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The Importance of Small Wetlands for the Conservation of the Endemic Caribbean Coot *Fulica caribaea*

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Abstract.—The Caribbean coot *Fulica caribaea* is a breeding resident on 15 islands in the Caribbean region. Formerly considered conspecific with American coot *F. americana* a reappraisal of its conservation status suggests it to be Vulnerable according to IUCN Red Listing threat criteria. Based on a study of 19 sites in the Netherlands Antilles and records of 49 sites (>5 ha) throughout its range I analyze the relationships between numbers of coots and wetland size and the relationships between wetland size, inclusion in the protected area network, and threats to the site and / or the coots. In the Netherlands Antilles there is no relationship between numbers of coots and wetland size, with some of the larger numbers (>200 birds) found on small (<20 ha) ponds. Throughout the Caribbean, protected sites tend to be smaller (median size 30 ha) than unprotected sites (400 ha) and there are significant size differences between threatened sites (drainage, reclamation, hunting), which tend to be large, and those site that are less threatened which tend to be small. While there is a need for field data from many parts of the species' range, it is clear that a successful conservation strategy needs to include education and increasing awareness about the plight of the Caribbean coot as well as an increase in active protection of both habitat and bird. The data from the Netherlands Antilles suggests that protection should not only focus on large wetlands but that protection and active management of a series of smaller ponds may provide a quick return on investment and allow a swift response to improve the status of the Caribbean coot.

Keywords.—Conservation status, management, rallidae, waterbirds

The Caribbean coot *Fulica caribaea* is endemic to the chain of islands from the Bahamas to Trinidad, and north-west Venezuela and off-lying islands (Raffaele et al., 1998; Nijman et al., 2008). Within this region, it has been recorded in 21 countries, but breeding has been confirmed on 15 islands, representing 11 countries or territories (BirdLife International, 2006; McNair 2005; McNair et al. 2005, McNair and Cramer-Burke 2006; Nijman et al., 2008) (Table 1).

The conservation status of the Caribbean coot has been complicated by the fact that it was formerly considered conspecific with the American coot *F. americana* (Voous, 1983), a species that breeds at northern latitudes, but that winters in large numbers in the Caribbean. Caribbean Coot, on the contrary, while having the ability to rapidly colonize new sites (Voous, 1983) appears to be largely sedentary. We recently assessed the global conservation status of the Caribbean coot and found that with a range of occupancy <2,000 km^2 and relatively high levels of threat the species meet the criteria for listing as Vulnerable (Nijman et al., 2008). With the West-Indian whistling duck *Dendrocygna arborea* (BirdLife International, 2007) the Caribbean coot is one of the few waterbirds endemic to the Caribbean that is considered globally threatened.

Studies in the Netherlands Antilles (Prins et al., 2005; Prins and Nijman 2005; Nijman et al., 2008) show that some of the smaller islands within the species range can be abundant. Some of the most important sites where Caribbean coots are observed in the Netherlands Antilles are all man-made (ponds, dams, wastewater treatment plants) and all are small - typically less than 10 ha during the wet season; but note that the amount of surface area can differ substantially between wet and dry season: Hulsman et al., 2008). Here I argue for improving the conservation status of the Caribbean coot

Table 1. Summary of breeding range of Caribbean coot *Fulica caribaea* with number of sites where the species has been confirmed present and estimated area of habitat these sites represent (data from Nijman et al., 2008 and McNair 2005).

Country	Size (km^2)	Sites (N)	Habitat (km^2)
Antigua	280	1	3
Barbados	431	2	<1
Barbuda	161	1	2
British Virgin Islands	56	1	<1
Guadeloupe	1706	4	14
Hispaniola	75940	15	553
Jamaica	10831	6	60
Martinique	1060	2	23
Netherlands Antilles	960	19	<1
Puerto Rico	8959	10	60
US Virgin Islands	281	5	<1

by focusing on some of the smaller, and often man-made, ponds, on the economically more affluent islands. Additionally, I make a plea for improving our understanding of the conservation status of Caribbean coot in other parts of the Caribbean, and list a number of priorities.

