EGGS OF THE CAROLINA PARAKEET: A PRELIMINARY REVIEW

By Daniel McKinley

The egg of the Carolina Parakeet (*Conuropsis carolinensis*) was, like all birds' eggs, "a complicated structure, which in its design ensures optimum growth and protection of the developing embryo" (Thomson, 1964:236). This justifies at least a certain minimum interest in eggs by ornithologists. A dash of dedicated fervor is also involved. This, too, may be justified, as pointed out by Alfred Newton (1896:182), from "the pains bestowed by such birds . . . as build elaborate nests . . . and the devices employed by those that, not doing so, display no little skill in providing for the preservation of their produce." Writing of a peculiar zeal among egg-collectors, Newton noted that not only did they dignify their passion by the learned name of "Oology," thus claiming for it the status of a science. The individual oologist, he went on, "endured the necessary hardships to accomplish his end, and the possession to him of an empty shell of carbonate of lime, stained or not (as the case might be) by a secretion of the villous membrane of the parent's uterus, was to him a sufficient reward" (1896:183-184).

Let us see how oology served the Carolina Parakeet.

GENERAL CHARACTERISTICS

The eggs of parrots are "rounded, white and variably glossy. The eggs of the smaller species tend to be more nearly round, those of the larger being more oblong-oval" (Harrison and Holyoak, 1970:42-43). The old game of egg-collecting is more and more sneered at, and many modern works make only perfunctory reference to knowledge about eggs. Exceptions to the rule, in modern literature, are the paper by Harrison and Holyoak (on parrots only) and the painstakingly thorough general treatment in the late Max Schönwetter's "Handbuch der Oologie." The current emphasis upon non-egg elements of ornithology helps explain why no records of eggs exist for a substantial number of parrot species. The fact that, as Harrison and Holyoak point out, most parrots also nest in holes in trees in tropical regions further helps account for absence of their eggs in most collections. It may also be true that, even though a few collectors specialize in collecting *only* white eggs, others simply are not discriminating (or scientific) enough to bother about such dull fare. At any rate, a preponderant proportion of verified parrot eggs in collections is derived from aviculturists. In this, the extinct Carolina Parakeet is no exception, there apparently being not a single record of wild eggs that can be accepted without reserve.

COLOR

In color, the eggs of parrots offer little variety. They are all unmarked white (Schönwetter, 1963). Despite this uniformity, collectors of eggs and the naturalists who have described them

have shown some ingenuity in devising qualifying statements.

Alexander Wilson, who certainly saw much of the American countryside and barred no efforts to correspond with dependable observers, never saw nests or eggs of the parakeet. Although he was told many tales, he could come to no firm conclusion. "Some made the eggs white; others speckled. One man assured me that . . . the broken fragments of . . . Parakeets' eggs . . . were of a greenish yellow color" (Wilson, 1811:94).

Bonnaterre and Vieillot (1823) correctly termed the eggs white, but I do not know who informed them of that fact.

Audubon, with his usual firmness, perhaps after having listened a little too attentively to some friend of Wilson's informant, wrote that parakeet eggs were "of a light greenish white" (Audubon, 1831:139). Possibly he was writing from memory, and perhaps it was pure invention. Nowhere in his extant background writings is there internal evidence that he ever actually saw their eggs. One might think that he would surely have encountered an unlaid, complete egg in all his dissections of specimens, but, again, no such simple observation has survived.

A little more specifically—with, perhaps, as little justification—Elliott Coues (1874:297) recorded: "The color is white; but the only specimen before me shows much yellowish discoloration, like that of the eggs of many geese and ducks." The exact pedigree of the egg that Coues had before him is not known, but apparently it must have been the only presumed parakeet egg then in the U.S. National Museum, one collected in Louisiana by James Fairie in 1859 (Specimen 35, Table 1). Whether authentic or not (I rather doubt that it is), the egg was presumably taken from a wild nest, and it may have been stained by nest-hole contents, as Schönwetter (1963) notes they commonly are.

