1971, emerged from the cloaca in our close view. During the emergence, we observed liquid blood on the margins of the cloaca. Within four seconds the egg was in Mrs. Hyndman's hand. The deposits were on and into the coating of moist mucus surrounding the shell. The coloring matter was still liquid, runny. It ran onto hands, and was washable in the manner of blood. Before coagulation, one blob was touched by a tissue swab which quickly soaked it up. The bottled swab and the intact egg were taken to the laboratory of Royal Jubilee Hospital, Victoria, B.C., within 20 hr, where we scraped coagulated blobs from the shell in the presence of technicians. Dr. George Anderson, lab director, examined both tissue and scrapings. Both contained red blood corpuscles, which were viewed by Drs. George Anderson and N. J. Ball, and one of us (C.C.H.). All observers agreed that they were blood proper. Later, at the University of Victoria, red corpuscles of fresh raven, gull, and owl blood were found to be similar to those of the eagle. Pigment gland or other glands which draw on the blood stream (with exception of the spleen) are separated from direct contact by the blood vessel walls, normally impenetrable to red corpuscles; "the blood cells remain in the blood vessels" (Kahn 1965). "The spleen is the only region, then, aside from the red marrow, in which they were formed, that the red corpuscles have direct contact with tissue cells, other than those that form the lining membrane of the blood vessels" (Martin 1923). Blood proper with its red corpuscles can only come from ruptured blood vessels or spleen (pers. comm., E. J. Fennell, Dr. G. Anderson).

In summary, we conclude that the reddish deposits typical of the Golden Eagle egg shell are in fact blood proper from hemorrhage, not the secretion of pigment glands.

LITERATURE CITED

BENT, A. C. 1961. Life histories of North American birds of prey. Pt. 1. Dover Publ., New York.

BROWN, L., AND D. AMADON. 1968. Eagles, hawks, and falcons of the world. Vol. 2. McGraw-Hill, New York.

GODFREY, W. E. 1966. Birds of Canada. Nat. Mus. Can., No. 203 (Biol. Ser. 73). Queen's Printer, Ottawa, Canada.

KAHN, F. 1965. The human body. Random House, New York.

MARTIN, E. G. 1923. The human body. Henry Holt, New York.

REED, C. A. 1965. North American bird eggs. Dover Publ., New York.

SIMPSON, K. [ed.] 1965. Taylor's principles and practice of medical jurisprudence. Vol. 1, 12th ed. Churchill, London.

THOMSON, A. L. [ed.] 1964. A new dictionary of birds. McGraw-Hill, New York.

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PROLONGED AND BISEXUAL INCUBATION BY CALIFORNIA OSPREYS

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In connection with studies on the reproductive status of the Osprey (*Pandion haliaetus*) in California, 10 nests at Eagle Lake in Lassen County were routinely checked during the nesting seasons of 1970 and 1971 between the end of March and mid-June to obtain information on nesting chronology. In addition, continuous surveillance was maintained for 2 days on seven of these nests and partial surveillance was maintained for one day on two nests at Lake Almanor in Plumas County in 1970 to record behavioral activity at nesting sites.

METHODS

Contents of the 10 nests at Eagle Lake, all in the tops of yellow pine stumps (*Pinus ponderosa*) approximately 5–8 m above the ground, were examined by climbing to them on an extendable aluminum ladder leaned against the nest trees and looking over the edge of the nests. The contents of each nest were checked up to a total of nine times during incubation: every other day until the first eggs were laid and while eggs were hatching, also once or twice in between. Incubating parents generally flushed from their nests as we approached within 15–45 m of the nest tree and returned at about the same distance as we departed. We made every effort to minimize our stay at the nests and managed to keep incubating parents off their nests for no more than 15 min, usually for about 5 min.

Observations in 1970 on behavioral activity at the seven nests at Eagle Lake were obtained from a blind between dawn and dusk on 18 and 20 May, and at the two nests at Lake Almanor by observing them from approximately 400 m with a spotting scope on 27 May.

RESULTS AND DISCUSSION

Nest contents were examined often enough in 1970 to obtain measurements on the duration of incubation in two nests. Three eggs were found in one nest on 2 May, and four were found when the nest contents were next examined on 21 May; one of these eggs hatched on 2 June, a second hatched on 7 June, a third hatched on 10 June, and a fourth failed to hatch. Even if the egg failing to hatch was among the first three eggs observed, the incubation period of the remaining two eggs had to be at least 31 and 36 days, respectively. One egg was found in the second nest on 29 April, and a second egg was found on 2 May; one egg hatched on 9 June, and the other hatched on 12 June. Presumably the eggs hatched in the order laid, thus they were incubated for at least 43 and 38 days, respectively.

Three eggs, freshly laid in each of three separate nests on 29 April 1971, were marked with permanent ink for identification. All three eggs hatched on 6 June, an incubation period of 38 days.

These incubation periods exceed those previously reported for North American Ospreys of 28–33 days (Bent 1937:361; Ames 1964:18), but compare with those reported for Eurasian Ospreys of 35–38 days (Dementiev and Gladkov 1951:340; England 1956: 49; Bannerman 1956:347; Brown and Waterston 1962: 137).

