**Frigatebirds *Fregata* Supplementary Material**

**Appendix A. Estimates of breeding populations for *Fregata ariel* and *Fregata minor* (sens. lat.)**

The tables below are not intended to summarise the earlier (e.g. before 1960’s) historical records. They are intended to provide the most recent published counts, together with previous reasonably reliable counts/estimates for comparison, while also including reference to all breeding sites cited by standard reference works (e.g. Marchant & Higgins 1990; Nelson 2005; Safford & Hawkins 2013) and important reviews (e.g. Sibley & Clapp 1967; Diamond & Schreiber 2020; Gauger Metz & Schreiber 2020). Abundances in parentheses are inferred from the reference cited. All estimates refer to annual breeding numbers (pairs, unless indicated otherwise). Because a proportion of the population may breed only biennially, the total number of mature breeding individuals or pairs will be greater than the annual estimate.

**Table 1. Breeding population estimates for Lesser Frigatebirds (*Fregata ariel ariel*) in Australian and adjacent waters.**

**Site Breeding pairs Date Reference**

Cocos (Keeling) Is 3,000 birds 1982 Stokes et al. 1984 3,000 pairs 2003 BirdLife International 2023a 711 active nests 2019 Clarke et al. 2021

Christmas I. >10 1990-2007 James & McAllan 2014

***Australia*** 18,700-19,400 Ross et al. 1995

 17,350-18,250 References below (footnote 1)

*Western Australia*

Adele Is. c. 5,000 1945 Fowler in Serventy 1952

 2,000-4,000 1972 Smith et al. 1978

 2,000+ (partial count) 1978 Abbott 1979

 5,700 1982 Burbidge et al. 1987

West Lacepede I. 2,700 1982 Burbidge et al. 1987

Bedout I. 2,000 1972 Bush & Lodge 1977

 900 1975 Kolichis 1977

 300 1978 Abbott 1979

2,290 1982 Burbidge et al. 1987

 1,113 1984 Burbidge et al. 1987

Ashmore Reef:

Middle I. 2,504 adults 2010 Clarke et al. 2011

East I. 1,773 adults 2010 Clarke et al. 2011

*Queensland*

Manowar I. 1,049 1982 Garnett & Crowley 1987

Raine I. c. 2,000 1975-1985 King 1986

 1,750 1997 Batianoff 2000

 1,851 1979-1993 Batianoff & Cornelius 2005

 599 1994-2003 Batianoff & Cornelius 2005

Saunders Is (Magra I.) Breeds Woodworth et al. 2021

Quoin I. 156 1981 King & Buckley 1985

 0 1982 King & Buckley 1985

Stapleton I. Breeds (footnote 2) 1979-2018 Woodworth et al. 2021

Swain Reef (Bell Cay) 44 1976 Limpus & Lyon 1981

 111 1985 Walker & Jones 1986

 187 1986 Walker & Jones 1986

Wreck Reef (Bird I.) 300 1960 Hindwood et al. 1963

 1 1990 T. Walker in Bourne et al. 2005

Cato I. 215 1960 Hindwood et al. 1963

 550 (birds?) 1990 T. Walker in Bourne et al. 2005 Magdelaine Cays Breeds ? Marchant & Higgins 1990

Diamond Is 1,079+ No date Marchant & Higgins 1990

Lihou Reef 382+ 1984 Marchant & Higgins 1990

Coringa-Herald Is NNR:

Chilcott I. 928 birds 1986 Marchant & Higgins 1990

SW Islet 3 1986 Marchant & Higgins 1990

NE Cay 1,337 1984 Marchant & Higgins 1990

 685 1986 Marchant & Higgins 1990

 2,500 1997 Batianoff 2000

 c. 1,920 (footnote 3) 1992-97 Baker et al. 2008

 c. 1,200 (footnote 3) 1998-2007 Baker et al. 2008

 168 2012 Baker & Holdsworth 2013

***Papua New Guinea***

St Matthias Is:

Tench I. Breeds Dutson 2011

Ekalau I. Extirpated?