Baird et al. (1874:590) wrote that "an egg of this species from Louisiana"—no doubt the Coues example—was "a uniform dull-white color." They do not refer to stains. "Ovum" (1875;editor of the Utica *Oologist* or a friend of his) characterized the egg of the parakeet as "greenish or dull white—no markings": from Audubon *and* other good authorities, no doubt—with measurements from Baird et al., which is getting the best of all worlds. C. J. Maynard (1881:249), an active and enthusiastic young ornithologist, *had been told* "by those who have seen them" that the eggs in nature were greenish-white. One wonders if he had not simply been reading his Audubon. He later had them more properly "creamy white" (Maynard, 1890:68), but it is not clear upon what evidence.

Under these circumstances of rampant ignorance, it is easy to see why an interest in parakeet eggs was alive and kicking. Hearsay and allegations became the order of the day. Real fraud must have also been rife, for surely a white egg would be a vulnerable target for faking. Candidates for authentic eggs came forward, as from Harry Balch Bailey, a founder of the American Ornithologists' Union and a collector of eggs. He had a "set" of two (except for inner convictions of oologists, there is almost

no evidence that a *set* consisted of two) from Georgia. They had been identified authoritatively—long after their collection and far from the scene—by Robert Ridgway, who certainly ought to have known if anyone at that time *could* have been sure, as eggs of the parakeet (Bailey, 1883:40-41). Bailey described them as "creamy-white" (perhaps the source of Maynard's revised version). These eggs, Specimens 23-24, will be discussed further.

Although Karl Russ, a German ornithologist and cage-bird enthusiast, spoke of the eggs as being pure white, Charles Emil Bendire (1895:6) wrote with a more cautious Germanic precision that authentic eggs from Ridgway's early captive birds were "white, with the faintest yellowish tint, ivory-like." The last term referred to color rather than texture or gloss; Bendire described those features separately.

Oliver Davie (1898), author of a standard work on American oology, obviously had not seen eggs of the species. Childs (1905), Crandall (1912), and Bent (1940:7) agreed that the parakeet egg was "pure white" or "dull white" (Bent so used the latter term for Specimen 2).

It may be presumed that references to "greenish" and "yellowish" tints, by people who really had seen eggs rather than accounts of them, pertain to colors shining through the dried shell from inside, not to pigmentation of the shell itself. This transmitted coloring in parrot eggs, according to Schönwetter, is mostly yellow; in smaller or medium species, it is often white or nearly so but also frequently greenish or yellowish (but orange in one species and more clearly green in small South American species). Bendire (1895:6, in reference to genuine eggs) noted specifically that, when he held "the egg in a strong light, the inside appears to be pale yellow."

SURFACE TEXTURE AND GLOSS

Otto Finsch (1867:64), citing an older work by O. Des Murs, wrote that eggs of parrots were "fine grained, irregularly porous, dull and without glaze," a generalization to which there are many exceptions. The egg, about whose identity one must be cautious, examined by Elliott Coues (1874:297) was "of rather rough texture." Bendire (1895:6) quoted the eminent German bird-keeper Dr. Russ who described allegedly indisputable eggs from caged birds as "fine grained . . . and quite glossy, like Woodpeckers' eggs." Reservations about Russ's reliability in regard to this species will be set forth in the coming discussion of egg shape.

Bendire himself, on the basis of eggs from Ridgway's captive birds, found the shell "quite glossy . . . rather thick, close grained, and deeply pitted, not unlike the eggs of the African Ostrich . . . but of course not as noticeable." "The deep pitting is noticeable in every specimen, and there can be no possible doubt about the identity of these eggs. The other eggs in the collection about whose proper identification I am not certain [this certainly included the alleged Louisiana "clutch" of two eggs collected by Weeks, Specimens 36-37; whether it also referred to the egg examined by Coues

is, unfortunately, not clear], and whose measurements I therefore do not give, have a much thinner shell, and do not show the peculiar pitting already referred to. There is no difficulty whatever in distinguishing these eggs from those of the Burrowing Owl or the Kingfisher, both of which are occasionally substituted for them."

As for gloss, John Lewis Childs (1905:98) spoke with evident pride of his prized eggs acquired from Ridgway (Specimens 20-22): they had "an ivory gloss surpassing that of the Ivory-billed Woodpecker." On the other hand, another egg from a Ridgway bird (Specimen 2) owned by John E. Thayer has been more recently described as having "a very slight gloss" (Bent, 1940:7). Whether the latter was incubated before being collected is not known. Those belonging to Childs had not been incubated.

