

BOLTE (1974) REPORTED THE FIRST records of the Caribbean Coot *Fulica caribaea* in North America, seven white-shielded birds around Fort Lauderdale, Florida, from January 28, to May 9, 1974. Several were photographed and on April 2 an immature male was collected (National Museum of Natural History 567252). Identification was based upon the broad, high, and bulbous frontal shield that lacked a red, corneous callus; in all other respects the birds resembled the American Coot *F. americana*. Bolte sketched the shields of all seven birds. Only two were wholly white. The shields of the other five (including the specimen) were marked variously with irregular, reddish patches, and three were washed with various shades of yellow. These 1974 birds were accepted as the first records for North America (A.O.U. 1983).

Additional white-shielded coots were found in Florida in each succeeding winter, although skepticism soon arose. In the winter of 1974-75, Stevenson (1975) reported "a spate of 'Caribbean Coot' records from Florida." This led

White-shielded coots in North America: a critical evaluation

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*Figure 1. Type A,
Typical American Coot.
June 1978, Palo Alto,
California/D. Roberson.*

some of us to suspect that most, if not all, of these were merely aberrant Am. Coots showing the variations of shield color and shape known in that species." Yet Caribbean Coots continued to be reported annually in Florida, all appearing during winter. In March 1985, a white-shielded bird paired with a typical American Coot and remained to nest near Tierra Verde, eventually raising several broods (L. Atherton, *in litt.*).

Away from Florida, white-shielded coots identified as Caribbean Coots were reported from Chattanooga, Tennessee, from November 1981 to February 1982 (Hall 1982, photo published; accepted by A.O.U. 1983) and near Detroit, Michigan, in April–May 1982. The latter bird paired with a typical American Coot, nested, and raised at least three young (Payne and Master 1983). Payne and Master suggested, as had DeBenedictis (1982) earlier, that white-shielded birds in North America simply represented sporadically occurring morphs within northern populations of coots. Payne and Master concluded that there was no evidence to suggest a Caribbean origin for the Michigan bird.

Clark (1985) summarized published

records of white-shielded coots and reported unpublished white-shielded birds in Texas during the winter of 1982, with photographs. Alan J. Ryff (*in litt.*) reported a white-shielded coot with a tiny red spot on the high point of the shield at Reifel Island, Vancouver, British Columbia, on October 6, 1984. Still another white-shielded bird was studied with American Coots in May–July 1985 in East Chicago, Indiana, where it eventually mated with a typical bird. It was not thought to have Caribbean origins (Peterjohn 1985). DeSante and Pyle (1986) rejected more northerly and westerly records, but accepted records for the Caribbean Coot in Florida. The National Rare Bird Alert (NARBA) reported "confirmed" reports of Caribbean Coots in 1986 from Florida, Texas, Illinois, and Arizona (*vide* J. Morlan). A review of white-shielded coots in North America is therefore warranted.

In the late 1970s and early 1980s, we both independently observed white-shielded, yellow-shielded, and intermediate coots in California. We report here our findings of variation in wintering populations of coots in coastal California and comment on their taxonomic significance.

In this paper we follow nomenclature of the A.O.U. (1983), which considers the Caribbean Coot *F. caribaea* of the Antilles and northwestern Venezuela a separate species from the American Coot *F. americana*, the breeding birds of North America, although some authors already consider them conspecific (*e.g.*, Roselaar 1980). American Coots occasionally nests as far south as Florida, and in the Bahamas and Greater Antilles. Recently birds showing the callus typical of the American Coot have been observed nesting with Caribbean Coots at St. Maarten, Netherlands Antilles, and apparent hybrids have been produced (Norton 1982). Similar mixed nesting has been noted in the Virgin Islands (R. L. Norton, *in litt.*). Many have suggested the two "species" represent polymorphism in the American Coot (Ripley 1977; Payne and Master 1983; A.O.U. 1983). A similar situation exists in the Andes, where the two phenotypes are simply considered morphs of *F. americana* (Gill 1964) or separate species, *F. americana* and *F. ardesiaca* (Fjeldsa 1983). Likewise the Hawaiian population of *F. americana alai* has both morphs (Pratt 1978, 1987), though in that population, white-shielded morphs are the commoner phenotype. Although our paper may have taxonomic implications, we wish primarily to propose an answer to two questions. Has the Caribbean Coot, whatever its taxonomic status, been documented to occur in North America? Is there any evidence to suggest that white-shielded birds anywhere in North America have Caribbean origins?

