



Conservation status of Caribbean coot *Fulica caribaea* in the Netherlands Antilles and other parts of the Caribbean

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ABSTRACT: In 2005 to 2006 we assessed the status of the Caribbean coot *Fulica caribaea* in the Netherlands Antilles, largely semi-arid islands in the South Caribbean, with small numbers of permanently available fresh water bodies. The Caribbean coot is a freshwater bird which is dependent on the seasonal availability of freshwater ponds for breeding; it breeds on 4 of the 6 islands of the Netherlands Antilles, viz. Curaçao (first recorded in 1956), Bonaire (1974), Aruba (1977), and St. Maarten (1981). Compared to the period up to and including 1979, group sizes in 1980 to 2006 were larger on Curaçao, and it appears more abundant in the latter period on all islands. We report on 49 sites (>5 ha) in the Caribbean where the species has been recorded, or where we would expect it to occur on the basis of available habitat. Threats to the Caribbean coot include drainage or reclamation of habitat, hunting, and pollution. Few sites receive protection. The coot has a restricted range of occupancy of some 1000 km², spread out over 13 islands, representing 10 countries. Based on its restricted range, coupled with high levels of threat and the limited amount of protection, we recommend that the species be included as 'Vulnerable' in the IUCN (International Union for the Conservation of Nature and Natural Resources, World Conservation Union) Red List. An increase in the level of (legal) protection, in addition to an increase in the amount of habitat included in the regional protected areas network and heightening the awareness of the needs of this Caribbean endemic are overdue. The establishment of permanent freshwater ponds, especially in the arid parts of its range, appears favourable for the species, and may aid conservation.

KEY WORDS: Conservation status · *Fulica americana* · Hybridisation · Restricted-range species · Waterbirds

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INTRODUCTION

The Caribbean coot *Fulica caribaea* is endemic to the chain of islands from the Southern Bahamas to Trinidad, with smaller numbers in northwest Venezuela and off-lying islands (Raffaele et al. 1998, Taylor 1996, Taylor & van Perlo 1998). Within this region, it has been recorded in 21 countries, but in most of these as vagrant or as a non-breeding resident. Breeding has

been confirmed on 13 islands, representing 10 countries (BirdLife International 2006, McNair & Cramer-Burke 2006) (see Table 2 and Fig. 1). The conservation status of the Caribbean coot has always been somewhat obscured as it was formerly considered conspecific with the American coot *F. americana* (e.g. Voous 1983), a species that breeds at northern latitudes, but that winters in large numbers in the Caribbean. Currently the species is considered 'Near Threatened'

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according to IUCN threat criteria as it has suffered a marked decline throughout the Caribbean as a result of hunting pressure, egg collection, habitat loss and introduced predators (BirdLife International 2006). On most of the islands within its range the Caribbean coot is uncommon to rare, and in parts of its range, e.g. St. Kitts and Nevis, and Barbados, it has disappeared as a breeding bird (although in Barbados it has recently been confirmed breeding after an absence of almost 100 yr; Frost & Massiah 2001).

There are marked climatic differences within the Caribbean; the southern part can be characterised as semi-arid with few permanent freshwater sources available, whereas rainfall is more plentiful in the north-west (Raffaele et al. 1998, H. Hulsman et al. unpubl.). In the less arid parts of its range the coot is largely dependent on freshwater lakes, ponds, marshes, and, less frequently, coastal brackish lagoons. In the more arid parts, the coot is an eruptive and irregular breeder, and is not present year-round (Voous 1983), although increasingly it makes use of permanent man-made ponds at e.g. golf courses and wastewater treatment plants (Prins et al. 2005).

Here we assess the conservation status of the Caribbean coot in the Netherlands Antilles. This group of islands is one of the few in the Caribbean for which detailed quantitative ornithological data are available from the 1930s onwards (Prins & Nijman 2005). We

quantify changes that have occurred over time by comparing recorded group sizes. With knowledge on the biology of the species from the Netherlands Antilles (Prins et al. 2005), and also other parts of its range, we estimate its range of occupancy in the Caribbean, and assess the species' conservation status.