That eggs of parrots in general are "variably glossy" is put down by Harrison and Holyoak. That there may be seasonal, regional or captivity-induced or other physiological variations is likely. Furthermore, as Max Schönwetter (1963:508-509) points out carefully, caged birds lay more rough-shelled eggs than those in the wild, perhaps because the thin outer organic layer (the "cuticle") does not develop fully in eggs laid by caged birds. In the whole order, he found the grain of the shell varying from smoothness as delicate as in doves and owls, even to the extent (especially in smaller species) that 10-power magnification revealed little granulation. Some big parrots (*Amazona*, *Lorius*, *Nestor*, and *Cacatua* are mentioned) are so coarse-grained that they can be confused with small eggs of domestic hens. Many kinds lack gloss on the shells—"at least in the collection or after incubation, although a gloss in the fresh condition is possessed by all except for *Trichoglossus*, *Psitteuteles*, *Glossopsitta* and *Melopsittacus*" (all Australasian genera). "Considerable gloss is permanently preserved especially in *Ara* and *Aratinga* (American genera), but gloss is always scanty in others."

The nature of the pores has not been comprehensively reported in microscopic detail in parrots, although such a study is much desired, perhaps with particular reference to agreement of *Conuropsis* with *Aratinga*. Schönwetter indicates that many genera, including *Ara*, *Aratinga*, and *Conuropsis*, show a porous condition, even under weak magnification. The pores are visible as deep pin-prick holes that are sometimes browned or blackened by collecting powdery substances. The pores tend to be rather widely scattered. Pores in eggs of the aberrant New Zealand *Strigops* (the Kakapo) are unique in having sharply angled short hair-line streaks radiating out from them.

SIZE

Measurements of eggs from various sources are summarized in Table 1. Some additional information and comments are added here. Bent had measured 24 eggs of the eastern form of the parakeet. I judge at least a dozen (probably more) of these to have been from captive birds and therefore genuine. They measured "34.23 by 27.80 millimeters; the eggs showing the four extremes mea-

sure *37* by 38 [i.e., 28?], 33 by *30.2*, *32.1* by 27.1, and 34.4 and *25.8* millimeters." Eggs of the western form (so-called Louisiana Parakeet) he characterized as indistinguishable from the nominate race, where "the only four eggs that I have been able to locate are *36* by 27, 35 by *27.5*, *35* by *26.5*, and 36 by 26.5 millimeters" (1940:7, 13). (Whether he had authentic eggs of the western form is questionable).

TABLE 1

Measurements and notes on Carolina Parakeet eggs

No.	Institution	Description, Comments
1	Cambridge: Museum of Comparative Zoology.	From Louisiana, 1859; coll'd James Fairie? ex J. E. Thayer; 4499.
2	"	Ridgway captive; 29 July 1897; ex Thayer; 4498
3	Bloomfield Hills: Cranbrook Inst. Science.	Entirely without data.
4*	Davenport: Davenport Public Museum.	"33.65 x 27.2 mm." No other data are known. E 382a.1; size is acceptable.
5-6*	Dresden: Staatl. Museum für Tierk. Forsch.	"From the Zoo"; a 'set'; 2510.
7-8*	"	As above; 2510A.
9*	"	As above; 2501B.
10-11	Gainesville: Florida State Museum.	Lake Okeechobee, 30 April 1927; coll'd by C. E. Doe; 89434; doubtful (Fig. 1, 2).
12-14	"	As above; 87234.
15-16	Lincoln: University of Nebraska Museum.	A 'set'; ex Shoemaker; no other data known; ZM-8437.
17*	London: British Museum (Natural History).	"36 x 30 mm" ("1.42 x 1.15 in."); from captive?; ex Nehrkorn; 1901.12.15.651; see Nehrkorn 1910; Oates 1903.
18-19	Newark: Newark Museum.	A 'set'; no other data are known.
20	New York: Amer. Mus. Nat. Hist.	32 x 27.5 mm.; 5 July 1901; from Ridgway's caged bird; ex Childs; ex P. B. Philipp; 8809; Fig. 5.
21	"	34 x 26.7 mm; all else as above except 12 July 1901.
22	"	34 x 28.75 mm; as above except 29 July 1902.
23-24	"	36.6 x 27.4 mm ("1.45 x 1.10 in."); 36 x 28.9 mm ("1.44 x 1.14 in."); 26 April 1855; coll'd by Dr. S. W. Wilson in Georgia; ex H. B. Bailey; 392; Fig. 3.
25-28	Oakdale: Bayard Cutting Arboretum	"1.40 x 1.10; 1.36 x 1.10; 1.40 x 1.14; 1.41 x 1.05 in.; laid in Philadelphia Zoo; no doubt

