# SUPPORTING INFORMATION

## **Figure S1.** Ile du Coin extant vegetation cover in relation to all other rat-infested, ecologically degraded islands > 0.5 km2 in the Chagos Archipelago. Dieg = Diego Garcia, Eagl = Eagle, Lunc = Lubine complex, Sudc = Sudest complex, Pier = Pierre, Coin = Coin, Bodd = Boddam, Poup = Poule (Peros Banhos), Diam = Diamant, Angs = Anglaise (Solomon Islands), Gras = Grand Souer, Yeye = Yeye and Taka = Takamaka.

## **Table S1.** Breeding habitat classification in the Chagos Archipelago. Twenty-four original categories as defined and mapped by Wilkinson (2017) and Bárrios and Wilkinson (2018) condensed in to six tropical seabird breeding habitats.

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| **Original categories** | **Breeding seabird habitat** | **Definition** |
| Manmade structures  Ornamental vegetation  Manmade wetlands | Omitted | All manmade structures were omitted from the analysis. These were only present on the inhabited western arm of Diego Garcia and constitute ~20% of the total landmass of the archipelago and held very few breeding seabirds (<50 breeding pairs combined of *Anous stolidus* (Brown Noddy) and *Gygis alba* (Common White Tern). Included in these omissions are an airport and a port; ornamental vegetation included a golf course, flowered-garden areas and lawns. Manmade wetlands are sewage settling ponds and an artificial lake |
| Brackish water | Wetlands (WETL)  IUCN habitat class 5.14/5.16 Permanent saline, brackish or alkaline lakes/ponds | Wetland habitat are areas of permanent fresh or brackish water not connected to the open sea. On Eagle and Moresby Island the wetlands are mangrove forest of the species *Lumnitzera racemosa* Willd. *Pemphis acidula* J*.*R Forst & G. Forst.is the other dominant wetland plant. |
| Broadleaf woodland  Mixed broadleaf and coconut  Asplenum sp.  Unknown sp.  Cordia  Pisonia (Ceodes)  Coconut with broadleaf  Dead Cordia | Native forest (NATF)  IUCN habitat class 1.6. Tropical moist lowland forest | Native forest is made up of 11 species of tree: *Barringtonia asiatica* (L.) Kurz, *Calophyllum inophyllum* L., *Ceodes* (*Pisonia*) *grandis* (R.Br.) D.Q.Lu, *Cocos nucifera* L., *Cordia subcordata* Lam, *Guettarda speciosa* L, *Hernandia nymphaeifolia* (C. Presl) Kubitzki, *Intsia bijuga* (Colebr.) Kuntze, *Morinda citrifolia* L, *Ochrosia* (*Neisosperma*) *oppositifolia* (Lam.) K.Schum. and *Heliotropium* (*Tournefortia*) *arboretum* (Blanco) Mabb. where it occurs as a tree. *Lumnitzera racemose* Willd. is the remaining native tree and is dealt with under the separate habitat of wetland. *Asplenum* is included as this fern is invariably associated with native forest, especially under *Hernandia*. Unknown species are included in native forest as there are no extensive tracts of non-native trees on any island that are not known and were not identified when being mapped. |
| Bare ground  Grass  Sand with sparse cover  Herbaceous savanna | Savanna (SAVA)  IUCN habitat class 2.2. Moist savanna | Bare ground and sand with sparse cover are included as savanna where they are not part of the beach habitat, i.e. where they are found inland behind the beach crest. The principle native floral components of savanna are the grasses *Lepturus repens* (G. Forst.) R. Br. and *Stenotaphrum micranthum* (Desv.) C.E. Hubb., the sedge *Fimbristylis cymosa* R. Br. and the vascular plants *Portulaca mauritiensis* Poelln., *P. oleracea* L., *Ipomoea macrantha* Roem. & Schultes, *Achyranthes aspera* var. *velutina* (Hook & Arn.), *Boerhavia repens* L., *Sida pusilla* Cav. and *Triumfetta procumbens* G. Forst. Included in savanna is the non-native *Stachytarpheta jamaicensis* (L.) Vahl. |
| Scaevola  Thicket | Mixed shrub (MISH)  IUCN habitat class 3.6. tropical moist shrubland | Mixed shrub is comprised of *Scaevola taccada* (Gaertn.) Roxb. and *Heliotropium* (*Tournefortia*) *arboretum* (Blanco) Mabb. where it occurs in bush form, normally in the interior of islands. Other shrub species are present but are not nested in by seabirds. |
| Beach  Beach littoral | Beach (BEAC)  IUCN habitat class 13.1/13.3 Sea cliffs and rocky offshore islands/coastal sand dunes | Beach is comprised of any substrate that forms the shoreline up to the point that vegetation starts. The usual substrate is sand or limestone. Beach is not vegetated. |
| Casuarina  Papaya  Coconut | Non-natural or non-native forest (NONF)  IUCN habitat class 14.3 Plantations | Non-native forest is comprised of *Casuarina equisetifolia* L., *Carica papaya* L. and *Cocos nucifera* L. In the Chagos Archipelago, *C. nucifera* occurs as a natural colonist and is found on shorelines and the interior where storm surges have pushed nuts inland. It also occurs unnaturally inland as an abandoned commercial crop planted where native vegetation has been cleared. Only *C. nucifera* planted as a commercial crop is included as non-natural forest. |

