

Conservation success bird species

The plight of indigenous birds on oceanic archipelagoes often makes depressing reading, as the author points out in his forthcoming book, *Naturalized Mammals of the World*. Habitat destruction by domestic stock and predation by accidentally introduced rats and mice are the major causes. In Bermuda this discouraging trend has been reversed by the successful rehabilitation of two species within the space of a quarter of a century.

The 360 or so islands which form the Bermudas at approximately 32° 19'N and 64° 46'W in the North Atlantic were discovered by the Spanish navigator Juan de Bermúdez in 1515. Bermuda then possessed an abundant avifauna; few if any species were more plentiful than the cahow or Bermuda petrel *Pterodroma cahow*—a pelagic bird, which nested on hillsides throughout the islands and whose population, according to a contemporary account by the Spaniard, Diego Ramirez (in Wilkinson, 1950), may have exceeded one million.

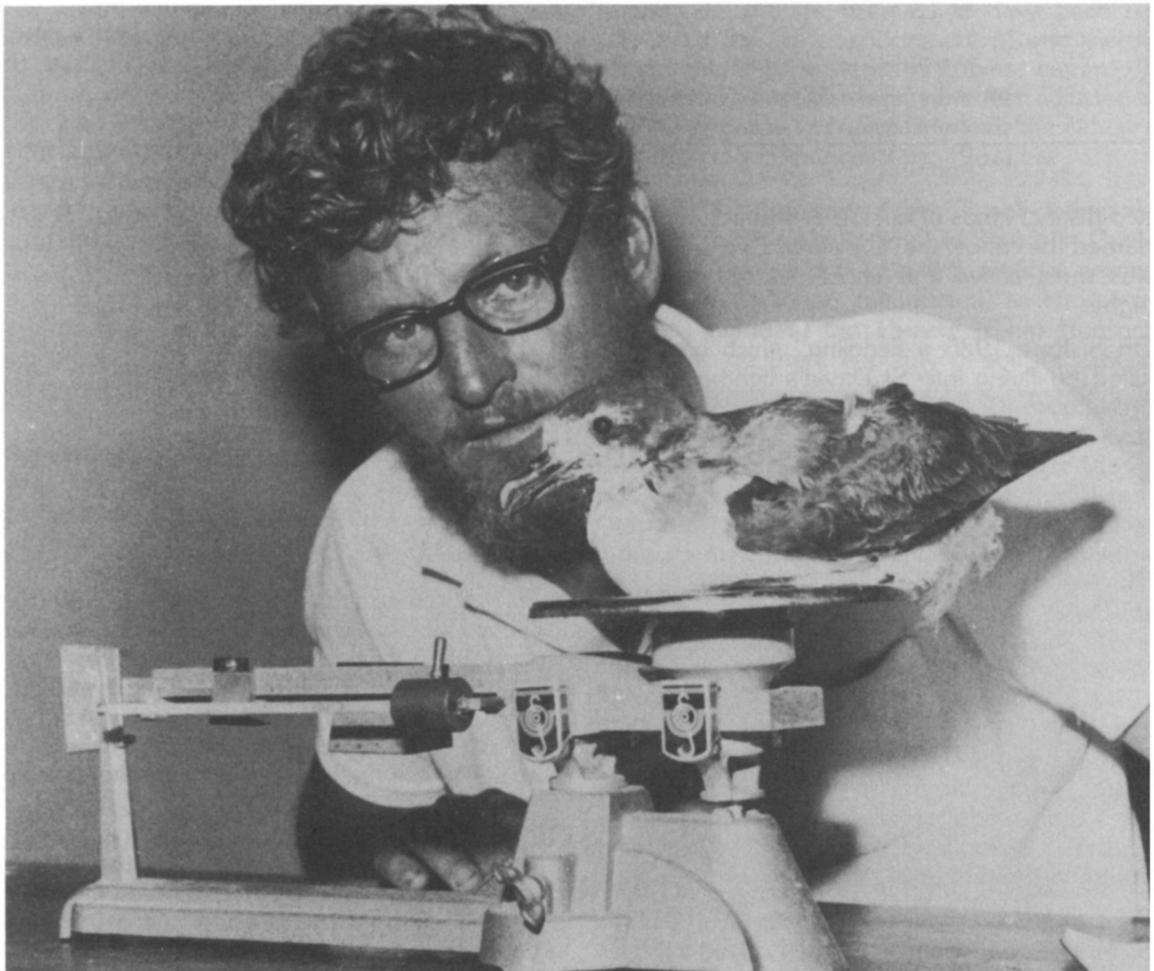
As a potential source of food for shipwrecked mariners the Spanish and other early visitors landed pigs *Sus domestica* on the islands, where they preyed on the cahows—which had evolved in a mammal-free environment—to such an extent that by the end of the century the 100,000 or so survivors were confined to a few islets that were inaccessible to pigs. In 1613, one year after the first permanent colony was established, black rats *Rattus rattus* were accidentally introduced from a Spanish grain ship (Wingate, 1981, *in litt.*). Within two years the rat population was large