		authentic; identified (and measured?) by Trotter; date of 24 Nov. 1885 of unknown application.
29	St. Johnsbury: Museum of Nat. Hist.	No information is known.
30-34	Santa Barbara: Museum of Nat. Hist.	Supposedly coll'd at Tallahassee, ca 1884 by Dr. Albert John Cook; original data, except that there were *six*, lost; identified by Richmond, U.S. Natl. Mus.; ex Arden Edwards; ex W. L. Dawson.
35	Washington: U.S. Natl. Mus.	Presumably coll'd James Fairie, Louisiana, 1859; "36 x 28 mm. (1.40 x 1.10 in.)"; authenticity doubtful.
36-37	"	Coll'd David Weeks, St. Mary's (now Iberia) Parish, March 1878; hollow cypress; dubious; 17709.
38	"	"33.27 x 29.92 mm. (1.31 x 1.06 in.)"; 19 July 1878, /from captive bird; see Fig. 6.
39	"	"34.54 x 27.18 mm. (1.36 x 1.07 in.)"; September 1883, from captive.
40	"	No data known; in Fish & Wildlife Service collection; ex P. C. Isbell.
41	"	"36.32 x 26.93 mm. (1.43 x 1.06 in.)"; August 1877, evidently from captive bird.
42-49	"	Laid July-Aug. 1900, from captive.

1. Quotation marks indicate measurements from literature.
2. Underlined numbers are judged certainly authentic.
3. Numbers with an asterisk are probably reliably identified.
4. Numbers at end of Description column are accession numbers of owner-institutions, when known.
5. "Ex" means a previous owner.

Schönwetter (1964) was able to report upon 30 eggs of *C. c. carolinensis*. The degree of overlap with those described by Bent is not clear. He knew eggs of alleged *C. c. ludoviciana* only through Bent's work, and I have not included his computations based upon them. Using a somewhat different method of recording from Bent, Schönwetter summarized the situation: 33.0—38.3 mm (shortest and longest lengths) × 26.1—30.1 mm (least and greatest widths); extremes of shell weights 1.23 - 1.50 grams. Averages are: length, 34.8 mm; width, 28.4 mm; shell weight, 1.33 g; shell thickness, 0.24 mm; computed fresh egg weight, 15.3 g; percentage shell weight of fresh weight, 8.7%.

The alleged Louisiana egg from James Fairie (Specimen 35) was measured by Baird et al. (1874:590): 1.40 × 1.05 in.; Coues (1874:297) gave it as 1.40 × 1.10 in. Maynard, making his ignorance all the plainer, supposed parakeet eggs to be "about the same size as those of the turtle dove," considerably wide of

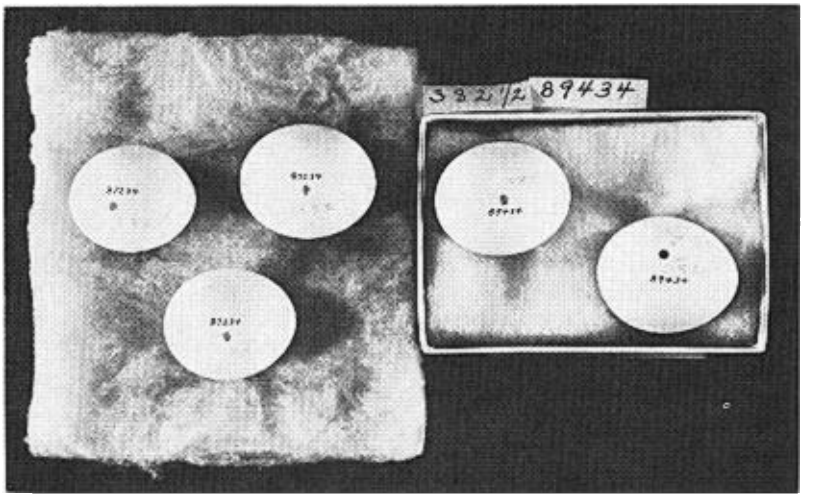

FIGURE 1. Two "sets" of alleged eggs of the Carolina Parakeet. Collected by C. E. Doe near Lake Okeechobee, Florida, 1927. Photograph courtesy of Oliver L. Austin, Jr.

the mark, considering that Bent calculated Mourning Dove eggs to average 28.4 × 21.5 mm. (Maynard, 1881:249; Bent, 1932:407).

