# SHORT COMMUNICATIONS

## A Clutch Of Unusually Small Peregrine Falcon Eggs

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Unusually small (dwarf or runt) eggs are rare, occurring at a frequency of 0.05-0.09% in the Domestic Chicken (*Gallus gallus*) (Romanoff and Romanoff 1949), 0.08% in the Common Grackle (*Quiscalus quiscula*), and 0.18% in the Red-winged Blackbird (*Agelaius phoeniceus*) (Rothstein 1973). More than one small egg in a clutch is even rarer. Pearl and Curtis (1916 cited in Romanoff and Romanoff 1949) found only 11% of chickens that laid any small eggs laid more than one, i.e. about 0.0055-0.0099% over all.

Small Peregrine Falcon (*Falco peregrinus*) eggs, here defined as those less than 40 ml in estimated volume, are also rare (Table 1). Although accurate frequency data from the wild are not readily available, Burnham (pers. comm.) found only 1 small egg in about 350 (0.3%) he has handled. Most small eggs occur as runts, an odd egg in an otherwise normal clutch (Ratcliffe 1980). The 2 eggs of the clutch described here are smaller than any noted in the literature for North American peregrines. That both eggs were small suggests a "normal" egg size for this female rather than odd eggs. I found the clutch in a Sonoran eyrie on 8 May 1981. This site was first known to be occupied in 1978 when an adult was seen there in mid-March. A pair of adults vigorously defended this area in late April of 1980, but the exact eyrie location was not found. The eyrie site used in 1981 was a small cave (ca. 2 X 2 X 2 m in size and hemi-conical in shape) near the top of an igneous cliff. There were 2 eggs in a scrape near the back wall of the cave. The eggs were cool to the touch and their contents sloshed when gently shaken, indicating they were addled. On 8 May successful eyries in this area should have contained nestlings, as had 10 other eyries previously visited. The estimated mean hatching date for Gulf of California peregrines is 12 April (n = 31), the latest known hatching date is 15 May (Porter et al. in prep.).

I measured the 2 eggs with a caliper having a Vernier scale marked in increments of 0.1 mm; the results are given in Table 1 as eggs A and B. Table 1 also compares the size of these 2 eggs with some published dimensions of small and average-sized Peregrine Falcon eggs.

Several factors have been given as causes for abnormally small bird eggs. Chickens may occasionally lay yolkless eggs which weigh only a few grams (Romanoff and Romanoff 1949). The only known yolkless peregrine egg from the wild, also from the Gulf of California, was noted by Risebrough (1971). This egg was small but its dimensions were not given. In captivity, yolkless eggs occur about once in 300 eggs; one measured 33.2 X 25.0 mm (Burnham pers. comm.). The sizes of eggs laid by individual peregrines may also vary with age; small eggs are produced by young females laying for the first time (Blair 1967) but also by old females (Ratcliffe 1980). The eggs of one female reported by Ratcliffe (1980) from Britain decreased in size in an 8-y period from almost normal eggs averaging 50.0 X 39.5 mm (39.7 ml) to the smallest recorded size of 4 eggs averaging 46.5 X 32.5 mm (25.0 ml).

Racial differences in egg size occur but are not great (Brown and Amadon 1968). The small-bodied subspecies *babylonicus* (considered by some to be a separate species) has the smallest mean egg size according to Brown and Amadon (1968) and is similar in body and egg size to the small *F. p. minor* (Table 1). Egg size variation due to racial differences are probably related to female body weight differences. Romanoff and Romanoff (1949) state that the smallest chicken eggs are produced by the lightest females.

The first egg of a cycle (clutch) in the chicken is generally the heaviest, decreasing thereafter (Romanoff and Romanoff 1949). Physical condition, nutrition, and climatic conditions can also affect egg size (Romanoff and Romanoff 1949).

Olsen (1982) found that peregrine egg size increased with increasing latitude (in the southern hemisphere), use of tree hollows as nests, and decreasing temperatures. These relationships disappeared in certain areas after the 1940s, a period corresponding with the introduction of DDT and intensification of land use. Olsen (1982) found no significant difference in egg size between the first and replacement clutches from the same nest site, nor any correlation between clutch size and egg size.

