

CAHOW RECOVERY PROGRAM
Breeding Season Report for 2006/2007
And Update on the Cahow Translocation Project



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CAHOW (BERMUDA PETREL)
Pterodroma cahow
RECOVERY PROGRAM

NESTING SEASON REPORT

For the Nesting Season October 2006 - June 2007
and
Update on the 4th Year of the Cahow Translocation
Project

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*Photos by Jeremy Madeiros except where indicated

1: Introduction

The following report summarizes the 2007 Nesting Season of Bermuda's national bird, the endemic and critically endangered Bermuda petrel or Cahow *Pterodroma cahow*. Despite the impact of Category 1 hurricane 'Florence' on the nesting grounds during September, 2006, the Cahow breeding population showed encouraging signs of continued recovery. The number of active nest sites with confirmed nesting pairs reached a record high number of 80 in 2007 on 4 small existing nesting islets, compared to 18 breeding pairs in 1960, when the present recovery program commenced.

The Cahow is subject to pressure from a number of threats and limiting factors, including nest site competition from the native White-tailed Tropicbird *Phaethon lepturus catsbyii*, the threat of introduced mammal predators (in particular Rats) swimming out to the nesting islets, predation by avian predators, lack of available nest sites and habitat at the present suboptimal nesting areas, and the yearly threat of damage or destruction to nest sites and the present exposed nesting islets by hurricane waves and storm surge. Much of the present management program for the species is focused on addressing and overcoming these various issues, with a high degree of success to date. The high probability of further major damage to the nesting islets from severe hurricanes and storms continues to be the single most serious threat to the Cahow. This threat cannot be fully addressed on the present tiny nesting islets, highlighting the need to establish new nesting colonies on nearby larger islands which are managed to exclude mammal predators and have restricted and/or controlled human access.

There were a number of highlights for this nesting season, which extended from mid-October 2006 with the first arrival of adult Cahows on the breeding islets and ended during mid-June 2007 with the departure to sea of the last Cahow chicks. These include the following:

- 1) A total of 39 Cahow chicks successfully fledged in 2007, compared with 36 chicks in 2006, 35 in 2005 and 29 in 2004.
- 2) The fourth year of a translocation project to establish a new breeding colony of Cahows on Nonsuch Island was carried out with 25 chicks moved to the new site, of which 24 fledged successfully out to sea. This brings to 79 the number of Cahow chicks which have fledged successfully from Nonsuch in the last 4 years.
- 3) This year saw the continued return of Cahows banded as fledglings in their nest burrows to the nesting islets as adults. In 2006, a total of 8 first-return birds were recorded, 6 of which were banded as fledglings in 2002 and 2 which were banded as fledglings in 2003. During 2007, 7 additional first-return birds, banded as fledglings during the 2002 (2), 2003 (3), 2004 (1) and 2005 (1) nesting seasons, were recorded returning to the nesting islets, bringing the total number of confirmed first-return young Cahows to 15.

- 4) Some 5 new nest burrows were occupied by prospecting pairs of young Cahows during this nesting season, with at least two others prospected by single birds.
- 5) A record number of 31 fledgling Cahows were regularly monitored, weighed and measured as part of an ongoing growth study and to indicate when fledglings chosen for the translocation project are ready to be moved.
- 6) The total number of active nesting burrows reached a new record high of 80 during 2007, up from 76 in the 2006 nesting season.

Full details on the 2007 breeding season are given in the following report; a brief summary of the Cahow Recovery Program is also included in addition to research proposals for the next several years.

2: Objectives of Cahow Recovery Program

The short and long-term objectives of the Cahow Recovery Program are covered in full in the Cahow Recovery Plan 2005; Briefly put, they are as follows:

1. To prevent nest-site competition with the White-tailed Tropicbird through the provision of wooden “baffler” plates to the entrances of all Cahow nest burrows, and by providing additional artificial “Igloo” nests to meet the nesting requirements of the Tropicbirds and reduce pressure on the Cahow burrows.
2. To regularly and frequently monitor all nesting and nearby islands for the presence of rats (*Rattus rattus* and *R. norvegicus*) and, when their presence is detected, to eradicate them with the use of anticoagulant rodenticide, using bait boxes purchased from the Bermuda Government Health Department.
3. To learn more about the biology of the species through an ongoing banding program initiated in 2002; also by carrying out growth studies of Cahow chicks from hatching to fledging and by morphometric measurements of adult Cahows.
4. To establish new breeding colonies of Cahow on larger, more elevated islands free of mammal predators which are safer from hurricane erosion and damage and have the potential of supporting larger populations of the birds; already underway on Nonsuch Island using translocation of near-fledged chicks and sound attraction; if successful here, also planned in the future for Southampton Island. (See page 25: review of translocation project).

5. To continue the program of building additional artificial nest burrows on all existing nesting islets and at locations where new nesting colonies are being established; to support continued increase in the breeding population.
6. To initiate studies of the oceanic and foraging ranges of the Cahow away from the nesting islets, by using miniature Data Loggers, fitted to the legs of individual Cahows for varying periods during the future 2008 and 2009 nesting seasons. These will record daily position fixes to determine the foraging range of Cahows when at sea, information that at present is largely unknown, as well as recording how deep the birds dive underwater when catching food and water temperature.
7. To investigate the genetic relationship of the Cahow to other Gadfly Petrel species and the genetic variability of the Cahow population, through DNA testing of live feather and/or blood sampling.

3: Methods used in Cahow Recovery Program:

The most fundamental management aspect of the Cahow Recovery Program is regular monitoring of the entire breeding population on the present breeding islets to confirm breeding success, check for potential problems so that remedial action can be taken, carry out banding and morphological measurement, record frequency of adult visits etc.

Checks of the nesting islets are carried out 2 to 3 times weekly (every 2 to 4 days), depending on weather conditions. These checks are carried out in the Terrestrial Conservation Division's 17' Guardian Boston Whaler boat, which is light and agile enough to make the close approaches to the islets, over shallowly submerged rocks and reefs, which are involved in landings.

Because of the exposed nature of the islets, they are often subject to strong ocean swell or waves, which, along with strong winds, may make landings impossible for up to several days at a time. The protocols for landings stipulates that sustained winds exceeding 20 – 25 knots generally render landings unsafe, although this is somewhat affected by the wind direction. Landings on the two western nesting islets are not safe with southerly or westerly winds over 25 knots, or with northwesterly or northerly winds over 18 knots, although it is usually still possible to land on the two eastern nesting islets, which are protected by Coopers Island in these wind directions. It may also not be possible to land on the two eastern nesting islets with strong northeasterly or easterly winds exceeding 20 to 25 knots. Strong southeasterly winds or ocean ground swell from hurricanes passing to the south of Bermuda may render it unsafe to land on any of the islets or travel around the southern tip of Coopers Island (Coopers Point). Large breakers may form without warning between the reef line and the headland and extreme caution should be exercised at these times.