New Ireland:

Nuguria I. Breeds Dutson 2011

Bougainville:

Trigoi I. (Nakumanu Is) Breeds Hadden 2004 (footnote 4)

***New Caledonia***

Chesterfield Is 1,550-1,600 1997-2009 Borsa et al. 2010

d’Entrecasteaux Reefs:

Surprise I. 9 Feb 2021 M. Philippe-Lesaffre in litt. 2023

 1,152 July 2021 M. Philippe-Lesaffre in litt. 2023

Walpole I. (Loyalty Is) 250 1993 Barré & Dutson 2000

Hunter I. 250+/-50 2018 Borsa & Baudat-Franceschi 2023

*Footnotes*

1. Sum of most recent count(s), those of birds/adults divided by two to convert to pairs.

2. Present but not breeding in 1984 and 1985 (King 1985)

3. Based on an 8-year mean ratio of 40:60 Great:Lesser Frigatebirds (Baker et al. 2008) applied to totals of c. 3,200 pairs (1992-1997), c. 2,000 pairs (1998-2007) and 419 pairs (2012; Baker & Holdsworth 2013)

4. Not seen; based on entry in BirdLife International’s Pacific Region seabird database (consulted Feb. 2023).

**Table 2. Breeding population estimates for Lesser Frigatebirds (*Fregata ariel ariel*) in the Pacific Ocean and adjacent waters.**

**Site Breeding birds/pairs Date Reference**

***Marshall Islands*** See footnote 1

*Gilbert Islands:*

Nonuiti (Nomuti) Breeds 1953-56; 1963 Child 1960; Morris 1963

Onotoa Breeds 1951 Moul 1954

***Palau***

Helen I. Breeds (still extant?) Pratt & Etpison 2008

***Kiribati***

*Line Islands*:

Teraina (Washington I.) Breeds? 1964 Sibley & Clapp 1967

 Not breeding 2019 R. Pierce in litt. (Pierce et al. 2019)

Kiritimati (Christmas I.) 5,000 birds Perry 1980

 1,000+ breeding birds 1960 Gallagher 1962

 1,000 nests 1964 Schreiber & Ashmole 1970

2,500-4,500 c.1980-82 Garnett 1983 (footnote 2)

1,000-2,000 1997 E.A. Schreiber in litt. 2022

c. 4,000 2007-09 R. Pierce in litt. 2023

Malden 7,000 birds 1964 Sibley & Clapp 1967

 15,000 2015 Pierce et al. 2015a

Tabuaeran Not breeding 2019 R. Pierce in litt. (Pierce et al. 2019)

Starbuck 15 birds 1964 Sibley & Clapp 1967

Tongareva (Penrhyn) 150 birds 1965 Sibley & Clapp 1967

Vostok 500 birds Perry 1980

 c. 100 1965 Clapp & Sibley 1967

Caroline (Millenium) I. 1,000 birds 1964 Sibley & Clapp 1967

46 1988 Kepler et al. 1994

 c. 1,000 birds 1990 Kepler et al. 1994

Flint I. 1,500 birds 1974 Garnett 1983

*Phoenix Islands*: 38,000 1964-65 Sibley & Clapp 1967 (footnote 3)

 10,610 2006 Pierce et al. 2006

Canton I. Visitor 1964 Sibley & Clapp 1967

 50+ 2006 Pierce et al. 2006

Enderbury I. 15,000 birds 1964 Sibley & Clapp 1967

 4,000 2006 Pierce et al. 2006

McKean I. 40,000 birds 1964 Sibley & Clapp 1967

 1,500 2006 Pierce et al. 2006

 1,200 2008 Pierce et al. 2010 (footnote 4)

Rawaki (Phoenix) I. 20,000 birds 1964 Sibley & Clapp 1967

 45,000 birds 1973 Garnett 1983 (footnote 4)

 4,300 2006 Pierce et al. 2006

Manra (Sydney) I. Visitor 1964 Sibley & Clapp 1967

 100+ 2006 Pierce et al. 2006

Nikumaroro (Gardner) I. 1,000 birds 1964 Sibley & Clapp 1967

 700 birds 1967 Garnett 1983 (footnote 4)

 60 2006 Pierce et al. 2006

Orona (Hull)) I. Visitor 1964 Sibley & Clapp 1967

 600 2006 Pierce et al. 2006

***US Minor Outlying Islands***

Johnston Atoll 1 2003 E.A. Schreiber in litt. 2022

Howland 20,000 birds 1964 Sibley & Clapp 1967

 0 1986 Rauzon et al. 2011

3,850 birds 2007 Rauzon et al. 2011

Jarvis 2,500+ birds 1964 Sibley & Clapp 1967

 1,500 1982 Rauzon et al. 2011

4,000 birds 2004 Rauzon et al. 2011

Baker 60 birds (breeding?) 1965 Sibley & Clapp, 1967

16,200 birds 2002 Rauzon et al. 2011

Palmyra 5 birds 2002 Depkin 2002

***Fiji***

Lau Is:

 Naiabo I (Nayambo) (Hundred+?) 1924 Sibley & Clapp 1967

 500 birds 2011 Anderson et al. 2012 (footnote 4)

 Tuvana 200 birds 2011 Anderson et al. 2012 (footnote 4)

 Islands 1,2,4 53 birds 2011 Bird 2012 (footnote 4)

Lakemba I. 500 1924 Sibley & Clapp 1967

Vetauua 200 birds 1984 Jenkins 1986

Namena 200 birds 1984 Jenkins 1986

Rotuma (Uea I.) Breeds 1991 Cibois et al. 2019

Vatu-i-Ra 500-700 1963 R.O. Morris in Tarburton 1978

 250 nests 1974 Tarburton 1978

 60 2003 BirdLife 2023b (footnote 4)

 177 2007 Nature-Fiji 2007 (footnote 4)

 >500 (birds? status?) 2008 Roneil et al. 2008 (footnote 5)

 124 2019 Taoi & Waqa 2021 (footnote 4)

 130 2021 Taoi & Waqa 2021 (footnote 4)

Vanua Masi Islet 500 1924 Jenkins 1986

5,058 birds 2010 BirdLife International 2023c

Mabualau I. 70 empty nests 1975 BirdLife International 2023d

 500 birds 1981 Jenkins 1986

Ringgold (Nanuku) Is: Breeds 1924 R.H. Beck in Jenkins 1986

 Nukupureti 400; 1,000 1984 Jenkins 1986

 319 2010 BirdLife unpubl. (footnote 4)

 Nukubasaqa 610 nests 1984 Jenkins 1986 (footnote 4)

 9, 182 2007 Jit et al. 2007 (footnote 4)

 5, 040 2008 E. Bell unpubl. (footnote 4)

 309; 326 2009 BirdLife unpubl. 2010 (footnote 4)

 645 2010 BirdLife unpubl. 2010 (footnote 4)

Wailagilala I. Breeds? 2020 Mangubhai et al. 2021 (footnote 4)

***Tuvalu*** Breeding unproven 1981 Child 1982

***Wallis & Futuna*** Breeds? 1985-86 Thibault & Guyot 1987

Alofi I. Probably breeds 2014 Thibault et al. 2014

Uvea I. Probably breeds 2014 Thibault et al. 2014

***Tonga*** Four sites Watling 2004

Fatumanga I. Breeds? 1925 Sibley & Clapp 1967

‘Ata Breeds (few) 1990 Rinke 1991

Late Breeds (few) 1990 Rinke 1991

Fonualei Breeds (few) 2013 Butler 2019

***American Samoa***

Rose Atoll 200-425 birds 1975-76 Amerson et al. 1982

 18 1998 O’Connor & Rauzon 2004

Tutuila Breeding unproven 1998 O’Connor & Rauzon 2004

Auau’u Breeding unproven 1998 O’Connor & Rauzon 2004

***Tokelau Is*** Breeding unproven 1965 Sibley & Clapp 1967; Garnett 1984

***Cook Islands***

Suwarrow (Manu, Gull) 4,971 chicks 1992 Jones 2001 (footnote 6)

 5,509 chicks 2008 Jones 2008

***French Polynesia***

*Society Islands:*

Maupiha’a (Mopelia) I. Breeds 2000 Sanford 2000

Tetiaroa (Motu Aie) Breeds 1976 Thibault 1976 (footnote 4)

Tetiaroa May breed 2006 Faulquier 2013 (footnote 7)

*Austral Islands:* Breeding unproven 2003 Pierce et al. 2003

RimataraBreeds 1989 Seitre & Seitre 1990 (footnote 4)

*Tuamotu Islands:*

Hiti Atoll Breeds 1923 Sibley & Clapp 1967

Nengo Nengo Atoll 200 1922 Sibley & Clapp 1967

Matu Hiva I. 1+ 1923 Sibley & Clapp 1967

Rangiroa Breeds 1991 Thibault et al. 1991 (footnote 4)

Tikehau Atoll Breeds (few) c. 1984 Poulsen et al. 1985

Anuanu Runga May breed 1990 Seitre & Seitre 1990 (footnote 4)

Reitoru 1,200+ birds 2003 Pierce et al. 2003

Tahanea 310+ birds 2003 Pierce et al. 2003

*Gambier Islands* Breeding unproven 2003, 2015 Pierce et al. 2003, 2015b

*Marquesas Islands*:

Hatuta’a Breeding 1922 Sibley & Clapp 1967

 200-300 1975 Thibault 1989

 0 1987; 2007; 2010 Thibault et al. 2013

Mohotani (Motani) 1,000-1,500 birds Raust & Sanford 2007

Fatu Huka Breeds Raust & Sanford 2007

Ua Pou Breeds 1971 Thibault 1973 (footnote 4)

*Footnotes*

1. Amerson (1969) reports possible breeding for several islands and atolls but evidence very circumstantial at best.

2. Not seen; quoted by Environmental Consultants Fiji (1999). Pierce et al. (2007) reported no breeding but stated that they did not visit the known breeding site

3. Pairs derived by halving estimated number of breeding birds.

4. Not seen; based on entry in BirdLife International’s Pacific Region seabird database (consulted Feb. 2023).

5. Not seen; cited in BirdLife International (2023b)

6. Species not distinguished but the “great majority” were *F. ariel*

7. In 2006 122 frigatebird nests recorded but species not distinguished; only *F. minor* definitively recorded breeding

**Table 3. Frigatebird breeding population estimates, western Indian Ocean.**

***Fregata ariel iredalei***

**Site** **Breeding pairs** **Date** **Reference**

Europa 1,000-1,200 1993-96 Le Corre & Jouventin 1997

Aldabra 5,352 1967-68 Diamond 1975

 2,941 1976-77 Reville 1983 (Burger & Betts 2001)

 6,600 2011 [Šúr](https://www.semanticscholar.org/author/M.-%C5%A0%C3%BAr/89261476) et al. 2013

 3,500 2012 [Šúr](https://www.semanticscholar.org/author/M.-%C5%A0%C3%BAr/89261476) et al. 2013

Tromelin 1-99+ Feare 1984

 Extirpated Le Corre 1996

St Brandon 200 (Île du Sud only) 1963 Pocklington et al. 1972

 260 (Île du Sud only) 1965 Pocklington et al. 1972

 c. 500? (see footnote) 1968 Staub & Gu**é**ho 1968

Chagos Is 89 1996 Symens 1999

 239 2006 McGowan et al. 2008

 70 2008-2018 Carr et al. 2021

Maldives Breeds Feare 1984

Extirpated Safford & Hawkins 2013

***Fregata minor minor?***

Chagos Is 12 1996 Symens 1999

 164 2006 McGowan et al. 2008

 640 2008-2018 Carr et al. 2021

***Fregata minor aldabrensis***

Europa 700-1,100 1993-96 Le Corre & Jouventin 1997

Aldabra 1,820 1967-68 Diamond 1975

 2,483 1976-77 Reville 1983 (Burger & Betts 2001)

 4,400 2011 [Šúr](https://www.semanticscholar.org/author/M.-%C5%A0%C3%BAr/89261476) et al. 2013

 3,000 2012 [Šúr](https://www.semanticscholar.org/author/M.-%C5%A0%C3%BAr/89261476) et al. 2013

Cosmoledo 100’s 1970’s Rocamora et al. 2003

 8 1989 Rocamora et al. 2003

Tromelin 1-99+ Feare 1984

 Extirpated Le Corre 1996

St Brandon c. 20? (see footnote) 1968 Staub & Gu**é**ho 1968

*Footnote*: Staub & Gu**é**ho (1968) reported 2,000 **birds** (1,000 on Île Albatros, 1,000 on southern islets), about 1 in 25 of which were *F. minor*, the vast majority *F. ariel* (Safford & Hawkins 2013).Feare (1984, Table 2) reported an unreferenced overall total of 2,000 pairs of both species combined in 1975.

**Table 4. Breeding population estimates for Great Frigatebirds (*Fregata minor*) in the Pacific Ocean and adjacent waters.**

