50), from as many different sets as possible, should be adequate to determine an upper size limit for runts. An efficient procedure is to measure 1 egg chosen randomly from each available set. Clutches containing only runt eggs, such as have been recorded in several species, must be picked out by eye and tested, using the absolute size criterion alone.

By eliminating the 38 eggs defined as runts by these criteria from the total sample of Acorn Woodpecker eggs, the distributions of length, width and volume change markedly (Table 1). The striking skewness and leptokurtosis of all 3 variables are lost, and the distribution of volume is normalized ($P > 0.50$, Kolmogorov-Smirnov test for normality).

Given the low frequency of runt eggs in most natural populations, samples containing more than, at most, a very few runts are difficult to obtain, and thus differences from species to species are difficult to test using standard statistical methods such as the χ^2 test. The Fisher exact test (Bailey, Statistical Methods in Biology, English Universities Press, London, England, 1959), though usually employed when the total sample size is quite small, can be modified for this problem. This statistic can readily be calculated, regardless of the total sample size, by use of Forsyth's formula for ln n!:

$$\ln n! = \ln \sqrt{2\pi} + \left[(n + \tfrac{1}{2}) \times \ln\left(\frac{\sqrt{n^2 + n + \frac{1}{6}}}{e} \right) \right]$$

Even with the aid of this statistic, however, statistically significant differences in runt egg frequency between species will be testable only on the grossest scale without large sample sizes.

Care must also be taken to insure that samples are comparable. In particular, the bias of museum collectors toward anomalies may result in a higher frequency of runt eggs in collections than in the wild. Furthermore, this bias probably differs among species with different types of nesting habits and of differing degrees of rarity.

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Breeding biology of Eastern Phoebes in northern Wisconsin.— The Eastern Phoebe (*Sayornis phoebe*) breeds widely throughout North America (Bent, U.S. Natl. Mus. Bull. 179, 1942). Despite this, relatively few studies of its breeding biology have been done. Furthermore, only 2 studies (Middleton and Johnston, Jack Pine Warbler 34:63–66, 1956; Cuthbert, Jack Pine Warbler 40:68–83, 1962) have been conducted in the Great Lakes states where the species is fairly common.

During the 1974–76 nesting seasons, I studied several aspects of Eastern Phoebe breeding biology in northern Wisconsin. The main objectives were to determine clutch-size, hatching and fledging success and mortality factors, and to examine the relationship between them and nest placement variables.

Study area and methods.—The study area was in northwestern Wisconsin, in Barron County, which lies in the Central Plain Province (Martin, The Physical Geography of Wisconsin, Wis. Geol. and Nat. Hist. Surv. Bull. 36, 1932). The Red Cedar River and its tributaries comprise the major drainage system. Vegetation was primarily northern deciduous forest (Curtis, Vegetation of Wisconsin, Univ. Wis. Press, 1959), comprised of maple (*Acer* spp.), basswood (*Tilia* spp.) and aspen (*Populus* spp.) subclimax. Willow (*Salix* spp.) and alder (*Alnus rugosa*) were common along stream banks.

I conducted field work in 1974–76, from April to August during the nesting seasons. Nests were located by checking beneath each highway bridge along a predetermined route. All bridges containing an active nest were marked on U.S. Geological Survey topographic maps. An active nest was one in which at least 1 egg was laid.

Initially, the following were recorded on field data sheets for each nest: date, time, general weather conditions, nest placement and height of nest above water; then each nest was visited 1–3 times per week, and its status recorded. Nesting data were later transferred to individual nest cards for analysis. During 1975, nestling Eastern Phoebes were banded with U.S. Fish and Wildlife Service aluminum leg bands. No attempt was made to capture adults. Data were assembled to test for significant differences using Chi-square (with $P \leq 0.05$).

Results and discussion.—Phoebes returned to the study area about 15 April each year. Singing and other territorial displays commenced within a week of arrival.

