Dead Neck Island (Barnstable Co., Massachusetts) heronry in June and July, 1980. Nestling response to disturbance was compared between three-week old chicks that had been regularly handled since hatching, and control nestlings. Every control nestling moved some distance from the nest during the observation period, whereas all experimental chicks remained in the nest. Mean distance traveled by control birds was 1.0 m (range 0.2 to 3.6 m). Experimental chicks became habituated to frequent handling, whereas a single, intense disturbance elicited escape behavior in control nestlings. Weights of three-week old control and experimental nestlings were not significantly different. Repercussions of altered chick behavior in experimental animals are discussed and results compared to other studies.

Many studies have addressed observer-induced effects on the breeding success of colonial birds, including pelecaniforms (Kury and Gochfeld 1975, Ellison and Cleary 1978, Schreiber 1979), ciconiiforms (Goering and Cherry 1971, Werschkul et al. 1976, Tremblay and Ellison 1979), and charadriiforms (Hunt 1972, Gillett et al. 1975, Robert and Ralph 1975, Cairns 1980). Most of these studies have emphasized the responses of adult birds to disturbance. All investigators have found that adult behavior, altered by disturbance, is most detrimental to reproduction during the egg-phase (Hunt 1972, Tremblay and Ellison 1979, Cairns 1980, Ollason and Dunnet 1980), with the exception of one study that reported the chick-phase to be most sensitive to human disturbance (Gillett et al. 1975). Response to human disturbance may vary within colonies, and clearly differs among species (Manuwal 1978, Ollason and Dunnet 1980).

Two studies have measured human-induced effects on breeding ardeids. Goering and Cherry (1971) found no significant effects on reproductive success in a large mixed-species heronry (93% Cattle Egret, *Bubulcus ibis*) as a result of disturbance frequency. Black-crowned Night Heron (*Nycticorax nycticorax*) adults were found to be most susceptible to disturbance just before and during egg-laying (Tremblay and Ellison 1979). Neither of these studies examined the behavior of chicks in response to human disturbance.

Possible adverse effects on nestlings due to human disturbance include: 1) premature nest-leaving (Veen 1977), which may increase nestling mortality if the chicks are unable to return to their nests (Teal 1965, Schreiber 1979) or are killed in territorial encounters with adults (Hunt 1972, Robert and Ralph 1975), and 2) weight loss as a result of regurgitations (Kury and Gochfeld 1975). Conversely, frequent disturbance may produce habituated behavior in nestlings (Robert and Ralph 1975, Burger 1981) rendering them relatively insensitive to human intrusion. To distinguish between these alternatives, we investigated nestling behavior of Black-crowned Night Herons at a monospecific colony on Dead Neck Island (Barnstable Co., Massachusetts) during June and July, 1980. We wished to document differences in chick behavior as a function of human disturbance. All nests were exposed to the presence of investigators in the colony, but chicks were handled in only half of the nests.

STUDY SITE

Dead Neck Island spans the large estuary between Cotuit and Osterville on the south shore of Cape Cod, Massachusetts. About 10% of the 1.25 km^2 island is tree-covered with a canopy height of less than 10 m. The remainder of the island supports a low herbaceous cover of mostly grasses, forbs, and heaths. In 1980, Black-crowned Night Herons nested in eastern redcedar (*Juniperus virginiana*) and pitch pine (*Pinus rigida*). The 56 nest-trees occurred on less than an acre of patchy habitat where most trees were non-contiguous (separated by low, grass and shrub cover). Black-crowned Night Herons have bred on the island since at least 1974 (R. Forster, pers. comm.). We counted 58 active night heron nests in mid-June, 1980.

TABLE 1. Behavior and weight of regularly disturbed and undisturbed Black-crowned Night Heron chicks.

	Control	Experimental	*P*
Mean routed distance (m) ± SD	1.19 ± 1.13	0.00 ± 0.00	0.002[a]
(*n*)[b]	(12)	(12)	
Mean straight-line distance (m) ± SD	1.05 ± 0.94	0.00 ± 0.00	0.001[a]
(*n*)[b]	(12)	(12)	
% Vocalizations	18	67	0.001[c]
(*n*)[d]	(51)	(36)	
% Nestlings that either defecated or regurgitated	43	25	ns[c]
(*n*)[b]	(14)	(12)	
Mean weight (g) of nestlings at three weeks of age ± SD	671.6 ± 56.3	620.8 ± 127.8	ns[a]
(*n*)[b]	(12)	(12)	

[a] *t*-test.
[b] Number of nestlings.
[c] χ^2.
[d] Number of possible instances.