A decided divergence from all these figures is to be found in what one on the surface would have considered reliable data from Dr. Karl Russ of Berlin, assuming that figures were not scrambled somewhere along the way. Bendire (1895:6) quoted Russ to the effect that eggs known to Russ (evidently several clutches, although perhaps not all were really measured) as being "very round . . . measuring 38 by 36 millimeters, or about 1.50 by 1.42 inches." (Note that conversion to inches is not accurate.)

A set of three alleged parakeet eggs, taken by Dr. H. E. Pendry (about whom I can find nothing) in Florida in 1896, was measured by John Lewis Childs (1906) and reported to be: "1.35 × 1.06—1.26 × 1.06—1.25 × 1.05" inches, obviously somewhat on the small side. As I shall explain in detail elsewhere, I am very dubious of this lot; besides, the eggs cannot now be found (Fig. 4). Another critically important case involves two sets of alleged Carolina Parakeet eggs collected in Florida in *1927* by C. E. Doe (Specimens 10-14; Figs. 1, 2). Their sizes are (in inches, from Doe's notebook and accession cards; in mm from more recent measurements made by O. L. Austin, Jr.): 1.20 × .98 (30 × 28)—1.21 × .98 (31 × 26.5); 1.19 × .98 (30.6 × 25.8)—1.15 × .97 (29.3 × 24.8)—1.06 × .96 (27.9 × 24.0). Judging by size alone, these Doe eggs are *too small* to be eggs of the Carolina Parakeet. Their shapes (according to templates to be discussed shortly) are varied. I am inclined to wonder if they are all from the same individual (or even species), although one can match each with one or another egg shape in the authenticated Bendire-Childs series of Ridgway eggs. Furthermore, as I shall argue in another publication, I

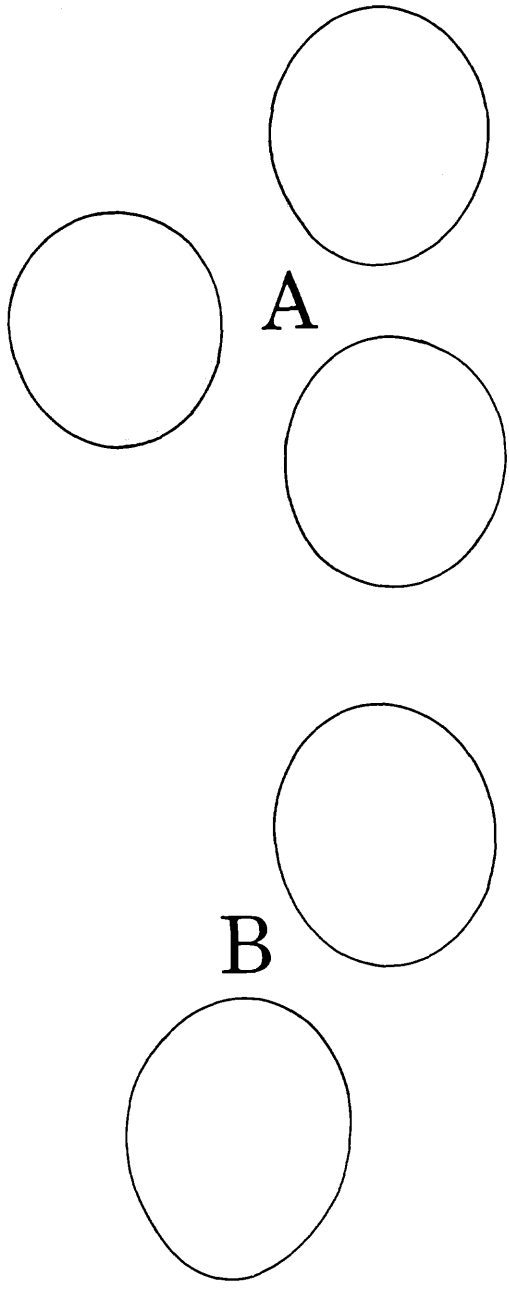

FIGURE 2. Outline drawings of the two "sets" of alleged eggs of Carolina Parakeet collected by C. E. Doe. From photograph supplied by O. L. Austin, Jr., Florida State Museum. A. Three eggs at top, "set" No. 87234. B. Two eggs at bottom, "set" No. 89434. *Note:* all eggs are drawn to the same width at point of greatest breadth.

