

**CASTLE HARBOUR ISLANDS NATURE RESERVE
NONSUCH ISLAND LIVING MUSEUM
History of Nonsuch Island**



**Jeremy L. Madeiros
Senior Terrestrial Conservation Officer
(Nonsuch Warden)**

**Department of Conservation Services
(Terrestrial Conservation Unit)
Ministry of Health, Seniors and the Environment**

BERMUDA GOVERNMENT

Overview and History of Nonsuch Island Living Museum:

This is the first of a series of reports on the Nonsuch Island Living Museum Project. Due to restrictions on the number and size of tours to Nonsuch, and the fact that available tours are prioritized for school and educational groups, it is realized that many people interested in visiting the island may not be able to do so. Weather conditions also often result in scheduled tours to this isolated and exposed island being cancelled. This report, on the interesting history of Nonsuch, will be followed by a series of annual reports on events, work and progress that have occurred on Bermuda's premier nature reserve for the year.

Nonsuch Island is one of the earliest examples of Ecological Restoration to be found anywhere, where a project to restore an entire ecosystem, with all of its associated plant and animal communities in their appropriate habitats, has been underway for more than 50 years. This project was started and managed by Dr. David Wingate, Bermuda's first conservation officer, from 1962 until his retirement in 2000, since when it has been managed by the author of this report. It is nothing less than an attempt to restore a small section of Bermuda to what the island would have looked like, in terms of the flora and fauna, before it was discovered and settled by humans. This is being carried out in the following ways:

- 1) By preventing plants, animals, insects etc. that are not native to Bermuda, but have been accidentally or deliberately introduced by man, from coming out to or establishing themselves on Nonsuch;
- 2) By removing, wherever possible non-native plants or animals that have already managed to reach Nonsuch, or that manage to reach the island annually (e.g. as seeds in the droppings of birds).
- 3) By replanting seeds or seedlings of native and endemic plant species in the appropriate habitats on Nonsuch, to re-establish the original plant communities that would have existed on pre-colonial Bermuda.
- 4) To re-introduce native or endemic birds, animals or marine organisms that had been lost on Nonsuch due to man's activities or the impact of introduced invasive species. For example, the Yellow-crowned Night Heron, West Indian Top Shell, Land Hermit Crab and Bermuda petrel or Cahow (*Pterodroma cahow*) have all been successfully re-introduced to Nonsuch as part of the management program after being eradicated from the island by the early settlers in the 1600s.

Nonsuch Island is now home to many of the island's rarest and most endangered plant, animal and bird species, and is Bermuda's single most important Nature Reserve.

Access: Due to the small size, sensitivity and extremely fragile status of many of the habitats and critically endangered species on the island, **Nonsuch is closed to all public access except for guided tours led by guides certified by the Department of Conservation Services.** These tours are largely held for school-age and educational groups and are mainly run from April to June and from September to November. The number and size of tours are limited to reduce disturbance to habitats and animals and to limit the risk of invasive species introduction. There are no tours scheduled in July and August.

History of Nonsuch Island

Nonsuch Island has had a long and extremely varied history since first being mentioned by the early settlers. Originally spelled “Nonesuch” on the Norwood map of Bermuda (1618), it is thought to have been named after the famous Tudor palace started by King Henry VIII in Surrey, England. When the “Sea Venture”, flagship of the relief fleet for the Jamestown colony in Virginia, was wrecked on Bermuda’s reefs **in 1609, Nonsuch was one of the “bird islands”** where seabirds, especially the Cahow, nested in the thousands and were gathered by the shipwrecked survivors for food. Collecting of Cahows for food continued after Bermuda was permanently settled in 1612, and was carried out so excessively that **by 1616 one of the first pieces of conservation legislation in the New World was passed “against the spoyle and havock of the Cahowes”** by Governor Daniel Tucker. Despite this, illegal collecting continued and by 1620, the Cahow had seemingly disappeared and was thought to have become extinct.

In the 1700s, as part of the “Common Lands” of St. George’s, Nonsuch was rented out by the colonial government for grazing livestock, but was never settled. In 1746 Rev. James Holiday remarked that “a family might live here prettily and keep a boat to fish, an excellent soil: a good many small cedars – ‘tis a charming place”. In 1759 it was sold into private hands in order to raise a herd of deer imported from England.

In 1865 Nonsuch was purchased by the Colonial Government in order to build a quarantine station for passengers and crew from arriving ships that were carrying infectious diseases, especially yellow fever. The Savage Map (1901) shows Nonsuch with a landing place, mortuary, cemetery, dining facility, keeper’s quarters and 2 hospital wards. The quarantine station was moved to Coney Island in 1914.