During landings, a quick check of the island is made, followed by systematic inspection of all active and potential nesting burrows. Over three-quarters of the nest burrows have removable concrete observation lids which enable inspection of birds in the nest chambers. These are removed for a brief time (no more than 1 minute is usually necessary) and a note is made of the number of adults present (if any), nest-building activity, and the presence of an egg or chick. It is particularly important to determine the date of egg-laying and the date of egg hatching, as these will help to determine when the chick will be ready to fledge. The nests are also checked for the presence of rocks or small stones which could cause breakage or cracking of the single egg and are still a significant cause of breeding failure. Any rocks or stones detected should be carefully removed. Adult Cahows can be briefly removed from nest chambers through the observation lids for morphometric measurement and checking of band numbers (if unbanded, birds are fitted with an identification band). This is best carried out during the nest-building stage in November or during egg brooding in February. Only single birds should be removed, with pairs of adults generally being left alone unless an assistant is present.

After hatching, chicks are also weighed and measured as part of an ongoing growth study (see page 23; Update on Growth Study of Cahow Fledglings) and in support of the ongoing translocation project (see page 25; Update on Translocation Project). Chicks are only removed from their nests if no adults are present, to avoid undue disturbance to the birds. Chicks are measured regularly from the earliest time after hatching that they are left alone in the nests by the adults, until their final departure out to sea. All chicks included in the translocation project are measured regularly in this way, which is also important to determine the optimal time for moving. In addition, a smaller number of non-translocated chicks which are raised normally to fledging by the adult birds are also measured throughout their development. These act as a control to ensure that the translocated birds are fledging at the same weights, wing lengths, and body condition as non-translocated birds, and that they depart at the same age and point of development.

Although it is not necessary to be present at the final departure of chicks, an effort is made to carry out a number of night watches during the period when chicks are out of their burrows to exercise prior to departure, both on the nesting islets and at the Nonsuch Island translocation site. The nesting islet night watches are useful for capturing chicks from nest burrows that are not accessible, and enable banding and morphometric measurements to be carried out. The night watches at the translocation site are mainly carried out to enable study to be made of behavior of the chicks in their new habitat during the exercise phase of their development.

4.1: Review of Management Actions for 2007 Cahow Nesting Season

The first action for the impending nesting season was the removal of Tropicbird exclusion baffles from the entrances of all Cahow nest burrows during the first week of October. This is carried out at this time because by this point the Tropicbird nesting season is essentially finished and there is no longer any danger of nest takeover by this aggressive species. The baffles are removed to provide greater ease of access for the returning adult Cahows during the important courtship, nest-building and egg-laying periods of the nesting season. Checks of all the nesting islets to ensure that rats have not swum out to them during the summer months are also carried out at this time.

The first adult Cahows were confirmed as having returned to nest sites on Green Island and Horn Rock by the 19th October, 2007. The first Cahows returning to the eastern islets were confirmed by the 21st October. The rest of the established nesting Cahows arrived at their nest burrows on the nesting islets through the end of October, with all birds having returned by the first week of November. At this time, bags of St. Augustine Grass *Stenotaphrum secundatum* have to be collected on Nonsuch Island and taken out to the nesting islets. This has to be done because these islets are so barren and rocky for the most part that the Cahows have insufficient material to gather to make a good nest. This can result in eggs being laid directly on the rocky floor of the nest chambers, making them much more susceptible to cracking and failure. The grass is broken into shorter 4” to 6” lengths and placed in piles to the sides of the burrow entrances, where it can be collected and pulled into the nest chambers by the adult birds at night.

The main nest-building and courtship period for established Cahow nesting pairs extends through the month of November. In addition to the usual nesting islet checks carried out during daylight hours, a total of 5 ‘night-watch’ checks were carried out after dark during November 2007 to observe courtship behaviour and activity by the adult birds. These night checks are necessary for behavioral observations as Cahows only fly over the nesting islets at night, remaining out on the open ocean or in their nest burrows during the day.

During the month of December, the Cahow breeding population departed to sea for several weeks on a ‘pre-egg laying exodus’ so that the female can feed intensively to enable her relatively large single egg to develop. The male uses the same period to build up fat reserves needed to carry out extended periods of incubating the egg.

The Cahows returned to the nesting islets by the beginning of January, 2007 with the first eggs being confirmed as having been laid by the 3rd January. All nesting pairs were back in their nest burrows, with most brooding eggs, by the 22nd January 2007.

Following the long 53-day egg incubation period, the first chicks were confirmed as having hatched by the 28th February. Over 30 chicks were confirmed as having hatched by the 15th March. At this point, regular monitoring of the growth and development of the

chicks became the most important component of the nesting islet checks. Note was also taken where possible of the frequency and number of adult feeding visits.

As an additional aspect of the nest checks, a record number of 31 Cahow chicks were regularly weighed and their wing chord growth recorded during the 2006 nesting season, both to determine when chicks were mature enough to translocate, and as part of a growth study of Cahow chicks and how maximum and average weights achieved by chicks vary from year to year (see page 23; 'Update on Growth Study of Cahow Fledglings').

During the first week of March, the Tropicbird exclusion baffles were fitted back on the entrances of all cahow nest burrows in preparation for the return of White-tailed Tropicbirds to the Castle Harbour Islands for the start of their own nesting season. This is an essential procedure to prevent burrow invasions by prospecting Tropicbirds, which would otherwise kill the Cahow chicks and take over the nest sites.

2007 marked the fourth year of the Cahow Translocation Project to establish a new nesting colony on Nonsuch Island, and resulted in 25 fledglings being moved from the present nesting islets to a new complex of artificial nest burrows on Nonsuch (see Fig. 4), with 24 fledging successfully. This is covered in full later in this report (see page 26; 'Update on 2007 Cahow Translocation Project'). One beneficial effect of the translocation project was that it enabled groups of students from local schools to see the translocated Cahow chicks undergoing daily feeding, weighing and measurement while visiting the island on natural history tours. As a result, four tour groups with over 94 school children, as well as 1 Bermuda Zoological Society (BZS) 'Nature Encounter' tour with 28 people, were able to see Cahow fledglings close up, and observe them being fed, measured and banded. This represents the largest number of people that have experienced a close encounter with the Cahow in one year since the 1600s! It is planned to introduce more school groups to Bermuda's national bird in this way during the remaining year planned for the translocation project.

The first two Cahow chicks to fledge left for the open sea on the night of 21st May, 2007. The last two Cahow chicks left from nests on Inner Pear Rock and the translocation site on Nonsuch Island on the night of 17th June, 2007, bringing the nesting season to a close.

