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NESTING SUCCESS OF OHIO'S ENDANGERED COMMON TERN[1]

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ABSTRACT. Nesting success of Ohio's endangered common tern (*Sterna hirundo*) population was studied during 1980 at Lucas County Port Authority Facility No. 3 (F3) located near Toledo in Maumee Bay, Lake Erie. Ninety-one clutches in three of eight tern subcolonies at this site were studied in detail. Sixty-nine percent (157/229) of the eggs failed to hatch, and abandonment of nests during incubation was responsible for nearly half of the hatching failures. Most abandonments were believed caused by nocturnal visits to nest sites by a feral cat. Observations at the fourth subcolony indicated that vegetation overgrowing nests and encroachment by juvenile ring-billed gulls (*Larus delawarensis*) caused additional nest abandonments. Fledging success in the three subcolonies studied in detail was estimated at 0.62 chicks fledged/nest. Production in 1980 was below replacement. Continued reproductive failures will result in extirpation of the common tern from Ohio.

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INTRODUCTION

Recently, declines have occurred in breeding populations of common terns in the Great Lakes region (Morris and Hunter 1976, Blokpoel 1977, Blokpoel and McKeating 1978, Scharf 1981, Shugart and Scharf 1983). As many as 5,000 pairs of common terns once nested in the western Lake Erie basin of Ohio, but this population has declined substantially (Trautman 1977, Courtney and Blokpoel 1983). In 1976 the common tern was classified as endangered in Ohio (Anon. undated). Common terns now nest at a single location in Ohio, Lucas County Port Authority Facility No. 3 (F3) on Maumee Bay at Toledo (D. Case, pers. comm.).

Common terns nested successfully at F3 in 1975 and 1976 but suffered 95% reproductive failure in 1977 (Scharf et al. 1978). Production was low in 1978 and again in 1979, when an estimated 350 pairs raised only 23 young (L. F. VanCamp, pers.

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comm.). Continued low reproductive success could lead to extirpation of the common tern from Ohio. This study was undertaken to determine causes and extent of nesting failures of the F3 tern population in 1980.

STUDY AREA AND METHODS

F3 is located at the mouth of the Maumee River in Lucas County. This facility was constructed by the U.S. Army Corps of Engineers for disposal of dredge material and consists of approximately four km of dikes that encompass nearly 98 ha (Bernhagen 1976). Outer sides of dikes are covered principally with crown vetch (*Coronilla varia*); inner sides are covered mainly with grasses and small forbs. A single dike connects the facility to the mainland. Crowns of dikes are covered by gravel and serve as one-lane access roads. Public access to F3 is restricted.

During the 1980 breeding season, common terns initiated 514 clutches at F3 in eight distinct subcolonies (fig. 1). About 3,000 pairs of ring-billed gulls and 200 pairs of herring gulls (*L. argentatus*) also nested at F3 in 1980. The ring-billed gull colony adjoined tern subcolony A. Herring gulls nested adjacent to terns at subcolonies E, G, and H.

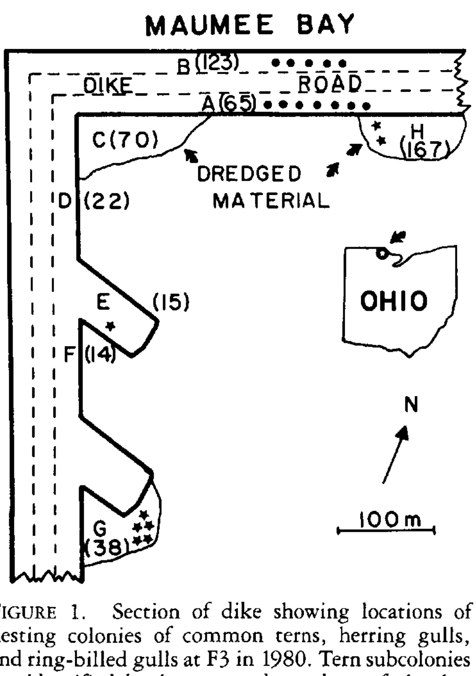

FIGURE 1. Section of dike showing locations of nesting colonies of common terns, herring gulls, and ring-billed gulls at F3 in 1980. Tern subcolonies are identified by letters, and numbers of clutches follows in parentheses. Each star represents 10 herring gull nests and each dot denotes 250 ring-billed gull nests.