From 1928 – 1934, Nonsuch Island was leased to the New York Zoological Society for use by Dr. William Beebe and Dr. John Tee Van as a marine research station, and as a base for a series of dives to observe deep sea animals in their native environment using the Bathysphere Diving Bell. A total of 35 dives were made setting the world record for the deepest dive for that time to 3,028 feet (923m) on 15 August 1934. During this time the “Sea Fern” hulk was raised from St. George’s Harbour and re-sunk at Nonsuch to form a breakwater and holding tank for fish. It can still be seen at the main landing dock.

From 1934 – 1948 the island was home to a training school, with the Government hiring Mr. Arthur Tucker (Nonsuch caretaker) to take “delinquent boys” to begin the Junior Training School. This school remained on Nonsuch for 14 years, educating boys with disciplinary problems or that had been involved in petty crimes and instructing them in masonry, carpentry, farming and other work. During this time, introduced scale insects killed about 95% of Bermuda’s dominant Cedar forest. On Nonsuch, all of the Cedar forest cover died, basically denuding the island. The damage to Nonsuch was further exacerbated when goats were permitted to graze the island, stripping the bark from and destroying almost all remaining vegetation.

In 1941, the United States was given a long lease to build a military base in Castle Harbour to support anti-submarine warfare and provide air support and an assembly point for trans-Atlantic convoys. Castle Harbour was extensively dredged to create 760 acres of reclaimed land, with a further 414 acres of St David's Island being incorporated into the Base. Coopers Island was joined to St. David's with dredged fill, and many of the smaller islands in Castle Harbour were destroyed at this time. This work was completed in 1944, resulting in the air base and the present Bermuda International Airport. Unfortunately, the new base cut off easy access to Nonsuch from St. George's. Due to its isolation, lack of safe anchorage and small size, the Training School was moved to Paget Island, and Nonsuch was abandoned to neglect and vandalism.

1951 – Ongoing: Nonsuch becomes Bermuda's "Living Museum"

In 1951, the Bermuda Petrel, or Cahow, thought to be extinct for over 300 years, was rediscovered breeding in very small numbers on the Castle Harbour Islands by Dr. Robert Cushman-Murphy of the American Museum of Natural History, Louis B. Mowbray, curator of the Bermuda Aquarium, and schoolboy naturalist David Wingate. Although Nonsuch was not one of the islands where the Cahow had survived, its larger size and higher elevation made it both an ideal location as a base for management work to keep to Cahow from going extinct, and a possible future site for the species to be relocated and re-introduced to.

In 1963, the "Living Museum" project was initiated by Dr. David Wingate. Major work started on the island with a massive native reforestation project in which over 18,000 endemic and native plants were eventually planted, and the creation of two artificial ponds, one for fresh water and one salt marsh habitat. During this time, several indigenous species that had been extirpated from Bermuda in the early days of settlement were successfully re-introduced, including the **Yellow-crowned Night Heron**, endemic **Bermuda Killifish**, and **West Indian Top Shell**, which is becoming common again along the southern coastline of Bermuda. In addition, between 1966 and 1976 over 16,000 Green Turtle eggs were imported from Costa Rica and buried on the Nonsuch South Beach, eventually hatching and going to sea, in an effort to re-establish this species with a breeding population on Bermuda. This project does not however appear to have succeeded to date.

By 1984, the replanted native forest on Nonsuch, including species such as the endemic **Bermuda Cedar**, **Bermuda Olivewood**, **Bermuda Palmetto Palm** and **Bermuda Snowberry**, had matured enough to start self-seeding. Rats were eradicated from Nonsuch and are kept off by an annual baiting program using anticoagulant rodenticides. The absence of seed-eating rats has resulted in spectacular germination of seedlings of rare endemic plants.

In 1987, Hurricane "Emily", which decimated non-native trees and forest areas on the main islands of Bermuda, **ripped off the roof of the warden's residence on Nonsuch** but caused almost no damage to the hurricane-tolerant restored native forest on the island. However, Hurricanes "Dean" in 1989, "Felix" in 1995 and "Gert" in 1999 caused significant damage and erosion to the coastal and beach areas of both Nonsuch and the small, exposed Cahow nesting islets, endangering the Cahow populations there and damaging the salt marsh and beach dune habitats on Nonsuch.

In 2000, Dr. David Wingate retired, with Jeremy Madeiros becoming the new Terrestrial Conservation Officer and warden of Nonsuch. His first priority, due to continuing hurricane erosion of the smaller nesting islets, was to investigate methods to establish a new Cahow nesting colony on Nonsuch, from where they were eradicated by the early settlers by 1620. After travelling to Australia to observe new techniques in seabird colony establishment, and be trained in the handling, banding and management of a number of seabird species, he decided to use a technique called translocation. This involves monitoring the growth of chicks from hatching, then moving them at a specific time in their development from the original nesting islets to a complex of new artificial nest burrows built on Nonsuch. These chicks were then hand-fed and allowed to imprint on the new site before fledging out to sea, hopefully to return several years later. The translocation was backed up with a solar-powered sound system playing back Cahow courtship calls at night, to encourage translocated Cahow chicks returning as adults to land and look for burrows to occupy as nest sites.