After a relatively calm start during November and December, a number of strong winter gales affected the Cahow nesting islets during January and February 2007. Gale-force winds on the 17th and 20th January were followed by a strong low pressure storm system which produced hurricane-force wind gusts on the 26th of the month, reaching 55-75 knots from the west-northwest. Further gale-force conditions with winds at 39 to 45 knots closed out the month on the 29th and 31st January. Gale conditions were also recorded on the 18th February, followed by another major storm developing on the 19th, with winds gusting as high as 66 to 70 knots. Gale warnings were also posted on the 20th and 23rd February, with winds from 35 to 45 knots affecting the islands. Monitoring visits to the Castle Harbour Islands had to be discontinued on all of these occasions, although only minor erosional damage occurred on the nesting islets. No major flooding of nest burrows occurred, mainly due to the retention of entrance baffles on vulnerable nest sites which had suffered flooding and nest failures during strong winter gales.

4.2: Summary of 2007 Cahow Nesting Season

The 2007 Cahow nesting season was considered to be a success with 39 chicks successfully fledging out to sea, compared with 36 in 2006 and 29 in 2004 (see figure 7); in addition, a total of 6 new nest burrows were colonized by new prospecting pairs of Cahows (Horn C24, Horn F6, Horn G1, Green #9, IPO E2 and IPO D1), while 1 established nest (Horn C4) was abandoned, bringing the total number of active nest sites to a record high of 76.

Following is a summary of the nesting season:

Total number of occupied nest sites with nesting activity confirmed.....	80
Number of new nest sites occupied for first time by establishing nesting pairs that had attempted breeding and built nests.....	5
Total number of confirmed successfully fledged Cahow chicks.....	39
Number of successfully fledged chicks from nest sites where observation of the nest chambers was possible.....	32
Number of successfully fledged chicks from non-observable nests.....	7
Total number of occupied nest sites with unsuccessful breeding.....	41
Number of confirmed failures from nest sites where observation of nest chambers was possible.....	37
Breakdown of causes of breeding failure from nest sites where observation of nest chambers was possible:	
Chick died hatching	1
Chick died from unknown causes	2
Chick died from lack of parental care	1
Broken or pipped eggs	9
Non-hatching/infertile eggs	9
Egg buried/knocked off nest	2

In addition, no eggs were produced at 13 nest sites where otherwise normal nest-building and courtship activity was observed.

5: Details of Breeding Success on Individual Nesting Islets:

HORN ROCK

- 33 confirmed nest sites with breeding activity (including 4 newly occupied nest sites – C25, F5, F8 & G2);
- 16 nest sites with successfully fledging chicks (B3, B5, C5, C7, C8, C9, C11, C14, C18, C19, C21, C22, C23, D4, F3, F4);
- 17 nest sites not producing chicks;
- 14 confirmed failures from nests with observable nest chambers (C6 - unhatched egg; C10 – egg broken; C12 – unhatched egg; C13 – no egg produced; C15 – egg broken; C17 – unhatched egg; C20 – egg broken; C24 – no egg produced (* first nesting); C25 – no egg produced (*first nesting); F2 – egg unhatched; F5 – no egg produced; F6 – unhatched egg (* first nesting); F8 – no egg produced; G1 – unhatched egg (* first nesting).
- 3 failures from non-observable nests (D3, D5, E1).

GREEN ISLAND

- 21 nest sites with confirmed breeding activity (including 1 newly occupied nest site - # 3/4);
- 10 nest sites with confirmed successfully fledging chicks, 8 from sites with observable nest chambers (# 1, #4, # 5, # 6, # 10, # 11, # 12, # 13), and 2 from nest sites with non-observable nest chambers (F1, F3);
- 11 confirmed failures from nests with observable nest chambers (A1 – unhatched egg; A2 – unhatched egg; D1 – egg knocked off nest; F2 egg broken; # 2 – unhatched egg; # 3/4 – no egg produced; # 4/5 – chick died hatching; # 5/6 – chick died late in fledging-adult abandonment; # 7 – egg broken; #8 – egg broken; # 9 – no egg produced;

INNER PEAR ROCK (OUTER)

- 18 nest sites confirmed with nesting activity (including 1 newly occupied nest site – B5);
- 7 nest sites with chicks confirmed as fledging successfully, all from nests with observable nest chambers (B1; B4; B8; D2; D3; D4; E2);
- 11 nest sites not producing a chick; 9 confirmed failures from sites with observable nest chambers (A1 – no egg produced; B3 – unhatched egg; B6 – egg broken; B7 – egg broken; B9 – no egg produced; C2 – no egg produced; C3 – egg knocked out of nest; C4 – chick died of unknown causes; D1 – egg broken.
- 2 failures from non-observable nest sites (E1; B5).

LONG ROCK

- 9 nest sites confirmed with nesting activity;
- 5 nests total confirmed with chicks fledging successfully, 4 from nests with observable nest chambers (D5; D7; E1; E4);
- 1 nest confirmed with chick fledging successfully with non-observable nest chamber (C);
- 2 confirmed failures from nests with observable nest chambers (D3 – no egg produced; H1 – no egg produced);
- 2 confirmed failures from nest sites with non-observable nest chambers (A; B;).

6: Cahow Banding (Ringing) Program

6.1: Update on Banding Program for 2007

A banding (ringing) program for the Cahow was first started in 2002, using identification bands (rings) made and supplied by Porzana Ltd. (U.K. Wetlands Trust affiliation). These bands are made of incoloy, a strong, light and corrosion-resistant alloy proven to last for 30 or more years. These bands each have a unique identification code and postal address, and are the easiest method to positively identify individual Cahows as the sexes are virtually identical and few birds are identifiable through distinctive markings.

The main objectives of the banding program are described as follows:

- (a) To band at least 75% of all Cahow fledglings produced annually by the breeding population; this is considered a priority as it results in identifiable birds of known age and origin that can essentially be followed through all of their breeding lifespan (see Section 6.2.). This target has been met or exceeded every year since the commencement of the program 5 years ago.
- (b) To band breeding adult Cahows, with an emphasis on banding both members of individual breeding pairs. This is enabling various aspects of the Cahow's breeding biology to be researched and/or confirmed.

During the 2006/2007 Cahow nesting season, a total of 31 fledglings were fitted with identification bands out of 39 that successfully fledged. In addition, a total of 12 adult Cahows were also banded. This makes a total of 266 Cahows that have been banded since 2002, consisting of 171 birds banded as fledglings and 95 which were banded as adults.

6.2: Report on Returning Cahows Banded as Fledglings

During the 2005/2006 nesting season, the first return to the nesting islets of Cahows banded as fledglings in their nest burrows was confirmed. This involved 8 birds, which were identified from their leg bands, from both the 2002 and 2003 cohorts of fledglings. 5 of these birds originally fledged from Green Island (3 from the 2002 season, 2 from 2003) and 3 fledged originally from Horn Rock (all from the 2002 nesting season). 5 of the 8 first-return birds were recaptured on the island they had originally fledged from, involving all 3 Horn Rock birds and 2 of the Green Island birds; while 3 were recaptured on different islands/rocks than they originally fledged from. These 3 were all from Green Island, 2 of which were recaptured on Horn Rock and 1 on Inner Pear Rock.

