

New Caledonian seabirds

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Abstract

Fifty-nine seabird species (among which 28 are confirmed breeders) from 26 genera and 11 families were listed for different regions of New Caledonia (Chesterfield and Bampton atolls, d'Entrecasteaux reefs, Loyalty islands, Grande-Terre / île des Pins, Northern lagoon, Southern lagoon, Walpole island, Matthew island, and Hunter island). A detailed account of systematics, taxonomy, distribution, and conservation status was given for the four breeding species represented by subspecies considered to be endemic to New Caledonia. These include two Procellariidae (New Caledonian Petrel, *Pterodroma leucoptera caledonica*, and the New Caledonian subspecies of Tahiti Petrel, *Pseudobulweria rostrata trouessarti*) and two Laridae (New Caledonian Silver Gull, *Larus novaehollandiae forsteri*, and New Caledonian Fairy Tern, *Sterna nereis exsul*). Two seabird species that breed in New Caledonia are considered by the World Conservation Union as vulnerable (Gould's Petrel, *Pterodroma leucoptera* and White-throated Storm Petrel, *Nesofregatta fuliginosa*) and two others, as near-threatened (Tahiti Petrel and Beach Thick-knee, *Esacus magnirostris*). Several species (Masked Booby, *Sula dactylatra*, Brown Booby, *S. leucogaster*, Fairy Tern, Silver Gull and possibly Herald Petrel, *Pterodroma heraldica*) have been extirpated from regions of New Caledonia where they bred until recently. Drastic conservation measures are urgently needed for the New Caledonian Fairy Tern.

Résumé

Oiseaux marins de Nouvelle-Calédonie. – Cinquante neuf espèces d'oiseaux marins (dont 28 nicheuses confirmées), appartenant à 26 genres et 11 familles, ont été inventoriées pour différentes régions de la Nouvelle-Calédonie (atolls des Chesterfield et Bampton, récifs d'Entrecasteaux, îles Loyauté, Grande-Terre / Ile des Pins, lagon Nord, lagon Sud, île Walpole, îlot Matthew et îlot Hunter). Une présentation approfondie est faite de la systématique, de la taxinomie, de la distribution, et de l'état de conservation des quatre espèces représentées en Nouvelle-Calédonie par des sous-espèces considérées comme endémiques. Il s'agit de deux Procellariidae (le Pétrel de Nouvelle-Calédonie, *Pterodroma leucoptera caledonica*, et la sous-espèce néo-calédonienne du Pétrel de Tahiti, *Pseudobulweria rostrata trouessarti*), ainsi que deux Laridae (la sous espèce néo-calédonienne de la Mouette argentée, *Larus novaehollandiae forsteri*, et celle de la Sterne nereis, *Sterna nereis exsul*). Parmi les espèces d'oiseaux marins qui nichent en Nouvelle-Calédonie, deux sont considérées par l'Union mondiale pour la nature comme étant vulnérables (le Pétrel de Gould, *Pterodroma leucoptera* et le Pétrel-tempête à gorge blanche, *Nesofregatta fuliginosa*) et deux autres comme étant quasi-menacées (le Pétrel de Tahiti et l'Oedycnème des récifs, *Esacus magnirostris*). Plusieurs autres espèces (Fou masqué, *Sula dactylatra*, Fou brun, *S. leucogaster*, Sterne nereis, Mouette argentée, ainsi que, peut-être, le Pétrel de Herald, *Pterodroma heraldica*) ont disparu de régions de Nouvelle-Calédonie où elles étaient, jusqu'à récemment, nicheuses. Des mesures drastiques de conservation s'imposent pour la Sterne nereis en Nouvelle-Calédonie.

Introduction

Visiting naturalists to New Caledonia and surrounding islands have mentioned seabirds as early as 1858-1860, (Bourne *et al.* 2005). Layard and Layard (1882) provided a first list of New Caledonian “waterbirds”, including four Procellariidae [*Oestrelata rostrata* (now *Pseudobulweria rostrata*), *O. mollis* (*Pterodroma mollis*, apparently a misidentification of *P. leucoptera caledonica*), *Adamastor cinereus* (*Procellaria cinerea*), *Puffinus brevicaudus* (*P. tenuirostris*)], one Hydrobatidae [*Oceanites wilsoni* (*O. oceanicus*)], two Phaethontidae [*Phaethon candidus* (*P. lepturus*), *P. rubricauda*], two Sulidae [*Sula piscator* (*S. sula*) and *Dysporus sula* (*S. leucogaster* ?)], one Phalacrocoracidae [*Phalacrocorax melanoleucus* (*P. melanoleucos*)], one Fregatidae [*Tachypetes aquilus* (*Fregata minor*?)], one Burhinidae (*Esacus magnirostris*) and six Laridae [*Larus novaehollandiae*, *Sterna bergii*, *S. melanauchen* (*S. sumatrana*), *S. gracilis* (*S. dougallii*), *Sternula placens* (*Sterna nereis*), *Haliplana fuliginosa* (*S. fuscata*)]. However, it was only recently that the census of populations was completed for the Southern lagoon of New Caledonia’s Grande Terre (Pandolfi-Benoît and Bretagnolle 2002), and initiated in the Northern lagoon, excluding the Belep and Daos archipelagos (Baudat-Franceschi 2006). Our knowledge of seabird populations in the other regions of New Caledonia is still partial.