enough to cause a severe famine and the starving settlers turned to cahows for food. The last major nesting colony of these tame and 'silly' birds (as they were described by a contemporary writer—'silly' = common or ordinary) on Cooper's Island in Castle Harbour was harvested so ruthlessly that in 1616 and 1621 the first Governor, Captain Daniel Tucker, issued proclamations to prevent 'the spoyle and havock of the Cahowes' (quoted by Halliday, 1978). Since then the species has been fully protected in Bermuda.

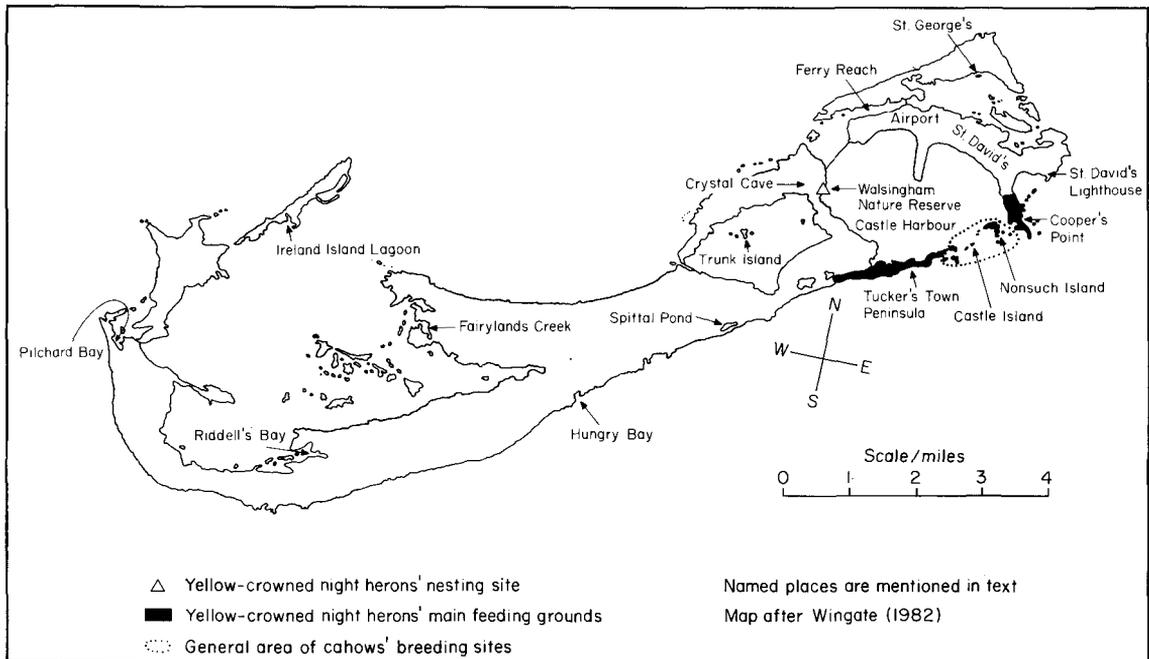
Nothing more was heard of the cahow for nearly 300 years, and it was believed to be extinct. Then, in 1916, R.W. Shufeldt associated the supposedly defunct cahow with the subfossilized bones of a *Pterodroma* petrel found, deeply embedded in calcite, in mid-Pleistocene and recent deposits in the limestone of Crystal Cave on Harrington Sound. It was then realised that a petrel collected on 22 February 1906 by L.L. Mowbray on Castle Island (which had been one of the cahow's last refuges in the seventeenth century), and described in that year by T.S. Bradlee as *Aestrelata gularis*, was in fact a long-lost cahow, and was accordingly renamed and described as the holotype by Nichols and Mowbray in 1916 (Fisher *et al.*, 1969). This lent greater credence to late nineteenth century reports of the cahow, which had previously been thought to be cases of mistaken identity with the then abundant Audubon's shearwater *Puffinus l'herminieri l'herminieri*, which has now, however, been reduced in Bermuda to only one or two breeding pairs (Wingate, 1983, *pers. comm.*). Contemporary Bermuda fishermen were apparently well aware of the existence of