During the 2006/2007 nesting season, 7 additional Cahows originally banded as fledglings were recaptured and confirmed as returning to the nesting islets for the first time. These include 4 birds banded on Horn Rock, 3 which were recaptured back on Horn Rock, and 1 which was recaptured over on Green Island. 3 of these birds fledged during the 2003 nesting season, and 1 (surprisingly) fledged during the 2005 nesting season.

This last one is of particular interest, having fledged only 2 years ago, with all other first-return birds being at least 3 or 4 years old. Of the remaining 3 birds, two originated from Green Island, one from the 2002 nesting season, and the other from the 2004 nesting season. Both birds returned to and were recaptured on Green Island, with both pairing up with other first-return birds in new nest burrows. The third bird was banded as a fledgling on Long Rock during the 2002 nesting season, and was recaptured in a nest burrow on Inner Pear Rock in 2007, where it had paired up with another first-return bird originating on Green Island, from where it had fledged during the 2002 nesting season.

These results have resulted in a major rethinking of the age of Cahow chicks when they first return to the nesting grounds upon maturity. Whereas it was originally thought that Cahows needed at least 5 to 8 years to mature and return to the nesting grounds, it is now known that the majority of birds first return at three to four years of age, although at least one bird returned as quickly as two years after fledging. Another major finding involves the belief that all Cahows return to the same island that they had originally fledged from. The recaptures over the last two years have shown that although the majority (two-thirds) of birds do indeed return to the same island, that one-third of all returning Cahows were recaptured on different islands than they originated from.

This highlights the importance of the banding program for confirmation of even basic knowledge of Cahow breeding biology. The fact that some of the major objectives of the banding program are already being realized after just five years points out the importance of using a simple, safe and proven technique to carry out life studies of individual birds over long periods. It also indicates that there is great potential in the use of new technologies such as data loggers and satellite trackers to enable investigation of the birds range and behavior while at sea, which has not been possible up to now. All of this new information and data will be vital in determining recovery and management strategy to ensure the survival and recovery of this critically endangered and historic species.

7.1: 2007 UPDATE ON FIRST-RETURN BANDED CAHOW CHICKS

The first return of Cahows banded as chicks during the 2002 and 2003 nesting seasons was confirmed during the 2006 (last year's) nesting season. Eight banded birds returned during 2006, including six from the 2002 season (four years of age) and Two from the 2003 season (three years of age). This has resulted in a complete revision of the time it takes for a juvenile Cahow to mature, as it was previously thought that it took at least five to eight years for the birds to mature and return to the nesting islets.

The recapture of birds banded as chicks has also forced a revision of the belief that Cahows always return to the same island that they originally fledged from. While it was confirmed that the majority of first-return birds (5) returned to the islet that they originally fledged from, a significant number (3) were recaptured on different islands from where they had originated.

During the 2007 nesting season, another seven Cahows banded as fledglings were confirmed as returning to the Castle Harbour nesting islets. This included two birds banded as fledglings during the 2002 season (five years of age), three birds from the 2003 season (four years of age), One bird from the 2004 season (three years of age) and one bird from the 2005 season (just two years of age). Of these Cahows, five returned to the islets they originally fledged from, and two were recaptured on different islands from where they had originated.

Therefore, as of the 2007 season, a total of fifteen Cahows originally banded as fledglings in nest burrows have now returned to the nesting islets, including eight from the 2002 season, five from the 2003 season, one from the 2004 season and one from the 2005 nesting season.

Following are the records for all first-return Cahows that have been confirmed as returning to the nesting islets:

(2006 Season)

(1) Bird from Horn C13 nest (2002 chick cohort)

Chick hatched – March 3rd, 2002; chick fitted with band # E0007 on May 21st, 2002; departed to sea – May 21st, 2002.

2006 Return: - Bird returned and recaptured in Horn Rock C14 nest burrow brooding egg on nest, Feb. 20th, 2006, paired up with older Cahow recorded from this nest for two previous years; - chick fledges successfully.

2007 – Bird recorded again in same nest burrow (Horn C14) during 2007 nesting season, paired up with same partner; pair again successfully raises a chick.

(2) Bird from Green Island F2 nest burrow (2002 chick cohort)

Chick hatched by March 10th, 2002; fitted with band # E0013 on May 25th, 2002; and departs to open sea on June 11th, 2002.

2006 Return:

Bird recaptured in Horn Rock C21 nest burrow; this nest was already occupied by an Established nesting pair of Cahows, which had already fledged and abandoned the nest for the season; this bird was not recaptured at this site during the 2007 nesting season, possibly being ejected by the original breeding pair established at this site, which bred and raised a chick successfully during 2007.

(3) Bird from Horn Rock C10 nest burrow (2002 chick cohort)

Chick hatched – by March 23rd, 2002; fitted with band # E0003 on May 21st, 2002; and departed to sea on June 25th, 2002.

2006 Return:

February 22nd, 2006 - Returned bird lured to ground & captured on Horn Rock at night between C11 and C20 nests; weight = 312 grams; Wing chord = 271mm.

2007 season:

Bird recaptured on March 21st, 2007, in Horn Rock C17 nest burrow brooding egg on nest, paired up with unbanded partner; nesting failed and egg did not hatch.

(4) Bird from Green Island # 4 nest burrow (2002 chick cohort)

Chick hatched by March 7th, 2002; fitted with band # E0016 on May 25th, 2002, and departed to sea on June 9th, 2002.

2006 Return:

February 22nd, 2006 - Returned bird lured to ground & captured at night on Horn Rock between C11 and C20 nests; released but recaptured 3 times in 20 minutes; weight =302 gms, wing chord = 270mm. Bird not recaptured during 2007 season.

(5) Bird from Horn Rock C11 nest burrow (2002 cohort)

Chick hatched by March 7th, 2002; fitted with band # E0021 on May 25th, 2002, and departed to sea on June 5th, 2002.

2006 Return:

March 2nd, 2006 - **Returned E0021 bird found in Horn Rock G1 nest burrow**; also second prospecting adult (banded on January 23rd with band # E0185) recorded at this nest (new pair).

2007 season:

Pair recorded in Horn Rock G1 nest burrow in 2006 returns to adjacent G2 nest burrow and lay egg during 2007 season; E0021 bird recorded brooding failed egg on nest on March 15th, 2007. Partner from 2006 (band # E0185) switches nest and partner and recorded in Horn Rock F8 nest burrow On March 7th, 2007.