Some of the above causes of small eggs can be eliminated as factors in the Gulf of California clutch. The female defending the nest was seen clearly at close range and was in full adult plumage with no immature feathers remaining. She probably was at least in her third calendar year of life and had probably laid other clutches. However, it is possible that she was a very old female. Racial differences in egg size can be eliminated because the eggs of this clutch are far smaller (ca. 35% less in estimated volume) than average eggs of the small subspecies *F. p. babylonicus*. The order of laying was not a factor because both eggs were unusually small. Whether or not the eggs were yolkless is not known, but it is unlikely that 2 such eggs would occur together. The effects of low latitude and warm temperatures as found by Olsen (1982), could be

Table 1. Dimensions of Peregrine Falcon eggs. Maximum length (L) and breadth (B) are in mm; estimated volume (V) was calculated according to Hoyt (1979) and is in ml.

| LOCALITY | SMALL EGGS[A] OR MINIMUM MEASUREMENTS[B] | | | | AVERAGE-SIZED EGGS | | | | REFERENCE |
|---|---|---|---|---|---|---|---|---|---|
| | N | L | B | V | N | L | B | V | |
| *F.p. anatum:* | | | | | | | | | |
| Sonora (A) | 1 | 44.2 | 34.3 | 26.5 | | | | | This paper. |
| Sonora (B) | 1 | 44.4 | 34.8 | 27.4 | | | | | This paper. |
| Gulf of California | | | | | 2 | 52.0 | 41.8 | 46.2 | Porter et al. (in prep.). |
| Baja California | 2[c] | 49.4 | 39.2 | 38.6 | 17[c] | 53.2 | 41.3 | 46.2 | West. Found. of Vert. Zool. coll. |
| North America | 124[b] | 46.5 | 37.6 | 33.5 | 124 | 52.8 | 41.1 | 45.4 | Brown and Amadon 1968. |
| North America | 1 | 48.5 | 38.5 | 36.6 | 61 | 52.0 | 41.0 | 44.5 | Bent 1938. |
| *F.p. peregrinus:* | | | | | | | | | |
| Britain | 3 | 48.6 | 37.2 | 34.2 | | | | | Blair 1967. |
| Britain | 1 | 46.0 | 38.2 | 34.2 | 100 | 51.8 | 41.0 | 44.3 | Bannerman and Lodge 1956. |
| Britain | 4 | 46.5 | 32.5 | 25.0 | 2,253 | 51.5 | 40.8 | 43.6 | Ratcliffe 1980. |
| Britain | 1 | 32.2 | 27.3 | 12.2 | | | | | Ratcliffe 1980. |
| Germany, Poland | 165[b] | 46.2 | 39.1 | 36.0 | 165 | 51.5 | 40.5 | 43.0 | Glutz von Blotzheim, et al. 1971. |
| *F.p. calidus:* | | | | | | | | | |
| Eurasian tundra | 202[b] | 46.0 | 37.0 | 32.1 | 202 | 53.0 | 42.0 | 47.6 | Cramp 1980. |
| *F.p. babylonicus:* | | | | | | | | | |
| Asian steppes, deserts | | | | | | 50.5 | 40.2 | 41.5 | Brown and Amadon 1968. |
| *F.p. minor:* | | | | | | | | | |
| Africa south of Sahara | | 47.9 | 38.0 | 35.2 | | 50.6 | 40.2 | 41.6 | Brown and Amadon 1968. |

[a]Small eggs are those less than 40 ml in estimated volume.

[b]Some authors reported ranges of egg measurements. In these instances I used the smallest dimensions given even though the length and breadth may not have been from the same egg; here n=the total sample size.

[c]Measurements are of one egg each from 19 clutches.

important because the eyrie is near the southern limit of peregrine distribution for the northern hemisphere, and is in an area that has mild temperatures during the time peregrines nest. Nevertheless, it is unlikely that even both of these effects in combination could produce such a large reduction from the average.

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## ADDENDUM

An additional record of a small peregrine egg was recently brought to my attention. Charles Bendire (Smith. Inst. Spec. Bull. No. 1, 1892) noted an egg with dimensions of 38.5 mm x 30 mm (L x B). This egg is smaller than any I could find recorded, but it was a single example (a runt) and not a clutch as in the case of the Sonoran eggs.

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# Eyrie Aspect as a Compensator for Ambient Temperature Fluctuations: A Preliminary Investigation

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Raptor ecologists have long recognized that nest site characteristics may influence reproductive success for many birds of prey (Olendorff 1973; Porter and White 1973; Ogden and Hornocker 1977). However, few studies have demonstrated relationships between nest site characteristics and physical factors that may provide energetic or reproductive advantages.

It has been suggested that the Prairie Falcon (*Falco mexicanus*) prefers nest sites with a southerly exposure (Enderson 1964; Olendorff 1973; Porter and White 1973; Denton 1975; Ogden and Hornocker 1977). Additionally, Leady (1972) and Williams (1981) noted a component of easterly-facing eyries. McGahan (1968) speculated that an easterly eyrie aspect in Golden Eagle (*Aquila chrysaetos*) in Montana may negate early morning chill and temper afternoon heat, however, he did not test this prediction.

In 1980, I studied the reproductive phenology of a local population of Prairie Falcons nesting at high elevations ($\bar{x} = 2720 \pm 199$ m) in central Colorado (Williams 1981). Of the 14 eyries examined, 7 had east or southeasterly aspects between 93-165°. I initiated a preliminary investigation using one of these eyries to estimate the relationship bet-