The objective of this paper was to present an updated list of New Caledonian seabirds by region, with emphasis on endemic taxa. For the latter, we provided details on current distribution, habitats, population sizes, and conservation status.

Methods

New Caledonia is located in the southwest Pacific Ocean, approximately 1,200 km east of Australia and 1,500 km northwest of New Zealand. The New Caledonian administrative territory extends from approximately 16°52’S to 23°10’S and 157°51’E to 173°57’E (Dubois 1981). The geopolitical definition of New Caledonia thus encompasses a main island, Grande Terre, the Loyalty chain of islands (Beautemps–Beaupré, Ouvéa, Lifou, Tiga, Maré, Walpole, all calcareous platforms arisen by tectonic movements) and about a hundred islands and islets scattered from the middle of the Coral sea (the Chesterfield archipelago, comprising low coral sand islets and cays) to the southern New Hebrides ark (Matthew and Hunter islands, both andesitic stratovolcanoes). Grande Terre is by far the largest island, at 350 km in length and between 50 to 70 km wide. A mountain range peaking over 1,600 m runs the length of the island. Surrounding Grande Terre, a barrier reef delimitates a large lagoon, geographically divided into two main lagoons, at the northern and southern extremities of Grande Terre. We compiled all the information that was accessible to us from the literature on the occurrence, taxonomy and distribution of New Caledonian seabirds. This included articles accessible through ISI Web of Science (Institute for Scientific Information, Philadelphia; <http://portal.isiknowledge.com>), the articles and documents listed in the bibliographic catalogue on the marine environment of New Caledonia compiled by Fromaget and Richer de Forges (1992), the articles and other reports listed in Barré and Dutson’s (2000) commented list of New Caledonian birds, unpublished reports by researchers from ORSTOM / IRD archived at the IRD library, Nouméa, unpublished reports by researchers from CIRAD / IAC, Port-Laguerre, and the collection of articles, books, and unpublished reports archived at Société calédonienne d’ornithologie (SCO), Nouméa, which currently is the only birdwatcher association of New Caledonia and BirdLife International affiliate since 2000. Many of the reports presently archived at SCO were collected during the BirdLife Int. project on important bird areas or IBAs in New Caledonia (Spaggiari *et al.* 2006). Additional, unpublished reports were provided by Direction des ressources naturelles of the province Sud government, Nouméa.

The term ‘seabirds’ as it is used here follows Harrison (1995), and includes all species of the families Diomedidae, Procellariidae, Hydrobatidae, Phaethontidae, Pelecanidae, Sulidae, Phalacrocoracidae, Fregatidae, and Laridae. We added to this list the Osprey (Accipitridae) and the Beach Thick-knee (Burhinidae) as these two species rely mainly, if not exclusively, on marine

resources and nest on the shore or on islets in the lagoon. The taxonomy used in the present list followed Brooke (2004) for Diomedidae, Procellariidae and Hydrobatidae, and Marchant and Higgins (1990, 1993) and Higgins and Davies (1996) for the other seabird families.

Results and Discussion

The present paper compiled the data on seabirds from 42 articles in scientific journals, 7 books and 38 other reports, to which a few unpublished observations were added. The updated list of New Caledonian seabirds, by region, is presented in Table 1. Although we may have missed some valuable contributions, we believe that the list presented here is likely to be exhaustive regarding the seabird species currently known to breed in New Caledonia. Fifty-nine seabird species, belonging to 26 genera, from 11 families were thus listed in total. Among them, 28 were confirmed breeders in New Caledonia. We did not include the Grey Petrel, *Procellaria cinerea* in our list of 59, as the location where it was collected was not precise enough ("off the coast, between Noumea and Australia"; Layard and Layard 1882). Neither did we include Beck's Petrel, *Pseudobulweria becki* in that list. Beck's Petrel, which was unrecorded since 1929 and considered as possibly extinct, was recently sighted in the Coral sea (BirdLife International 2006). This observation took place near Cato island, in Australian waters (R. Baxter, in litt.) and not strictly within New Caledonian waters. However, since Beck's Petrel's colonies historically were, and presumably still are located in the Solomon islands, it is likely from R. Baxter's sighting that its zone of foraging includes a wide part of the northern Coral sea and is therefore likely to extend to New Caledonian waters.