(6) Bird from Green Island #5 nest burrow (2002 chick cohort)

Chick hatched by Feb. 27th, 2002; fitted with band # E0015 on May 25th, 2002, and departs to sea after May 26th, 2002.

2006 Return:

March 21st 2006 **Returned E0015 bird found in Inner Pear Rock D1 nest burrow**; weight = 295 grams; wing chord = 265 mm.

2007 season:

E0015 bird recaptured in Inner Pear Rock D1 burrow on Nov. 10th, 2002; weight = 316 grams; wing chord = 269 mm; with 2nd first-return bird, from Long Rock D5 burrow, 2002 chick cohort, band # E0012; weight = 289 grams, wing chord = 267 mm. * pair lays egg, which fails and is broken.

(7) Bird from Green Island #10 nest burrow (2003 chick cohort)

Chick hatched by March 7th, 2003; fitted with band # E0068 on May 15th, 2003, and departs to sea on May 31st, 2003.

2006 Return:

March 29th 2006 - **First return Cahow found in Green Island # 9 nest burrow** and removed for band check; band no. E0068; weight = 315 grams; wing chord = 277 mm.

2007 season:

Pair of Cahows seen together in Green Island #9 nest burrow. One of these is another first-return bird, from Green Island #10 burrow, 2002 chick cohort, and band # E0018.

(8) Bird from Green Island F2 nest burrow (2003 chick cohort)

Chick hatched by March 7th, 2003, fitted with band # E0074 on May 19th, 2003, and departs to sea by June 7th, 2003.

2006 Return:

April 6th 2006 **Returned bird found in Green Island 4/5 nest burrow;** band number E0074; weight = 287 grams, wing chord = 270 mm. (joins 2nd adult already recorded in nest since 2005, band number E0137).

2007 season:

Pair of adult Cahows first recorded together in Green Island 4/5 burrow on Nov. 7th, 2006. Pair produces egg, chick hatches by March 12th, 2007, chick weight = 28 grams on Mar. 16th, 2007, chick dies by Mar. 21st. (failure)

2007 NESTING SEASON

(9) Bird from Green Island 10 nest burrow (2002 chick cohort)

Chick hatched by March 10th, 2002; fitted with band # E0018 on May 25th, 2002, and departs to sea by June 4th, 2002.

2006 Return:

Pair of adult Cahows together in Green Island # 9 nest burrow; March 29th, 2006 other adult recaptured in burrow, band # E0068.

2008season:

Bird recaptured in Green Island # 9 burrow; band # E0018; weight = 344 grams; wing chord = 278 mm. Pair fails with no egg produced.

(10) Bird from Long Rock D5 nest burrow (2002 chick cohort)

Chick hatched by March 7th, 2002; fitted with band # E0012 on May 21st, 2002, and departs to sea by June 9th, 2002.

2006/2007 Return:

E0012 bird recaptured November 10th, 2006 in Inner Pear Rock D1 nest Burrow: weight = 289 grams, wing chord = 267 mm. with other first-return bird (band # E0015, Green Island #5 chick, 2002 cohort). Egg produced in January 2007 but fails and cracks.

(11) Bird from Horn Rock C19 nest burrow (2003 chick cohort)

Chick hatched by March 15th, 2003; fitted with band # E0086 on June 13th, 2003, and departs to sea on June 19th, 2003. Note: bird was quite light throughout its development, reaching a maximum weight of only 296 grams, and fledging at a critically low weight of 185 grams.

2006/2007 Return:

E0086 bird recaptured at night on Horn Rock by being lured to ground by calling on November 11th, 2006; lands just north of C11 nest burrow. Very calm, placid bird, weight = 317 grams, wing chord = 259 mm. Bird not recaptured for rest of season.

(12) Bird from Horn Rock C15 nest burrow (2003 chick cohort)

Chick hatched by March 4th, 2003; fitted with band # E0064 on May 25th, 2003, and departs to sea on June 7th, 2003.

2007 Return:

E0064 bird recaptured March 12th, 2007 in newly colonized C25 nest burrow on Horn Rock, just 3' from C15 natal nest it originally fledged from; weight = 307 grams, wing chord = 266 mm. Note: bird is one of a pair first recorded together in nest on March 7th, 2007. E0064 bird seen again in nest on newly built grass nest on March 21st, 2007; no egg laid this first year.

(13) Bird from Horn Rock B3 nest burrow (2003 chick cohort)

Chick hatched by March 4th, 2003; fitted with band # E0063 on May 14th, 2003, and departs to sea by early June, 2003.

2007 Return:

E0063 bird is recaptured March 27th, 2007 in newly colonized Horn Rock F8 nest burrow; weight = 282 grams, wing chord = 272 mm. Note: new pair of Cahows first recorded in new burrow on February 28th, 2007; other bird is recaptured on March 7th, 2007 and has band number E0185, first recorded in Horn Rock G1 nest in 2006.

(14) Bird from Green Island # 7 nest burrow (2004 chick cohort)

Chick hatched by March 1st, 2004, fitted with band # E0116 on May 18th, 2004, and departs to sea by late May, 2004.

Green Island # 7 nest burrow (2004 chick cohort – continued)

2007 Return:

E0116 bird recaptured April 2nd 2007 in newly colonized Green Island # 3-4 nest burrow, weight = 309 grams, wing chord = 277 mm. Same bird recaptured in same burrow on April 19th, 2007; weight = 337 grams.

(15) Bird from Horn Rock C23 nest burrow (2005 chick cohort)

Chick hatched by March 14th, 2005, fitted with band # E0178 on May 26th, 2005, and departs to sea by June 9th, 2005.

2007 Return:

E0178 bird recaptured April 23rd, 2007 in Green Island # 3-4 nest burrow , weight = 249 grams, wing chord = 270 mm. Note: E0116 first-return bird already recaptured in this burrow and has paired up with this bird. Prospecting visits to this nest first noted on April 13th, 2007.