Day-long observations maintained on the seven nests at Eagle Lake in 1970 revealed that both sexes

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TABLE 1. Division of incubation time by sexes on seven Osprey nests at Eagle Lake, California.

Nest no.[a]	Date of observation 1970	No. exchanges	Hours incubation ♂	Hours incubation ♀
5	20 May	9	6.97	6.03
6	20 May	7	8.33	4.67
7	20 May	5	10.85	2.15
9	18 May	7	8.33	4.67
10	18 May	10	7.38	5.62
11	18 May	2	11.33	1.67
12	18 May	5	10.87	2.13
		Average 6.4	9.15	3.85
		% of total	70	30

[a] These are seven of 60 Osprey nests discovered in Lassen and Plumas Counties; their location, history of use, and productivity will be presented later (Garber, Koplin, and Kahl, in prep.).

of each pair exchanged position on the eggs an average of 6.4 times during each 13-hr period of daylight and that males incubated the eggs an average of 30% of the time during the observations (table 1). Ospreys also were observed to exchange position on two nests at Lake Almanor, but the relative length of time each parent remained on the nests at Lake Almanor was not measured. Observations at both Eagle Lake and at Lake Almanor in early June when eggs began to hatch indicated that only one parent, presumably the female, incubated eggs or brooded young at that time.

To the best of our knowledge this is the first report of both sexes of North American Ospreys incubating, although it is apparently well known that both sexes of Eurasian Ospreys incubate (Dementiev and Gladkov 1951:340; Bannerman 1956:347; England 1956:49; Brown and Waterston 1962:135; Brown and Amadon 1968:199). It is interesting that Eurasian male Ospreys incubate eggs during 30% of the daylight hours also (Brown and Amadon 1968:199).

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LITERATURE CITED

AMES, P. L. 1964. Notes on the breeding behavior of the osprey. Atlantic Nat. 19:15–27.

BANNERMAN, D. A. 1956. The birds of the British Isles. Vol. 5. Oliver and Boyd, Edinburgh.

BENT, A. C. 1937. Life histories of North American birds of prey. Pt. 1. U.S. Nat. Mus. Bull. No. 167.

BROWN, L., AND D. AMADON. 1968. Eagles, hawks and falcons of the world. Vol. 1. McGraw-Hill, New York.

BROWN, P. E., AND G. WATERSTON. 1962. The return of the osprey. Collins, London.

DEMENTIEV, G. P., AND N. A. GLADKOV [eds.]. 1951. Ptisy Sovetskaya Sayoza. Vol. 1. Moskva.

ENGLAND, M. D. 1956. Photographic studies of some less familiar birds, LXXVI. Osprey. Brit. Birds 49:489–492.

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SHORTNESS OF TAIL IN RED-CROWNED WOODPECKERS AND THEIR HABIT OF ENTERING ROOST HOLES BACKWARD

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An extraordinary habit of Red-crowned Woodpeckers (*Melanerpes rubricapillus*), possibly unique among woodpeckers, is their way of backing into roost holes, a habit described but not explained by Skutch (Pacific Coast Avifauna 35:465, 1969). These birds also have remarkably short tails, as described by Selander and Giller (Bull. Amer. Mus. Nat. Hist. 124:219, 1963). It recently occurred to me, while observing these woodpeckers near Cardenas Village in the Panamá Canal Zone between November 1970 and February 1971, that these two peculiarities, one behavioral and one anatomical, might have survival advantages and be related as adaptations to roosting in a particular type of hole.

An initial observation was at 17:40 on 1 January when a male Red-crowned Woodpecker flew to its roost hole in a broken branch stub 7–8 cm in diameter, peered in several times, then hitched up beyond it and backed down in, turning as it did so that, once inside, it was ready to fly out, which it did at 6:20 on the following morning. The tree involved was a large, spreading one at the edge of woods, and I noted five other broken stubs containing either one or two roost holes. Some of these were of recent origin, while others were in varying stages of decay.

Features of such holes, in addition to the narrowness of the stubs they were in, were their large oval entrances, at least half again as large as ones seen elsewhere in cavities excavated by both sexes at nest sites. In Figures 1 and 2 are reconstructions of events in the two kinds of holes. The woodpecker in figure 1 has to back into its narrow roost hole, for there is no room for it to turn once inside. This feat is aided not only by the large entrance and its thin walls, which permit the woodpecker to slip in at a steep diagonal, but also by the woodpecker having a short, maneuverable tail. The situation is different with a nest stub. Here, as shown in figure 2, the entrance is thick-walled and just fits the body size of the woodpecker, both of these features serving to make the cavity to some extent secure and defensible. The woodpecker can enter such a hole only head first. Once inside, however, there is ample room to turn around.

The question is why should Red-crowned Woodpeckers have evolved the use of a fragile type of roost hole that demands special behavioral and anatomical adaptations to be entered effectively? Two reasons are conceivable. The first involves the common observation that suitable nest stubs, that is, ones of the right diameter at a sufficient height above the ground and decayed sufficiently to excavate, but not so decayed that they break off, are in short supply for many, if not most, species of woodpeckers. If a woodpecker uses one of these stubs by carving a hole in it for roosting in the non-nesting season, it may rot out or even be taken over by some nest-hole competitor before the nesting season begins. Here, any stratagem which will conserve the limited supply of nest stubs will have survival advantages, and one of