Among the species that breed in New Caledonia, two (Gould's Petrel, *Pterodroma leucoptera*, White-throated Storm Petrel *Nesofregatta fuliginosa*) are considered by the World conservation union (IUCN) as vulnerable, and two other species (Tahiti Petrel, *Pseudobulweria rostrata*, Beach Thick-knee, *Esacus magnirostris*), as near-threatened (IUCN 2006). Some other species have been extirpated from regions where they bred until recently: *Sula dactylatra* and *S. leucogaster* signalled as breeders in the southern lagoon (de Naurois and Rancurel 1978) no longer nest there. Idem, *Sterna nereis exsul* on Grande Terre (Layard and Layard 1882). We consider the latter to be the most endangered of all New Caledonian seabirds (see below). The Herald Petrel, *Pterodroma heraldica*, has not been observed on the Chesterfield islands since the collection of two presumed breeding adults, presumably on those islands in 1858-1860 (Bourne *et al.* 2005). The seabird fauna, and the fragile vegetation and soil of the Chesterfield islands were subsequently devastated by whalers and by guano-extraction activities (Bourne *et al.* 2005). This may have extirpated Herald Petrels from the Chesterfield islands. Last, the Silver Gull, *Larus novaehollandiae forsteri*, was said to breed in large numbers on the Huon islands, d'Entrecasteaux reef, at the end of the 19th century (Layard and Layard 1882) but subsequent reports have not mentioned it there.

Four of the breeding species are represented by subspecies considered to be endemic, including two Procellariidae (New Caledonian Petrel, *Pterodroma leucoptera caledonica* and Tahiti Petrel, *Pseudobulweria rostrata trouessarti*), and two Laridae (Silver Gull, *Larus novaehollandiae forsteri* and Fairy Tern, *Sterna nereis exsul*). We restricted the following species account to those 4 endemics. This account includes details on their taxonomy and systematics, their distribution and their current conservation status.

Table 2 is a provisional list of the voucher specimens available for a number of species, including two of the four endemics.

New Caledonian Petrel, *Pterodroma leucoptera caledonica* de Naurois, 1978

Gould's Petrel (*Pterodroma leucoptera*) breeds only in Australia and New Caledonia. The Australian subspecies *P. l. leucoptera* is restricted to two closely distant breeding locations – Cabbage Tree island and Boondelbah island at the entrance to Port Stephens, New South Wales (Marchant and Higgins 1990; Priddel and Carlile 1997; Brooke 2004).

A form of Gould's Petrel breeding in the mountains of New Caledonia was discovered by de Naurois (1978) during his studies of Petrels in New Caledonia. This author first recognized New Caledonian Gould's Petrel as a distinct subspecies on the basis of larger bill and paler plumage on the back, wings and sides of chest (Imber and Jenkins 1981) but eventually changed his mind because he believed that the old Australian *P. leucoptera* specimens he had compared his New Caledonian specimens to were too few to ascertain the distinction, hence the validity of the new subspecies (Imber and Jenkins 1981; Palma and Tennyson 2005). Morphometrics subsequently allowed Imber and Jenkins (1981) to assign specimens of Gould's Petrels washed up on the shores of New Zealand's North island between 1942 and 1980 to the New Caledonian subspecies. The New Caledonian Petrel is clearly distinct from its close Australian relative, hence it was considered a valid subspecies (Imber and Jenkins 1981). These authors considered de Naurois (1978) as the authority for the new subspecies, as "he provided an available name, a breeding locality and some valid characters" although he did not formally describe the subspecies nor designate a type specimen. Imber and Jenkins (1981) nevertheless understood that the specimens studied by de Naurois (1978), now deposited at Museum National d'Histoire Naturelle, Paris, were the types of *P. leucoptera caledonica*, but Palma and Tennyson (2005) recently considered otherwise and designated a specimen from New Caledonia preserved at the American Museum of Natural History as lectotype (Table 2). Palma and Tennyson (2005) also proposed that the authorship of the subspecies be ascribed to Imber and Jenkins (1981), instead of de Naurois (1978) as it is currently cited in major ornithological publications (e.g. Marchant and Higgins 1990; del Hoyo 1992; Dickinson 2003).

This subspecies breeds in New Caledonia and Vanuatu (Tana island: V. Bretagnolle, in Brooke 2004). New Caledonian Petrel breeding sites in New Caledonia are the steep, vegetated slopes of the central chain of mountains at 400-650 m above sea level (de Naurois 1978; V. Bretagnolle, in Brooke 2004). The population size of New Caledonian Petrel is estimated to be on the order of 1,000 – 10,000 pairs (V. Bretagnolle, in Brooke 2004).

Tahiti Petrel, *Pseudobulweria rostrata trouessarti* Brasil, 1917

The Tahiti Petrel is widespread in the South West Pacific. Its breeding locations include the Society islands, the Gambier archipelago, the Marquesas islands, Fiji, and New Caledonia (Villard *et al.* 2006, and references therein).