In November 1983–January 1984, we surveyed coots wintering on selected small ponds in California. For the most part these were ponds where we had found atypical coots in previous years, though half were selected without knowing what was present. We rather arbitrarily divided the shield characters observed into five categories:

- A = Normal American Coots with typical red callus (Figure 1).
- B = "Intermediates," with red callus but washed with yellow on shield below callus (Figure 2), some having a very reduced callus (Figure 3).
- C = Bulbous shields strongly washed yellow, sometimes with reddish splotches (Figure 4).
- D = Bulbous white shields, with obvious reddish spots, streaks, or



Figure 2. Type B, "Intermediate". November 1983, San Francisco, California/K. Hansen.

spots, but not a callus (Figure 5).

E = Bulbous white shields with little or no reddish staining, limited (if present) to extreme upper edge of shield (Figures 6, 7).

Although there is some subjectivity in assigning birds to these categories, they provide a convenient means of quantifying the frequencies of the morphs in various populations sampled. Our survey results are summarized in Table 1. These surveys indicate a frequency of bulbous-shielded birds (types C, D & E) of about 1.4%, and a frequency of atypical birds (types B, C, D & E) of about 3%. Bolte's (1974) seven Caribbean Coots in Florida (out of approximately 800 birds surveyed) fell into categories C, D & E, a frequency of 0.8%. Clark (1985) thought the frequency of Caribbean-type birds in his surveys of Texas and Florida birds to be about 0.25%, but somewhat greater than 0.5% if "intermediates" (our type B) were included. The Ft. Lauderdale, Florida, Christmas Bird Count has reported six Caribbean Coots among 6910 coots over the past five years (1981-1985), a frequency of only 0.1%. These surveys suggest that Caribbean-type coots occur as frequently in California as in Florida. Apart from our findings, additional white-shielded coots have been reported in California away from the areas of our surveys: McGrath State Beach, Ventura County (completely white-shielded bird, August 5, 1982; L. Atherton), Oakland (completely white-shielded bird, February 11, 1984; J. Morlan), Fresno (February 1984; K. Hansen *vide* J. Morlan), Palo Alto (two birds in November 1986; J. Morlan), and Santa Barbara (one white-shielded, one intermediate in November 1986; J. Dunn, R. Abbey, *all pers. comm.*).

Given our assumption that all California coastal birds are American Coots, we questioned whether any of the Florida birds could claim true Caribbean origin. Florida birds with bulbous shields, like those in California, appear primarily in the wintering population from November to May (L. Atherton, *in litt.*) and appear to show the same range of variation observed in California birds. There is no empirical evidence to suggest a Caribbean origin for any Florida bird, except for Bolte's (1974) specimen. Therefore we compared the only North American putative specimen of the Caribbean Coot



Figure 3. Type B, "Intermediate". November 1986, Palo Alto, California/J. Morlan.



Figure 4. Type C. December 1983, Arcadia, California/D. Roberson.

Table 1. Frequency of occurrence of coot morphs from various California localities.

Locale	Total N	Shield Type				
		A	B	C	D	E
Chain-of-Lakes, Golden Gate Park, San Francisco	134	119	9	4	1	1
Nearys Lagoon, Santa Cruz	86	85	0	0	0	1
Los Angeles Arboretum, Arcadia (one pond only)	19	17	1	1	0	0
Crespi Pond, Pacific Grove	121	121	0	0	0	0
Lake El Estero, Monterey	216	213	1	0	2	0
Naval Golf Course, Monterey	116	116	0	0	0	0
TOTAL	692	671	11	5	3	2



Figure 5. Type D (center). November 1983, San Francisco, California/K. Hansen.

