Since I first noticed the concealing pose, I have recorded it in my notes as fully expressed by 29 of 104 Saw-whet Owls that I found during the day, captured, and banded with lock-on bands. Of the remaining 75, several expressed it partially. Many were captured while still "asleep" (my presence apparently unknown to them until capture). Others were frightened into flight before they were seen, and afterward exhibited only fright reaction. A few made no attempt to hide, but woke up very suddenly when danger was close at hand (noose and pole ca. 1 foot away) and showed fright reaction. No concealing pose was induced by approach in a recently banded owl (up to an hour after release), even if it had behaved in this way when initially found. Measurements suggested that the concealing pose is independent of sex (wing chords in early spring ranged from 128 mm to 143 mm). Similarly I have recorded the concealing pose in its full expression in two of nine Boreal Owls banded.

It was obvious, and proved experimentally on several occasions, that the concealing pose occurred when the owls were disturbed from a distance, usually in excess of 3 feet, and then approached more closely, and that it rarely occurred when they were surprised by a sudden, close disturbance from less than 3 feet away, which elicited the fright reaction. Therefore I suspect that some, if not all, of the remaining 62 percent of Saw-whet Owls and 78 percent of Boreal Owls would have demonstrated the concealing pose had they been approached in a manner to induce this response, and further that such response is characteristic in the behavior of these species.

I thank R. R. Taylor for criticizing this note.—PAUL M. CATLING, *104 Victoria Park Avenue, Toronto 13, Ontario, Canada.* Accepted 30 Apr. 71.

Use of time-lapse photography to study nesting activities of birds.[1] —Collecting quantitative data on incubation movements, attentive periods, and other nest-related behavior is a time-consuming, meticulous, and demanding task. Yet such recording is mandatory for gathering information on incubation effort (by sexes if both are involved), nest relief displays, feeding rates of young, nest and egg care, patterns timed to daily cycles, and even weather and light conditions. Quantitation is essential, and, although many devices have been used to record such activities as nest attentiveness (see Speirs and Andoff, 1958), most events at nests must be recorded visually.

A complete record of all activities at a nest is unlikely except by team efforts (Pettingill, 1963), and variation in observers or in the alertness of any one observer over a long period may reduce accuracy. Moreover in colonial species the availability of several nests offers a unique opportunity for gathering data but an almost impossible recording task for one person. Observation and recording efficiency presumably is inverse to the number of nests watched or to the complexity and number of events occurring at a single nest.

For these reasons Weller started in 1963 to develop a time-lapse 8-mm movie camera for recording events at nests. Problems with the timing device reduced the quality and reliability of the results. A timer eventually was built incorporating a mechanical automobile clock wound electrically about every 2½ minutes. The winding device was used as an electrical contact to activate a solenoid on the single-frame socket of a Nikkorex Zoom 8-mm movie camera. More recently, portable battery-operated time-lapse units have become available, and some are even built

[1] Journal Paper No. J-6700 of the Iowa Agriculture and Home Economics Experiment Station, Ames, Iowa. Project 1504.

into cameras, such as the Braun Nizo S–80 Super 8 cartridge camera with zoom lens (10–80 mm). This unit also has an automatic exposure system that functions on single-frame exposures. We have used these time-lapse cameras experimentally at nests of both solitary and colonial species. This paper reports the research possibilities and the problems associated with the use of time-lapse photography for recording events at nests. Penney (1968) and Cowardin and Ashe (1965) used time-lapse units to record general activities of penguins and ducks, respectively, but they directed attention either to population counts or to general behavior of larger groups of birds.

In 1969–70 we recorded the incubation behavior of the Adélie Penguin (*Pygoscelis adéliae*) at Hallett Station, Antarctica (72° 19′ S, 170° 13′ E) with three time-lapse cameras: A Nikkorex Zoom 8, which averaged intervals of 2.47 minutes (Rg. = 1.95–2.91, SD = 0.18 for 40 samples), and two Nizo S–80 cameras set for 1 frame per minute (M = 1.01, Rg. = 0.99–1.01, SD = 0.005 for 40 samples). As each cartridge of Super 8-mm film has approximately 1,500 frames, at the Nizo setting of 1 frame per minute, replacement was necessary every 60 hours. Changing cartridges takes only a few minutes and was often done with the loss of only a few frames. We exposed a total of 2,100 feet of Super 8 film that yielded nearly 151,200 individual frames.

To provide a continuous record of individuals and sexes in incubating birds, we marked birds by spray-painting a black band across the sides of the chest of males and the lower sides of females (Figure 1). We determined sexes by watching copulating pairs (Sladen, 1958, Penney, 1968) and color-marking them immediately with felt-tipped markers attached to sticks. Later we captured individuals when they were more broody, sprayed them, and banded them with flipper bands from the U. S. Antarctic Research Program designed by Sladen et al. (1968).