The study site was visited twice weekly from 19 April to 8 June and daily or every other day thereafter until 3 August 1980. Because of the endangered status of this species and the possible adverse affects of human disturbance on reproductive success (Burger 1981), visits to nest sites were restricted to two isolated subcolonies (F and G) which could be entered without disturbing any other subcolony. All nests in subcolonies F and G were individually marked with numbered wooden tongue depressors. Records of eggs laid and lost, hatching success and fate of newly hatched young were kept on each visit to F and G. Similar records were kept on 39 clutches in subcolony H which could be readily observed from the dike road from an automobile used as a blind. Observations of nesting success at the other five subcolonies were made periodically throughout the breeding season from the automobile-blind. Additional data on nest numbers and success were obtained during three visits to band young terns in each subcolony.

RESULTS AND DISCUSSION

Common terns began laying eggs at F3 on 7 May 1980. Nesting attempts were separated into early ($N = 302$) and late ($N = 212$) clutches on the basis of a distinct bimodal pattern in clutch starts. We assumed that all clutches initiated before 7 June were first nesting attempts. Because adult terns were not individually marked, extent of renesting after 6 June could not be determined. Thus, a minimum of 302 pairs of common terns nested at F3 in 1980. This figure is similar to the estimates of 263 pairs in 1977 (Scharf et al. 1978) and 350 pairs in 1979 (L. F. VanCamp, pers. comm.).

Forty-six clutches were begun in subcolonies F and G in the early period, and 45 (39 in subcolony H and 6 in subcolony G) were initiated in the late period. Early clutches were significantly larger than late clutches (Wilcoxon Rank Sum test, $z = -2.93$, $P < 0.005$, table 1) and had greater hatching success than late clutches ($X^2 = 33.68$, d.f. $= 1$, $P < 0.0001$, table 2). Only 48% and 12% of eggs hatched in early and late clutches, respectively. All eggs were lost in 13 early and 39 late clutches.

Disappearance was the greatest source of loss of early eggs (table 3). Predation by black-crowned night-herons (*Nycticorax nycticorax*) was the probable cause of low

TABLE 1

Size of early and late common tern clutches sampled in 1980 at F3.

	Clutch size 1	2	3	Total	$\bar{x}$ clutch ± SD
N Clutches					
Early	3	9	34	46	2.67 ± 0.60
Late	2	25	18	45	2.36 ± 0.57*

*Distribution of clutch size values significantly different (Wilcoxon Rank Sum test, P < 0.005)

TABLE 2

Hatching and fledging success of early and late common tern clutches sampled in 1980 at F3.

	Early (n = 46)	Late (n = 45)	Total (n = 91)
Eggs hatched/ egg laid	0.48	0.12	0.31
Chicks fledged*	54	2	56
Chicks fledged/ egg laid	0.44	0.02	0.24
Chicks fledged/ nest	1.17	0.04	0.62

*Maximum estimate of chicks fledged

nesting success of common terns at F3 in 1977 (Scharf et al. 1978). In 1980, black-crowned night-herons frequented the main access dike at F3 but were rarely seen near tern nesting areas. Nevertheless, nocturnal predation by night-herons may have been responsible for some egg disappearance. The hatching failure of nearly 70% of late eggs was due to abandonment of nests during the incubation periods (table 3). Our observations suggested that the major cause of abandonment of late nests was nocturnal visits by a feral cat. During July and early August, many terns in subcolony H deserted their nests in the evenings and did not return until the following mornings. The cat was observed in daylight at subcolony H three times during this period; frequency of nocturnal visits by the cat was unknown. Night desertions by nesting larids in response to frequent visits to nesting sites by a potential predator were reported by Emlen et al. (1966), Nisbet (1975), Hunter and Morris (1976) and Minsky (1980).

Five of the 59 chicks hatched from 46 early clutches in subcolonies F and G were found dead. One chick was killed by an unknown predator, but cause of death for the other four chicks was unknown. After two to three days, chicks were capable of leaving nests and became increasingly difficult to locate. Since subcolonies F and G were not fenced to enclose chicks, the fate of the remaining 54 early chicks could not be determined. All 11 chicks hatched from late clutches in subcolony H died or disappeared before fledging. Although we witnessed no predation upon tern chicks by the feral cat,

TABLE 3

Causes of common tern egg loss in 91 sample clutches in 1980 at F3.

