MORTALITY OF COMMON EGRETS AND OTHER HERONS

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The purposes of this paper are to present preliminary data on the mortality rates of the Common Egret (*Casmerodius albus*), to compare these with published values of mortality in other herons (Ardeidae), and to discuss some apparent differences between the temporal distribution of first-year mortality in three migratory herons and that in one non-migratory heron.

Methods

Ages at death of Common Egrets were computed from band recovery records in the files of the U. S. Fish and Wildlife Service, Laurel, Maryland. Most of the records represent egrets banded by Ben B. Coffey, Jr., near Glen Allan, Mississippi, between 1935 and 1949. All recoveries recorded up to December, 1960, were analyzed, but only birds banded before 1950 were used in computing mortality rates. Birds reported shot were excluded from the sample. The method used in the construction of life tables follows that pioneered by Lack (1943) which has been reviewed and expanded by Deevey (1947) and Hickey (1952).

First-year mortality in birds should be carefully evaluated, for it is generally higher than the average adult mortality and can strongly influence population dynamics. There has been some difference of opinion as to the most suitable starting date for calculating first-year mortality. Lack (1949) used June 1 and Hickey (1952) used August 1 as the starting date in compiling mortality statistics of first-year herons. I have followed the pattern of Verheyen and LeGrelle (1952), Olsson (1958), and Owen (1959) in calculating first-year mortality after July 1. Several sources of potential bias in band recovery data have been discussed by Hickey (1952). Recognition of these makes the figures and interpretations presented here tentative.

Common Egret Mortality

Analysis of the band recoveries indicates (Table 1) that 76 per cent of the fledged Common Egrets alive on July 1 died during their first year. On the average, 26 per cent of the older birds died each year. Life expectancy at fledging was 1.4 years, and at the start of the second year expectancy of further life was 3.3 years. The oldest reported Common Egret reached 16 years of age.

If these figures on mortality are representative of the population in general, we can calculate the amount of productivity necessary to main-

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TABLE 1

ABRIDGED LIFE TABLE FOR THE COMMON EGRET, COMPUTED FROM BANDING RECOVERIES*

Age (x)	*Alive at start* (l_x)	*Number dying* (d_x)	*Mortality rate* (q_x)	*Survival rate* (s_x)	*Further life expectancy* (e_x)
0–1	178	135	76%	24%	1.4 years
1–2	43	17	26%	74%	3.3 years
2–3	26	2	"	"	
3–4	24	11	"	"	
4–5	13	3	"	"	
5–6	10	1	"	"	
6–7	9	0	"	"	
7–8	9	2	"	"	
8–9	7	2	"	"	
9–10	5	1	"	"	
10–11	4	0	"	"	
11–12	4	0	"	"	
12–13	4	0	"	"	
13–14	4	1	"	"	
14–15	3	0	"	"	
15–16	3	3	"	"	
Total	346	178			

* Using July 1 as a starting date for each year.

tain a stable population. In such a calculation the main gap in our knowledge is the age at which the egret is normally capable of breeding. Although no direct evidence is available for this species, it seems likely, judging from other herons, that most Common Egrets are capable of breeding when two years old; some possibly do so as early as one year of age. If we assume that Common Egrets breed at two years of age (third summer), it is necessary for each 50 pairs to raise 146 young to fledging to replace the 26 adults dying in that year. This means an average production of 2.92 young fledged from each nest, if all second-year and older birds nest once per year. Information on the average number of young fledged from Common Egret nests is apparently unavailable. However, records of clutch size indicate that the Common Egret usually lays three to four eggs (Palmer, 1962). Thus an annual productivity of 2.92 young fledged per breeding pair does not seem unreasonable.

Before any of these figures can be regarded as better than tentative, more egrets must be banded and more data on life history must be gathered. Particularly helpful would be studies of color-banded egrets to determine the age at which they begin breeding. Nesting studies are needed to measure the amount of egg and nestling mortality and the average nest productivity. Experiments designed to test the frequency of band loss would indicate whether this is a factor producing a biased (too high) juvenile mortality rate.

TABLE 2
COMPARISON OF REPORTED MORTALITY IN SIX HERON POPULATIONS

Species	Number of recoveries used	Mortality (in per cent)		Expectancy of further life		Oldest individual	Reference
		First year	Older birds	At fledging	Second year		
Great Blue Heron (*Ardea herodias*)	349	71	29	1.5 years	2.9 years	20–21 years	Owen (1959)
Common Heron (*Ardea cinerea*)	195	69	31	1.5	2.7*	15–16	Lack (1949)
Common Heron	247	78	—	1.0	—	11.2	Verheyen and Le-Grelle (1952)
Common Heron	845	67	28	1.7	3.1	18.3	Olsson (1958)
Common Egret (*Casmerodius albus*)	178	76	26	1.4	3.3	16	This paper
Black-crowned Night Heron (*Nycticorax nycticorax*)	141	61	31	1.8	2.7	12–13	Hickey (1952)
Averages	326	70	29	1.48 years	2.94 years	15.7 years	

* Originally stated as 2.8 years by Lack (1949); corrected to 2.7 years by Lack (1954).