The mean date of laying the first egg was 7 May (range 5–8 May). This is several weeks later than the findings of Klaas (Occ. Pap., Univ. Kansas Mus. Nat. Hist. 41:1–48, 1975) in Kansas, and later than several Illinois records (Graber et al., Illinois Nat. Hist. Surv. Biol. Notes, No. 86, 1974). Klaas documented the effect of temperature on the initiation of egg-laying in phoebes. A shorter growing season associated with the more northerly latitude of Wisconsin probably explains differences between the later nest initiation I observed, and dates for Kansas and Illinois.

Peak nesting activity, or the maximum number of active nests, for first nesting attempts occurred between 30 May and 10 June. Second nesting attempts (those occurring after successful first attempts) reached a peak during mid-July. Nesting activity ceased by 10 August each year.

All nests examined (N = 71) were found on cross beams under highway bridges constructed primarily of concrete and steel. Height of nests above water varied from 0.9–3.05 m ($\bar{x}$ = 2.04 ± 0.51; N = 71). Bridges are important nest-sites for other phoebe species. Ohlendorf (Wilson Bull. 88:255–271, 1976) found 40.7% of Say's Phoebe (*Sayornis saya*) and 77.3% of Black Phoebe (*Sayornis nigricans*) nests examined, under bridges.

In all instances except one, nests were placed within 2 m of the upstream edge of the bridge. The 1 nest placed within the downstream section was 1 m from the center of the bridge. All nests were placed on the end of the bridge where the deepest water occurred. Coffey (Migrant 34:41–49, 1963) also reported nests on cross beams, with most located on the upstream side of the bridge. He thought that nests placed near deeper water are probably afforded greater protection from terrestrial predators than those placed over shallow water.

I observed 110 nesting attempts, including 39 second nesting attempts. There were 502 eggs laid in the active nests for an average clutch-size of 4.56 ± 0.7. The range was 3–7 eggs, with 5 being the mode. Klaas (1975) reported a clutch-size of 4.33 in nests not parasitized by Brown-headed Cowbirds (*Molothrus ater*) in Kansas. Middleton and Johnston (1956) found an average clutch-size of 5 in 85 nests in Michigan.

The length of time from laying the last egg to the hatching of the last young averaged 16.3

TABLE 1

COMPARISON OF NUMBER, CLUTCH-SIZE, YOUNG FLEDGED AND NESTING SUCCESS BETWEEN FIRST AND SECOND BROODS

Year	Brood number	Active nests	Clutch-size	Young fledged	Successful nests	Percent successful nests
1974	1	24	4.5	71	18	75.0
	2	13	4.5	49	11	84.6
1975	1	23	4.6	69	17	73.9
	2	12	4.6	35	10	83.0
1976	1	24	4.6	73	20	83.0
	2	14	4.6	51	12	85.7

± 0.9 (range 15–17) days in 76 nests. There was no apparent difference in incubation periods between first and second broods. Kendeigh (Illinois Biol. Monogr. 22:1–356, 1952) reported that the average incubation period of Eastern Phoebes was 16 days. Coffey (1963) found the incubation period in Tennessee ranged from 16–20 days, and Cuthbert (1962) cited incubation estimates of 15–21 days.

Three hundred ninety-two of the 502 eggs hatched, for a hatching success of 78.0%, and 348 young fledged, or 69.3% of the total eggs resulted in fledged young. This was greater than fledging success ranging from 38.2–55.8% in nonparasitized nests observed by Klaas (1975). Young fledged from 88 of 110 active nesting attempts, or a nesting success of 79.8%. This was considerably higher than 67.9% reported by Klaas (1975).

