ROOSTING OF A SPOTTED ANTBIRD (FORMICARIIDAE: *HYLOPHYLAX NAEVIOIDES*) IN COSTA RICA

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Although the natural history of the Spotted Antbird (*Hylophylax naevioides*) is well known, thanks to nesting studies by Skutch (1950, 1969) and a forthcoming monograph by E. O. Willis (1971), its roosting behavior away from nests has not been reported.

At 20:00 on 3 February 1970 at Finca La Selva (Slud 1960), a large tract of primary growth lowland (89 m) wet forest situated 2 mi. SW of the village of Puerto Viejo de Sarapiquí (10° 26′ N) in the Caribbean lowlands of Costa Rica, I found by flashlight a male Spotted Antbird sleeping 3.2 m off the ground on a horizontal branch of a leafy small dioecious tree (Rubiaceae). I had been doing nightly sampling of emerging cicada nymphs over a wide area of forest floor since early January, but had not noticed the bird before. From 3 February to 30 May (table 1) I checked for a sleeping bird on this particular perch and in nearby understory trees. Whenever possible, I made observations several times each evening, including the time that the bird arrived at the sleeping perch. Although this sleeping individual was unmarked, its presence in the same place over this period suggests that it was the same bird. Moreover, Spotted Antbirds are known to have stable territories, and to not permit much trespassing (E. Willis, pers. comm.).

This Spotted Antbird roosted in the *same* tree on many evenings each month, and for about 84 per cent of these evenings it was on the *same* branch of this tree. Occasionally, when the bird was not in the tree on these evenings, I searched quietly with a flashlight in other trees of similar size within about 30 m of the usual roosting site. I never located the bird on such occasions, despite a thorough search of the area several times; presumably the bird roosted elsewhere. In addition, I never saw more than one individual roosting in the 30-m area on a given evening and this individual was always the one roosting on the same tree. During the day the bird was never seen perching on this tree nor in the immediate surrounding understory (checks made several days each month at differing hours including morning and afternoon).

Perhaps the most interesting result of this study was the pronounced spatial persistence of the roosting site for a relatively long period of time (table 1). Time of nightly arrival at the roosting site was also very regular. The biological significance, if any, of such consistency in a solitary roosting site could not be determined in this study. It may be that consistent roosting behavior allows birds to become extremely familiar with a given portion of their habitat and thus to ensure some sort of protection against predators. Also, a site that has been safe in earlier nights may be away from predator routes and hence safer. Location of solitary night-roosting sites may also be related to the distribution of preferred prey sources in the habitat, but Spotted Antbirds can easily return to any given site in their small territories from any other site at which they may have been foraging (E. Willis, pers. comm.). According to Slud (1960, 1964) and Willis (pers. comm.), Spotted Antbirds occasionally follow army ants but forage away from them when no ants are on their territories. Individuals stay on the same or nearly the same territories for years in the moderately seasonal forests of Barro Colorado Island in Pánama, so that in relatively nonseasonal forests like Finca La Selva food should be available within a short distance of a roosting site in both wet and dry periods.

TABLE 1. Nightly occurrence of Spotted Antbird (*Hylophylax naevioides*) at one roosting site.

Date[a]	Present[b]	Bird arrived[c]	Weather[d]
Feb. 4	+	18:05	overcast
5	+	18:00	overcast
6	+	18:00	rain
7	+	18:10	rain
8	+	17:56	overcast
9	+	18:05	clear
10	+	18:00	rain
18	+	17:55	overcast
19	+	17:57	clear
20	+	18:02	clear
21	—		clear
22	+	18:00	clear
23	+	17:48	overcast
24	+	18:10	overcast
Mar. 4	+	18:00	clear
5	+	17:54	clear
6	+	17:50	rain
7	—		rain
8	+	17:57	overcast
9	+	17:55	clear
10	+	18:12	clear
11	+	18:00	clear
17	+	17:52	overcast
18	—		rain
19	+	17:56	rain
20	+	18:04	overcast
21	+	18:05	overcast
22	+	18:00	rain
23	+	17:55	rain
28	+	18:12	clear
29	+	18:09	clear
30	+	18:02	clear
Apr. 1	+	18:00	clear
2	+	17:57	clear
3	+	18:08	rain
4	+	18:00	rain
17	+	17:54	overcast
18	+	17:51	rain
19	+	18:05	rain
20	+	18:00	overcast
21	—		rain
22	—		clear
23	—		overcast
May 28	+	17:47	clear
29	+	18:00	rain
30	—		rain

[a] Dates include the drier months ("veranillo") at Finca La Selva, which for this year were actually rainy (light, intermittent rainfall interspersed with days of no rain) and part of the wet season (April and May).

[b] "+" indicates bird present, "—", bird absent, on a given date.