No other heron bred on the island during the 1980 season.

METHODS

We found and tagged 50 nests in mid-May. Nests were checked every three to four days prior to hatching. We examined the effect of handling on nestling behavior for 26 newly-hatched young. Experimental and control nests contained complete broods of either two, three, or four chicks each. The proportion of each brood size to the total number of broods was approximately equal in both experimental and control nests. This ensured that weight differences within broods due to hatching sequence were approximately the same for all nests.

Twelve nestlings from experimental nests were handled on alternate days from hatching until three weeks of age (=initial period). Experimental chicks were marked, weighed on 10 occasions with Pesola spring balances (±1.0% error), and returned to their nests. We never handled control chicks ($n = 14$) during the initial period, although their nests were checked twice each week. Initial-period nest-checks of the entire colony required 0.5 to 1.0 h. All initial-period visits to the heronry were during mid-morning.

Three weeks after hatching, all 26 nestlings were observed during a several-minute prescribed routine of increasing disturbance, which culminated in capture of the chick (=observation period). We recorded nestling behaviors for each chick during each of four phases (standing by the nest-tree, parting the branches, climbing the tree, capturing the chick) which constituted the routine. Distance traveled from the nest (=routed distance) and straight-line distance from the nest were measured for each chick. We observed no chick for more than 10 min. All captured young were weighed and returned to their nests. The total amount of time spent in the heronry during the observation period was two hours, between 10:00 and 12:00 on 28 June 1980.

RESULTS

Prior to the observations made on three-week old nestlings, checks of control nests and our general disturbance of entering the colony elicited no response from control chicks. Control young commonly adopted a "freeze" posture and did not move far (1.0 to 2.0 m) from the nest. They rarely exhibited aggressive or defensive behaviors such as gaping, vocalizing, feather- or wing-raising, or lunging. As the experimental chicks developed locomotor skills over the first three weeks, our approach was increasingly greeted with defensive postures and vocalizations.

The young that we handled occasionally regurgitated fish, which they often swallowed again if the chick and fish were returned together to the nest. We did not see control young regurgitating fish during the initial period.

During the observation period (three weeks after hatching), every control nestling ($n = 14$) moved some distance from the nest, whereas all ($n = 12$) experimental chicks remained in the nest (Table 1). Mean distance traveled by control birds was 1.0 m (range 0.2 to 3.7 m), although this is an underestimate since two control chicks leaped from their nest-trees. Nestlings who left their nest-trees were not pursued as this would have increased their routed distance, and reduced the probability of their return to the nest.

Control chicks were much less likely to call aggressively during the observation period than handled young. Of 51 possible instances, control nestlings vocalized nine times (18%). Experimental birds called in 24 of 36 possible instances (67%). Six of the 14 control nestlings (43%) either defecated or regurgitated during the observation period, whereas 3 of 12 experimental nestlings (25%) exhibited one of these behaviors (Table 1).

Mean weights of control and experimental chicks did not differ significantly (Table 1). Our failure to weigh two control chicks may modify the averaged weights for all control chicks during the observation period. We found that, in general, the youngest or smallest chick was the first chick to leave the nest and traveled farthest from the nest when disturbed. (First-leaving control chicks weighed an average of 623.8 ± 8.6 g and traveled 1.3 ± 1.5 m on the average. Mean weight of all other control nestlings was 710.0 ± 46.1 g. They averaged 0.6 ± 0.6 m from the nest.) We conclude, therefore, that the mean weight of control nestlings is an overestimate.