for two Bermudan

Sir Christopher Lever



David B. Wingate with a cahow. He has been working for the cahow's conservation since 1958 (*Bermuda News Bureau*).
Conservation success in Bermuda



two distinct kinds of nocturnal seabird, and nicknamed the cahow the 'Christmas Bird' because it was most active and vociferous on midwinter nights.

On 8 June 1935 a fledgling, which had been killed by flying into St David's lighthouse, was brought to Dr William Beebe at his research station on Nonsuch Island in Castle Harbour. Beebe sent it to Dr Robert C. Murphy, who found that its bones were identical with the subfossil and recent ones described by Shufeldt, and confirmed it as a specimen of *Pterodroma cahow* (Beebe, 1935, 1936). In June 1941 a third specimen was found dead, the bird having flown into a telephone cable in St George's, and in March 1945, during the wartime construction of a US Air Force base on St David's Island, an American officer and ornithologist, Fred T. Hall, discovered positive evidence—in the form of recent bones, fragments of feather and the carcass of an adult from Cooper's Island—of the general location of the cahow's last surviving breeding-site (Fisher *et al.*, 1969).

Encouraged by these findings Murphy and Louis S. Mowbray (the latter the son of the cahow's re-discoverer) searched the Castle Harbour islands in January and February 1951 and

discovered seven cahow nests and a suspected population of about 18 pairs (Murphy and Mowbray, 1951). Shortly afterwards a research and conservation programme began (with generous financial assistance from Childs Frick and the New York Zoological Society) which continues to this day.

The cahow, whose three-foot wing-span makes it a powerful flier, spends most of its life far out to sea, coming ashore only to nest between late October and mid-June, and then only at night (Greenway, 1958; Palmer, 1962; Wingate, 1973, 1977; Zimmerman, 1975; Halliday, 1978). Because it is restricted to rocky offshore islets on the margin of its breeding range, where it is unable to find soil in which to excavate its nesting-burrows, it has been forced to nest instead in natural holes and rock crevices, where it competes for breeding-sites with another pelagic species, the diurnal white-tailed tropicbird or 'Bermuda longtail' *Phaethon lepturus*, which begins nesting several months after the cahow. Thus, when tropicbirds arrive to breed they find cahow nesting-sites vacated for the day by the adults and containing a helpless nestling (cahows lay only a single egg), which they promptly destroy: when the parent cahows return in the