7.2: Results and Findings from Returning Cahows Banded as Fledglings

A total of 15 Cahows banded as fledglings have been recorded returning to the nesting islets. These birds have known histories and can now be followed for the rest of their breeding lifespan. This is a primary aim of the banding program and has already begun to provide a great deal of interesting results and findings, which are outlined as follows:

- Out of 29 Cahow chicks banded from the 2002 cohort of 36 chicks, a total of 8 have returned as prospecting adults, 6 during the 2006 season, and 2 during the 2007 season. This represents a total of 27.4 % of chicks banded in 2002 that have now been confirmed as returning to the nesting islets.
- Out of 33 Cahow chicks banded from the 2003 cohort of 39 chicks, a total of 5 have now returned as prospecting adults, 2 during the 2006 season, and 3 which returned during the 2007 season. This represents 15 % of chicks banded in 2003 that have now been confirmed as returning to the nesting islets.
- 12 of the returned birds were captured in nest burrows, while 3 have been captured by luring them to the ground as they were flying with other Cahows at night over the nesting islets.
- 3 of the returned birds have paired up with older adult birds, already occupying nest burrows for 2 or more years, that had lost their original partners; one of the resulting pairs (Horn C14) successfully raised a chick in the 2006 season, while 2 of the pairs (in both Horn C14 and Horn C21) successfully raised chicks in 2007 .
- 10 first-return Cahows were captured in new nest burrows not previously occupied by established adult pairs; 6 of these paired up with other first-return birds, while 4 paired up with unbanded birds of unknown age or origin.
- 1 returned bird was captured in a nest burrow (Horn C21) already occupied by an established pair of banded adult Cahows which had failed for the 2006 season. . During the following season in 2007, this bird evidently replaced one of the adult birds from the established pair, pairing up with the remaining bird and successfully raising a chick together during this season.
- 10 of the 15 returned birds were recaptured on the same island they had originally fledged from, while the other 5 were recaptured on other islands.
- Of the 15 returned birds, 7 originated from Horn Rock, while 7 originated from Green Island and 1 from Long Rock. To date, no banded birds fledging from Inner Pear Rock have been recovered.
- To date, 6 of the 7 returned Horn Rock birds were recaptured on the island of their birth; 1 was recaptured on Green Island. In contrast, 4 of the 7 returned Green Island birds returned to Green Island, while 2 were recaptured on Horn

rock and 1 was recaptured on Inner Pear Rock. The single returned bird from Long Rock was captured in a burrow on Inner Pear Rock, where it has paired up with a returned bird from Green Island.

8: Update on Growth Study of Cahow Fledglings

Objectives and methodology

In 2002 a growth study of Cahow fledglings was initiated as part of the effort to investigate various aspects of breeding biology of the species which were not well understood. This study is being carried out in tandem with the banding program, and aims to track the development of a sample of each breeding season's cohort of chicks from hatching until final departure out to sea. The study involves removing chicks briefly from their nest chambers through the removable inspection lids which approximately 80% of all Cahow nest burrows are equipped with. The chicks are measured for body mass (weight) and wing chord (outer wing length), and occasionally other morphometric body measurements to determine development and rate of growth.

This study has several objectives:

- 1) To determine the normal range of weight and body size among a representative sample of fledglings over a number of years;
- 2) To support the translocation project by determining how close the fledgling is to final departure, and thus when the chick is ready to be translocated;
- 3) To identify any fledgling that is dangerously underweight, through abandonment or mortality of one or both adults or insufficient adult feeding visits, and to help determine when to remove such chicks for care in the Wildlife rehabilitation Centre at BAMZ before the chick is beyond hope of recovery;
- 4) To help determine the general productivity of the oceanic foraging grounds of the Cahow; by determining the mean maximum weights achieved by all Cahow fledglings which are part of the study during any one year, and comparing this to the mean maximum weights achieved by samples of fledglings during other years.

All equipment used for growth studies are obtained from AFO (Association of Field Ornithologists) Banding Supplies, Box 1770 Manomet, MA 02345 508/224-6521, USA. Weighing of fledglings is carried out using small Pesola spring scales with a range of 0 to 600 grams. Measurement of wing chord length is carried out using a specialized stainless steel wing chord ruler. Measurement of other morphometrics (bill length, bill depth at gonys, total head length, tarsus length, and total foot length) is carried out using a Scherr-Tumico caliper. To facilitate the weighing, measurement and banding of the birds, cloth bird weighing bags obtained from AFO Banding Supplies have been found to be very effective in gently holding and calming birds, while immobilizing them to enable measurement and banding to be carried out.

A total of 21 fledglings were used in the study during its first year in the 2001 – 2002 nesting season. Body mass (weight) was the only measurement taken of fledglings during this season, with checks carried out every 2 to 4 days on average. 21 fledglings were also studied during the 2002 – 2003 nesting season, with measurement of wing chord growth also being taken of fledglings from about 60 days of age onwards. Checks of fledglings were also carried out on consecutive days to determine the amount of food provided during adult feeding visits. 20 chicks were studied during the 2003 – 2004 nesting season, of which 14 were translocated to the new nesting colony site on Nonsuch Island in the first year of the Cahow Translocation Project (see page 25: Update on Cahow Translocation Project). The other 4 chicks were used as controls to determine if there were any differences between naturally fledging chicks (raised entirely by the adult Cahows) and those which were translocated and artificially fed during their final fledging period. The weight studies were crucial in determining that translocated chicks were fledging over 40 grams lighter on average than birds which were not moved. It is as yet unknown how this would affect chick survival during the post-fledging period, but the amount of fat reserves that the chicks fledge with are most likely important during the crucial period after fledging when the chicks are still learning how to locate and catch food. This resulted in the decision to provide larger amounts of food during feeding of translocated chicks during the next nesting season and over the duration of the translocation project.

During the 2004 – 2005 nesting season, a total of 24 Cahow fledglings were measured as part of the growth study, of which 21 were eventually translocated to Nonsuch Island. As a result of the feed size adjustments, the chicks fledged at weights comparable to the control (non-translocated) birds.

For the 2005 – 2006 Cahow nesting season, a total of 26 fledglings were included as part of the growth study. 21 of these birds were eventually translocated to Nonsuch Island, while 5 birds were used as controls. The results again indicated that the translocated Cahow fledglings fledged at essentially the same weight, wing chord and age as the control birds.

The 2006 – 2007 nesting season saw a record number of 31 chicks measured as part of the continuing growth study. A total of 24 of these were eventually translocated to Nonsuch Island at the appropriate point in their development, with growth measurements continuing after translocation until their final departure. The remaining 7 chicks were used as controls for comparison purposes. This was the first year that translocated Cahow chicks fledged at substantially higher mean weights (306 grams) than the control chicks (286 grams).

9: Update on Cahow Translocation Project

9.1: Review of Translocation Project to date:

During 2006, the third year of the Cahow Translocation Project was carried out as the centerpiece of a project to establish a new breeding colony of Cahows on the Nonsuch Island Living Museum. This project is being carried out for two main reasons;

- (1) The present nesting islets have suffered severe erosion and damage from several recent hurricane events, and remain vulnerable to further erosion and damage to nest sites. There exists the real possibility of catastrophic collapse of large sections of some of the nesting islets in the event of a severe hurricane.
- (2) The small size and low elevation of the present nesting islets place physical restraints on the future growth and recovery of the Cahow population.