Two subspecies are currently recognized for Tahiti Petrel, namely *Pseudobulweria r. rostrata* and *P. r. trouessarti*. Brasil's (1917) recognition of the New Caledonian form of Tahiti Petrel as a distinct subspecies was later challenged by Murphy and Pennoyer (1952). However, a morphometric analysis of 14 individuals from New Caledonia and 13 from Tahiti confirmed the distinctness of the New Caledonian Tahiti Petrels, on the basis of its heavier bill and longer tarsus (de Naurois and Erard 1979), hence validating Brasil's (1917) taxonomy. Further biometric measurements have confirmed the distinction between *P. r. trouessarti* and *P. r. rostrata* (the other subspecies) from Polynesia (Villard *et al.* 2006). Based on mitochondrial-DNA (cytochrome *b* gene) sequences, Bretagnolle *et al.* (1998) reported that *P. r. trouessarti* differed from Polynesian *P. r. rostrata* by 0.6% nucleotide divergence, which was less than the divergences estimated between nominal species in *Pseudobulweria* and in *Pterodroma*. Additional biometric and genetic data for those and geographically intermediate samples are nevertheless needed to confirm whether *P. r. trouessarti* is a valid subspecies, and whether it eventually would deserve specific rank.

In New Caledonia, the Tahiti Petrel breeds in small scattered colonies on the mountain slopes of Grande-Terre up to 1000 m or more, and on coral and rocky islets in the lagoon (Spaggiari *et al.* 2006; Villard *et al.* 2006, and references therein). Tahiti Petrels are frequently observed from the outer reef to further offshore (Baudat-Franceschi 2006; BirdLife International 2006; Borsa 2006). Individuals are regularly encountered along roads or near villages, up to 45 km from the sea in northern Grande-Terre (Baudat-Franceschi 2006).

The Tahiti Petrel, which digs its burrow under arbustive or forested cover, is threatened by introduced predators (feral pigs and cats, and dogs) and habitat destruction (grazing ungulates, fires and open-cast mining). As those threats occur in many of the islands of the tropical southern Pacific, that is overall almost its whole breeding range, the survival of Tahiti Petrels depends on the long-term preservation of forested terrestrial island ecosystems in the Pacific. The current population size of Tahiti Petrel in New Caledonia is unknown. An estimate of population size has only been provided for the Southern lagoon (ca. 100 pairs; Pandolfi-Benoît and Bretagnolle 2002).

New Caledonian Silver Gull, *Larus novaehollandiae forsteri* Mathews, 1912

Three subspecies of Silver Gull have been recognized following the review of Johnstone (1982) : *L. n. novaehollandiae*, which is distributed along the shores of Australia and Tasmania, *L. n. scopulinus*, which occurs in New Zealand and in the Chatham, Snares, Auckland and Campbell islands, and *L. n. forsteri* in New Caledonia (Higgins and Davies 1996). Silver Gulls are occasional visitors to Lord Howe and Norfolk islands, and southern New Guinea. They have also been sighted in Vanuatu (Higgins and Davies 1996).

Silver Gulls from New Caledonia have distinct wing patterns to birds from Queensland (Johnstone 1982), with which they were earlier thought to be of the same subspecies, while recognized as different from those of southern Australia and Tasmania (Dwight 1925, in Higgins and Davies 1996). Although abundant morphometric data are currently available for *L. n. novaehollandiae* and *L. n. scopulinus* (Higgins and Davies 1996), no data was mentioned by these authors for *L. n. forsteri*. More study is therefore needed to clarify the patterns of geographical variation in Silver Gulls and, in particular, to characterize the New Caledonian subspecies. We believe this should be based on morphometrics, coupled with molecular population genetics. Novel microsatellite markers for Silver Gull (Given *et al.* 2002) should prove adequate tools to investigate population structure and gene flow patterns between populations.

New Caledonian Silver Gulls forage on the sandy, coralline or rocky beaches and nearby reefs, beach-rock platforms, mudflats, and sand banks. They also catch small fish swimming at the surface. On land, Silver Gulls are generally attracted to sites of human waste, such as fish landing docks and dumps. They breed on both low vegetated islets and rocky islets of the lagoon around Grande Terre (Pandolfi-Benoît and Bretagnolle 2002; Baudat-Franceschi 2006). As its population size in the Southern lagoon is < 1,500 pairs (Pandolfi-Benoît and Bretagnolle 2002), and that of the Northern lagoon is < 500 pairs (Baudat-Franceschi 2006), the total population size of New Caledonian Silver Gull, non-breeders included, is likely to be no more than within the few thousands.

New Caledonian Fairy Tern, *Sterna nereis exsul* Mathews 1912

Three subspecies are currently recognized that differ mainly in size, one each for Australia and Tasmania (*S. n. nereis*), New Zealand (*S. n. davisae*), and New Caledonia (*S. n. exsul*) (Higgins and Davies 1996). The Australian-Tasmanian population of Fairy Tern is the largest, with ca. 3,000-9,000 individuals, and that of New Zealand is the smallest (8 breeding pairs), with intermediate population size for New Caledonia (with, perhaps, ca. 100 breeding pairs) (Brunton and Baling 2005; Baling *et al.* 2006b, and references therein).