I surveyed essentially all freshwater and coastal brackish lagoons on Bonaire, Klein Bonaire and Curaçao in August-September 2005 and July 2006. Simultaneously, in July 2006 M. Aliabadian surveyed all similar sites on the island of Aruba. At 16 sites we recorded Caribbean coot group sizes for each lake or lagoon mostly based on multiple visits during this period. In addition we compiled data collected by colleagues, other birders and ornithologists from the period 1938-2006 as deposited in the archives of the Zoological Museum Amsterdam (Prins et al. 2005). Visibility in the wetlands in Netherlands Antilles' is good and there is no a priori reason to assume that the size of the wetland will have a significant influence on detectability of coots. Data from other Caribbean islands was compiled from Directory of Neotropical Wetlands (Scott and Carbonell 1986) and other sources (Nijman et al. 2008), searching for wetlands >5h in size where either Caribbean coot had been recorded, or that, based on the description of the habitat, were likely to hold Caribbean coot (see below for how these two categories were treated in the analysis). To the resulting list of 55 sites I added data on whether or not the site was included in the regional protected area network and whether or not the site itself was threatened (pollution, reclamation, drainage, etc.) and/or whether the coots themselves were persecuted. Using these data I explore the relationships between numbers of coots present on the different wetlands with the size of the area (Netherlands Antilles only), and the relationships between size of the sites, whether or not they are included in the protected area network, and the threats the site and/or the coots faces (Caribbean Region) testing the null-hypothesis that neither size, level of protection or level of threat hold a relationship with Caribbean coot presence or numbers. I use non-parametric statistics to test for significance, accepting a statistically significant relationship when $P<0.05$ in a two-tailed test.

In the Netherlands Antilles maximum group sizes (that is the largest number of individuals on a particular pond) ranged from six to over 800 birds. There were significant differences in group sizes among the four islands where the species breeds (Kruskall Wallis one way analysis of variance, $H=10.8$, $df=3$, $P=0.01$). Pairwise comparisons indicated that only Curaçao exhibit significantly larger numbers of coots compared to the other three islands combined (Curaçao, median group size 63 birds, other islands 13 birds, Mann-Whitney U, $n_1=3$, $n_2=107$, $P<0.05$). Including 19 sites on four islands for which information on maximum group sizes was available, I did not find a relationship between size of the pond (range 20 m^2 -25 ha) and maximum group size (range 5-800) (Spearman Rank Correlation Coefficient $r_s=0.37$, $N=19$, $P=0.12$). The largest numbers of coots tend to be found on some of the larger lakes, e.g. 800 birds at the 1.4 ha Dam Muizenberg in Curaçao. Small ponds, such as Kaya Fortuna on Curaçao, measuring a mere 200 m^2 during the wet season, can support over 200 birds, whereas the 25 ha large Bubali bird sanctuary in Aruba rarely holds more than 40 coots at a time. Likewise, other small ponds, such as the Klein Hofje wastewater treatment plant on Curaçao, are important sites for a significant number of coots. Especially in the past, when in drier years ponds became desiccated,

breeding may have been more erratic, occurring not every year. Based on 80 breeding records on Bonaire and Curaçao (Prins et al. 2005; V. Nijman unpubl.) about half occur in the three month-period (Jan-March) after the heavy rains when reservoirs and ponds fill up.

I compiled Caribbean-wide data on sites >5ha where the Caribbean coot is known to occur (34 sites, median size 450 ha), or where on the basis of available habitat and the fact that the species is known to breed locally, it is expected it to occur (21 sites, median size 300 ha). Although sites where the species was confirmed tended to be larger than the ones from where we expected it to occur this difference was not significant (Mann-Whitney U, $n_1 = 26$, $n_2 = 21$, $P = 0.28$). Considering confirmed cases only ($n = 28$ sites), about half were (in whole or partially) included in a protected area network: protected sites were smaller (median 32 ha) than those that were not included in a protected area network (725 ha) (Mann-Whitney U, $n_1 = 13$, $n_2 = 14$, $P < 0.05$). We can conclude that we have confirmation of the occurrence of Caribbean coot in on average rather small areas, and the sites that are included in the protected area network are, on average, small. Some of the larger populations are found on small wetlands amidst urbanized areas, or indeed on man-made ponds.