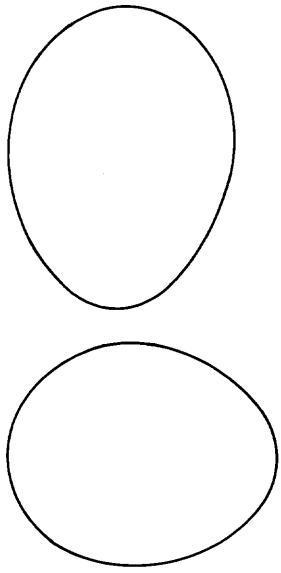

FIGURE 3. Outlines of a two-egg "set" of alleged eggs of the Carolina Parakeet; collected by S. W. Wilson in Georgia; described by H. B. Bailey (1883); eggs are now in American Museum of Natural History.

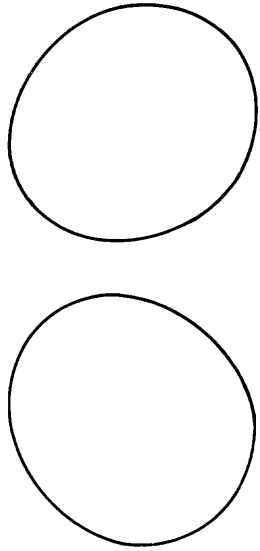

FIGURE 4. Outlines of two of three eggs in a 'set' of eggs claimed by H. E. Pendry to be those of Carolina Parakeet, drawn from published photograph (Childs, 1906).

question them on the basis of their season of deposition. This is still a kind of argument-to-a-standstill and the development of other tests is all the more to be desired.

A final measurement from the literature may be given: 1.44 by 1.12 inches (Crandall, 1912:835); it seems probable that it was taken on a genuine egg of the species, but I do not know which specimen or specimens.

SHAPE

Bonnaterre and Vieillot (1823:1402), with disarming finality, wrote that the eggs of the Carolina Parakeet were "almost round." The source of their information is as unknown as that used as basis of Audubon's (1831:139) statement that the eggs "are nearly round." Otto Finsch (1867:64, 67), author of a substantial monograph on parrots, may not have critically examined eggs of this species, although captive specimens had by then laid eggs in the Zoological Garden of Frankfurt. He quoted O. Des Murs to the effect that eggs of the genus *Conurus* (then, of course, consisting of the Carolina species and many more) were "oval." But Des Murs denoted as "egg-shaped" eggs of such diverse genera as *Platycercus* and *Cacatua*, where shape diverges considerably, being much rounder in the former genus, according to Joseph Forshaw (1969).

The alleged Louisiana specimen (No. 35) is described as "rounded oval shape, equally obtuse at either end" (Baird et al. 1874: 590) or "nearly equal at both ends" (Coues, 1874:297): as will be seen, a rather doubtful shape for this species.

H. B. Bailey (1883) described two *originally unlabeled* eggs that were collected in Georgia by Dr. S. W. Wilson. These were thought by Bailey to be eggs of the Carolina Parakeet, an opinion corroborated by both Ridgway and Bendire. They were said to be "pointed at one end." I have photographed these eggs, and tracings by Ryland Loos (Fig. 3) may be matched against the outline of the undoubted egg figured by Bendire (1895, plate I, fig. 1) (my Fig. 6). Their shapes match the Bendire egg more closely than they do shapes of the three undoubted eggs later acquired by Childs from Ridgway (Childs, 1905; Amadon, 1966) (Fig. 5). When compared with F. W. Preston's templates of egg shapes (Palmer, 1962:13), one of the Wilson eggs is exactly Short Oval; the other is more elongate, being intermediate between Short Subelliptical and Subelliptical. (In justice to Wilson, it ought to be recalled that *he* did not label the eggs; identification rests upon the specimens' merits, not his.)