Oryx Vol 18 No 3

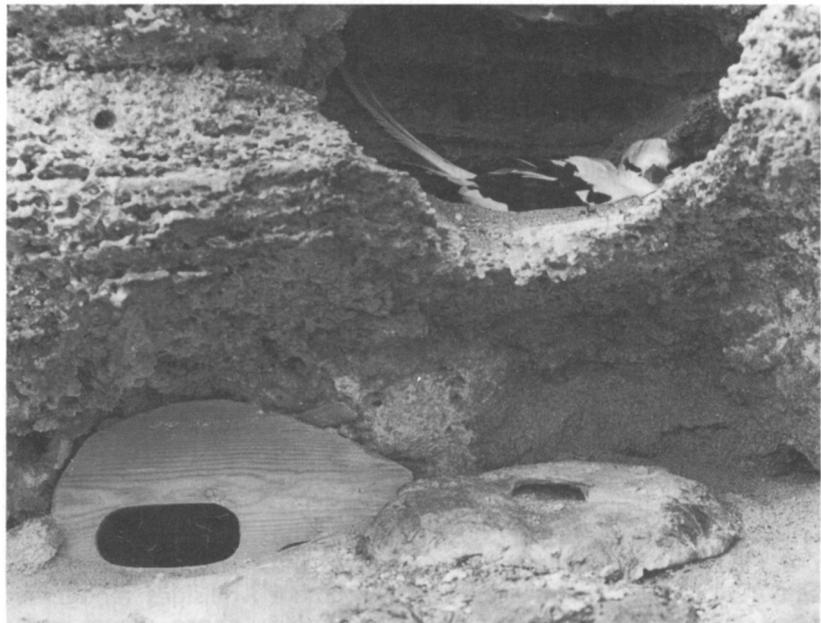
evening they find their nest occupied by the larger and more aggressive tropicbird (Wingate, 1960). A solution to this problem was essential if the cahow was to survive. In 1954 an early warden, Richard Thorsell, devised an ingenious wooden 'baffle' to fit over the entrance to each nest with a hole large enough to admit a cahow but small enough to exclude a tropicbird (Fisher *et al.*, 1969; Zimmerman, 1975). This device reduced predation of cahow chicks by tropicbirds to nil by 1961, and the number of fledged young doubled.

In 1958 David B. Wingate assumed responsibility for the cahow's conservation and three years later the nesting-sites of the species's entire breeding population were discovered; some of these had not been commandeered by tropicbirds even before the advent of Thorsell's baffle, which helps to explain how the cahow had managed to survive. By 1966 the cahow's breeding population had increased by an average of one pair a year to 24, but productivity (which at the best of times is low) had slightly declined, owing to a marked decrease in the breeding success percentage (Wingate, in Fisher *et al.*, 1969). Initially this was believed to be the result of an ageing population in which adequate recruitment had been prevented by tropicbird predation. Analysis of unhatched embryos and dead chicks, how-

ever, revealed the presence of DDT residues (which make egg-shells thin and vulnerable) in an average of 6.44 ppm. In view of the cahow's pelagic feeding habits, and since the Castle Harbour islets have never been exposed to DDT, this contamination can only have been acquired via the oceanic food-chain (Wurster and Wingate, 1968).

In the early 1970s the breeding success rate rose—probably as a result of the decreasing use of DDT on the American mainland—and in 1972 a population of 26 pairs reared 16 young, although the average annual production in the 1970s was only 12.7 (Wingate, 1974 and 1977, pers. comms, in King, 1981). Landing lights at the nearby airport are believed to have been responsible for the abandonment of one islet in recent years (Wingate, 1977, pers. comm., in King, 1981), but these have now been adjusted to a level apparently compatible with the cahow's breeding requirements (King, 1981).

In 1961 the Bermuda Government designated more than 25 acres (10 ha) of islands in Castle Harbour (on several of which artificial nesting burrows have been constructed) as bird sanctuaries, including the 15-acre (6-ha) Nonsuch Island where there is plenty of soil for cahow-



An ingenious wooden 'baffle' was devised in 1954 by warden Richard Thorsell, to fit over cahow nesting-burrows to exclude tropicbirds, which would otherwise destroy cahow chicks and occupy the burrow. A tropicbird can be seen occupying a nesting-burrow unprotected by a 'baffle' (*Bermuda News Agency*).

Conservation success in Bermuda

burrows. Five years later a conservation unit was established in the Department of Agriculture and Fisheries and Dr Wingate was appointed conservation officer with responsibility for the preservation of Bermuda's endangered fauna and flora. One of his major projects is the restoration, so far as possible, of the ecosystem on Nonsuch Island to its pre-colonial condition. He considers that the Castle Harbour islands, which are strictly protected and kept free from rats, are capable of supporting a population of up to 25,000 cahows. On a visit to Bermuda in April 1983 I accompanied him on one of his routine inspections of the cahows' breeding islets in Castle Harbour.