## **Table S2.** AICc values for model selection for models of rat-free islands.

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| --- | --- | --- | --- |
| **Model** | **Fixed effect structure** | **AICc** | **Difference in AIC relative to most parsimonious model** |
| Rat-free islands | | | |
| Without size | Vegetation type \* Species + Island | 3703368 | 0 |
| Without island | Vegetation type \* Species + Size | 3792935 | 89566 |
| Without two-way interaction or size | Vegetation type + Species + Island | 4690585 | 987217 |
| Full model | Vegetation type \* Species + Island + Size | 83505181 | 79801813 |

## **Table S3.** Model scores from receiving operator characteristic curves of most parsimonious models by model selection.

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| --- | --- | --- | --- | --- | --- | --- |
| **Model** | **Correct classification (%)** | **Positive Predictive Power (%)** | **Negative Predictive Power (%)** | **Sensitivity** | **Specificity** | **Area under curve** |
| Rat-free islands | 74.4 | 25.8 | 99.5 | 0.97 | 0.72 | 0.84 |

## **Table S4.** Mean breeding population estimates for all 18 species of tropical seabird in the Chagos Archipelago for the six breeding habitats. Population estimates come from the contemporaneous reference site of the 24 rat-free islands. Red-tailed Tropicbird and Little Tern have only ever been found breeding on rat-infested Diego Garcia.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **HABITAT** | ***Ardenna pacifica* (Wedge-tailed Shearwater)** | ***Puffinus bailloni* (Tropical Shearwater)** | **, *Phaethon lepturus* (White-tailed Tropicbird)** | ***Phaethon. rubricauda* (Red-tailed Tropicbird)** | ***Sula dactylatra* (Masked Booby)** | ***Sula sula* (Red-footed Booby)** | ***Sula leucogaster*  (Brown Booby)** | ***Fregata minor*  (Great Frigatebird)** | ***Fregata ariel* (Lesser Frigatebird)** | ***Thalasseus bergii* (Great Crested Tern)** | ***Sterna dougallii* (Roseate Tern)** | ***Sterna sumatrana* (Black-naped Tern)** | ***Sternula albifrons* (Little Tern)** | ***Onychoprion aenathetus* (Bridled Tern)** | ***Onychoprion fuscatus* (Sooty Tern)** | ***Anous stolidus* (Brown Noddy)** | ***Anous tenuirostris* (Lesser Noddy)** | ***Gygis alba*  (Common White Tern)** |
| Beach | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 532.1  +/- 2.6 | 14.3  +/- 0.2 | 100  +/- 0.7 | 0.0 | 189.3 +/- 1 | 0.0 | 714.3  +/- 8.3 | 0.0 | 0.0 |
| Mixed shrub | 240.5  +/- 9 | 135.1  +/- 5 | 0.0 | 0.0 | 0.0 | 7276.6 +/- 155 | 0.0 | 238.7  +/- 10.4 | 45.1  +/- 2.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 900.9  +/- 42 | 82  +/- 1.5 | 0.0 | 0.0 |
| Native forest | 2,855.4 +/- 125 | 1,223.1 +/- 50 | 2.5  +/- 0.1 | 0.0 | 0.0 | 3,605.8 +/- 174 | 0.0 | 305.8  +/- 12.7 | 16.5  +/- 0.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 826.5  +/- 42 | 734.7  +/- 8.5 | 41,624 +/- 838.1 | 276.9  +/- 2.9 |
| Non-native forest | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 20.8  +/- 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 354.2  +/- 2.3 | 0.0 | 212.5  +/- 1.2 |
| Savanna | 8.8  +/- 0.1 | 0.0 | 0.0 | 0.0 | 482.4  +/- 6 | 0.0 | 2,717.6 +/- 31 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 38.2  +/- 0.4 | 575,000 +/- 3,065 | 2,367.7 +/- 25.2 | 0.0 | 0.0 |
| Wetland | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 13,750 +/- 2.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

## **Supplement S1.** Working Example: Hypothetical future breeding seabird populations on a rat-cleared Ile du Coin, Chagos Archipelago, without conversion of abandoned plantations to native habitats.

Legend:

BEAC = beach, MISH = mixed shrub, NATF = native forest, NONF = non-native forest, SAVA = savanna, WETL = wetland.