**Site Breeding birds/pairs Date Reference**

***Fregata minor minor*?**

***South China Sea***

Paracel (Xisha) Is Common 1930’s-1950’s Hsu & Melville 1994

 7 2003 Cao et al. 2003

8 2005 Cao et al. 2007

***Indonesia*** 1,700-3,500 1981, 1987 de Korte 1991

 1,100-2,200 2009 de Jong 2011

Moromaho 50-100 1987 de Korte 1991

 No breeding 2009 de Jong 2011

Kakabia 100-200 1986, 1987 de Korte 1991

 No breeding 2022 Gaston 2022

Gunung Api 200-500 1938 van Bemmel & Hoogerwerf 1940

 400-800 1981, 1987 de Korte 1991

 500-1,000 2009 de Jong 2011

Pulau Manuk 1,200-2,400 1981 de Korte 1991

 600-1,200 2009 de Jong 2011

***Australia***

***Fregata (minor) listeri***

Christmas Island 3,500 1990-2007 James & McAllan 2014

***Fregata minor minor***

Cocos (Keeling) Is1,000+ 1982 Stokes et al. 1984

*Western Australia*

Adele I. 200-300 1990 Coate 1997

Ashmore Reef 40 2010 Clarke et al. 2011

*Queensland*

Manowar I. 1 1982 Garnett & Crowley 1987

Raine I. <10 1975-1985 King 1986

Quoin I. 1-2 1980-81 King & Buckley 1985

Magdelaine Cays 57 1985 Marchant & Higgins 1990

Diamond Is 222 1984 Marchant & Higgins 1990

Coringa-Herald Is NNR:

Chilcott I. 114 1984 Marchant & Higgins 1990

SW Cay 148 1984 Marchant & Higgins 1990

 215 (footnote 2) 2007 Baker et al. 2008

NE Cay 380 1985 Marchant & Higgins 1990

 250 1986 Marchant & Higgins 1990

 932 (footnote 2) 2007 Baker et al. 2008

 251 2012 Baker & Holdsworth 2013

Coringa Group 64 1985 Marchant & Higgins 1990

 660 1986 Marchant & Higgins 1990

***Fregata minor minor?***

***Papua New Guinea***

St Matthias Is:

Tench I. Breeds Dutson 2011

Bougainville:

Tokapaita I. (Nukumanu Is) Breeds Hadden 2004 (footnote 3)

Geahuajei I. (Tukuu Atoll) Breeds Hadden 2004 (footnote 3)

***New Caledonia***

Chesterfield Is 350-480 1991-2009 Borsa et al. 2010

d’Entrecasteaux Reefs:

Surprise I. (Tens of pairs) c. 1995 Robinet et al. 1997

70 Feb. 2021 M. Philippe-Lesaffre in litt. 2023

329 July 2021 M. Philippe-Lesaffre in litt. 2023

Walpole I. (Loyalty Is) 50 1993 Barré & Dutson 2000

Hunter I. 100-300 2005? Spaggiari et al. 2007 (footnote 3)

 60+/-10 2018 Borsa & Baudet-Franceschi 2023

***Fregata minor palmerstoni***

***Mariana Islands*** Breeding unproven1980’sReichel 1991

Maug I. 3 1992 Stinson 1995; Lusk et al. 2000

Farallon de MedinillaSeveral 1996 Lusk et al. 2000

***Hawaiian Islands***

*Hawaiian Islands:* 8,315-10,500 1972-1982 Harrison et al. 1984

 10,445 mid-2010’s Pyle & Pyle 2017

Main islands 5-10 1970’s Harrison et al. 1984

Kaula 250-350 1970’s Harrison et al. 1984

Nihoa 3,500-4,500 1978-1982 Fefer et al. 1984

Necker 700-900 c. 1964-71 Clapp & Kridler 1977

French Frigate Shoals 350-375 1960’s Amerson 1971

 c. 450-700 1995-2005 Hatfield et al. 2012

 700 mid-2010’s Pyle & Pyle 2017

Laysan 2,000-2,500 1978-1982 Fefer et al. 1984

 3,500 mid-2010’s? Pyle & Pyle 2017

Lisianski 750-850 1964-69 Clapp & Wirtz 1975

Pearl and Hermes Reef 300-400 1963-69 Amerson et al. 1974

Midway 60-75 1978-1982 Harrison et al. 1984

Kure 200-250 1965-69 Woodward 1972

***Marshall Islands*** See footnote 1

*Northern Marshall Is*

Taongi (Bokak) 6,300-7,300 birds 1964 Amerson 1969

Bikar Small numbers 1967 Amerson 1969

Mili Breeds (few) 1967 Amerson 1969

Bikini Probably not breeding 1986 Garrett & Schreiber 1989

*Gilbert Islands* Breeding unproven 1967 Amerson 1969; Garnett 1984

***Palau***

Helen I. Extirpated 1992 Kepler 1992

Fana I. Probably (still) breeding 1979 Engbring 1983

Breeds 1992 Kepler 1992

***Federated States of Micronesia***

Yap:

Sorol Atoll (Pigelmol) 15+ nests 2004 R. Schodde in Buden 2012

 5-6 fledglings 2011 Buden 2012

Pohnpei:

Ahnt (Ant) Atoll 5 1995 Buden 1996

Chuuk:

East Fayu 100-200 1996 de Korte & Meltofte 1997

***Kiribati***

*Line Islands*: 10,000+ Garnett 1984

Teraina (Washington I.) 100 1979 Garnett 1983 (footnote 3)

 Not breeding 2019 R. Pierce in litt. (Pierce et al. 2019)

Kiritimati (Christmas I.) 10,000 birds Perry 1980

 2,500 nests 1967 Schreiber & Ashmole 1970

6,000 mid 1980’s E.A. Schreiber in litt. 2022

20,000 birds 1983 Garnett 1983 (footnote 3)

500-700 birds 2007 Pierce et al. 2007

1,500 2009 Pierce & Brown 2009

Malden 3,000 birds Perry 1980

 3,000 2015 Pierce et al. 2015a

Tabuaeran (Fanning I.) 1,000 birds Perry 1980

 Not breeding 2019 R. Pierce in litt. (Pierce et al. 2019)

Vostok 4,500 birds Perry 1980

 1,500 1965 Clapp & Sibley 1971

 1,000 nests 1974 Garnett 1983 (footnote 3)

Caroline (Millenium) I. 4,000-6,000 1974 Grossman & Grossman 1974

 2,427 1990 Kepler et al. 1994

Flint I. 200 birds 1974 Garnett 1983 (footnote 3)

*Phoenix Islands* 10,000+ Garnett 1984

 8,000 birds 1983 Garnett 1983 (footnote 3)

Canton 225 birds 1983 Garnett 1983 (footnote 3)

Enderbury I. 1,500 birds 1983 Garnett 1983 (footnote 3)

300+ 2006 Pierce et al. 2006

McKean I. 1,500 birds (status?) 1983 Garnett 1983 (footnote 3)

400 2006 Pierce et a. 2006

Rawaki (Phoenix) I. 1,000 birds (status?) 1983 Garnett 1983 (footnote 3)

5 2006 Pierce et al. 2006

20 2009 Pierce et al. 2011

Nikumaroro 8,000 birds (status?) 1983 Garnett 1983 (footnote 3)

Orona (Hull)) I. 20,000 birds 1983 Garnett 1983 (footnote 3)

300-350 birds 2000 Kepler 2000 (footnote 3)

50+ 2006 Pierce et al. 2006

***US Minor Outlying Islands***

Johnston Atoll 200-300 1963-67 Amerson & Shelton 1976

 c. 50+ 1982-83 Schreiber 2003

 50-150 1995 Citta et al. 2007

Howland 0 1986 Rauzon et al. 2011

550 birds 2007 Rauzon et al. 2011

Jarvis 50 birds 1982 Rauzon et al. 2011

 2,400 birds 2004 Rauzon et al. 2011

Baker 3 birds 1965 Rauzon et al. 2011

900 birds 2002 Rauzon et al. 2011

Palmyra 400 birds 2002 Depkin 2002

Wake Atoll 2,000+ birds 1923 Rauzon et al. 2008

 9 nests 1964 Rauzon et al. 2008

 1 1968 Rauzon et al. 2008

***Fiji*** Breeds? Garnett 1984

***Wallis & Futuna*** Breeds? 1985-86 Thibault & Guyot 1987

Alofi I. Probably breeds 2014 Thibault et al. 2014

Uvea I. Probably breeds 2014 Thibault et al. 2014

***Tonga***

‘Ata Breeds 1990 Rinke 1991

Late Breeds 1990 Rinke 1991

Fonualei Breeds 2013 Butler 2019

***Samoa***

Aleipata Is (Nu’ulua I.) c. 100 1991 Lovegrove et al. 1992

c. 100 2000 Parrish & Sherley 2012

***American Samoa***

Rose Atoll 200-750 birds 1970-76 Amerson et al. 1982

 11 1990 O’Connor & Rauzon 2004

Tutuila Breeding unproven 1998 O’Connor & Rauzon 2004

Auau’u Breeding unproven 1998 O’Connor & Rauzon 2004

***Tokelau Is*** Extirpated? Watling 2004

***Cook Islands***

Takutea 80 nests 1973 Holyoak 1980 (footnote 3)

c. 100 1990 McCormack 1994

Suwarrow 329 chicks 2008 Jones 2008

Aitutaki (Motukitiu) Breeds (reputedly) 1980 Child 1981

***French Polynesia***

*Society Islands:*

Tetiaroa Breeds (few) Thibault 1976 (footnote 3)

 17 nests 2006 Faulquier 2013 (footnote 4)

Manuae/Motu One etc 150; 250 1989 Seitre & Seitre 1990 (footnote 3)