Brunton and Baling (2005) produced mitochondrial DNA nucleotide sequences (1,041 base pairs of the ND2 gene) for samples of Fairy Tern from western Australia, southeastern Australia, New Zealand and New Caledonia. A salient feature of the parsimony network of Fairy Tern haplotypes (Fig. 2 of Brunton and Baling 2005) was the long branch (0.5% nucleotide divergence) separating the unique New Caledonian haplotype from that of New Zealand, the latter being in turn separated from a cluster of Australian haplotypes by ca. 0.3% nucleotide divergence. Conversely, populations as far apart as those from western and southeastern Australia shared the same, major haplotype. In other terms, on the basis of the available data, the three Fairy Tern subspecies are geographically isolated

from each other, reaching relatively strong levels of genetic divergence and forming reciprocally monophyletic lineages. To our opinion, specific rank might well be justified for the current subspecies of Fairy Tern. Further genetic studies on Fairy Tern populations including, if possible, the analysis of samples from an intermediate location for which no data are currently available (the Chesterfield and Bampton atolls) may help address that question.

Until recently, the New Caledonian Fairy Tern was known to breed only on small coral islets of the Southern lagoon, including the islets immediately south to Nouméa (Layard and Layard 1878), Kouaré islet (Rancurel 1976) and Redika islet (P.B., unpubl. obs. in 1993: 12 pairs). The breeding population was estimated to be <10 pairs in the mid-1990s (Pandolfi-Benoît and Bretagnolle 2002). More recently, the population size in the Southern lagoon was estimated to be <20 pairs, breeding on 3 islets including Kaé islet and Atiré islet, with a very low reproduction success as checked at the fledgling stage (Brunton and Baling 2005; Baling *et al.* 2006b). Fairy Terns were reported to also breed in the Chesterfield islands (Rancurel 1976; de Naurois et Rancurel 1978). The islets off the northwestern coast of Grande Terre have recently been identified as a key area for the New Caledonian Fairy Tern (N. Baillon, N.B., J.B-F. unpubl.). Overall, the population is considered to be declining, owing to human disturbance at nesting sites (Brunton and Baling 2005; Baling *et al.* 2006b). As the status of Fairy Tern in New Caledonia is now highly critical, drastic steps for its conservation should be taken urgently. Considerable effort has been devoted in New Zealand to achieve similar objectives, not without some success (Ferreira *et al.* 2005).

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Table 1 Updated list of New Caledonian seabirds, by region. *Chest.* Chesterfield- Bampton islands; *d'Entr.* d'Entrecasteaux reef; *Loyalty* Loyalty islands; *Gde Terre* Grande Terre and Isle of Pines; *N. Lag.* Northern lagoon; *S. Lag.* Southern lagoon; *Walpole* Walpole island; *Matthew* Matthew island; *Hunter* Hunter island; *o* observed; breeding status: *b* confirmed breeder; *l* likely breeder. *At sea* at-sea records: *o* records for which references were provided (for all non-breeding and for some rarely observed species); + many records, for which references were not provided. References: 1. Bourne (1967); 2. Delacour (1966); 3. Hannecart and Létocart (1983); 4. MacDonald and Lawford (1954); 5. Warner (1947); 6. J.S., unpubl. obs. in 2006; 7. Anonymous (1996); 8. Barré *et al.* (2006a); 9. Chapman (1983); 10. Rancurel (1976); 11. P.B., unpubl. obs. in 2002; 12. Layard and Layard (1882); 13. Barré and Dutson (2000); 14. Barré *et al.* (2006b); 15. Baudat-Franceschi (2006); 16. Bedin (1996); 17. Bell (1998); 18. Beugnet *et al.* (1993); 19. Bourne *et al.* (2005); 20. Condamin (1977); 21. Condamin (1978); 22. Condamin (1979); 23. de Naurois and Rancurel (1978); 24. Desmoulins and Barré (2006); 25. Kusser and Suprin (1990); 26. Lambert (1987); 27. Pandolfi-Benoît (1993a); 28. Pandolfi-Benoît (1993c); 29. Pandolfi-Benoît and Bretagnolle (2002); 30. Rancurel (1973a); 31. Rancurel (1973b); 32. Robinet, Craig and Chardonnet (1998); 33. Robinet *et al.* (1997); 34. SCO (1996); 35. Spaggiari and Barré (2003); 36. Spaggiari and Barré (2005); 37. Villard (2002a); 38. Villard (2002b); 39. Villard (2003); 40. T. Walker and F. Savage, in Bourne *et al.* (2005); 41. Bourne (1984); 42. Meeth and Meeth (1983); 43. Layard and Layard (1878a); 44. Gray (1859); 45. Mayr (1945); 46. Bourne (1966); 47. Jespersen (1933); 48. Borsa (2004); 49. de Naurois (1978); 50. de Naurois and Erard (1979); 51. Hannecart (1988); 52. Spaggiari and Barré (2004); 53. Villard and Barré (2002); 54. Villard *et al.* (2006); 55. obs. by F. Hannecart in 1981 (pers comm.); 56. Salvin (1888); 57. Spaggiari *et al.* (2006); 58. Gibson (1960); 59. P.B., unpubl. obs. in 2004; 60. Bretagnolle (2001); 61. Imber and Jenkins (1981); 62. J.S., unpubl. obs. in 2005; 63. Bourne (1970); 64. Barritt (1975); 65. de Naurois and Rancurel (1978); 66. Sullivan (1928); 67. Condamin and de Naurois (1987); 68. Godard (1982); 69. Layard and Layard (1880); 70. Pandolfi-Benoît (1993b); 71. Sirgouant (1994); 72. Villard (2001); 73. Borsa (2006); 74. Cohic (1959); 75. Costa and Thévenon (1987); 76. Hamel (1993); 77. Hannecart and Laplagne (1969); 78. Kusser (1986); 79. Rancurel (1974); 80. Barré and Géraux (2004); 81. Hannecart and Létocart (1980); 82. Manceau and Barré (2001); 83. Bretagnolle *et al.* (2001); 84. Bruce (1978); 85. Bruce (1985); 86. Condamin (1978); 87. obs. by G. Dutson in 2003 (pers comm.); 88. Barré and Bachy (2003); 89. Baling *et al.* (2006b); 90. Bretagnolle and Pandolfi-Benoît (1997); 91. de Naurois (1985); 92. MacMillan (1938); 93. J.B-F., unpubl. obs. in 2006; 94. N.B., unpubl. obs. in 2005; Borsa and Boiteux (2007).