MATERIALS AND METHODS

Status assessment in the Netherlands Antilles. The Netherlands Antilles and Aruba (Fig. 1) comprises 6 islands, and 2 islets; the Caribbean coot has been confirmed on 4 islands (Aruba, Curaçao, Bonaire, and St. Maarten). In August to September 2005 and July 2006 we conducted fieldwork on the first 3 islands (and the islet of Klein Bonaire), visiting essentially all freshwater and coastal brackish lagoons. We recorded group sizes for each lake or lagoon, and gave total numbers for each island. Caribbean coot appear to have become more common on these islands in recent years, and in order to quantify these temporal changes, we compared the data collected by us, other birders and ornithologists from the period 1980 to 2006 ($n = 57$), with those collected likewise by other birders and ornithologists in the period 1938 to 1979 ($n = 78$) as deposited in the archives of the Zoological Museum, Amsterdam, The Netherlands. The cut-off line be-

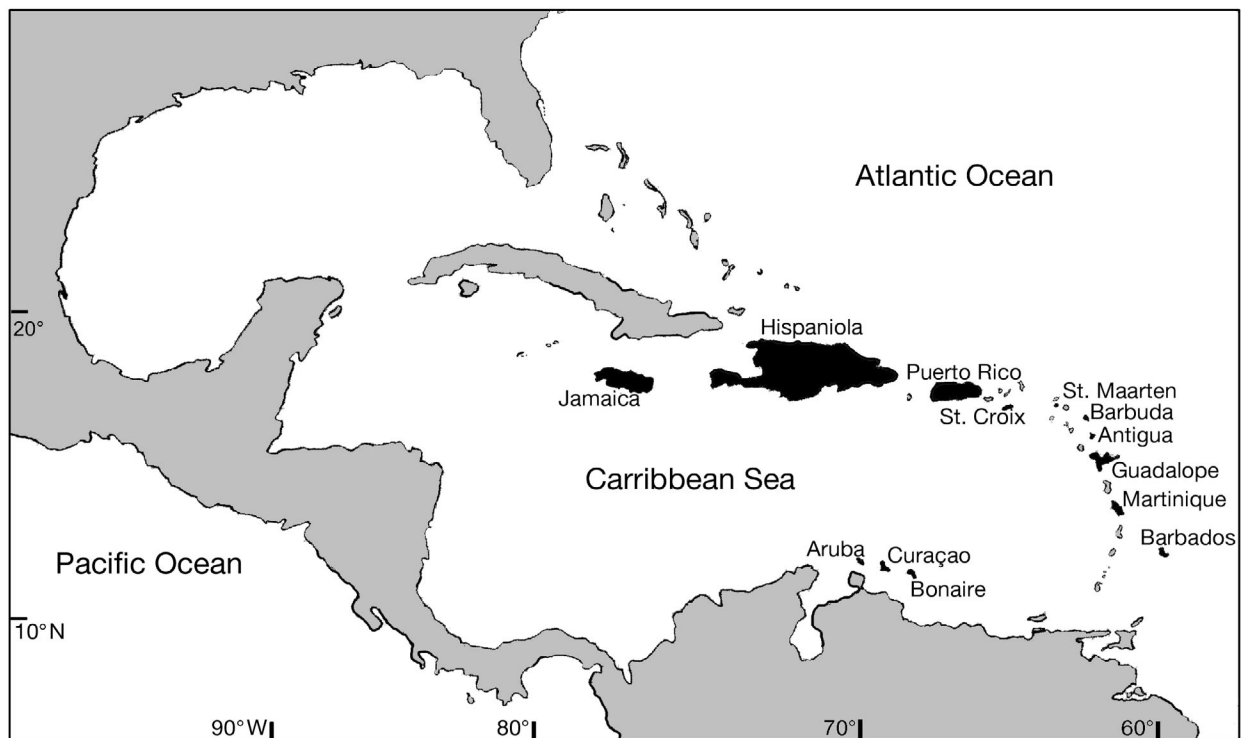


Fig. 1. *Fulica caribaea*. Breeding range of the Caribbean coot showing all islands (black) where the species has been confirmed breeding

tween these 2 periods (1980) was chosen somewhat arbitrarily but roughly coincides with the transition of the islands from a rural–industrial economy to one based largely on tourism (Prins & Nijman 2005).