	Early clutches: No. eggs lost	Early clutches: % eggs lost	Late clutches: No. eggs lost	Late clutches: % eggs lost	Total clutches: No. eggs lost	Total clutches: % eggs lost
Abandoned during incubation	2	1.6	74	69.8	76	33.2
Disappeared	46	37.4	13	12.3	59	25.8
Unknown	7	5.7	5	4.7	12	5.2
Abandoned after other eggs in clutch hatched	9	7.3	0	0.0	9	4.0
Predation by ruddy turnstone *(Arenaria interpres)*	0	0.0	1	0.9	1	0.4
Totals	64	52.0	93	87.7	157	68.6

the disappearances of seven chicks from subcolony H coincided with sightings of the cat near this subcolony. The fate of the two late chicks hatched in subcolony G was unknown. If these two chicks and the remaining early chicks in subcolonies F and G survived to fledge, the three tern subcolonies studied produced a maximum of 56 fledglings, or 0.62 fledglings/nest (table 2).

Smaller clutch sizes and lower hatching success of late nests observed in this study may indicate late nesting by young or inexperienced terns (Morris et al. 1976). However, most nest mortality in the late period was a result of mass nest abandonment. We therefore believe the nearly complete failure of late clutches was due primarily to the cat. The cat was not seen during the early nesting period, and this absence probably explains the lower rate of abandonment and higher overall success of early nests (table 3).

Observations at other subcolonies indicated that low nesting success was a general phenomenon at F3 in 1980 and that abandonment of nests was primarily responsible for this low success. Patches of grass growing from a height of five cm in early May to over one m by 6 June apparently caused the abandonment of 30 nests in subcolony A by physically preventing adult terns from reaching their nests. We frequently observed adult terns experiencing difficulty attempting to land amid tall grass, and on several occasions adults left the nesting area after having hovered over the nest site for several seconds, unable to land. An estimated 25 additional nests in subcolony A were abandoned between 7 and 18 June when flightless juvenile ring-billed gulls using subcolony A as a staging area apparently forced adult terns from their nests. Much aggression between terns and gulls was observed, and two tern chicks were found dead at the base of the dike, apparently having drowned after being forced over the steep bank by encroaching gulls. All 167 late nests in subcolony H (including 39 sample nests) were abandoned, presumably because of the presence of the feral cat. Abandonment of an estimated 35 late clutches in subcolony C was also believed caused by the feral cat.

Results of banding young terns substantiated our observations of low nesting success of the F3 tern population in 1980. A total of 148 tern chicks were banded on 11, 14, and 24 June. If all 148 banded chicks survived to fledge, productivity of the entire F3 population was 0.49 fledglings per nest. No chicks fledged from 202 of the 212 late clutches; the fate of the chicks from the remaining 10 nests was unknown.

As in the previous three years, 1980 production fell short of the 1.1 fledglings/pair/year needed to maintain stability in the common tern colony (DiCostanzo 1980). Continued low reproductive success will result in extinction of this colony unless immigration of terns from other colonies can sustain it. Haymes and Blokpoel (1978) showed that movement of common terns among colonies within the Great Lakes often occurs but that immigration of common terns to the Great Lakes from other regions is rare. Thus immigrants to F3 would have to come from colonies within the Great Lakes. With widespread reproductive failure and declining populations of common terns in the Great Lakes region (Morris and Hunter 1976, Blokpoel 1977, Blokpoel and McKeating 1978, Scharf et al. 1978, Scharf 1981, Courtney and Blokpoel 1983, Shugart and Scharf 1983), production of emigrants to maintain the F3 colony appears to be minimal or non-existent. Therefore, reproductive success of this population must be increased if a viable common tern population is to exist in Ohio.

To enchance common tern nesting at F3, we recommend that all mammalian predators inhabiting the site be removed and that growth of vegetation within common tern nesting areas at F3 be controlled. Vegetation control techniques for use on dredge islands are described in Soots and Landin (1978). We also recommend that common tern nesting sites be protected against encroachment of flightless juvenile ring-billed gulls by enclosing with a 60 cm high wire-mesh fence all tern subcolonies adjacent to nesting gulls. The ring-billed gull population at F3 has increased from 59 pairs in 1977 (Scharf et al. 1978) to approximately 3,000 pairs in 1980. The earlier nesting gulls usurped former tern nesting areas as F3 in 1977 (Scharf et al. 1978). If expansion of the ring-billed gull population into tern nesting areas continues, destruction of gull nests may be necessary to provide nesting sites for common terns at F3.

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