J. Field Ornithol., 52(3):210–213

# REGIONAL VARIATION OF GREAT BLUE HERON LONGEVITY

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Researchers have examined Great Blue Heron (*Ardea herodias*) band recovery data, but they have not determined if regional variation in longevity occurs (Owen, Auk 76:464–470, 1959; Henny, U.S. Fish and Wildlife Service, Wildl. Res. Rep. 1, 1972; Graber et al., Ill. Nat. Hist. Notes, Surv. Biol. Notes no. 109, 1978). If local variation in longevity is great, pooling all band recoveries may obscure important local differences in population dynamics (e.g., the number of young required to maintain a stable population, see Henny, op. cit.). Pooling may also be misleading if used to compare average longevities between time periods (e.g., pre- and post-pesticide periods), especially if the proportions of herons recovered from regions of markedly different longevities are not similar in the different time periods. Here I examine regional variability in Great Blue Heron longevity.

## METHODS

I analyzed Great Blue Heron (henceforth termed heron) band recovery data processed through December 1978, but herons banded after 1974 are not included because many of them would not have been recovered by 1978. I have included recovery data only for herons known to be banded as nestlings that were recovered on a known date 30 days or more after banding. Following Henny (op. cit.), I have used the date of banding of nestlings as the "birthdate." I have not included sight recoveries, recoveries of herons used for research, or recoveries of a band or a band number without additional information (i.e., How Obtained: Code 98). Code 98 recoveries were excluded because bands can last longer than the heron, and the date of recovery of a band may not reflect the longevity of the banded heron. For example, I found that the oldest known heron was 20 years old, but a band was reported (Code 98) 43 years after a heron had been banded; this probably does not represent the age of the heron at death (also see Postupalsky, Bird-Banding 50:263–264, 1979).

I arbitrarily divided the United States into quadrats separated by 100°W longitude and 40°N latitude (Fig. 1). Only the two quadrats north of 40°N had sufficient recoveries for statistical analysis, and only recoveries for these two quadrats are discussed below.

I divided band recoveries into four time periods. The 1925–1946 period was chosen because it was prior to the extensive use of pesticides, and the 1947–1958 period because there will probably be no additional recoveries (i.e., by the end of 1978 all herons would have been at least 20 years old). The choice of the 1959–1968 and 1969–1974 periods was arbitrary.

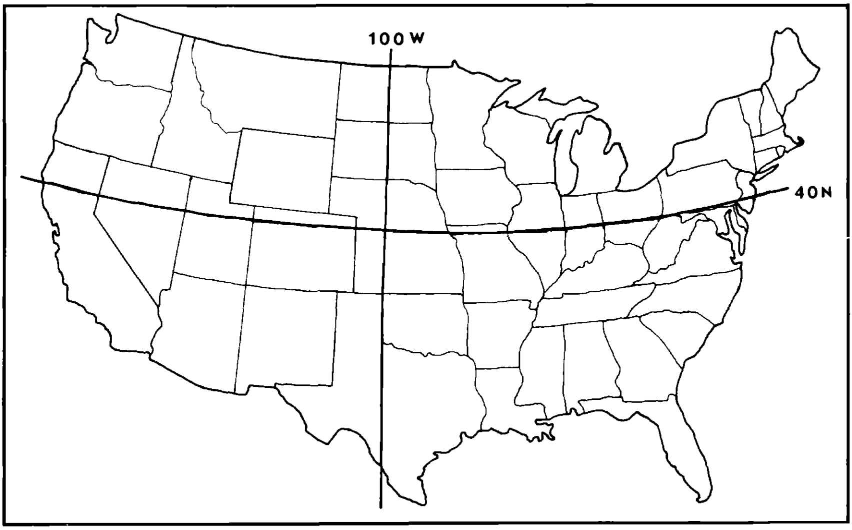


FIGURE 1. Quadrats (bounded by 40°N and 100°W) used for Great Blue Heron band recovery analysis.

## RESULTS AND DISCUSSION

National Wildlife Refuge (NWR) permittee banded herons, which were only west of 100°W, lived longer than other herons. These herons were presumably banded on NWR's and may live longer because they are protected from harassment. East of 100°W, most herons (≥64%) were recovered before they were one year old, 23% were two years or older, and 11% lived four years or longer (Table 1). This was similar to longevities west of 100°W in the 1925–1946 and 1947–1958 periods (Table 1) when 11% and 6%, respectively, of the recoveries were of herons banded by NWR permittees. Although there were few recoveries from NWR banded herons in these periods (N = 11 from the Ul Bend-Bowdoin NWR in Montana), these NWR herons had a greater longevity than non-NWR herons. Only 37% of the NWR herons were recovered in their first year, while 45% lived two years or more, and 36% lived four years or more. In the 1959–1968 period, all but two recoveries west of 100°W in Table 1 were from the Medicine Lake NWR in Montana, the Malheur NWR in Oregon, and the Klamath Basin NWR in Oregon and California. Only 30% of these 43 NWR recoveries were found in the first year, at least 44% lived two years or more, and 24% were recovered after four years. In the 1969–1974 period west of 100°W, 29% of the 49 band recoveries were from the Klamath and Malheur NWR's. These NWR herons also had greater longevities than non-NWR herons with only 50% of NWR herons recovered in their first year, and 36% recovered when 2–4 years old. Pooling all NWR recov-

TABLE 1. Percentage of Great Blue Herons recovered per age-class (in years) during four time periods for herons recovered through 1978. All herons were banded north of 40°N. A dash indicates that data are not available because not enough time has elapsed (i.e., a minimum of 20 years) for all herons to have been recovered.