WETS = *Ardenna pacifica* (Wedge-tailed Shearwater), TROS = *Puffinus bailloni* (Tropical Shearwater), WHTT = *Phaethon lepturus* (White-tailed Tropicbird), REFB = *Sula sula* (Red-footed Booby), GREF = *Fregata minor (*Great Frigatebird), LESF = *Fregata ariel* (Lesser Frigatebird), GRCT = *Thalasseus bergii* (Great Crested Tern), ROST = *Sterna dougallii* (Roseate Tern), BLNT = *Sterna sumatrana* (Black-naped Tern), BRIT = *Onychoprion aenathetus* (Bridled Tern), SOOT = *Onychoprion fuscatus* (Sooty Tern), BRON = *Anous stolidus* (Brown Noddy), LESN = *Anous tenuirostris* (Lesser Noddy), COWT = *Gygis alba* (Common White Tern).

Estimating breeding abundance of seabirds in the Chagos Archipelago for islands where rats have been eradicated. Worked example: Ile du Coin, Peros Banhos (1.26 km2).

To estimate breeding abundance (e.ba) post rat eradication on Ille du Coin, we sum (Σ) the abundance of every species (sp1-18) breeding in every habitat (hab1-6) using the present-day mean breeding abundance of species (μ) from the contemporaneous reference sites of 24 rat-free islands in Chagos (Equation 2).

e.ba = Σ (hab1-6 x μsp1-18)

Where, hab 1-6 is the area (km2) covered by the six breeding habitats on Ile du Coin (BEAC = 0.011, MISH = 0.024, NATF = 0.066, NONF = 1.154, SAVA = 0, WETL 0) and μsp1-18 = is the mean breeding abundance of species breeding in habitat1-6, extracted from Table S4.

* BEAC: GRCT (0.011 x 532.1 +/- 2.6) + ROST (0.011 x 14.3 +/- 0.2) + BLNT (0.011 x 100 +/- 0.7) + BRIT (0.011 x 189.3 +/- 1) + BRON (0.011 x 714.3 +/- 8.3)
* MISH: WETS (0.024 x 240.5 +/- 9) + TROS (0.024 x 135.1 +/- 5) + REFB (0.024 x 7,276.6 +/- 155) + GREF (0.024 x 238.7 +/- 10.4) + LESF (0.024 x 45.1 +/- 2.1) + SOOT (0.024 x 900.9 +/- 42) + BRON (0.024 x 82 +/- 1.5)
* NATF: WETS (0.066 x 2,855.4 +/- 125) + TROS (0.066 x 1,223.1 +/- 50) + WHTT (0.066 x 2.5 +/- 0.1) + REFB (0.066 x 3,605.8 +/- 174) + GREF (0.066 x 305.8 +/- 12.7) + LESF (0.066 x 16.5 +/- 0.7) + SOOT (0.066 x 826.5 +/- 42) + BRON (0.066 x 734.7 +/- 8.5) + LESN (0.066 x 41,624 +/- 838.1) + COWT (0.066 x 276.9 +/- 2.9)
* NONF: GREF (1.154 x 20.8 +/- 0.2) + BRON (1.154 X 354.2 +/- 2.3) + COWT (1.154 x 212.5 +/- 1.2)

This condenses down to:

* BEAC: GRCT (5.85 +/- 0.03) + ROST (0.16) + BLNT (1.1 +/- 0.01) + BRIT (2.08 +/- 0.01) + BRON (7.86 +/- 0.09) = 17.05 (+/- 0.14)
* MISH: WETS (5.77 +/- 0.22) + TROS (3.24 +/- 0.12) + REFB (174.64 +/- 3.72) + GREF (5.73 +/- 0.25) + LESF (1.08 +/- 0.05) + SOOT (21.62 +/- 1.01) + BRON (1.97 +/- 0.03) = 214.05 (+/- 5.4)
* NATF: WETS (188.46 +/- 8.25) + TROS (80.72 +/- 3.3) + WHTT (0.17) + REFB (237.98 +/- 11.49) + GREF (20.18 +/- 0.84) + LESF (1.09+/- 0.05) + SOOT (54.55 +/- 2.77) + BRON (48.49 +/- 0.56) + LESN (2747.18 +/- 55.32) + COWT (18.28 +/- 0.19) = 3397.1 (+/- 82.76)
* NONF: GREF (24 +/-0.23) + BRON (408.75 +/- 2.65) + COWT (245.23 +/- 1.38) = 677.98 (+/- 4.26)

This condenses down to:

* 17.05 (+/- 0.14) + 214.05 (+/- 5.4) + 3397.1 (+/- 82.76) + 677.98 (+/- 4.26)

Without conversion of abandoned coconut plantations to native habitats conducive to breeding seabirds post rat eradication, the six breeding habitats on Ile du Coin, of which only four are present, could support 4,306 +/- 93 breeding pairs of 14 species.