Table 2. Measurement (in mm) of two taxa of *Fulica*:

Taxon	Sex	N	Range	\bar{x} (\pm s.d.)	sig.*
WING					
<i>F. americana</i>	M	10	186–212	199.5 (8.96)	
	F	10	185–209	194.4 (9.80)	
<i>F. caribaea</i>	M	11	171–202	188.73 (9.15)	P < .01
	F	9	164–197	176.89 (10.10)	P < .005
CULMEN					
<i>F. americana</i>	M	10	40.5–52.5	45.27 (3.82)	
	F	10	36.6–54.6	43.58 (4.92)	
<i>F. caribaea</i>	M	11	46.6–57.8	52.43 (3.39)	P < .01
	F	9	42.8–51.3	47.24 (2.99)	n.s.
BILL					
<i>F. americana</i>	M	10	13.1–16.8	14.89 (1.06)	
	F	10	13.7–16.5	14.95 (.95)	
<i>F. caribaea</i>	M	11	13.5–16.3	14.86 (.74)	n.s.
	F	9	12.9–15.3	13.91 (.81)	n.s.
GONYS					
<i>F. americana</i>	M	10	10.0–12.0	10.79 (.79)	
	F	10	8.0–11.2	9.93 (.98)	
<i>F. caribaea</i>	M	11	9.9–12.3	11.04 (.72)	n.s.
	F	9	9.4–11.3	10.39 (.65)	n.s.
TARSUS					
<i>F. americana</i>	M	10	55.7–63.5	59.11 (2.33)	
	F	10	54.6–65.1	57.67 (3.95)	
<i>F. caribaea</i>	M	11	56.1–65.6	62.46 (4.27)	P < .05
	F	9	54.2–65.4	59.41 (3.98)	n.s.

* 2-tailed t-test, *F. americana* compared with *F. caribaea*.

with 20 *F. americana* (ten males, ten females from California, Colorado, and Indiana) selected randomly from the collection at the California Academy of Sciences, San Francisco, and 19 *F. caribaea* (ten males, nine females from the Lesser Antilles and Haiti) from the collection of the National Museum of Natural History.

Males averaged larger than females in all measures in both taxa (Table 2). Male *F. americana* had longer wings than *F. caribaea* (199.50 versus 188.73; $p < 0.01$). Wings of female *F. americana* also were longer than wings of female *F. caribaea* (194.4 versus 176.89; $p < 0.005$). The shorter wings of the Caribbean Coot may reflect the relatively sedentary nature of this taxon as compared to its mainland relatives. Male *F. caribaea*, however, averaged larger in culmen length (52.43 versus 42.27; $p < 0.01$) and tarsal length (62.46 versus 59.11; $p < 0.05$) than *F. americana*. There is no difference, however, in bill length from nostril between the two taxa (14.89 versus 14.86; $p > 0.10$). The longer culmen in *F. caribaea* is thus probably a reflection of the difference in shield height. We found no other significant morphometric differences between the two taxa (Table 2).

The wing chord of the Florida bird,



Figure 6. Type E (center). November 1983, San Francisco, California/K. Hansen.

a male, was 196 mm. The published information on wing chords of male American Coots range from 188–199.8 (\bar{x} = 195.9; Godfrey 1966), 182–199 (Ripley 1977) and 174–202 (\bar{x} = 190.3; Blake 1977). The published range for male Caribbean Coots is from 173–191 (\bar{x} = 184.9; Ripley 1977; Blake 1977). Clearly, the Florida bird's wing chord falls outside the published range of *F. caribaea*, but we found much more variation in extremes of both species than previously reported. It does appear that most American Coot males have a wing chord from 190–199, whereas that of most Caribbean Coot males is between 184–189. On that basis the wing length of the Florida bird is much nearer the mean of the American Coot. We did, however, find three male *F. caribaea* with wing chords as long or longer than the Florida specimen: December 5, 1928, Puerto Rico (196 mm., USNM 353805); July 26, 1937, Montserrat (198 mm., USNM 353826) and January 14, 1938, Montserrat (202 mm., USNM 353821). The tarsal length of the Florida bird, 60 mm., is also closer to the mean of *F. americana* (59.11 mm., Table 2). Although we cannot say with certainty that the Florida specimen is not *F. caribaea*, the evidence at hand strongly suggests it is an



Figure 7. Type E. January 1984, Santa Cruz, California/D. Roberson.

individual of the bulbous-shielded morphs present in North American populations.