Global status assessment. Observations elsewhere (Voous 1983, Taylor & van Perlo 1996, Raffaele et al. 1998, Frost & Massiah 2006, McNair & Cramer-Burke 2006), together with our own observations, indicate that the Caribbean coot is largely dependent for breeding on lakes, ponds, marshes, and, albeit less frequently, coastal brackish lagoons. We aimed to assess the species' range of occupancy, by summation of the total wetland areas in the 10 countries where the species has been confirmed breeding. As a starting point, for each island, we used the Directory of Neotropical Wetlands (Scott & Carbonell 1986), and searched for wetlands where either Caribbean coot had been recorded, or which, based on the description of the habitat, were likely to hold Caribbean coot. On 1 site (Southgate Pond, St. Croix, US Virgin Islands) in addition to pure Caribbean coots, mixed pairs of Caribbean coot and American coot have also been recorded (McNair & Cramer-Burke 2006), and this site is included in our analysis. Secondly, we searched the internet (including the Global Biodiversity Information Facility website [www.gbif.org] which lists data from participating zoological collections) for affirmative records of Caribbean coot in each of the 10 countries, mostly by checking birding reports. This often resulted in the confirmation of the presence of the species in areas listed in the Neotropical Wetlands database. Sites with an estimated area of <5 ha were excluded. From the database, as well as from the bird reports, we made a qualitative assessment of the threats faced by the Caribbean coot.

RESULTS

Netherlands Antilles

Breeding in Curaçao was first recorded in 1956, in Bonaire in 1974, in Aruba in 1977, and in St. Maarten as recently as 1981. Although the Caribbean coot may

have bred on the islands prior to these dates, intensive ornithological explorations particularly on the first 3 islands (summarised in Voous 1982, 1983, 1985) did not find any evidence of earlier breeding activity. For this reason we believe that the recent recorded increase in breeding activities is genuine.

There are significant differences in group sizes found on the 4 islands (Kruskall-Wallis 1-way analysis of variance, $H = 11.7$, $df = 3$, $p = 0.009$ and $H = 10.8$, $df = 3$, $p = 0.01$, for the pre-1980 and post-1980 period, respectively; Table 1). On 3 out of 4 islands the average group size has increased over time; however, the difference is only significant for Curaçao. On all 4 islands the number of sites has seen a temporal increase, and currently the species is known from 19 ponds, lakes, and reservoirs. Some of these are very small, i.e. less than 5 ha, and sometimes even less than 1 ha, and breeding is not confirmed from all sites.

Global status

We compiled data from 49 sites where the Caribbean coot is known to occur ($n = 28$), or where, based on the available habitat and the fact that the species is known to breed locally, it is suspected to occur ($n = 21$) (Table 2). Most of the sites where the Caribbean coot has been recorded are small, with only 15 areas covering >1000 ha. The total area of these sites is some 1000 km².

Legal protection is limited; only 11 sites are included in the regional protected area network, and at an additional 5 sites the species receives some partial protection (mostly in the form of restrictions imposed on hunters). Some sites are privately owned and the coots present at these sites may or may not be adequately protected.

Despite some sites receiving legal protection, all but a few sites are threatened. The most common threats are drainage or land reclamation (19 sites), hunting (17 sites), and pollution (10 sites), and at many sites the Caribbean coots face multiple threats, despite 'protection'.