Figure 1. Colony of marked and banded Adélie Penguins showing nest-marking stakes and clock. Chest mark shows bird at right is a male, and a marked female is third from right. Male third from left is starting a head-up ecstatic display.

In the Antarctic we used two systems to keep the batteries warm for proper camera operation and battery life. Cameras were placed either in a heated observation hut or in an insulated box heated by a thermostatically controlled heat tape (Figure 2). Excessive heat (up to 120° F) was a greater problem than low temperatures (56° F minimum) were because the box was painted black to absorb solar heat. Nevertheless the Nizo S–80 cameras functioned well over the entire temperature range.

Clocks included in the field of view (Figure 1) provided a record in the event of variation of the timing interval. The Nizo S–80 timer was so accurate this proved unnecessary, but the presence of the clock in each frame was convenient in analyses and in recording time of film changes, nest visits, or other disturbances. Dated and numbered cards placed in the field of view at the end of each film roll prevented mixing of rolls by film processors.

Although possible timing of the Nizo cameras ranged from 1 frame per second to 1 frame per 2 minutes, 1 per minute was selected because it allowed a one-sixtieth sample of events at the nest and provided film duration and battery life of about 2½ days. Obviously some events can be missed in the 1-minute interval between frames, and even more can be missed in the 2.4-minute interval of the timing device used for the Nikkorex. However many movements associated with incubation involve long periods: change of sex on the nest, duration of attentive period, and in some species, nest relief ceremonies and copulation. Threats, nest building movements, egg rolling, and other movements often of less than 1 minute duration can be missed, but the sampling system assumes that some of each will be recorded and that a factor can be calculated to correct for the sample if desirable.

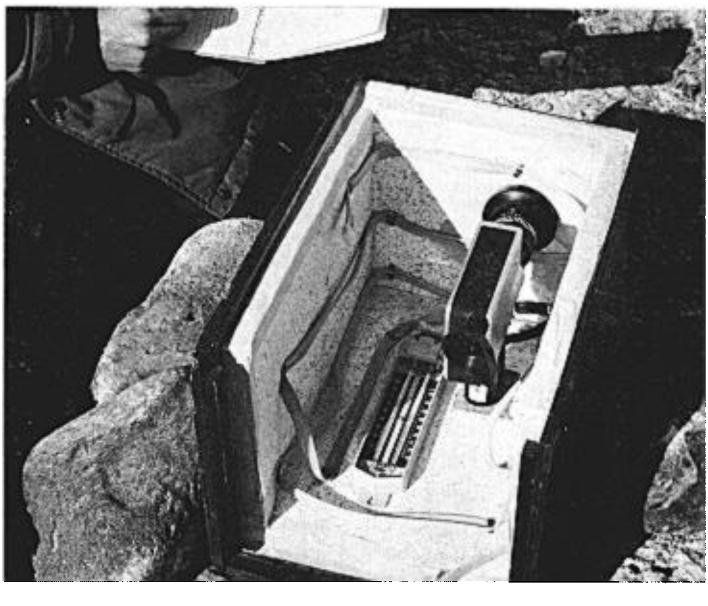

Figure 2. Insulated box with heat tape housing 8-mm Braun-Nizo S–80 camera.

To determine the degree and direction of error, Weller took notes for twelve ½-hour periods to compare with the film sequences. An attempt was made to determine those events not recorded by the camera interval and, eventually, to learn those actions the observer missed. Such comparisons are necessary in each study to evaluate the accuracy of the sampling of movements of occasional occurrence. In twelve ½-hour periods of observation, Weller recorded 2,243 events, such as position on nest, preening, rock-gathering, etc. Of these events the camera missed 110 (4.9 percent) but corrected the observer for errors of various types 50 times (2.2 percent). Moreover events missed were of considerably lesser significance than were events recorded: preening, rock-gathering, and threats at intruders. The camera recorded almost all displays.

Without comparison with Weller's original notes, Derksen analyzed the filmed events of comparable magnitude. He recorded 2,157 events, or 86 fewer than the 2,243 Weller observed, but 25 more than the 2,133 events that Weller noted had been recorded by the camera, a difference produced by more careful study of the pictures. In general both observers recorded all major events.

In the summer of 1970 Weller used a Nizo S–80 at the nest of an American Bittern (*Botaurus lentiginosus*) near Ruthven, Iowa. One 12-hour period from 07:01 to 19:01 and a 9-hour period from 09:15 to 17:10 were recorded at a rate of 1 frame per minute. Because of the accuracy of the timer, no clock was used in the field of view. The camera was enclosed in a plastic bag, and the tripod was placed in the water and supported with a 2 $\times$ 2 inch post. Examination of the color film shows adequate clarity for analysis, although dense vegetation and variable cloudiness limited illumination. In the same area, the camera was used at the same time interval to record events at a nest of Black Terns (*Chlidonias niger*) where young were confined for food utilization studies. A 6-hour recording was obtained.