Blake (1977) suggested a further character to distinguish the two taxa is that *F. caribaea* has the outer web of the outermost primary more broadly edged with white and the secondaries usually more conspicuously tipped with white. We found neither of these characters to be useful. We measured the extent of white on the outermost pri-

mary. In neither species does the outer white web extend to the tip. In *F. caribaea* it is lacking completely on four of the 19 specimens; in the others it extends to within four to 45 millimeters of the tip, thus being very variable in extent. Likewise, in *F. americana* this character is variable. In our 20 randomly selected specimens, the white outer web terminated from three to 46 mm. from the tip. One of 75 specimens in the California Academy of Sciences

lacked white on the outer web (CAS 73952 from Colorado) and five others had the white reduced to a hair-thin white edge. Contrary to Blake, we find the extent of white on outer web to be highly variable in both taxa. The Florida specimen lacks white entirely on its outer primary, a character consistent with either form. Likewise, an additional character suggested by Ridgway (1887), the much-wrinkled shield of *F. caribaea*, was found in several of the California birds studied in the field (e.g., Figure 4).

Clark (1985) suggested that the Caribbean Coot occurs in two forms: a "Lesser Antilles form" with a much broader shield and a "Haitian form" with a reduced shield. He further concluded that North America white-shielded birds were of the "Haitian form". We found no evidence to support this hypothesis. Rather, males tended to have larger shields than females, and the two specimens we had from Haiti were females. They had small shields (8.3×16.0 mm and 8.1×12.5 mm), consistent in size with two females taken in the Lesser Antilles (8.5×12.0 mm and 8.8×12.5 mm). Furthermore, the Florida male (11.5×18.3 mm), said by Clark to be of the "Haitian form", is in fact quite consistent in shield size with Lesser Antillian males (which range from 10.9×17.3 mm to 14.1×22.8 mm).

Seasonal and age variation in size and composition of the shield has been documented by Gullion (1951), who found that the red callus attached to the shield of the American Coot is of a different composition than the underlying shield, which is simply continuous with the maxilla. He further found that the size and shape of the shield was correlated with breeding activity, being larger and more swollen in both sexes during nesting and when birds are pair-bonded and territorial, whether nesting locally or not. Some old coots retained a large shield year-round. Microscopic examination of testes showed a direct correlation between gonadal activity and shield size. He was able to enlarge the shield experimentally by administration of testosterone. Implantation resulted in rapid growth of the shield in both sexes. Birds with enlarged shields tended to be more aggressive and maintain dominance over smaller-shielded birds. The size of the shield in both manipulated and control birds attained dimensions as large as 12×15 mm. and even 14

$\times 17$ mm., well within the range of the Caribbean Coot. Finally, Gullion reported handling four birds with a much reduced callus and one bird entirely lacking a callus, having only a red spot on an otherwise white frontal shield (as in our type D).

The available evidence on white-shielded birds in North America suggests that most, if not all, are males. The Florida specimen is a male and the Michigan breeding bird was a male (copulation observed; Payne and Master 1983). Many Florida birds have been very aggressive (L. Atherton, *in litt.*), as have most birds in California (pers. obs.). Indeed, Stevenson (1982) wondered if Florida birds might not simply be "a few old males among this population [that] have stepped up their output of testosterone."

Our experience with California birds indicates that wintering populations of American Coot have a small percentage of bulbous, white-shielded birds (Table 1). Review of photographs of birds from Florida, Tennessee, Michigan, and Texas show the same variability, including a preponderance of yellow color and red splotches with but a few pure white-shielded birds, as is shown by coots in California. Our examination of the Florida specimen suggests that it is simply a white-shielded morph of *F. americana*. Lyn Atherton (*in litt.*) reports that one white-shielded bird at Cape Canaveral bore a green neck collar coded "K49"; her correspondence unearthed the fact that the collar had been placed on it during the breeding season in Wisconsin! Karen West (*in litt.*, *vide* L. Atherton) reported banding 15 coots without a callus out of 1041 coots banded at Horicon National Wildlife Refuge in 1981 and 1982; "K49" had been banded at three years of age on July 23, 1982. Therefore, irrespective of the taxonomic status of *F. caribaea*, we conclude that there is no evidence to show that coots of Caribbean origin have occurred anywhere in North America.

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