Table 1. *Fulica caribaea*. Group sizes of Caribbean coot (mean \pm SD), and number of sites where the species was recorded in the Netherlands Antilles. n: no. of groups recorded; range: minimum and maximum group sizes recorded. p-values refer to Mann-Whitney *U*-tests on group sizes between the 2 periods

Island	Pre-1980 (1938–1979)				Post-1980 (1980–2006)				p
	Mean \pm SD	n	Range	No. of sites	Mean \pm SD	n	Range	No. of sites	
Aruba	4.5 \pm 4.5	28	1–20	2	8.8 \pm 12.6	10	2–40	3	0.40
Curaçao	21.2 \pm 52.4	18	1–170	3	109.3 \pm 215.7	16	3–800	6	0.001
Bonaire	24.8 \pm 41.4	26	1–200	4	13.8 \pm 18.7	32	1–40	7	0.33
St Maarten	8.3 \pm 7.5	5	1–18	1	4.3 \pm 2.4	6	1–7	3	0.93

Table 2. *Fulica caribaea*. All locations where Caribbean coot has been recorded or where it is suspected to occur, on islands where the species has been confirmed breeding, showing protection status of the site and existing threats. NA: Netherlands Antilles. ?: no data available

Island	Locality	Approximate size (ha)	Habitat	<i>F. caribaea</i> confirmed	Protection	Threats
St. Croix, US Virgin Islands	Southgate Pond	18	Seasonal brackish pond	Yes	Coastal reserve	Environmental degradation
Puerto Rico	Torrecilla Alta	1000	Lake	No	None	Disturbance, hunting
	Cibuco Swamp	450	Mangroves, marshes	Yes	None	Drainage, recreational activities
	Tortoguero Lagoon/Cabo Caribe	1000	Lagoon, swamp	Yes	Nature reserve	Pollution, hunting, land reclamation
	Tiburones Swamp	400	Lagoon, marshes, mangroves	Yes	None	Drainage
	Cartegena Lagoon	325	Lake, marshes	Yes	None	Hunting, drainage, eutrophication
	Boqueron Refuge	200	Mangroves, marshes	No	Wildlife refuge	Hunting
	Serralles Lakes	200	Reservoirs	Yes	Partial	None
Barbados	Humanco Swamp	3000	Lagoon, marshes, swamps	Yes	Partial	Pollution, hunting, land reclamation
	Lago Enrique	?	Lake	Yes	?	?
	Punta Guaniquilla	?	?	Yes	Forest reserve	?
	Graeme Hall Swamp	32	Marshes	Yes	Partial	Pollution
	Chancery Lane Swamp	16	Lagoon	No	None	Hunting, land reclamation
Martinique	Bale des Anglais	120	Mangroves, marshes	No	Partial	Hunting
	Baie de Fort-de-France	2200	Mangroves, swamps, marshes	No	Partial	Pollution, hunting
Guadeloupe	Grand Cul-de Sac Marin	1000	Mangroves, swamps, marshes	Yes	None	Drainage, reclamation, hunting
	Point d'Antiques Marsh	100	Marshes	Yes	None	Drainage, hunting
	Marais de Folle Anse	400	Marshes	No	None	Pollution, hunting
	Gaschet Reservoir	?	Reservoir	Yes	None	?
	Negril Morass	2300	Marshes	No	None	Drainage
Jamaica	Black River Lower Morass	5700	Marshes	Yes	None	Drainage, mining
	Portland Bight Swamp	2083	Marshes	No	None	Reclamation, pollution
	Cockpit Salt River Swamp	166	Swamp	No	None	Drainage
	Turtle Crawle Swamp	25	Marshes	No	None	Reclamation
	Pear Tree Swamp	16	Marshes	No	None	?
	Laguna Limon	300	Lake	Yes	None	Disturbance, hunting
	Laguna Bermesi	125	Lake, marshes	No	None	Drainage
Hispaniola–Dominican Republic	Laguna de Rincon	3000	Lake, marshes	Yes	Scientific reserve	Hunting, drainage
	Laguna de Don Gregorio	26	Lake, marshes	No	None	Hunting, drainage
	Estuaries Rio Higuamo/Rio Soco	300	Marshes, mangroves	No	None	?
	Laguna Limon	488	Lakes, marshes	No	Scientific reserve	Hunting
Haiti	Laguna Redonda	700	Marshes, mangroves	No	Scientific reserve	Hunting
	Laguna de Saladilla	2000	Lakes, marshes, mangroves	Yes	None	Hunting, pollution
	Floodplains Arthonite River	47500	Marshes, lagoon, mangroves	Yes	None	Reclamation
Hispaniola–Haiti	Lac Caiman	2500	Lake, marshes	Yes	None	?
	Miragoane Lakes	4500	Lakes, marshes	No	None	?