Îles Palliser (Arutua)Breed*s* 1989 Lovegrove et al. 1989

Îles Palliser (Toau) Breeds? 1990 Seitre & Seitre 1990

*Austral Islands*

Maria 220 birds 2003 Pierce et al. 2003

Ravaivae Breeds 2003 Thibault 2003

*Tuamotu Islands:*

Rangiroa Breeds Thibault et al. 1991 (footnote 3)

Morane 173 birds 2003 Pierce et al. 2003

Paraoa 40+ birds 2003 Pierce et al. 2003

Reitoru 810 birds 2003 Pierce et al. 2003

Tahanea 60+ birds 2003 Pierce et al. 2003

 200 nests 2006 Raust & Sanford 2007

Fakarava 135 birds 2003 Pierce et al. 2003

Anuana Runga 100 1990 Seitre & Seitre 1990 (footnote 3)

Pukarua 70 birds Butaud 2008 (footnote 3)

*Gambier Islands* Breeding unproven 2010 Waugh et al. 2013

Vahanga Atoll 10 2012 Cranwell & Radford unpubl.

 100+ 2015 Pierce et al. 2015b

Tenararo Atoll 110+ 2015 Pierce et al. 2015b

*Marquesas Islands*:

Hatuta’a 150-300 1975-2007 Thibault et al. 2013

> 1,000 2010 Thibault et al. 2013

Mohotani/Motani Breeds Sachet et al. 1975

Fatu Huka Breeds Raust & Safford 2007

**Pitcairn Islands**

Henderson < 100 1991 Vickery & Brooke 1994

Ducie Low numbers c. 1991 Brooke 2006

Oeno 100 1997-98? Brooke 2006

**Chile**

Islas Sala y Gomez 200 birds 1972 P. Scott in Schlatter 1984

 c. 200-300 2009-2018 Marin & Gonzalez 2022

Islas Desventuradas c. 8-10 2020-21 Marin & Gonzalez 2022

Isla de Pascua (Easter I.) Breeding unproven Marin & Gonzalez 2022

*Footnotes*

1. Amerson (1969) reports possible breeding for many islands and atolls but evidence very circumstantial at best.

2. Based on species ratio in study plots (see Table 1, footnote 3).

3. Not seen; based on entry in BirdLife International’s Pacific Region seabird database (consulted Feb. 2023).

4. An additional 122 frigatebird nests recorded in 2006 but species not distinguished.

**Appendix B. Proposal 872 (Rasmussen 2020) to South American Checklist Committee to ”Change species limits in Magnificent Frigatebird *Fregata magnificens*”**

This proposal, essentially to recognise the nominate subspecies (endemic to Galapagos Is) and *F. m. rothschildi* as separate species, failed to pass (consensus amongst 10 respondents) because of concerns about:

a) morphological differences only minor (1 respondent);

b) low (0.88%) genetic divergence (1 respondent);

c) absence of analysis of data on vocalisations and displays (2 respondents);

d) insufficient sampling of Pacific range (8 respondents, for 5 of whom it was their only negative comment).

The SACC membership lacks any representative with recognised specialist seabird expertise. In respect of points a) to c) above, it might be worth recollecting that frigatebirds share many characteristics with archetypal groups of pelagic seabirds, especially Procellariiformes (albatrosses, petrels etc). Thus their lifestyle and demographics show delayed sexual maturity, high levels of natal philopatry and high subsequent site fidelity. Most taxa disperse and migrate widely across oceans, although some may be appreciably sedentary, at least as adults. In albatrosses and petrels, these attributes are typically associated with low levels (1-2%) of genetic divergence between closely-related species. Like Procellariifomes (and most other seabird groups), morphological, morphometrical and plumage variation is highly conservative; displays (and associated vocalisations) mainly reflect mate selection and individual identification, not species discrimination). Frigatebirds, however, are possibly the most extreme example of such traits: morphometric differences between taxa are typically small (as are museum-derived sample sizes) and even when significant, seldom decisive alone; the nature and development of plumage characteristics is subtle and complex, respectively; unusual (partially biennial) breeding cycles, and associated high divorce rates place a premium on mate selection and partner recognition through vocal and visual displays; bare part (bill and orbital-ring) colours may be important characters but how these vary within and between populations and/or species is unstudied and unclear. These issues sometimes confounded even those who did characterise taxa based on subtle characters (Mathews 1914; Rothschild 1915, Lowe 1924) and later led to many taxa being synonymised (or ignored) by others without critical re-appraisal. In Procellariiformes, numerous cryptic taxa are now being accorded (or re-accorded) species rank, initially in albatrosses and now especially in groups like storm-petrels, prions and gadfly petrels. Critical studies of other seabird groups are likely to follow; leading seabird experts (e.g. Howell & Zufelt 2019; Harrison et al. 2021) suggest that there may be c. 50 cryptic seabird taxa meriting consideration as potential species.