[c] These are the times when the bird arrived at the roosting site since the observer usually was present at the site by 17:30 on a given evening.

[d] These are the weather conditions for 17:00–19:00. "Overcast" means heavy clouds, very dark in the forest interior.

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Although nesting female Spotted Antbirds are known to stay on the nest at night, as is usual for female antbirds (Skutch 1969), it is not known if females roost in the way this bird did during periods when they have no nest. It would be interesting to determine the kinds of roosting in this species and their relationship to foraging, reproduction, and other biological activities in both nonseasonal and seasonal forests.

I am grateful for research funding as a post-doctoral associate of The Comparative Ecosystem Study (Section VIII: Arboreal Insect Populations; D. H. Janzen, principal investigator, N.S.F. Grant 7805) of The Organization for Tropical Studies in Costa Rica. F. Gary Stiles kindly identified the species for me during March 1970 when he was at Finca La Selva. E. O. Willis encouraged and assisted in publication.

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Accepted for publication 8 September 1970.

SHELL THINNING IN EGGS OF THE COMMON MURRE, *URIA AALGE*, FROM THE FARALLON ISLANDS, CALIFORNIA

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In recent years several fish-eating or raptorial birds that depend entirely or in part upon the marine food chains in California no longer occur as breeding species or are now experiencing reproductive failures as a result of excessive shell thinning. The Peregrine Falcon (*Falco peregrinus*) began to lay thin-shelled eggs in California in 1947 (Hickey and Anderson 1968) and now no longer breeds in the wilderness environment of the Channel Islands (Herman et al. 1970). The Bald Eagle (*Haliaeetus leucocephalus*) was a common resident of the Channel Islands in the 1930s (Willett 1933:18–19), but there have been no reports of eagles in that area in recent years. Extensive field work carried out on Anacapa Island by Banks in 1963 and 1964 (Banks 1966) and the authors in 1969 and 1970, failed to find a single eagle where several pairs of eagles once nested. Significant shell thinning was found in eggs of the Brown Pelican (*Pelecanus occidentalis*) collected on Anacapa in 1962 (Anderson and Hickey 1970), and in 1969 virtually all eggs of the Brown Pelican on Anacapa broke during incubation (Risebrough, Davis, and Anderson 1970). In investigating the status of other marine birds in California that might be experiencing reproductive failures, we have looked for shell thinning in the eggs of several species. In this paper we report on our investigations of the Common Murre (*Uria aalge*) on the Farallon Islands.

The Farallon Islands west of San Francisco have long been the breeding site of vast numbers of murres. Ray (1904) wrote of Great Murre Cave on South Farallon Island, where all ledges and projections, as well as the cave floor, were covered with murres, as a "wonder to behold." Initially we examined five murre eggs collected on the Farallon Islands in 1968 for shell thickness, shell weight, and shell thickness index. The thickness index, devised by Ratcliffe (1967), was determined by dividing 10 × the weight (in g) of the shell by the product of the length and the breadth (in cm^2). The values obtained were compared with those of 66 eggs in the Museum of Vertebrate Zoology, University of California, Berkeley, collected by M. S. Ray on the Farallons in 1913. These were measured by D. W. Anderson, using methods described by Anderson and Hickey (1970). The eggs obtained in 1968 were found to have significantly thinner shells, and significantly lower shell weights and shell thickness indices ($P < 0.05$). Since the sample size was small, we examined an additional 24 eggs collected on the Farallons in 1970. The average value of each parameter, with the 95 per cent confidence limits of the mean of the combined 1968 and 1970 collections, are given in table 1.

The length and the breadth of the recent eggs do not differ significantly from the length and breadth of the eggs obtained in 1913. Thickness, thickness index, and shell weight, however, all show significant decreases ($P < 0.05$). Thickness decreased by 12.8 per cent, thickness index by 11.9 per cent, and shell weight by 11.5 per cent.

The five eggs collected in 1968 were analyzed for chlorinated hydrocarbons by methods described by Risebrough, Florant, and Berger (1970). Lipid extracts of the eggs contained an average of 297 ppm DDE (range, 240–395), 168 ppm PCB (range, 122–283), and 0.021 ppm dieldrin (range, 0.00–0.045). No p,p'-DDD or p,p'DDT were detected. An average of 12.9 g of lipid was extracted from each egg, comprising 13.7 per cent of the total wet weight contents.

Ratcliffe (1970) found no differences in thickness index of eggs of the Common Murres of Great Britain in collections obtained before 1937 and after 1950. Chlorinated hydrocarbon pollution of British seas appears, however, to be considerably lower than in California coastal waters. The average DDE concentration in 16 recent eggs of British murres was 2.12 ppm on a wet weight basis (total weight of fresh egg contents), or approximately 16 ppm on a lipid basis. PCB concentrations in the British murres averaged 5.13

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