COMPARISON WITH MORTALITY IN OTHER HERONS

Mortality has been studied in only a few other species of herons. Lack (1949), Hickey (1952), Verheyen and LeGrelle (1952), Olsson (1958), and Owen (1959) offer comparable figures on mortality of different heron populations. These are listed, along with those for the Common Egret, in Table 2. The six heron populations (composed of four species) considered here showed an average first-year mortality rate of 70 per cent and, in each year thereafter, an average mortality rate of 29 per cent. Average expectancy of further life at fledging was 1.48 years, and at the beginning of the second year it was 2.94 years. The average maximum longevity in these populations was 15.7 years. Fairly good agreement is found between the mortality rates of older birds. First-year mortality appears more variable, although the differences are not statistically significant. These variations may result, in part, from the somewhat different methods used by the various authors in figuring mortality.

APPARENT TEMPORAL DISTRIBUTION OF FIRST-YEAR MORTALITY

An interesting feature of first-year heron mortality is shown in Table 3. Of four populations for which monthly mortality figures are available, three show a strong predominance of first-year mortality in the months July–December, with a sharply lower mortality in the months January–June. On the other hand, the fourth population shows only a slight difference (57 per cent and 43 per cent, respectively) in mortality between the two halves of the first year. This difference in distribution of first-year mortality between the British Common Heron (*Ardea cinerea*) and the three North American herons is statistically significant ($P = <0.02$). Possibly it results from the fact that the British bird is essentially non-

TABLE 3
SEASONAL DISTRIBUTION OF REPORTED MORTALITY IN FOUR POPULATIONS OF FIRST-YEAR HERONS*

Species	*July–December (in per cent)*	*January–June (in per cent)*	*Migratory*	*Significant difference from mean*	*Reference*
Great Blue Heron	82 (300)	18 (65)	Yes	No	Owen (1959)
Common Heron	57 (77)	43 (58)	No	Yes ($P = <0.02$)	Lack (1949)
Common Egret	92 (185)	8 (16)	Yes	No	This paper
Black-crowned Night Heron	86 (134)	14 (21)	Yes	No	Hickey (1952)

* Figures in parentheses indicate actual number recovered during period.

migratory (Rydzewski, 1956), whereas the three North American species are migratory. This would suggest that perhaps in the latter three species, the factors producing most of the first-year mortality operate during the "nomadic period" (*Zwischenzug*), and during migration, while the inexperienced juveniles are in unfamiliar territory. Such factors could include inadequate food supply, increased exposure to natural enemies (including man), and lack of suitable cover during inclement weather. In general, it might be expected that the mortality factors affecting a bird would become stronger in unfamiliar territory. Furthermore, during long-range movements the birds often must cross unfavorable habitats, such as mountainous regions or open water, where the above dangers would be greater.

Although migration may have evolved for other reasons, it has probably persisted because conditions in the wintering range are more conducive to survival during the winter months than conditions in the breeding range at that time. Thus it seems likely that mortality would decrease once the birds reach their winter home. If high mortality in first-year birds results, as Lack (1946) suggests, primarily from inexperience, the survivors of the fall migration should be better able (more experienced) to complete the return trip the next spring. In this manner first-year birds of a migratory species might have a higher mortality in the first half of the year than in the second half. An essentially nonmigratory species, such as the British Common Heron, while not subject to the dangers of an extensive *Zwischenzug* and a long migration, may be subject to fairly rigorous conditions in its home range throughout the entire winter; and mortality might be more evenly distributed over the year. This hypothesis could best be tested by the examination of first-year mortality in a single species having both migratory and nonmigratory populations.

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Summary

Mortality of Common Egrets, determined from banding recoveries, was 76 per cent in the first year and 26 per cent each following year. If egrets begin breeding at two years of age, each pair must raise 2.92 young to fledging each year to maintain the population. Published mortality figures for six heron populations showed an average first-year mortality of 70 per cent and an average annual mortality of 29 per cent in older birds. It is recognized that some of these data may contain bias. Three

migratory heron populations exhibit an apparent predominance of first-year mortality during the first six months after leaving the nest, whereas a nonmigratory population shows a more even distribution of mortality throughout the entire first year. This difference may be related to the dangers encountered in *Zwischenzug* and on migration and the first-year birds' relative inexperience in the fall.

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