Table 1

Family, Species	Vernacular name	Region of New Caledonia									At sea	References	
		Chest..	d'Entr.	Loyalty	Gde Terre	N. Lag.	S. Lag.	Walpole	Matthew	Hunter			
Diomedidae													
<i>Diomedea exulans</i>	Wandering Albatross											o	1, 2, 3, 4, 5
<i>Diomedea antipodensis</i>	Antipodean Albatross											o (dead)	6
<i>Diomedea epomophora</i>	Southern Royal Albatross											o (dead)	7
<i>Thalassarche melanophrys</i>	Black-browed Albatross											o	2, 3, 5
Procellariidae													
<i>Macronectes giganteus</i>	Southern Giant Petrel											o	3
<i>Macronectes halli</i>	Northern Giant Petrel											o	8
<i>Daption capense</i>	Cape Petrel											o	9, 10, 11
<i>Procellaria cinerea</i>	Grey Petrel											o	12
<i>Calonectris leucomelas</i>	Streaked Shearwater											o	13
<i>Puffinus pacificus chlororhynchus</i> ¹	Wedge-tailed Shearwater	b	b	b	b	b	b	o	o	b		+	10, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40
<i>Puffinus bulleri</i>	New Zealand Shearwater											o	95
<i>Puffinus carneipes</i>	Flesh-footed Shearwater											o	11, 41, 95
<i>Puffinus griseus</i>	Sooty Shearwater											o	4, 13, 42
<i>Puffinus tenuirostris</i>	Short-tailed Shearwater											o	5, 13, 15, 42, 43, 93
<i>Puffinus garia</i>	Fluttering Shearwater											o	2, 4, 43, 44, 45
<i>Puffinus lherminieri gunax</i>	Audubon's Shearwater											o	2, 8, 45
<i>Puffinus assimilis</i>	Little Shearwater											o	46, 47
<i>Pseudobulweria rostrata trouessarti</i>	Tahiti Petrel			o	b	b	b		o	o		+	2, 12, 14, 15, 17, 29, 48, 49, 50, 51, 52, 53, 54, 55, 95
<i>Pterodroma neglecta</i>	Kermadec Petrel											o	59
<i>Pterodroma heraldica</i> ²	Herald Petrel						l					o	1, 8, 15, 19, 45, 56, 57
<i>Pterodroma solandri</i>	Providence Petrel						o					o	58, 59
<i>Pterodroma inexpectata</i>	Mottled Petrel											o	1, 13
<i>Pterodroma brevipes</i>	Collared Petrel											o	8
<i>Pterodroma leucoptera caledonica</i>	New Caledonian Petrel					b		o	o	l		+	10, 45, 49, 51, 60, 61
<i>Pterodroma cookii</i>	Cook's Petrel											o	11, 42
<i>Pterodroma cervicalis</i>	White-necked Petrel											o	42
<i>Pterodroma nigripennis</i>	Black-winged Petrel			o		l	b		o	l		+	15, 21, 22, 29, 42, 51, 55, 61

Table 1 (continued)