Table 2. (continued)

Island	Locality	Approximate size (ha)	Habitat	<i>F. caribaea</i> confirmed	Protection	Threats
	Les Cayes Lakes	300	Lakes, marshes	No	None	?
	Les Cayes marshes	7000	Marshes	No	None	?
	Ile de La Gonave Wetlands	5000	Marshes, mangroves	No	None	?
Barbuda	Bull Hole	200	Marshes, mangroves	No	None	?
Antigua	Potswork reservoir	?	Reservoir	Yes	?	?
Curaçao, NA	Muizenberg/Kaya Fortuna	16	Reservoir, lake	Yes	Protected park lands	Disturbance, pollution
	Malpais	5	Lakes	Yes	Protected conservation land	None
Bonaire, NA	Playa Grandi	5	Lagoon, lake	Yes	National park	None
	Washikemba	7	Lagoon	Yes	None	Pollution
Aruba, NA	Bubali	25	Lakes	Yes	Bird sanctuary	None
St Maarten, NA	Little Bay Pond	5	Lake	Yes	None	?
	Fresh Pond	5	Lake	Yes	None	?
	Belair Pond	5	Lake	Yes	?	Pollution

DISCUSSION

Status in the Netherlands Antilles

We documented an increase in number of sites, and, at least for Curaçao, a significant increase in group sizes (and hence overall numbers) of Caribbean coot in 4 of the 6 islands of the Netherlands Antilles. Confirmed cases of breeding on these islands are mostly recent, and overall, there is a clear indication that the Caribbean coot has expanded its range in the Netherlands Antilles. Although the total area of occurrence on these islands is small and the species is not protected by law, the species seems not to be threatened by hunting or egg-collection, and as such the situation here fares well compared to other parts of the species' range (cf. Prins & Nijman 2005). The observed increase is mostly due to an increase in the number of permanently available freshwater ponds, in part as a means of accommodating the needs of the increased number of tourists. Better maintenance of dams allows ponds to retain water even during dry years, and newly created ponds (on golf courses, water treatment plants) increase the available habitat. In addition, a general increase in environmental awareness on the islands may allow for better protection of the Caribbean coot.

IUCN threat status and conservation implications

The total area of the 49 sites where Caribbean coot is known or expected to occur is some 1000 km², but the amount of suitable habitat must be smaller. Although small areas (<5 ha) are not included in Table 2, and in this way we may be potentially underestimating the species' range of occupancy, this is more than counterbalanced by the fact that particularly some of the larger areas listed are covered only in part with suitable habitat. Furthermore, for many sites there are few or no records of Caribbean coot, suggesting poor coverage by ornithologists, or presence of coots being restricted to certain years or to certain parts of the year only, or both.

We have shown that the Caribbean coot has a restricted range of occupancy in the order of 1000 km², spread out over 13 islands. Even if we account for additional sites not included in our estimate, given that most of the sites where it has been recorded thus far cover a small area only, it is unlikely that the species' range of occupancy is significantly larger than our estimate. Within this limited range, the species receives a limited amount of protection, and at most sites where the species has been recorded it faces direct or indirect threats.

BirdLife International (2006) considered that the Caribbean coot nearly qualified for listing as threat-

ened under IUCN Criteria A2cde, i.e. an observed, estimated, inferred or suspected population size reduction of $\geq 30\%$ over the last 10 yr, where the reduction or its causes may not have ceased or may not be understood or may not be reversible, based on a decline in area of occupancy, extent of occurrence and/or quality of habitat, actual or potential levels of exploitation and the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

We were not able to quantify this reduction, but we argue that the species faces a high risk of extinction in the wild based on the limited area of occupancy coupled with continuing threats and limited effective protection. With a range of occupancy $< 2000 \text{ km}^2$, that is severely fragmented, and an inferred or projected decline in the area of occupancy, the area, extent and quality of its habitat, and the number of mature individuals, the species meet the IUCN Criteria for listing as 'Vulnerable' (B2ab, ii-iii-v).

