

THE INCUBATION PERIOD IN PEALE'S FALCONS

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Abstract. Based on observations of three clutches of *Falco peregrinus pealei* eggs in the wild, the period of time from the laying of the last egg until the essentially synchronous hatching of the young is about 32 to 34 days, but may be as long as 35 days. Observations by others on captive Peale's Falcons suggest similar or slightly longer incubation periods. The 28 to 29 day interval mentioned in the literature for Peregrines does not apply to *F. p. pealei* and probably does not apply to a number of other subspecies of the Peregrine.

In view of efforts currently directed towards captive breeding of Peregrines and artificial incubation of eggs taken from captive Peregrines, the following observations are offered as an indication of the length of the incubation period in *Falco peregrinus pealei* in the wild on the Queen Charlotte Islands, British Columbia. Comparisons will be made with lengths of incubation stated in the literature and as seen in some captive breeding Peregrines.

During the 1971 season I was able to observe parts of the sequence of egg-laying and the duration of the incubation period from distant blinds at three eyries. By "incubation period" I refer strictly to the interval between the laying of the last egg and the hatching of that egg, according to Swanberg's (1950) definition. Nice (1954), considering this definition, noted that "in nature it is generally possible to ascertain the incubation period with satisfactory exactitude by checking the time from the laying of the last egg to the hatching of the last young. To this I will add the qualification, when all eggs hatch." By referring only to the last egg, the incubation period describes what is most likely the shortest interval between laying and hatching of an egg in a given clutch; earlier eggs presumably will have the same or a longer interval between laying and hatching.

During my study I did not number the eggs as they were laid. Furthermore, I was unable to carry out a continuous watch through the entire laying period and through the hatching period. Although the incubation periods described here are only approximate, they are accurate to within about one day, as will be seen.

Field Observations. At Eyrie 1 the first egg (E1) was observed on April 8 and was probably laid the previous day, I suspect very early in the morning. The second egg (E2) was present on April 9. The other eggs appeared on April 11, 13 and 15. The fresh egg could usually be told from others in the clutch for the

first day by its brighter rusty coloration. Two eggs were lost before hatching. On May 16 one egg was pipped. At first light on May 17 one nestling was hatched and dry. The second nestling was emerging from its eggshell when the female left the scrape at 06:52. The remaining egg did not hatch. Presuming one of the two nestlings hatched from the last-laid egg, the incubation period was 32 days. If the two eggs which hatched were laid earlier in the clutch, and if serious incubation began with the second-last egg, then the interval of serious incubation was as much as 34 days.

I was unable to visit Eyrie 2 regularly during laying. E1 was present on April 16 and it might have been laid the previous day. Three eggs were present on the 23rd and, presumably, the last one was laid on April 19 or 20, most likely the 20th. On May 22 the parents were incubating solidly and their behavior gave no suggestion that the eggs were active (i.e. noisy, cracking, or pipping). I was unable to observe this eyrie on May 23. On May 24, at noon, there were three nestlings present. I am fairly certain that they hatched early on the 24th. Incubation period at this eyrie was a minimum of 33 days, a maximum of 35 days but, most likely, 34 days.

At Eyrie 3, one egg was seen on April 24 and may have been laid on the 23rd. It was very pale in color. On April 28 there were three eggs, the original one one which was half tan and half normal color, and a third fresh egg of normal coloration. I suspect they were laid on April 24, 26, 28, although each could have been laid a day earlier. On May 27 the three eggs were present, with no signs of hatching. On May 29 one nestling was present at 10:30. At 15:44, after many minutes of uncoordinated trying, its mother fed it what appeared to be its first meal, suggesting that it had hatched earlier on the 29th. The two abnormally colored eggs did not hatch. The incubation period at this eyrie was probably 31 or 32 days. However, if the normal-colored egg was E2, then incubation took 33 or 34 days.

Hatching in a wild Peale's Falcon clutch appears to be quite synchronous. At only one eyrie (not one of the three noted above) has hatching of the last nestling been as much as a day later than the hatching of the others.

If, as is suspected, serious incubation begins with the second-last egg, the last-laid egg might be expected to hatch about two days later than the other eggs. However, there is some means whereby a late embryo might attempt to "catch up" to its nestmates so that the hatching interval might be reduced (e.g. see Johnson 1969).

Observations of Captive Peale's Falcons. Peregrines breeding in captivity seem to have an incubation period similar to or even longer than that seen in the wild.