In respect of point d), the decisive issue in rejection of the proposal, substantial misunderstanding is apparent from responder statements like: “geographical sampling inadequate, “too many unsampled populations”, “more samples along Pacific coast of Americas” etc.

In reality: a) Atlantic coast and Caribbean sites are well sampled by Hailer et al. (2010) – see map below; b) the main Pacific coastal populations in Mexico and Panama (together representing c.90% of the population of the whole Pacific coast) are adequately sampled by Hailer et al. (2010) plus Rocha-Olivares & Gonzalez-Jaramillo (2014); c) the only effective population of *F. m. rothschildi* south of Mexico (see summary in Annex below) **not** sampled is that off south-west Ecuador.

As several respondents cited sampling issues (now shown not to be soundly based) as their only grounds for rejection, it is to be hoped that, with the new genetic perspectives, SACC might revisit its earlier decision.

*Annex*

**Magnificent Frigatebird breeding sites on the Pacific coast of the Americas south of Mexico**

Guatemala, El Salvador, Honduras, Nicaragua: none reported (Diamond & Schreiber 2002, 2020)

Costa Rica: one colony (Isla Bolanos, c. 200+ pairs) (Stiles 1984)

Panama: Isla Iguana (c. 1,300 pairs, largest Panama colony), BonáI. (454 pairs), Pacheca I. (314 pairs), Galera I. (148 pairs); all in 2005-06 from Angehr & Kushlan (2007). [First two colonies sampled by Hailer et al. 2010]

Colombia: none reported by Diamond & Schreiber (2002, 2020). A few nests have been recorded at a couple of sites in the San Andres Archipelago on the Caribbean coast (Howard et al. 2009). The specimen from Nuqui sampled by Hailer et al. (2010) has no supporting data and seems unlikely to reflect a local breeding site.

Ecuador: two colonies on islands off south-west: Isla de la Plata (“hundreds, perhaps more” in 1990’s); Isla Santa Clara (”1000+ pairs” in 1993) (Ridgely & Greenfield 2001).

Peru: no breeding sites; roosts on Tumbes coast, north-west Peru (Duffy et al. 1984).



**Figure:** Hailer et al. (2010), Figure 1. Sampling locations and sample sizes of magnificent frigatebirds analysed in this study. Small yellow dots denote toepad samples. Large dots denote fresh samples: red, Galapagos; yellow, eastern Pacific; black, Atlantic. HC, Halfmoon Caye (Belize); MW, Man O’War Caye (Belize).

**Appendix C. Priority breeding sites for acquisition of new data on frigatebird breeding populations**.

*F.* *(magnificens) magnificens*

**Galapagos Is**. Review/update overall estimate; estimates needed for main colonies on each island.

*F. (magnificens) januaria*

**Brazil**. New site-specific estimates needed, especially for main colonies.

*F.* *(magnificens) rothschildi*

**Mexico**. Up-to-date estimates for Bahía Pabellón (10,000-20,000 pairs in late 1980’s) and Bahía Santa Maria (18,000 pairs in late 1980’s).

**Panama**. Update estimate for Isla Iguana (1,300 pairs in 2005-06 but informal sources nowadays state 5,000 pairs).

**Ecuador**. Update estimates for Isla Santa Clara (1993) and Isla de la Plata (1990’s).

*F. ariel ariel*

**Kiribati**. Update estimates for Caroline I. (1990) and Flint I. (1974).

*F. minor minor*

**Cocos (Keeling) Is**. New estimate needed (1982).

*F. minor palmerstoni*

**Hawaiian Is**. Update current estimates, which mainly date from 1980’s*.*

**Marshall Is**. New estimate for Taongi needed (existing from 1964 and colony may even be no longer extant).

**Kiribati**. Update estimates for Line Is, especially Flint (1974), Vostok (1974) and Nikumaroro (1983).

**Fiji**. Clarify if any breeding sites.

**Tonga**. Estimates for any extant breeding sites.

*F. (minor) ridgwayi*

**Galapagos Is**. Population estimates needed on island-specific basis for at least all main colonies.

*F. (minor) listeri*

**Christmas I.** An updated estimate for this single-island endemic taxon would be valuable.

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