terpreting population indices from BBS data. For example, if BBS indices indicated yearly increases, our results suggest that one could infer that the population had indeed increased but one could only speculate on the magnitude of the change unless additional supportive information, e.g., important habitat changes, was available. While we believe that male density can be derived from BBS counts via the statistical models presented, and subjected to the logical constraints defined above, we acknowledge that neither predictive models nor single-sample surveys can replace carefully implemented censuses of bird populations (Wiens, Am. Nat. 117:90–98, 1981). This study demonstrated that BBS counts can be extremely useful in deriving estimates of male red-wing density; further research appears warranted to determine the nature of the relationship between BBS counts and (male) densities for other species.

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Calculating incubation periods of species that sometimes neglect their last eggs: the case of the Sora.—Most investigators follow Heinroth (J. Orn. 70:172–285, 1922) and Nice (Condor 56:173–197, 1954) in determining the shortest normal incubation periods of birds by calculating the time elapsed between laying of the last egg to hatching of the last young in nests in which all eggs hatch (and preferably in which each egg is marked individually on the day of laying). Usually hatching occurs between successive visits to a nest by the observer, so any estimate of the incubation period of a clutch should be accompanied by a "margin of error" (Nolan, Ornithol. Monogr. No. 26, 1978). The Heinroth-Nice method standardizes the incubation periods of free-living birds reported in the literature, applies to most species with different hatching schedules, and minimizes the uncertainty concerning the time when attending adults begin incubating.

We describe here a modified Heinroth-Nice procedure that is recommended for determining the minimal normal incubation periods in large-brooded species which sometimes neglect the last one or two eggs in a nest causing them to hatch later than they otherwise would have (Nice 1954:173; this study). We examine this problem using the Sora (*Porzana carolina*) as an example.

The Sora has a clutch-size of 5–15 eggs (9–12 is a more typical range) and incubation and care of young is shared by the sexes (Pospichal and Marshall, Flicker 26:2–32, 1954; Tanner and Hendrickson, Iowa Bird Life 26:78–81, 1956). During the hatching period, one adult

TABLE 1

EGG NEGLECT IN A SORA NEST AND USE OF MODIFIED AND UNMODIFIED HEINROTH-NICE PROCEDURES FOR DETERMINING SORA INCUBATION PERIODS

Nest-cycle variable	Data on nest	Remarks
Date first egg laid, last egg	22 May, 31 May	Laid one egg/day; clutch-size 10
Start of hatching, eggs 1–4	12 June, 16:55–13 June, 09:45	Synchronous hatching; assumed start of incubation, laying of egg 4 (see text)
Hatching sequence, eggs 5–8	one egg/day	Asynchronous hatching between successive visits ca. 1 day apart
Hatching, egg 9	18 June, 17:05–19 June, 10:30	Egg neglect, skipped ca. 1 day between eggs 8 and 9
Hatching, egg 10	20 June, 07:45–21 June, 11:00	Egg neglect, skipped ca. 1 day between eggs 9 and 10
Total hatching interval (h)	187.9 ± 22.03	From hatching of first egg to hatching of last egg ± margin of error[a]
Incubation periods[a], eggs 4–10 (h)	450.3 ± 8.42	Modified Heinroth-Nice estimate of incubation period, egg 4
Egg 5	450.3 ± 10.62	
Egg 6	450.3 ± 9.21	
Egg 7	450.3 ± 12.97	
Egg 8	454.4 ± 15.13	
Egg 9	475.8 ± 8.71	
Egg 10	495.4 ± 13.63	Unmodified Heinroth-Nice estimate of incubation period, egg 10

[a] On several early morning visits to the nest during egg-laying, the egg laid that day had already been deposited; for purposes of calculating incubation periods and their margins of error (Nolan 1978:235), we use 06:00 as an arbitrary and standardized laying time for all eggs.

continues to incubate the remaining eggs in the nest while the other stays with the incomplete brood nearby (Walkinshaw, Auk 57:153–168, 1940).