Bendire (1895:6) carefully pointed out that of the three eggs laid by Ridgway's captive birds "None . . . can be called round; they vary from ovate to short ovate, and are rather pointed." Surely, then, there is something wrong with Russ's "almost perfectly round eggs." The egg shown in Bendire's plate is, in Preston's terminology, Short Oval precisely.

The three eggs that Ridgway sold to Childs (Amadon, 1966)—they are not a single "clutch" and one is from a different year—have shapes as follows: one is quite short (through blunting on

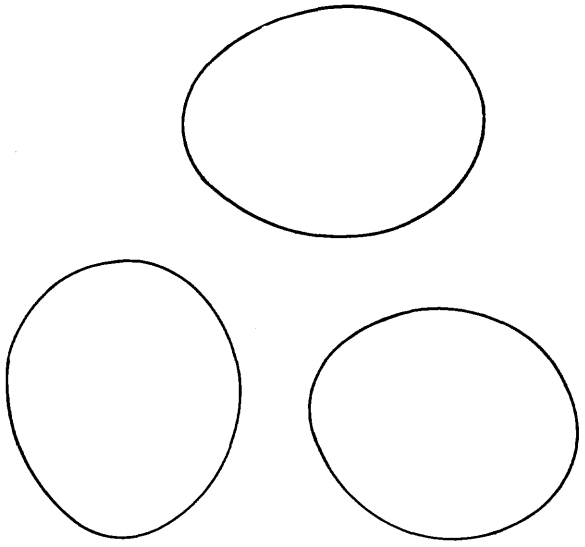

FIGURE 5. Outlines of authentic eggs of the Carolina Parakeet. These were sold by Robert Ridgway to John Lewis Childs; now in American Museum of Natural History; see Childs (1905), Amadon (1966). Egg at lower right measures 32 x 27.7 mm; the others, going clockwise, measure 34 x 28.75 and 34 x 26.7 mm.

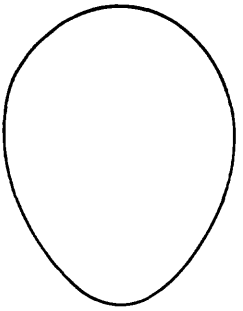

FIGURE 6. Outline of an authentic egg of the Carolina Parakeet; laid by bird kept by Robert Ridgway; from Bendire (1896, Pl. I, fig. 1).

the small end) Short Subelliptical; the second is only very slightly elongated Subelliptical; and the third is short (by blunting of the small end) Short Oval (Fig. 5).

In contrast, the three alleged eggs of the parakeet collected in Florida by Dr. Pendry (Childs, 1906) are, judging from the photograph published by Childs, a more varied lot (Fig. 4). Two of them fall nearly midway between Spherical and Elliptical (that is, not appreciably more pointed at one end than the other); the third is quite definitely an odd number with a classical Short Subelliptical shape. Added to what I point out elsewhere about these eggs, this evidence makes them less and less likely candidates for parakeet eggs.

It may be noted, finally, that relatively little is known about eggs of most tropical American parrots. As a result, eggs of exotic parrots might be confused with those of the Carolina Parakeet, especially when observation was slipshod in the first place and no specimens of birds were taken. Eggs of the Carolina Parakeet do, however, seem to be regularly larger than those of any species of the genus *Aratinga*, rather widely supposed (perhaps a little too freely) to be closely related to the genus *Conuropsis*. This may be a critical factor in disposing of the identity of eggs collected by Doe in Florida in 1927 and claimed by him to be those of the Carolina Parakeet (it would settle mistaken identity; it would hardly disprove deliberate fraud except by implication). But when one is stumped by monotony of color, ambiguity of shape and relative evenness in size, the only hope for eventual identification (or at least negation of claims) lies in microscopic and biochemical comparative work not yet done (see, for example, the paper on falconiform eggs by Tyler (1966) for one type of study that might be developed).

ACKNOWLEDGMENTS

I am indebted especially to O. L. Austin, Jr., Dean Amadon, and the late Donald J. Nicholson for information. Many others, here not named, were kind enough to supply other data. Ryland Loos traced egg shapes, and Robert Speck provided photographic copy for my figures. For short periods of time in the past I had financial help from the Frank M. Chapman Memorial Fund (American Museum of Natural History) and summer fellowships from the State University of New York Research Foundation.

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