DISCUSSION

Disturbed and undisturbed nestlings differed significantly in behavior, although not in weight. The tendency for control young to either regurgitate or defecate and to move silently from their nests suggests that low-intensity disturbance followed by intense disturbance elicits escape behavior. Accelerated nest-leaving as a result of human disturbance has been documented for Sandwich Tern (*Sterna sandvicensis*) chicks (Veen 1977). Regurgitation and/or defecation may be a quick means of reducing weight (Kury and Gochfeld 1975), enabling a threatened chick to escape more readily. Regurgitation in young birds may also be adaptive in proffering an alternative food source (to themselves) to potential predators such as gulls (Kury and Gochfeld 1975).

Although regurgitation may have predator avoidance value, it could also result in significant food loss if disturbance is frequent. Frequently handled night heron chicks in this study did not regurgitate or defecate as often as unhandled young. Cairns (1980) found Black Guillemot (*Cepphus grylle*) chicks in oft-disturbed areas to be significantly heavier than young in occasionally disturbed areas. Weights of experimental and control heron chicks did not differ significantly, but young guillemots may gain weight with fewer regurgitations. This effect is heightened if nestlings are unable to re-ingest their meals due to gull parasitism. Gulls parasitize disturbed cormorant colonies by eating regurgitated meals (Kury and Gochfeld 1975).

Young Black-crowned Night Herons occasionally re-ingested their own meals, and although one or two Herring Gulls (*Larus argentatus*) often accompanied us into the heronry, we never saw gulls in a heron nest or eating regurgitated fish. As a result of low parasitism by gulls, control nestlings at Dead Neck Island may have maintained growth rates approximately equal to experimental nestlings by re-ingesting regurgitated meals. It is also possible that the low-intensity disturbance control nestlings received prior to the observation period did not elicit regurgitations.

Alternatively, frequently handled young might be expected to weigh less than control nestlings if the frequent presence of humans at the experimental nests disrupted feeding by adults. This was unlikely in our study because experimental nests were randomly located in the heronry and our frequent presence at experimental nests caused a general disturbance whereby all adult herons left their nests. In addition, we minimized our disruption of the feeding program by visiting the heronry only during mid-morning.

Behavior of experimental nestlings was characterized by aggressive vocalizations and no movement from the nest, suggesting habituation. Several studies have shown that adult birds become habituated to disturbance (McNicholl 1973, Kury and Gochfeld 1975, Schreiber 1979). Robert and Ralph (1975) suggested that Western Gull (*Larus occidentalis*) chicks may become habituated to investigators. Our results show a strong tendency for frequently disturbed nestlings to vocally defend the nest against human intruders. Experimental chicks habituated to the extent that they did not run from their nests when approached closely by humans.

Control nestlings did not become habituated to the same extent as experimental birds. Control chicks remained motionless, behaving as if their whereabouts were unknown to the observers. When approached closely for the first time, however, they fled their nests. A panicked nestling may travel far once it reaches the ground at Dead Neck Island. The patchy nature of the heronry and the fact that only two nest-trees contained more than one nest makes unlikely an unfriendly encounter with an adult bird. This is not the case, however, in most heronries. Since Dead Neck Island is relatively predator-free, the greatest danger facing a fleeing chick may be its inability to find its nest and parents again.

Experimental chicks became increasingly defensive of their nests throughout the initial period and remained in their nests during the observation period. The habituated behavior of experimental chicks may have increased the probability of their fledging and survival.

Since many studies of nestlings (e.g., growth analysis) involve repeated, high-intensity disturbance, the effect of infrequent, low-intensity disturbance has rarely been evaluated. The capability of nestlings to respond to repeated disturbance may explain why breeding success is generally less sensitive to disturbance during the chick-phase than the egg-phase.

ACKNOWLEDGMENTS

We are indebted to Stuart Parsons for cheerful and invaluable field assistance, and to the Massachusetts Audubon Society for permission to work on Dead Neck Island.

LITERATURE CITED

BURGER, J. 1981. Effect of human disturbance on colonial species, particularly gulls. Colonial Waterbirds 4:28–36.

CAIRNS, D. 1980. Nesting density, habitat structure and human disturbance as factors in Black Guillemot reproduction. Wilson Bull. 92:352–361.

ELLISON, L. N., AND L. CLEARY. 1978. Effects of human disturbance on breeding of Double-crested Cormorants. Auk 95:510–517.

GILLETT, W. H., J. L. HAYWARD, AND J. F. STOUT. 1975. Effects of human activities on egg and chick mortality in a Glaucous-winged Gull colony. Condor 77:492–495.