Bermuda is composed of aeolian limestones formed mainly of comminuted shells drifted and deposited by the wind. As is normally the case with wind-blown deposits these limestones are irregularly stratified; when new the rock is soft, but after prolonged exposure to the weather and action of the sea it becomes covered by a hard crust—often losing all trace of stratification and assuming an irregular honeycombed appearance. This makes landing and walking on the breeding-islets (whose precise identity, for reasons of security, are not disclosed) both hazardous and difficult. The cahows' nests are several feet deep in the rock or under overhung crevices, and a powerful torch, often with the assistance of a mirror on the end of a short pole, are necessary to view the chick. Outside some entrances the impression of the adult's feet in the sandy soil reveals its nocturnal visits; where no tell-tale soil is available Dr Wingate arranges small twigs which the adult must disturb to gain access to its nest.

Intensive management of the birds' nesting sites since 1961 has, after many years of more or less negative growth, enabled the population to recover from a low of 18 breeding pairs in that year to 35 breeding pairs in 1983, with a trebling of reproductive success over the same period (Wingate, 1983, pers. comm.). The species is classified as 'endangered' in the *ICBP Red Data Book*, and also by the United States Government which affords it protection under the US Endangered Species Act of 1973 (King, 1981). The *Red Data Book* concludes its account of the cahow by saying: 'The measure of improvement in the status of this species as well as all we know

of its biology can be attributed to the unceasing efforts and dedication of Mr Wingate'.

Yellow-crowned night herons

From subfossil bones discovered as recently as 1981 it is known that yellow-crowned night-herons—similar in conformation to the Socorro Island form *Nycticorax violaceus gravirostris*—were resident in Bermuda in pre-colonial times (Wingate, 1982). It is uncertain when the species died out as a breeding bird, but being an arboreal nester it was apparently better able to survive the introduction of pigs than the cahow. Bartram (in Wingate, 1965) collected adult specimens of yellow-crowned night-herons in breeding plumage at Castle Harbour and Walsingham Bay in June 1861 and 1862 respectively, and Moore (1941) said that they were 'present throughout the year round Longbird Island and from the way that pairs of adults are seen with young birds in autumn I would think that it is quite likely that they breed there. One such party of two adults and a young bird was seen repeatedly in October, 1940. They are usually present in small numbers but I once saw six together and once eleven'. The destruction of the extensive mangrove swamps in which the herons nested on Longbird Island when the United States airfield was constructed between 1941 and 1943 may well mark the time when yellow-crowned night-herons ceased to breed in Bermuda.

Trying to re-establish a heronry through the re-introduction to Bermuda of a non-migratory population was a natural concomitant of the project to restore Nonsuch Island to its pre-colonial state (Wingate, 1982). This is being achieved by the replacement, so far as practicable, of alien trees and shrubs with native species; already, when the programme is as yet incomplete, Nonsuch differs floristically from any other island in the group, and closely resembles the probable appearance of Bermuda before the arrival of man. The yellow-crowned night-heron was selected for the experiment both because it had been present before human settlement began, and also because its principal prey, the land crab *Gecarcinus lateralis*, was extremely common on Nonsuch Island—as it is on coastal hillsides along the whole of Bermuda's south shore, where its burrowing activities cause such

Oryx Vol 18 No 3

damage that it is universally regarded as a pest: indeed, it was hoped that the heron's successful reintroduction might even result in a degree of biological control (Wingate, 1982).

In 1976, 1977 and 1978 10, 17 and 19 nestlings respectively (of the form *N. v. violaceus*) were collected in sibling groups from nests in the Alafia Banks heronry in Tampa Bay on the west coast of Florida and air-freighted to Bermuda, where they were placed in a roofless enclosure on Nonsuch Island, from which they were allowed to fly free when fully-fledged; they became independent of hand-feeding (almost exclusively with land crabs) within about 4–9 weeks of their arrival and were soon commuting daily to rocky islets and mangrove swamps in and around Castle Harbour (Wingate, 1982).

Although Dr Wingate deliberately refrained from searching for nests for fear of disturbing the birds, he considers that the introduced herons first bred successfully in July 1978 in Walsingham Marsh—a thickly wooded district with a dense understorey of vines, bushes and poison ivy *Rhus toxicodendron* covering an area of 34.5 acres (14 ha), plus 3 acres (1.2 ha) of mangrove swamps around the bay—and probably also did in the following year. Dr Wingate found three nests in 1980 and 14 in 1982. By the end of the 1982 breeding season—when there were more than 30 fledglings and the total population consisted of a minimum of 14 adult pairs plus at least 12 young—he considered that the colony was self-perpetuating.