Family, Species	Vernacular name	Region of New Caledonia								At sea	References	
		Chest.	d'Entr.	Loyalty	Gde Terre	N. Lag.	S. Lag.	Walpole	Matthew			Hunter
Hydrobatidae												
<i>Oceanites oceanicus</i>	Wilson's Storm Petrel					o					o	3, 12, 15, 43, 45, 62, 93
<i>Fregatta grallaria</i>	White-bellied Storm-Petrel										o	4, 63
<i>Nesofregatta fuliginosa</i> ⁵	White-throated Storm Petrel										o	13, 64
Phaethontidae												
<i>Phaethon lepturus</i>	White-tailed Tropicbird			l				b	o	o	o	14, 21, 37, 51, 57, 65, 66
<i>Phaethon rubricauda</i>	Red-tailed Tropicbird	b	b	b				o	b	b	b	10, 12, 14, 21, 31, 32, 33, 34, 37, 48, 51, 57, 59, 65, 66, 67, 68, 69, 70, 71, 72
Pelecanidae												
<i>Pelecanus conspicillatus</i>	Australian Pelican					o						3
Sulidae												
<i>Sula serrator</i>	Australasian Gannet					o						13
<i>Sula dactylatra personata</i> ⁴	Masked Booby	b	b	b		b	b		b	b	+	10, 14, 15, 16, 19, 21, 25, 26, 27, 28, 30, 33, 34, 40, 48, 51, 57, 65, 72, 73, 74, 75, 76, 95
<i>Sula sula rubripes</i> ⁵	Red-footed Booby	b	b	o			b	b		b	+	10, 14, 17, 19, 20, 21, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 37, 39, 40, 57, 65, 70, 71, 73, 74, 76, 77, 78, 79, 95
<i>Sula leucogaster plottus</i> ⁶	Brown Booby	b	b	b		b	b	b	b	b	+	10, 14, 15, 16, 19, 20, 21, 25, 26, 27, 28, 30, 31, 33, 34, 37, 40, 51, 57, 65, 67, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 95
Phalacrocoracidae												
<i>Phalacrocorax carbo</i>	Great Cormorant				b							13, 80
<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant	o										13, 20, 68, 80, 81
<i>Phalacrocorax melanoleucos melanoleucos</i>	Little Pied Cormorant		o		b						+	13, 28, 68, 80, 81
Fregatidae												
<i>Fregata ariel ariel</i>	Lesser Frigatebird	b	b	o		o		b		b	+	10, 12, 14, 15, 19, 21, 30, 31, 32, 33, 34, 37, 38, 40, 51, 65, 69, 71, 72, 74, 76, 82, 93
<i>Fregata minor</i>	Great Frigatebird	b	b	o		o		b	o	b	+	10, 14, 15, 19, 20, 21, 28, 30, 31, 32, 33, 34, 37, 40, 48, 51, 65, 69, 70, 71, 74, 76, 79, 82, 93, 95

Table 1 (continued)

Family, Species	Vernacular name	Region of New Caledonia									At sea	References	
		Chest.	d'Entr.	Loyalty	Gde Terre	N. Lag.	S. Lag.	Walpole	Matthew	Hunter			
Accipitridae													
<i>Pandion haliaetus leucocephalus</i>	Osprey			o	b	b	b					+	10, 15, 45, 81, 83, 84
Burhinidae													
<i>Esacus magnirostris</i> ⁷	Beach Thick-knee					b							3, 12, 15, 85, 86
Laridae													
<i>Catharacta macrorhynchos</i>	South Polar Skua											o	13, 42
<i>Stercorarius pomarinus</i>	Pomarine Jaeger				o								87
<i>Stercorarius parasiticus</i>	Arctic Jaeger											o	9, 10, 13
<i>Larus novaehollandiae forsteri</i> ⁸	Silver Gull			o	o	b	b					+	5, 14, 15, 17, 29, 39, 43, 44, 51, 81, 82
<i>Sterna bergii cristata</i>	Great Crested Tern	b	o	b		b	b					+	5, 10, 12, 14, 15, 19, 23, 29, 30, 37, 38, 39, 40, 43, 51, 57, 68, 72, 82
<i>Sterna dougallii bangsi</i>	Roseate Tern			o		b	b					+	5, 10, 12, 13, 14, 15, 19, 23, 29, 38, 39, 40, 51
<i>Sterna sumatrana sumatrana</i>	Black-naped Tern	o	b	o		b	b					+	4, 10, 14, 15, 19, 23, 29, 32, 33, 38, 39, 40, 51
<i>Sterna albifrons sinensis</i>	Little Tern				o		o					+	88
<i>Sterna nereis exsul</i> ⁹	Fairy Tern	b				b	b					+	4, 10, 12, 15, 17, 23, 29, 39, 45, 51, 89, 94
<i>Sterna anaethetus</i>	Bridled Tern		o			b	b					+	10, 15, 17, 23, 29, 39, 57, 90, 91
<i>Sterna fuscata serrata</i>	Sooty Tern	b	b	b		b	l	o	b	o		+	10, 15, 19, 20, 21, 23, 26, 30, 31, 32, 33, 34, 39, 40, 48, 51, 57, 64, 67, 70, 73, 75, 76, 77, 78, 92, 94
<i>Anous stolidus pileatus</i>	Common Noddy	b	b	o		b	b	b	b	b		+	5, 10, 14, 15, 16, 17, 19, 20, 21, 23, 25, 26, 28, 29, 30, 31, 32, 33, 34, 39, 40, 51, 67, 71, 73, 76, 78, 95
<i>Anous minutus minutus</i>	Black Noddy	b	b			l	b	b			b	+	5, 10, 15, 17, 19, 21, 23, 25, 27, 29, 30, 32, 39, 40, 51, 57, 67, 76, 73, 93, 95
<i>Cygis alba candida</i>	White Tern	o						b	o	l		+	10, 51, 59, 67, 71
<i>Procelsterna albirivitta</i>	Grey Noddy							b	b	b		+	10, 21, 31, 48, 51, 57, 67