GOERING, D. K., AND R. CHERRY. 1971. Nestling mortality in a Texas heronry. Wilson Bull. 83:303–305.

HUNT, G. L. 1972. Influence of food distribution and human disturbance on the reproductive success of Herring Gulls. Ecology 53:1051–1061.

KURY, C. R., AND M. GOCHFELD. 1975. Human interference and gull predation in cormorant colonies. Biol. Conserv. 8:23–34.

MANUWAL, D. A. 1978. Effects of man on marine birds: a review, p. 140–160. *In* Wildlife and People. John S. Wright Forestry Conf. Proc., Dep. Forestry and Natural Resources and the Cooperative Extension Service, Purdue Univ.

MCNICHOLL, M. K. 1973. Habituation and aggressive responses to avian predators by terns. Auk 90:902–904.

OLLASON, J. C., AND G. M. DUNNET. 1980. Nest failures in the fulmar: The effects of observers. J. Field Ornithol. 51:39–54.

ROBERT, H. C., AND C. J. RALPH. 1975. Effects of human disturbance on the breeding success of gulls. Condor 77:495–499.

SCHREIBER, R. W. 1979. Reproductive performance of the Eastern Brown Pelican *Pelecanus occidentalis*. Nat. Hist. Mus. Los Ang. Cty. Contrib. Sci. 317:1–43.

TEAL, J. M. 1965. Nesting success of egrets and herons in Georgia. Wilson Bull. 77:257–263.

TREMBLAY, J., AND L. N. ELLISON. 1979. Effects of human disturbance on breeding of Black-crowned Night Herons. Auk 96:364–369.

VEEN, J. 1977. Functional and causal aspects of nest distribution in colonies of the Sandwich Tern (*Sterna s. sandvicensis Lath.*). Behaviour Suppl. 20.

WERSCHKUL, D. F., E. MCMAHON, AND M. LEITSCHUH. 1976. Some effects of human disturbance on the Great Blue Heron in Oregon. Wilson Bull. 88:660–662.

Program in Ecology, Rutgers University, and Biology Department, Livingston College, Rutgers University, New Brunswick, New Jersey 08903. Received 14 May 1981. Final acceptance 13 October 1981.

Condor 84:187

RECENT PUBLICATIONS

Where to Find Birds in New York State/The Top 500 Sites.—Susan Roney Drennan. 1981. Syracuse University Press. 499 p. Hardcover $38.00, paper cover $18.95. Source: Syracuse University Press, 1011 East Water Street, Syracuse, NY 13210. This book is precisely what its title says. Covering the entire state of New York, it provides practical information on many more than 500 sites where birding is rewarding. "The state has been divided into ten regions based on the presently existing reporting regions as defined by the Federation [of New York State Bird Clubs] . . . . Each region has an overall map showing the location and name of each of its sites. Detailed accounts of each site, organized by county, include directions for reaching the site, some of its botanical, geological, and avian merits, its best seasons, and, of course, the exceptional and many common birds which may or should be there." Many detailed site maps are also given. Special chapters cover pelagic birding and vantage sites for hawk migration. Admirably planned and executed, this birding Baedeker will be invaluable in New York and might well serve as a model for guides in other states.

Familiar Birds of the Northwest.—Harry B. Nehls. 1981. Portland Audubon Society. 185 p. Paper cover. $6.95. Source: Portland Audubon Society, 5151 N.W. Cornell Road, Portland, OR 97210. This little book is an introductory guide to the common birds of the Pacific Northwest. It combines, revises, and enlarges two earlier publications of the Portland Audubon Society: on land birds by David B. Marshall and on waterbirds by Harry B. Nehls. Unlike field manuals, the species accounts are not telegraphic or subdivided, but are easily readable paragraphs. They sketch identification features, habits, preferred habitat, distribution, and seasonal status in the region. No details are given and many descriptive phrases are vague. Color paintings by R. Bruce Horsfall, Amy C. Fisher, L. B. McQueen, and Zella M. Schultz depict the birds in natural settings, one species per picture. While many of the paintings are nice, this treatment occupies a lot of space that could have been put to better use.