In 2002, a banding program was started to fit identification bands to both adult and fledgling Cahows and Tropicbirds on the Castle Harbour Islands. In addition, weighing and body measurement of accessible Cahow chicks was initiated, and new concrete nest burrows constructed on two of the nesting islands.

In 2003, hurricane ‘Fabian’, the strongest storm to affect Bermuda in over 50 years, affected the island with sustained 121 mph winds gusting to over 160 mph, and affected the South Shore, including Nonsuch and the Castle Harbour Islands, with a 9-foot storm surge and waves of over 30 feet. **There was major damage to the Cahow nesting islands**, with 3 of the islands completely submerged, and two of the islands partially collapsing, with 10 Cahow burrows being destroyed. **On Nonsuch, the salt pond and mangrove habitat, along with the south beach and dune habitat, was completely destroyed**, with Nonsuch almost divided into two islands. In addition, the coastal vegetation belt on the south and east coastlines of the island were stripped down to bedrock up to 35’ above sea level, while the coastal cliff areas suffered major erosion and collapse, destroying many Tropicbird nest sites. On a good note, the restored native forest suffered almost no damage on the higher sections of the island, showing the greater resistance that native tree and plant species exhibit in surviving hurricane conditions. Damage to the buildings on Nonsuch included windows being blown in, flooding, cracked roofs and collapsed internal ceilings.

The period following Hurricane Fabian was taken up with urgent repairs to damaged Cahow nest burrows on the breeding islets, and the construction of new nest burrows on the highest sections of these islets, to replace nests entirely lost when sections of the islets collapsed. This work was completed successfully by the time the cahow population returned to nest, but the disruption caused by this hurricane was evident as both the number of nesting pairs and the number of successfully fledged chicks fell during the following nesting season.

In 2004, spurred on by the damage to the nesting islets during the previous year’s hurricane, **the first translocation of 14 Cahow chicks** from these islets to a new group of artificial nest burrows constructed on Nonsuch (where Cahows used to nest before the 1620s) was carried out. These chicks were hand-fed on fresh squid and anchovies and monitored through their development until all of them successfully fledged to sea two to three weeks later. Over the

next five years, 2004 to 2008, 14 to 24 chicks were moved to Nonsuch annually until **a total of 105 chicks had been translocated, of which 102 successfully fledged out to sea.**

In 2005, 21 Cahow chicks were translocated from the four original nesting islets to Nonsuch Island, with all fledging successfully out to sea. In April of this year, it was discovered that Black Rats (*Rattus rattus*) had managed to swim out to Nonsuch Island and had established a sizeable population. Over 90 bait-boxes were set out around Nonsuch and the rats were eradicated successfully within three weeks by use of anticoagulant rodenticides.

In 2006, hurricane Florence passed only 50 miles to the southwest of Bermuda, bringing hurricane-force winds and high ocean swells which caused further erosion to the nesting islands, but little damage on Nonsuch. Another 22 Cahow chicks were translocated to Nonsuch, with 21 fledging successfully out to sea.

In 2007, A total of 25 Cahow chicks were translocated to Nonsuch Island, with 24 fledging successfully out to sea.

In 2008, the last 23 Cahow chicks were translocated, with 22 fledging from Nonsuch Island; in addition, **the first 4 translocated Cahows were recaptured returning to Nonsuch Island**, where they were positively identified from their band numbers.

In 2009, more translocated Cahows returned to Nonsuch, and **the first breeding pair occupied a nest burrow on Nonsuch**, producing a chick which became the first naturally hatching Cahow on Nonsuch since at least the 1620s. This chick, which became known as Somers*, fledged successfully out to sea on June 17th. (*after Admiral Sir George Somers, whose flagship was wrecked on Bermuda 400 years ago in 1609, leading to the settlement of the island by the English). In September, major Category 4 hurricane “Bill” passed 120 miles to the southwest of Bermuda, producing winds on the island of near hurricane force and moderate coastal and beach erosion.

In 2010, another major hurricane, “Igor”, approached Bermuda as a Category 3 storm, and although it weakened to a Category 1 storm before hitting the island almost directly, still produced winds gusting at 90 to 112 mph and waves of up to 25’, causing severe erosion and damage to the cahow nesting islets and the south shoreline and beach area of Nonsuch Island. **The South beach of Nonsuch was completely scoured away down to bedrock, effectively cutting the island in two**, although the beach began to rebuild almost immediately. Further minor damage was also caused to the buildings on Nonsuch. Fairly severe erosion, flooding and damage to nest burrows also occurred on the original Cahow nesting islets. Despite this damage, the new Cahow breeding colony on Nonsuch continued to grow, with 4 breeding pairs producing 1 successfully fledging chick.