Black-and-white film was used for recording penguin sequences because of its greater exposure latitude and because prints are easily made. The use of color film has distinct advantages for certain sexually dimorphic birds and for birds well camouflaged in their nest sites. Prints are more expensive but quality is good.

A disadvantage of the existing timing systems is that the camera operates at night as well as day. This provided a continuous record of events in the Antarctic where light levels rarely reached the minimum required for photographs. In median latitudes cameras could be wired to a light-controlled timing device.

For photographing species active at night, synchronization with electronic flash is possible, but this requires a power source or battery pack, which would influence the rate at which pictures could be taken. We have done no work with such species to evaluate either the system or the effects of movie lights.

Perhaps the greatest disadvantage to the system is the lengthy process of analysis. Films must be viewed over and over to check for events, and we have found no automatic means of doing this. A mechanical viewing aid is essential, and, although film editors have proved useful, we have found the Kodak Ektagraphic MFS–8 Super 8 projector ideal because frames can be viewed full size but advanced 1, 6, 18, and 54 frames per second, forward or backward.

This work was sponsored by NSF Antarctic Research Program Grant No. GA13827 to John R. Baker of Iowa State University. We are indebted to Dr. Baker and to George Llano, Program Director for Antarctic Biology, for their assistance in making the Antarctic studies possible. We also are indebted to Ron Kirkoff of the Iowa State University Instrument Shop for making the timer used with the Nikkorex Zoom 8.

Literature Cited

Cowardin, L. M., and J. E. Ashe. 1965. An automatic camera device for measuring waterfowl use. J. Wildl. Mgmt., 29: 636–640.

Penney, R. L. 1968. Territorial and social behavior in the Adélie Penguin. Pp. 83–131 *in* Antarctic bird studies (O. L. Austin, Jr., Ed.). Antarctic Res. Ser., vol. 12. Washington, D. C., Amer. Geophys. Union.

Sladen, W. J. L. 1958. The Pygoscelid penguins. Falkland Islands Dependencies Surv., Sci. Rept. No. 17.

Sladen, W. J. L., R. C. Wood, and E. P. Monaghan. 1968. The USARP Bird Banding Program, 1958–1965. Pp. 213–262 *in* Antarctic bird studies (O. L. Austin, Jr., Ed.). Antarctic Res. Ser., vol. 12. Washington, D. C. Amer. Geophys. Union.

Speirs, J. M., and R. Andoff. 1958. Nest attentivity of Lincoln's Sparrow determined using thermister bridge. Canadian J. Zool., 36: 843–848.

Pettingill, O. S., Jr. 1963. All-day observations at a Robin's nest. Living Bird, 2: 47–55.

Milton W. Weller and Dirk V. Derksen, *Department of Zoology and Entomology, Iowa State University, Ames, Iowa 50010.* Accepted 3 May 71.

House Sparrows in Guatemala.—When Hugh Land prepared the manuscript for his guide to the birds of Guatemala sometime before his death in 1968, he had no report of House Sparrows (*Passer domesticus*) in that country, but he noted that House Sparrows were reported in the neighboring Mexican state of Chiapas (Land, Birds of Guatemala, Wynnewood, Pennsylvania, Livingston Publ. Co., 1970, p. 115). A map in a paper by Sick (Bol. Mus. Nacional, Zool., No. 207, 1959, p. 8, Figure 3) shows the range of this species extending as far south as Nicaragua, but the text refers only to Mexican records so the map is undoubtedly in error.

House Sparrows have now penetrated Guatemala. On 1 May 1970 I found a colony of them in the central plaza of Quezaltenango (14° 50′ N, 91° 30′ W), a city in the volcanic highlands about 70 airline kilometers from the Mexican frontier. Its elevation is 2,350 meters.

It was difficult to estimate the size of the colony. Movement of dogs and people through the plaza kept the birds flying from one place to another. I counted 10 individuals at one time; probably there were 25 or more.

When I visited Huehuetenango, elevation 1,900 meters, about 60 kilometers north of Quezaltenango, on 2 May 1970, I saw no House Sparrows there. It should be worthwhile to follow the progress of this species in Guatemala, noting the routes followed and the impact on native species.—Walter A. Thurber, *Cornell Laboratory of Ornithology, 159 Sapsucker Woods Road, Ithaca, New York 14850.* Accepted 6 Apr. 71.