The goal of the Translocation Program is to move a total of 95 Cahow fledglings over a five-year period from nest sites on all 4 of the present nesting islets to a new complex of artificial burrows built at a new colony site on Nonsuch Island. During the trial year of the project in 2004 a total of 14 Cahow fledglings were moved to the nest complex on Nonsuch, with all fledging successfully. A smaller initial number of birds were moved during this trial year to check the methodology and techniques used for the project, to look for any possible problems and to fine-tune the exact time to best move the fledglings, feed size and food items used etc. Nicholas Carlile, a petrel and seabird specialist from the New South Wales Department of Parks and Wildlife with experience in the translocation of *Pterodroma* petrel species, was engaged to come to Bermuda and oversee the trial year. This expertise was important as every effort is being made to ensure the success of the translocation project, which is considered vital to the long-term survival and recovery of the Cahow. The trial year was considered a success as all chicks fledged successfully, with age at fledging (89 days) and wing chord at fledging (250 mm) very similar to that of 10 non-translocated control chicks (93 days and 251mm respectively). The only concern was that translocated chicks fledged on average about 49 grams lighter (mean weight = 231 grams) than the control chicks (mean weight = 280 grams). It was unknown whether this would affect chick survival after fledging.

In 2005, the second year of the translocation project resulted in 21 Cahow chicks being moved to the new nest burrow complex on Nonsuch Island, with all 21 again fledging successfully out to sea. Experience from the 2004 season resulted in slightly larger feed amounts being given to the chicks, averaging 50 to 90 grams of squid and fresh anchovies (range 34 – 108 grams). This resulted in chick departure weights essentially identical to those of departing non-translocated chicks which were raised solely by the adult birds.

9.2: Results of 2007 Cahow Translocation:

2007 was the fourth year that Cahow chicks have been moved to Nonsuch Island for the translocation project. A total of 25 chicks were moved to Nonsuch, of which 24 successfully fledged to sea from the island. The first Cahow chick was translocated from

Inner Pear Rock B4 nest on 4th May, with the last from Green Island #6 nest translocated on the 1st of June. The median date for chick translocations was the 20th May. This compares to the 17th May for the median date in 2006 (range 6th May to 31st May), 20th May for 2005, (range 8th May to 2nd June) and 22nd May for 2004 (range 13th May to 1st June).

The chicks were 78 days old on average (2006) when translocated to Nonsuch Island (range 69 to 92 days of age). This is very close to the figure in 2005 (81 days mean, range 73 to 87 days) and in 2004 (77 days mean, range 68 to 88).

The average mean weights of 10 naturally fledging (non-translocated) Cahow chicks at departure was recorded in 2004 and 2005 as being 280 grams and 288 grams respectively. During the trial 2004 translocation, the 14 translocated chicks fledged at an average mean weight of 231 grams, some 49 grams lighter than the control sample. This was of some concern since it is thought that the amount of fat reserves that a chick fledges with could affect their survival rate during the first, crucial week or two at sea when they are learning to forage and hunt for themselves. As the average meal size for the 2004 translocation was about 40 grams, it was decided that for subsequent years the meal size should be substantially increased.

Accordingly, for the 2005 and 2006 translocations, average meal sizes were increased to between 50 grams and 70 grams. This appears to have addressed the problem, as the average mean weight of the 21 chicks translocated in 2005 was 302 grams at fledging (range 232 grams to 375 grams) and of the 20 translocated chicks fledging in 2006 was 281 grams (range 243 grams to 332 grams). Therefore, the departure weights of translocated chicks during 2006 was essentially identical to naturally fledging (completely adult raised) chicks, indicating that the amount of food being fed to the chicks was now optimal.

For the 2007 translocation, the average mean weight of the Cahow chicks fledged was 306 grams. This is marginally heavier than the departure weights of the control birds and may have come about because many chicks were fed up to a period closer to their departure to sea than during previous years.

Food provided to the Cahow chicks consisted of fresh unfrozen Squid (*Loligo sp.*) obtained from Miles Supermarket, Pitts Bay Road, Pembroke. Fresh Fish was netted locally and provided by Chris Flook, chief collections officer for the Bermuda Aquarium, Museum and Zoo (BAMZ). Fish provided was mainly fresh Anchovy *Sardinella anchovia*, but also included Redear Sardine *Harengula humeralis* and Atlantic Threadfin Herring *Opisthonema oglinum*. A typical meal for one chick consisted of 2 Squid bodies (with or without heads), and 6 to 10 Anchovies or equivalent.

Cahow chicks are translocated when their wing chord length exceeds 190 mm and they have attained adult plumage on at least 5 of the following 8 body parts (face; head; shoulders; wings; rump; tail; chest; belly). The first chick (Green Island #8) was translocated to a nest burrow at the translocation site on Nonsuch Island on the 6th May, 2006. This was followed by the other chicks at the rate of one or two a day until the last 2

chicks (Horn Rock C19 and C22) were translocated on the 31st May (see page 32: Summary of results for 2006 Cahow Translocation Project). The Green 8 chick was also the first bird to fledge 16 days after its translocation on the 22nd of the month. The final chick to fledge (Horn C19) did so on the 17th June. This chick had been somewhat underweight when moved to Nonsuch, and so was fed every day rather than on alternate days. Despite taking longer than normal to fledge at 109 days, the daily feeding enabled the chick to build up adequate fat reserves and depart at a normal weight of 274 grams.

Once the cahow chicks are fully fledged (determined when wing chord length exceeds 250 mm and/or all natal down is lost and the chick develops all adult plumage) feeding is discontinued and the chicks complete development from their fat reserves. At this point, the chicks begin to emerge from their nest burrows at night to exercise their flight muscles and explore and imprint upon their surroundings. Studies of non-translocated chicks since 2001 indicate that the mean period between first emergence and final fledging out to sea can range between 5 and 8 days. Translocated chicks have proven to generally fledge within this range, averaging 7 days in the 2004 translocation, 4 days in the 2005 translocation, and 5 days in the 2006 and 2007 translocations.

In the 2007 translocation, out of a total of 25 chicks that were translocated to Nonsuch Island, 24 chicks fledged successfully, while one chick died from an unidentified gastric ailment. This chick had been consistently underweight throughout its development, most likely due to poor provisioning by the adults. This chick was not in the best condition and would not normally have been included in the translocation, but was brought to Nonsuch as it needed to be taken into care at any case. Despite beginning to respond and gain weight for the first few days, it eventually began to refuse and regurgitate all food and died after 9 days. This is only the second chick to suffer mortality out of a total of 81 cahow chicks translocated to Nonsuch Island since 2004. (The first chick died in the 2006 translocation from a wing joint deformity that was not easily detectable until the chick attempted to fledge. The deformity rendered the chick unable to fly and it fell into the ocean during a night with high winds and was overcome in the breakers).

Even with the second mortality recorded of a chick in the translocation project, a total of 79 Cahow chicks have now fledged successfully from the new colony site on Nonsuch Island out of the target total of 95 chicks. The final year of the Project will aim for the translocation of 21 more chicks to reach the final target figure. It is hoped that by the last year of the project in 2008, that the first returns of translocated chicks will be recorded, based on the results this year with the first return to the present nesting islets of Cahows banded as chicks in 2002 and 2003 (see page 18: First Confirmation of Return of Banded Fledglings).