In 2011, the Ascendant Group of Companies began a public-private partnership with the Department of Conservation Services, with Ascendant pledging \$500,000 over a ten-year period (\$50,000 per year) as well as volunteer work groups, for building repairs and painting, electrical system upgrades, removal of Casuarinas and other non-native vegetation, and construction of new artificial Cahow and Longtail nest burrows. This support began with

repairs and painting of the building roofs on the island, and with assistance in the topping and removal of Casuarina trees along the north side of Nonsuch. The number of translocated Cahows returning to Nonsuch continued to increase, with 7 nesting pairs, 4 of which produced successfully fledging chicks. 70 Longtail (Tropicbird) nests were monitored on Nonsuch as part of a long-term study, of which 60 had breeding activity, and 47 had successfully fledging chicks.

In 2012, two late-season hurricanes came close enough to Bermuda to affect Nonsuch and the Castle Harbour Islands with strong winds and damaging ocean swell. Hurricane “Raphael” passed only 100 miles south of Bermuda on the 16th October, while “Sandy”, an unusually large hurricane, passed 300 miles west of the island on the 29th October before hitting the New Jersey and New York coastlines with record high storm surges and tides. Some erosion and damage to the south coastline of Nonsuch was caused, as well as to the smaller neighboring Cahow nesting islands. In addition, volunteer work groups from the Ascendant group of companies built new concrete Cahow burrows, painted buildings, and topped Casuarina trees on Nonsuch. The new Cahow breeding colony on Nonsuch continued to grow, with ten breeding pairs producing a total of seven successfully fledging chicks.

In 2013, the Cahow breeding colony on Nonsuch grew to twelve nesting pairs, making it larger than the smallest original nesting colony. Five chicks successfully fledged out to sea from this site in May and June, making a total of 18 chicks produced since 2009 at this new nesting site. The Ascendant Group of Companies sponsorship of the Nonsuch Living Museum made two major achievements possible this year; (1) the installation of infrared “burrow-cams”, developed by Mr. JP Rouja of LookTV, which enabled for the first time video clips of growing Cahow chicks inside their dark nest burrows to be made and posted on a website so that the public could follow the development of a Cahow chick from hatching to fledging out to sea. (2) A new state-of the art solar power system was installed near the warden’s residence, giving reliable electrical power for the first time since 2003, when hurricane “Fabian” destroyed the original solar power system. Another major project was started with the first translocation of Cahow chicks from the original nesting islets to a second location on Nonsuch, to hopefully establish a second foothold for the species. A total of 14 Cahow chicks were translocated to artificial burrows at this new location, of which 12 fledged successfully out to sea, hopefully to imprint upon and return to Nonsuch in several years.

In 2014, Nonsuch experienced a number of noteworthy events and some real challenges. A record Cahow nesting season saw the continued growth of the new nesting colony on Nonsuch to thirteen nesting pairs, which produced a record number of nine successfully fledging chicks. The total population of Cahows on all nesting islands grew to a record number of 108 breeding pairs, producing a record number of 58 successfully fledging chicks. In addition, the second year of the new translocation project to a second, ‘B’ colony site on Nonsuch was carried out, with 20 Cahow chicks translocated from all four nesting islets to artificial burrows, with 19 chicks fledging successfully out to sea. At the same time, Rats were found to have re-colonized Nonsuch for the first time since 2005. These rats were brought under temporary control by the use of live-traps, but efforts to totally eradicate them were still ongoing by year’s end.

In October, 2014, not one, but two hurricanes struck Bermuda in quick succession, causing widespread damage. Hurricane “Fay” struck the island on 12th October, followed only five days later by hurricane “Gonzalo” on the 17th October. Hurricane Fay caused little damage on Nonsuch Island despite winds gusting over 100mph, but “Gonzalo” was a much more powerful Hurricane, with sustained winds of 110 mph gusting to 144mph. In addition, the calm center or “eye” of Gonzalo passed directly over Bermuda, so that destructive winds were experienced first from the east, and then from the west-northwest after the eye.

Damage caused to vegetation on Nonsuch Island was extensive, with the endemic Bermuda Cedar and the native Bay-Grape trees being particularly affected, with many trees uprooted. The endemic Olivewood trees and Bermuda Palmetto Palms, however proved to be particularly resilient and although tattered, suffered almost no damage. Damage to buildings on Nonsuch was generally minor and restricted to loss of window blinds, plaster stripped from the wall of the garage building, and collapse of sections of internal ceilings in the main house.

Jeremy Madeiros
Senior Terrestrial Conservation Officer