In order to increase the survival chances of the Caribbean coot, both the species itself and its habitat need more active protection. The species is best served by improved legal protection within the countries of its range (sustained by effective enforcement), which would aim, for example, to reduce the number of birds killed by hunters, as well as the numbers of eggs collected by egg-collectors. Protection of habitat is best achieved by an increase in the amount of habitat included in the protected area network (again coupled with active hands-on protection). Thus far, most countries within the range of the species have invested heavily in protecting the marine environment, omitting much needed protection of terrestrial species.

Hybridisation is relatively uncommon in Gruiformes (Aliabadian & Nijman 2007), but there are reported cases of mixed pairing between Caribbean coot and American coot from islands where the species is rare (Voous 1983, McNair & Cramer-Burke 2006). This low number of reported cases of mixed pairing may suggest that hybridisation poses a low threat to the Caribbean coot, although this requires urgent further research. We hope that our analysis will draw the attention of both local communities and governments and national and international conservation NGOs operating in the region to the plight of the Caribbean coot, as well as other freshwater species in this region.

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LITERATURE CITED

- Aliabadian M, Nijman V (2007) Avian hybridisation: incidence and geographic distribution of hybridisation in birds. *Contrib Zool* 76:59–61
- BirdLife International (2006) Species factsheet: *Fulica caribaea*. Available at: www.birdlife.org/datazone/search/species_search.html?action=SpcHTMDetails.asp&sid=2947&m=0 (accessed on 18 December, 2006)
- Frost MD, Massiah EB (2001) Caribbean coot (*Fulica caribaea*) – the return of a former breeding resident bird. *J Barbados Mus Hist Soc* 47:85–89
- McNair DB, Cramer-Burke C (2006) Breeding ecology of American and Caribbean coots at Southgate Pond, St. Croix: use of woody vegetation. *Wilson J Ornithol* 118:208–217
- Prins TG, Nijman V (2005) Historic changes in status of Caribbean coot in the Netherlands Antilles. *Oryx* 39:125–126
- Prins TG, Roselaar K, Nijman V (2005) Status and breeding of Caribbean coot in the Netherlands Antilles. *Waterbirds* 28:146–149
- Raffaele H, Wiley J, Garrido O, Keith A, Raffaele J (1998) *Birds of the West Indies*. Christopher Helm Identification Guides, A & C Black, London
- Scott DA, Carbonell M (1986) A directory of neotropical wetlands. International Union for the Conservation of Nature and Natural Resources (IUCN), Cambridge, and International Waterfowl and Wetland Research Bureau, Slimbridge
- Taylor PB (1996) Family Rallidae (rails, gallinules and coots). In: del Hoyo J, Elliott A, Sargatal J (eds) *Handbook of the birds of the world, Vol 3 Hoatzin to Auks*. Lynx Edicions, Barcelona, p 108–209
- Taylor PB, van Perlo B (1998) *Rails. A guide to the rails, crakes, gallinules and coots of the world*. Pica Press, Tonbridge
- Voous KH (1982) Stragglers to islands—South American birds in the islands of Aruba, Curaçao, and Bonaire, South Caribbean. *J Yamashina Inst Ornithol* 14:171–178
- Voous KH (1983) *Birds of the Netherlands Antilles*. De Walburg Pers, Zutphen
- Voous KH (1985) Additions to the avifauna of Aruba, Curaçao, and Bonaire, South Caribbean. In: Buckley PA, Foster MS, Morton ES, Ridgely RS, Buckley FG (eds) *Neotropical ornithology (Ornithological Monographs 36)*. American Ornithologists' Union, Washington, DC, p 247–254

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