The most common threats to known breeding areas are drainage or land reclamation (19 sites), hunting (17 sites), and pollution (10 sites). At many of the confirmed sites, the species is directly persecuted (hunting, egg collection) and habitat is threatened by pollution, reclamation, and drainage. Sites where the species appears not to be threatened are few in number and small in size (4 sites, median size 15 ha). Those sites where the habitat was considered threatened but the species is not hunted were somewhat larger (9 sites, 32 ha), but at the largest sites both the habitat and the Caribbean coot itself was threatened (8 sites, 1000 ha); the difference in sizes being significant (Kruskal-Wallis, $P = 0.04$).

My results illustrate a positive relationship between the total available habitat and island size (Spearman Rank Correlation Coefficient $r_s = 0.79$, $N = 11$, $P = 0.007$), however, we have very little information on numbers of coots present in the wetlands of some of the largest islands. Some of the smaller countries may hold significant numbers, yet because of lack of surveys this information has yet to surface.

Apart from the lack of survey data in large parts of the Caribbean coot range, we have limited data on the breeding biology and its (local) habitat needs. Breeding has been studied in the Virgin Islands (McNair and Cramer-Burke 2006), to a lesser extent on Barbados (Frost and Messiah 2001), and, based on aggregate data, in the Netherlands Antilles (Prins et al. 2005). From these data it seems that Caribbean coots are year-round breeders in the northern part of their range (McNair 2005) but seasonal breeders in the south (Prins et al. 2005; V. Nijman unpubl.). For large parts of the Caribbean what happens outside the breeding season and whether or not the species' is indeed sedentary throughout its range is largely unknown.

Results obtained in this study highlight the plight of the Caribbean coot, as well as other freshwater species, and should be of greater concern both to the local communities and governments, as well as conservation NGOs operating in the region. Education and raising public awareness is paramount if we are to successfully adopt a conservation strategy for the Caribbean coot. The West Indian Whistling-Duck and Wetlands Conservation Project (Sorenson et al. 2004; Sorenson and Dobson 2007) provides local teachers and educators with training and educational materials and works to raise public awareness and appreciation for the value of local wetlands Baring in mind that teaching guides and poster are no substitute for hands-on habitat and species management, where both the West Indian whistling duck and the Caribbean coot co-exist (Jamaica, Hispaniola, Puerto Rico, Antigua and Barbuda) the latter probably benefits already, but in other parts of its range there is a need for active management as well.

Given the small extent of occupancy of the Caribbean coot, protection of the remaining wetland habitats throughout the Caribbean region is important, not just for the coots but also for other (threatened) wetland species. As many wetlands in most of

the Caribbean islands are surrounded by a matrix of intensely human-used lands and non-wetland habitats, Caribbean coots may often occur in small numbers. If not done so already, active protection of these wetlands is recommended. The presumed sedentary nature and gregariousness of the Caribbean coot coupled with a tolerance for many different wetland habitats, allows focussing on the protection of a number of wetlands (either as Ramsar sites or otherwise) as a management strategy. Following the arguments of Staus (1998) for the West Indian whistling duck, the results from the present study, and indeed others (McNair and Cramer-Burke 2006; Frost and Messiah 2001) suggest that reserves do not need to consists of large protected tracts of land but could be composed of a number of individual small wetlands. Protection of the remaining wetland habitat is a top-priority may be best achieved by a pragmatic approach involving landowners, local authorities (including those from nearby villages), and local NGOs, with institutional and financial support from international donors.

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