| | ≥100°W Age (years) | | | | | | <100°W Age (years) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | 0.1–0.9 (%) | 1.0–1.9 (%) | 2.0–3.9 (%) | 4.0–9.9 (%) | ≥10 (%) | N | 0.1–0.9 (%) | 1.0–1.9 (%) | 2.0–3.9 (%) | 4.0–9.9 (%) | ≥10 (%) |
| 1925–1946 | 81 | 65 | 14 | 11 | 7 | 2 | 90 | 69 | 8 | 12 | 8 | 3 |
| 1947–1958 | 31 | 74 | 16 | 3 | 6 | 0 | 75 | 64 | 16 | 9 | 11 | 0 |
| 1959–1968 | 45 | 33 | 24 | 18 | 24 | — | 56 | 75 | 11 | 9 | 5 | — |
| 1969–1974 | 49 | 76 | 16 | 8 | — | — | 26 | 73 | 23 | 4 | — | — |
| 1925–1968[1] | 52 | 33 | 25 | 17 | 25 | — | 0 | 0 | 0 | 0 | 0 | 0 |
| 1925–1968[2] | 102 | 73 | 14 | 9 | 5 | — | 217 | 70 | 12 | 11 | 8 | — |

[1] Banded by National Wildlife Refuge (NWR) permittees.
[2] Banded by non-NWR permittees.

eries from 1925 through 1968 for the four age-classes in Table 1 less than 10 years old, I found that herons banded by NWR permittees had significantly longer lives than non-NWR herons either west of ($\chi^2$ = 32.05, df = 3, $P < 0.01$) or east of 100°W ($\chi^2$ = 20.82, df = 3, $P < 0.01$) (also see Table 1). This difference was not a west-east difference as the longevities for non-NWR herons west of 100°W did not differ significantly from those east of 100°W ($\chi^2$ = 1.44, df = 3, $P > 0.10$).

A high proportion of NWR banded herons could result in western and eastern quadrats differing in longevities for the same time period. As previously mentioned, the proportion of NWR herons in the 1925–1946 and 1947–1958 periods was small. In these periods, the longevities among three age-classes (0.1–0.9, 1.0–2.9, and ≥ 3.0 years old) were not significantly different between the two quadrats (1925–1946, $\chi^2$ = 3.77, df = 2, $P > 0.10$; 1947–1958, $\chi^2$ = 2.64, df = 2, $P > 0.10$). In 1959–1968, when there was a high proportion of NWR herons west of 100°W, western herons had significantly greater longevities for three age-classes (0.1–0.9, 1.0–2.9, and 3.0–9.9 years old) ($\chi^2$ = 17.70, df = 2, $P < 0.01$). For the 1969–1974 period, there were insufficient data to determine any statistical differences between herons banded west and east of 100°W.

For the same quadrat, the proportion of NWR herons was the deciding factor in determining if herons from different time periods differed in longevity. East of 100°W, where there were no NWR herons, recovery rates were similar for the 1925–1946, 1947–1958, and 1959–1968 periods (Table 1) and did not differ significantly for the four youngest age-classes in Table 1 ($\chi^2$ = 4.75, df = 6, $P > 0.10$). West of 100°W, the high proportion of NWR herons recovered from 1959 through 1968 resulted in significant differences between these time periods ($\chi^2$ =

20.20, df = 6, $P < 0.02$), but the 1925–1946 and 1947–1958 periods did not differ significantly from each other ($\chi^2 = 2.74$, df = 3, $P > 0.10$).

NWR herons longevities can dramatically alter calculations of the number of young necessary to maintain a stable population. There are insufficient data to rigorously compare this for NWR and non-NWR herons because not all herons banded from 1958 through 1968 may have been recovered (see Henny's Table 26) and the number of herons banded on NWR's is not known (see Henny's Table 27). However, for the sake of comparison, I calculated a high estimate of the number required for a stable population by using Henny's (op. cit.) methods for his Table 26. This estimate would always be high because when additional older herons are recovered the number would decrease. I estimated that the number required for the 1925–1968 non-NWR herons north of 40°N would be 2.33 young per year (N = 324 recoveries, 1st year mortality = 0.69, 2nd year = 0.39, 3rd year and after, $\bar{x} = 0.22$). In contrast, NWR herons in this period would only need 1.07 young per year (N = 54 recoveries, 1st year mortality = 0.35, 2nd year = 0.37, 3rd year and after, $\bar{x} = 0.22$). Pooling all 1946–1965 recoveries, Henny (op. cit.) rigorously calculated that 1.99 young would be required to maintain a stable population.

The proportions of NWR heron recoveries in different time periods can influence time period longevity comparisons. Pooling recoveries, Henny (op. cit.) found that post-1946 herons lived longer than pre-1946 herons, and he suggested that this may have resulted from decreased shooting. However, I suggest that the difference results from uneven proportions of NWR herons between these periods. Prior to 1947, I found that 5% of the United States recoveries north of 40°N were from NWR's, compared to 21% for 1947–1968 herons. The higher proportion of NWR herons after 1946 would result in the observed longer longevities.

ACKNOWLEDGMENTS

I am grateful to the U.S. Fish and Wildlife Service Bird Banding Laboratory for band recovery data and to K. Klimkiewicz of the Bird Banding Laboratory for her assistance. D. W. Mock, D. Werschkul, and J. A. Wiens constructively commented on various drafts of this manuscript.

*423 SW 9th, Newport, OR 97365.* Received 4 Sept. 1980; accepted 21 Mar. 1981.