Soras initiate incubation at least 3 days before the last egg is laid. Within this span start of incubation can be quite variable, having been reported from laying of the first egg (evidently unusual) to laying of the ninth egg in large clutches (Pospichal and Marshall 1954:15; Walkinshaw 1940:158). Thus, not only is spread of hatching between first and last eggs similarly variable between Sora nests, but Soras typically exhibit a mixed hatching schedule in which a first batch of eggs hatch synchronously and the rest hatch asynchronously. Often the eggs in the latter group hatch as they were laid, one each day. However, some birds attending the last few unhatched eggs in nests appear to modify their incubation behavior and cause the ultimate or penultimate and ultimate eggs to miss days before hatching. Application of the last egg rule in such instances will overestimate minimal incubation periods.

Modified Heinroth-Nice procedure.—When several eggs in large clutches hatch on the first day of hatching and the rest hatch asynchronously as in the Sora, we assume that full incubation begins with deposition of the last egg in the group to hatch synchronously. We suggest that the Heinroth-Nice procedure is best applied in the Sora (and in other species that similarly exhibit egg-neglect) by calculating the incubation period for the egg laid on the day that incubation begins. This is equivalent to current practice in groups of birds in which all eggs hatch synchronously (within one 24-h period). By extension, if all eggs hatch asynchronously as they were laid, one can assume that incubation begins with the first egg and that its incubation period is a representative minimal period for the clutch.

Since egg neglect should affect only the last few eggs to be laid in a Sora nest, incubation periods calculated for the first several eggs laid after incubation begins may well be similar (Table 1). But, for purposes of standardization, any method employed should be used consistently.

In two Sora nests that we recently observed on Long Island, New York (Greenlaw and Miller, Kingbird 32:78–84, 1982), we found evidence of egg neglect affecting the hatching time of the last one or two eggs. We have full data on laying and hatching schedules for only one of these nests, so we use it here to illustrate the applications of unmodified and modified Heinroth-Nice procedures for determining minimal incubation periods (Table 1).

In this nest, 10 eggs were laid, one each day. Incubation began with laying of egg 4 (eggs 1–4 hatched synchronously). Eggs 5–8 hatched on a daily schedule, but eggs 9 and 10 each missed a day before hatching. Using egg 4 as the representative egg (modified procedure), the incubation period for this nest is 18.8 ± 0.35 days. This value is close to the mean period of 18.7 days reported by Pospichal and Marshall (1954) for a sample of 22 Sora nests. An indiscriminate use of the unmodified procedure (egg 10) for our nest yields a period of 20.6 ± 0.57 days, a value which lies near the upper end of the range of reported values for this species (Pospichal and Marshall 1954; Tanner and Hendrickson 1956; Walkinshaw 1940; Auk 74:496, 1957).

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Do secondary roosts function as information centers in Black-billed Gulls?—In a widely-cited hypothesis, Ward and Zahavi (Ibis 115:517–534, 1973) suggested that certain bird assemblages function primarily as information centers, where birds that are unsuccessful in finding food follow more successful birds. Relevant assemblages were said to include breeding colonies, large communal roosts, and "secondary" roosts that sometimes form as satellite aggregations closer to current food sources. Gulls (*Larus ridibundus, L. argentatus*) were included as examples of species employing secondary roosts, but no one to date appears to have looked closely at gull roosts to see if they could function as information centers. One study (Lowman and Tamm, Am. Nat. 115:285–305, 1980) has examined the relevance of the information center hypothesis at communal roosts of Hooded Crows (*Corvus cornix*) and Common Ravens (*C. corax*), but with equivocal results.

Roosts are common on or near foraging areas used by Black-billed Gulls (*L. bulleri*) breeding inland in New Zealand. These gulls typically feed on short-lived but temporarily rich and patchily distributed food (Evans, Behaviour 79:28–38, 1982) and so might be expected to employ functional information centers as an aid to food finding. I examined this hypothesis for roosts located inland, adjacent to the Ashley River, near Christchurch, in 1979. I found