When I visited the yellow-crowns' heronry at Walsingham with Dr Wingate in 1983 there were 14–16 nests—all in living or dead Bermuda cedars *Juniperus bermudiana*. Although the birds are now regularly observed on all the Castle Harbour islets and on the nearby Tucker's Town peninsula and Cooper's Point, and roost on cliffs and in mangroves at Ireland Island Lagoon, Pilchard, Riddell's and Hungry Bays, Fairylands Creek, Spittal Pond, Trunk Island and Ferry Reach, they do not seem to nest outside the Walsingham Nature Reserve. Since even this secluded area is subject to disturbance, for example by illegal marijuana growers, it seems probable that the herons' main limiting factor will be a shortage of suitable nesting sites in the densely populated islands rather than lack of

Conservation success in Bermuda

food. As even in the few years they have been established the herons appear to be affecting the land crab population, their reintroduction can be considered a success from both the aspect of biological control and heritage restoration (Wingate, 1982; Lever, in prep.).

Acknowledgment

For his generous co-operation in the field and for kindly reading and commenting on my manuscript I should like to thank Dr David B. Wingate.

References

- Beebe, W. 1935. Rediscovery of the Bermuda Cahow. *Bull. N. Y. zool. Soc.* **38**, 187–190.
- Beebe, W. 1936. Recent notes on Bermuda birds. *Proc. Linn. Soc. N.Y.* **48**, 60–65.
- Fisher, J., Simon, N. and Vincent, J. 1969. *The Red Book—Wildlife in Danger*. Collins, London.
- Greenway, J.C. 1958. Extinct and vanishing birds of the world. *Spec. Publ. Am. Comm. int. wildlife Prot.* **13**.
- Halliday, T. 1978. *Vanishing Birds—their Natural History and Conservation*. Holt, Rinehart and Winston, New York.
- King, W.B. 1981. *Endangered Birds of the World—the ICBP Bird Red Data Book*. Smithsonian Institution Press/ICBP, Washington.
- Lever, C. (in press). *Naturalized Mammals of the World*. Longman, London.
- Lever, C. (in prep.) *Naturalized Birds of the World*. Longman, London.
- Moore, H.B. 1941. Notes on Bermuda birds. *Proc. Linn. Soc. N.Y.* **52–53**.
- Murphy, R.C. and Mowbray, L.S. 1951. New light on the Cahow. *Pterodroma cahow*. *Auk*, **68**, 266–280.
- Palmer, R.S. (ed.) 1962. *Handbook of North American Birds*. Vol. 1. Yale University Press, New Haven.
- Wilkinson, H.C. 1950. Spanish intentions for Bermuda 1603–1615 as revealed by the records in the archives of the Indies. Seville, Spain. *Bermuda Hist. Quart.* **7**(2), 56.
- Wingate, D.B. 1960. Cahow, living legend of Bermuda. *Can. Audubon*, **22**, 145–149.
- Wingate, D.B. (ed.) 1965. Commentarium of J.T. Bartram, naturalist of 19th century Bermuda. *Bermuda Hist. Quart.* **22**, 1–34.
- Wingate, D.B. 1973. *A Checklist and Guide to the Birds of Bermuda*. Bermuda Press, Hamilton.
- Wingate, D.B. 1977. In *Endangered Birds: Management Techniques for Preserving Threatened Species* (Ed. S.A. Temple). University of Wisconsin Press, Madison.
- Wingate, D.B. 1982. Successful reintroduction of the Yellow-Crowned Night-Heron as a nesting resident on Bermuda. *Colonial Waterbirds*, **5**, 104–115.
- Wurster, C.F. and Wingate, D.B. 1968. DDT residues and declining reproduction in the Bermuda Petrel. *Science*, **159**, 979–981.
- Zimmerman, D.R. 1975. *To Save a Bird in Peril*. Coward, McCann and Geoghegan, New York.

Sir Christopher Lever, Bt., Newell House, Winkfield, Windsor, Berkshire SL4 4SE, UK.