¹ One observation, of a light-phase individual, done in June 2005 at Yaté, Grande Terre (V. Chartendault, pers. comm.); dark phase otherwise (see Plates); ² Known in the Chesterfield islands from the two specimens presumed to have been collected there by HMS *I Herald* in 1858-1860 (Bourne et al. 2005). Not observed in the Chesterfield islands since then; ³ Reported as breeder in New Caledonia (BirdLife International 2000); ⁴ Historical breeder in the Southern lagoon, until 1974 (de Naurois and Rancurel 1978); ⁵ Dark and light phases in similar proportions in New Caledonia (Rancurel 1976); ⁶ Historical breeder in the Southern lagoon, until 1974 (de Naurois and Rancurel 1978); ⁷ Historical breeder on Huon island, d'Entrecasteaux reef and also reported from the eastern coast of Grande Terre by Layard and Layard (1882); ⁸ Historical breeder in d'Entrecasteaux reef (Layard and Layard 1882); ⁹ Historical breeder on Grande Terre (Layard and Layard 1882)

Table 2. Voucher specimens for New Caledonian seabirds. *NHM* Natural History Museum, London; *MNHN* Muséum national d'histoire naturelle, Paris; *AMNH* American Museum of Natural History, New York; *MV* Museum Victoria, Melbourne.

Species	Collection (specimen nos.)	Comments	Reference
<i>Pseudobulweria rostrata trouessarti</i>	MNHN	Type specimen studied by Brasil (1917) and 12 skins and skeletons collected by de Naurois (1978)	de Naurois and Erard (1979)
	MNHN, AMNH, NHM	Several specimens studied by Villard <i>et al.</i> (2006)	Villard <i>et al.</i> (2006)
<i>Pterodroma heraldica</i>	NHM (nos. 62.6.22.10 and 88.5.18.110)	Two specimens assumed to have been collected by H.M.S. <i>Herald</i> in the Chesterfield in 1858-1860	Boume <i>et al.</i> (2005)
<i>Pterodroma leucoptera caledonica</i>	AMNH (no. 824271, coll. No. NC20)	Specimen designated lectotype by Palma and Tennyson (2005)	Palma and Tennyson (2005)
	MNHN	Several specimens from Monts Dzumac collected by de Naurois	Imber and Jenkins (1981)
<i>Sterna dougallii</i>	F. Hannecart, private collection	Two stuffed specimens	F. Hannecart, pers. comm.
<i>Anous stolidus</i>	MV	One specimen from Observatory Islet, Middle Bellona Reefs	Boume <i>et al.</i> (2005)



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Adult Gould's Petrel (*Pterodroma leucoptera caledonica*) at the entrance of its burrow, Monts Dzumac, Grande Terre



© SCO/Nicolas Barré

Juvenile Tahiti Petrel (*Pseudobulweria rostrata trouessarti*), shore of Lac Yaté, Grande Terre



© SCO/Robert Aublin

Pair of Wedge-tailed Shearwaters (*Puffinus pacificus*) at Pindai colony, Grande Terre



© SCO/Robert Aublin

Juvenile Lesser Frigatebird (*Fregata ariel*) at Surprise island, d'Entrecasteaux reef



© IRD/Philippe Borsa

Red-tailed Tropicbird (*Phaeton rubricauda*) at Hunter island



© SCO/Étienne Spaggiari

Masked Booby (*Sula dactylatra*), adult and chick, Matthew island



© IRD/Philippe Borsa

Brown Noddy (*Anous stolidus*) at Kouaré islet, southern lagoon



© SCO/Étienne Spaggiari

Adult White Tern (*Gygis alba*) nesting on Walpole island



© SCO/Robert Aublin

Adult Silver Gull (*Larus novaehollandiae forsteri*), Grande Terre



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Grey Noddies (*Procelsterna albivitta*) on Matthew island



© SCO/Pierre Bachy

Roseate Tern (*Sterna dougalli*) on Signal island, southern lagoon



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Fairy Tern (*Sterna nereis exsul*), southern lagoon



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Dead coral and sand banks devoid of vegetation: Sèche-Croissant cayes, southern lagoon



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Low islet of coral sand covered by vegetation: Redika islet, southern lagoon



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Rocky islet: Mato islet, southern lagoon



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Steep and forested slopes of the central chain of mountains: Koniambo massif, Grande Terre

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