Even though the birds were not *F. p. pealei*, it is useful to consider Waller's (1968) successes with Peregrines in captivity. In 1942 his Peregrine laid eggs on March 5, 8, 10 and 13. One egg was lost during incubation. Two nestlings hatched on April 12. The remaining chick pipped on the 13th, but was dead in the egg on the 14th. If E4 was expected to hatch on April 14, then the incubation period was 32 days. If serious incubation began with E3, then the interval of

incubation for the two eggs which hatched was 33 days. Waller noted that the falcons were not incubating in earnest at the time of the arrival of the third egg, so the actual interval of incubation for E1, E2 and E3 may have been somewhat less than 33 days.

In Waller's 1943 attempt, eggs were found on February 25, 28 and March 3. The last was an abnormal egg which later proved to be infertile. On April 3 the second-laid egg hatched. E1 died at the pipping stage. From March 3 to April 3 is 31 days. There is no way of knowing whether the E3, had it been fertile, would have hatched on April 3 or several days later. If we ignore that egg and presume serious incubation began with the arrival of the second-last egg (E2 in this instance), then incubation of E2 lasted 34 days.

With his captive *F. p. pealei*, Beebe (1967) felt that incubation began with the arrival of the second egg of clutches of four. The fertile eggs in 1967 experienced difficulties at hatching and those that hatched died in a short time. Beebe suggested a 32-day interval between laying and hatching for each egg, but he noted that the deaths of the nestlings might have been due to prolonged intervals in the eggs. If we presume that the one egg which hatched unassisted was one of the first three laid, and that incubation began with the second-last egg (E3), then the interval from onset of incubation (March 28) to hatching (April 29) was 32 days.

In describing Schramm's captive *F. p. pealei*, Peterson (1968) noted that "after 38 days two of the (three) eggs hatched." This would represent a particularly long incubation period.

Meng's (1971, and BPIE report) captive *F. p. pealei* had one egg on March 29, three on April 2, and laid a fourth sometime later. Probable dates of laying were March 29, 31, April 2 and 4. Incubation of this clutch and an earlier infertile clutch was stated to have begun with the second-last egg (E3). The sounds of nestlings were heard on May 8, indicating that some eggs had hatched. A visit to the ledge on May 10 showed two dead nestlings, a third one almost dead, and a fourth just hatching. From April 4 (possible date of laying of E4) to May 8 is 34 days. If E4 was laid on April 4 and was seen hatching on May 10, then the incubation period was 36 days. Likewise, if the serious incubation of the eggs began with the laying of E3 (presumably April 2), then the duration of actual incubation would have been about 36 days for E1, E2 and E3.

Literature References. Although not specifically referring to *F. p. pealei*, some references to incubation intervals elsewhere in the literature are interesting and, perhaps, potentially harmful if followed closely. Bent (1938) mentioned that for Peregrines "the period of incubation has been said to be 28 days"; however he noted that J. A. Hagar "has definitely determined that it varies from 33 to 35 days" in the Massachusetts Peregrines. Witherby *et al.* (1939) state the incubation period of Peregrines as 28 to 29 days for each egg. Brown and Amadon (1968) noted, "Incubation begins with second or third egg as a rule, and in any case before the completion of the clutch," but they then add, "The young hatch after incubation of 28-29 days for each egg, with some difference between the oldest and youngest eyasses." Herbert and Herbert (1965)

observed, "On the Hudson, incubation did not usually begin until the laying of the second or third egg, depending on air temperatures. It began most frequently on the fifth day with the laying of the third egg and averaged 32-33 days from the time of commencement until the hatching of the last egg." This suggests that, in the strict sense, the incubation period was 30 to 31 days.

Discussion. Clearly, the incubation period itself, and the interval of serious incubation of individual eggs, are quite variable and are considerably longer than many of the references in the literature suggest. One might think that birds which enjoy the close proximity of one another and the protection from disturbances afforded in captivity would incubate very closely and hatch their eggs in a shorter period of time than wild birds could. It seems to be true, however, that some captive *F. p. pealei* must incubate their eggs somewhat *longer* than wild falcons of the same subspecies. Air temperatures, clutch sizes, sizes of individual eggs, substrate of the eyries, and physiology and sizes of the parents may be important factors leading to variations in incubation intervals. It seems likely that smaller subspecies might have slightly shorter incubation periods than those found in *F. p. pealei*.

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