Of the 110 nesting attempts I observed, only 1 (0.9%) was parasitized. No young were produced from this nest. A second nesting attempt by this pair produced 4 young. Klaas

TABLE 2

COMPARISON OF EASTERN PHOEBE REPRODUCTIVE SUCCESS, 1974, 1975 AND 1976

	1974	1975	1976	$\bar{x}$	SD
Nesting attempts	37	35	38	36.6	1.52
Second broods	13	12	14	13	1
Eggs laid	166	161	175	167.3	7.09
Clutch-size	4.48	4.6	4.6	4.56	0.07
Eggs hatched	130	122	140	131	9.01
Eggs hatched per nest	3.5	3.48	3.68	3.55	0.11
Percent eggs failed	22.0	24.3	20	22.1	2.15
Young fledged	120	104	124	116	10.5
Young fledged per nest	3.24	2.97	3.26	3.15	0.16
Young fledged per successful nest	4.13	3.85	3.87	3.95	0.16
Successful nests	29	27	32	29.3	2.51
Percent successful nests	78.3	77.1	84.2	79.9	3.8

(1975) reported a very high rate of cowbird parasitism. He found 117 of 321 nests (36.4%) were parasitized. Rates of parasitism from other studies include 1.2% in Tennessee (Coffey 1963), 11.7% in Michigan (Middleton and Johnston 1956) and 14% in Michigan (Cuthbert 1962). The low rate of cowbird parasitism probably contributed to the high rate of reproductive success in my study.

The nestling period ranged from 13–16 days ($\bar{x}$ = 15.2 ± 0.5). Bent (1942) and Coffey (1963) reported fledging at 15–16 days and 15 days, respectively. At a few nests, the return of fledglings made it difficult to determine the length of the nestling period at these nests.

Thirty-nine of the 110 nestlings were second broods, which were always more successful than first broods (Table 1). No significant difference existed between second brood success ($\bar{x}$ = 84.4% ± 1.35) and first brood success ($\bar{x}$ = 77.3% ± 4.96). There was no significant difference in the average number of fledglings per successful nest ($\bar{x}$ = 3.4 ± 0.43) in second broods and ($\bar{x}$ = 3.0 ± 0.04) in first broods.

Annual reproductive success remained essentially constant even though several reproductive parameters varied (Table 2). Chi-square analysis indicated there was no significant difference in yearly reproductive success.

Nest mortality was attributable to infertile eggs, embryonic death, nest abandonment and nest mites. Overall, 22.1% of the eggs laid failed because of all mortality factors combined. Seven nests were abandoned, of which harassment by trout fishermen probably caused 3. The causes of the other 4 abandonments are unknown.

Nest mites observed in 9 nests probably contributed to the deaths of 35 young phoebes. Coffey (1963) reported a low incidence of nest mites, with 3 of 78 nests containing mites. Although the possibility of young being pushed or knocked from the nest seemed high because of the shallow construction, only at 1 site did it appear that nestlings had been pushed out.

During incubation, adult phoebes were passive when I investigated the nest. The incubating adult usually flew from the nest and perched on a nearby branch. Upon my departure, the adult would usually return within 2 min. With young in the nest, the adults became very aggressive when I approached and the brooding adult would give a loud chip call. The mate would usually arrive upon hearing the call note and both adults would fly rapidly among perches continuing to call.—CRAIG A. FAANES, *U.S. Fish and Wildlife Service, Minneapolis, Minnesota 55111.* (Present address: *U.S. Fish and Wildlife Service, Northern Prairie Wildlife Research Center, Jamestown, North Dakota 58401.*) *Accepted 28 Mar. 1979.*

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Variation in promiscuity among Red-winged Blackbirds.—Promiscuous matings by female Red-winged Blackbirds (*Agelaius phoeniceus*) have been observed by a few investigators (Allen, Proc. Linn. Soc. N.Y. 24–25:43–128, 1914; Beer and Tibbitts, Flicker 22:61–77, 1950; Simmers, M.S. thesis, Univ. Mass., Amherst, Massachusetts, 1961). Bray et al. (Wilson Bull. 87:187–195, 1975) were the first to apply experimental method to the phenomenon by vasectomizing males and using fertile clutches produced on their territories as evidence of promiscuity. They found fertile clutches on marshes in which 100% of the males were sterilized, suggesting that some breeding takes place outside the polygynous "harem."

In 1976, we applied the vasectomy technique at 9 study sites near Amherst, Massachusetts, as part of a study of red-wing promiscuity. Each site contained the territories of a sterilized