One concern associated with the Translocation Project was that Cahow chicks moved to the new colony site on Nonsuch would return as adults to the site to prospect for their own nest sites and partners, only to be attracted back to the present tiny nesting islets by the activity of the breeding pairs there. This is thought to be a potential problem due to the fact that although returning Petrels tend to return to the point from which they originally fledged, social facilitation is also a strong motivating factor for this family of seabirds. There is strong evidence that prospecting Cahows can be attracted to concentrations of nest burrows that are currently active.

In order to encourage returning Cahows to stay at the translocation site, prospect for nest burrows and attract mates at that location, the 'Murremaid' Sound Attraction System has now been moved to Nonsuch and set up at the Translocation site. This Sound System was first set up during 2004 and 2005 on Horn Rock at a new artificial nest burrow complex built on the highest section of the island to replace nest burrows which were destroyed during hurricane Fabian in 2003. This Sound System, which plays back recordings of Cahow courtship calls, coupled with the physical transfer of adult birds found at the destroyed nest sites into the new nest burrows, was successful in attracting Cahows to the new nest complex, with 3 burrows occupied by nesting pairs by the 2005 nesting season and 4 burrows by the 2006 season. This new complex of nest burrows has continued to grow despite the sound system being moved to Nonsuch, with 2 new burrows being occupied by nesting pairs during the 2007 season, bringing the total of occupied burrows at this new complex to 6, from which 2 chicks successfully fledged.

9.3: Summary of Results for 2007 Cahow Translocation Project

Date of Translocation of Bermuda Petrel Chicks to Nonsuch Island, Age at Translocation, Number of Feeds and Total Feed Weight, Period of Emergence to Fledging, Date of Fledging, and Age, Weight and Wing Chord (Length) at Fledging.

Individual (Origin – Island & nest No.)	Translocation		Number of Feeds		Exercise Period (days)	Fledging			
	Date of Translocation	Age when moved (days)	No. of feeds after moving	Total Feed weight (grams)		Date of Fledging	Age from hatching (Days)	Weight at fledging (grams)	Wing Chord (mm)
IPO B4	4 May	72	8	550g	5	21 May	89	286g	257mm
HORN B3	9 May	71	7	490g	5	23 May	85	269g	258mm
HORN C5	9 May	77	7	452g	3	23 May	91	310g	253mm
IPO D2	9 May	73	9	596g	6	26 May	90	329g	256mm
LONG E1	9 May	70	9	574g	3	26 May	87	281g	257mm
GREEN 13	12 May	71	10	684g	9	31 May	90	312g	265mm
IPO E2	13 May	76	8	487g	7	28 May	91	276g	255mm
LONG D7	13 May	75	9	818g	5	31 May	93	299g	258mm
GREEN 1	15 May	72	9	635g	4	2 June	90	333g*	263mm
HORN C9	16 May	76	6	496g	3	29 May	89	245g	252mm
LONG D5	17 May	76	8	702g	4	31 May	89	303g	245mm
HORN C23	18 May	75	7	515g	6	2 June	90	347g*	253mm
GREEN 11	20 May	83	9	600g	7	3 June	97	348g	259mm
GREEN 5	20 May	76	5	341g	6	4 June	91	241g	255mm
HORN C19	21 May	78	11	858g	6	5 June	92	308g	253mm
HORN C14	21 May	78	11	784g	8	6 June	94	300g	258mm
HORN F4	21 May	78	11	810g	4	10 June	98	322g	265mm
GREEN 4	21 May	77	7	530g	5	5 June	92	271g	264mm
LONG E4	21 May	73	8	452g	5	7 June	90	286g	262mm
HORN C8	22 May	75	8	533g	7	7 June	91	369g	255mm
IPO D3	24 May	79	12	1000g	7	11 June	97	336g	246mm
IPO D4	24 May	82	11	860g	3	8 June	97	349g	248mm
HORN C22	27 May	79	12	854g	6	15 June	98	310g	273mm
GREEN 6	1 June	75	12	783g	7	17 June	91	325g	258mm
Mean		76	9	642g	5		92	306g	257mm
Median	20 th May 2007					3 rd June 2007			

* Chicks which were not weighed on last 2 days before departure; amount given is last weight taken

10: Future Management and Research Proposals

There are a number of new or ongoing management and research proposals anticipated for the next two Cahow nesting seasons; the most important are outlined as follows:

- 1) The final year of the five-year Cahow Translocation Project is scheduled to take place during the 2007/2008 nesting season. A total of 79 Cahow chicks have already fledged from Nonsuch Island, with translocated chicks now fledging with essentially identical body weights, wing measurements and timing as their non-translocated counterparts. It is therefore planned to translocate another 21 chicks from the present 4 nesting islets in the next nesting season, to bring the number of translocated chicks to the target number of 100 proposed for the entire five years of the Translocation Project.
- 2) The Sound Attraction System should be used at the Nonsuch translocation colony site for at least the next two to three years, in order to encourage returning translocated chicks to stay at the site to prospect for and occupy nest burrows. It is hoped that this will counteract any tendency for returning birds to be attracted back to the present nesting islets by the activity around their existing Cahow breeding colonies.
- 3) It is proposed to initiate studies of the almost entirely unknown oceanic range of the Cahow away from Bermuda through the deployment of miniature Data Loggers, which have been field-tested and used with an increasing number of seabirds in the Pacific and Southern Oceans during the last two years. This includes Albatross, Shearwater and Petrel species, with very interesting results already obtained regarding foraging and migratory ranges and diving depths during foraging. At present it is proposed that this should take place during either the 2008 or 2009 Cahow nesting seasons, and that an overseas expert in deployment, use and recovery of the Data Loggers and downloading and interpretation of information they have recorded be engaged to come to Bermuda to assist and lend advice in this project.
- 4) At present there is a problem with some 20% of Cahow nest burrows that cannot at present be observed or accessed in any way. This makes it difficult to interpret what is happening in the burrow, and often it is difficult to even know if the burrow contains a chick until the last few days before the chick fledges. Some of these burrows also habitually fail, possibly because of a simple problem such as a rock or pebble in the nest causing egg breakage. This represents a significant percentage of the breeding population where simple management procedures which can increase breeding success cannot be carried out due to lack of information. It is proposed that a 'Burrow-scope' instrument is purchased to solve this problem, the instrument basically being an endoscope with flexible, maneuverable cable which has an infra-red light and mini-camera. This can penetrate up to 15' into a small burrow and allow the user to see what is happening inside. This equipment also has great scope for use with other species, including Tropicbirds, Bermuda Skinks and Crab species.

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