

NEW RECORDS OF FEATHER MITES (ACARI: ASTIGMATA) FROM PELECANIFORMES (AVES) IN BRAZIL

F. A. Hernandez¹, M. P. Valim² and L. G. A. Pedroso¹

¹Departamento de Zoologia, Universidade Estadual Paulista, Rio Claro, SP 13506-900, Brazil; e-mails: abakashi@gmail.com; luizgustavopedroso@gmail.com

²Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil; e-mail: mpvalim@gmail.com

ABSTRACT: This study provides the first account on feather mites associated with pelecaniform birds (Pelecaniformes) in Brazil. New records of nine feather mite species of the families Alloptidae, Xolalgidae (Analgoidea) and Freyanidae (Pterolichoidea) were made from tropicbirds, gannets, boobies, and cormorants from coastal areas of Brazil.

KEY WORDS: Acari, feather mites, taxonomy, biodiversity, Pelecaniformes, Brazil

INTRODUCTION

Feather mites (Astigmata: Analgoidea and Pterolichoidea) are the most diverse arthropods permanently living on birds, with more than 2400 described species worldwide (Mironov 2003). The great majority of these arthropods lives in different microhabitats of the birds' plumage, but representatives of several families are inhabitants of the skin and nasal cavities. It is disputable among some researchers whether feather mites living in the plumage are true parasites or commensals, because these species normally do not cause any visible damage to birds (Blanco et al. 2001; Dowling et al. 2001; Galván et al. 2008). Specialized inhabitants of the skin, such as Epidermoptidae and Dermationidae (Fain 1965), or mites living under the leg scales, such as *Knemidokoptes* Furstenberg, 1870 (Knemidokoptidae) (Fain and Elsen 1967), are conventional parasites.

The bird order Pelecaniformes harbors a large diversity of feather mites with approximately 45 described species representing 10 different families (Gaud and Atyeo 1996); among them, the families Alloptidae, Avenzoariidae and Freyanidae are the most species-rich on these birds (Černý 1967; Fain and Atyeo 1975; Atyeo and Peterson 1967; Peterson and Atyeo 1968; Gaud and Mouchet 1957; Gaud 1953; Mironov and Gallo-way 2002; Mironov and Pérez 2000; Mironov 2000; Atyeo and Peterson 1992).

Brazil is a country with the largest bird biodiversity in the world (ca. 1900 species — CBRO 2014). However, a number of bird orders, in particular Pelecaniformes, Procellariiformes, Podicipediformes, and Strigiformes, remain completely unexplored in relation to their specific feather mite fauna (Valim et al. 2011). In the present paper we

report new findings of feather mites from birds of the order Pelecaniformes in Brazil.

MATERIALS AND METHODS

Feather mites were collected by MPV from museum skins deposited at the ornithological collection of the Museu Nacional do Rio de Janeiro, Rio de Janeiro, Brazil (MNRJ). Mites were taken from skins by scraping technique according to Gaud and Atyeo (1996), cleared and softened in 30% lactic acid for 24 h at 50° C, and mounted on microscopic slides using Hoyer's medium (Krantz and Walter 2009). Vouchers were deposited at DZUnesp-RC — Collection of Acari at the Department of Zoology of the Universidade Estadual Paulista, Rio Claro, São Paulo, Brazil.

The taxonomy of birds follows Del Hoyo et al. (1992) for taxa of the family group and Dickinson (2003) for taxa of the generic group. The former classification includes six families within the order Pelecaniformes: Phaethontidae, Pelecanidae, Sulidae, Phalacrocoracidae, Anhingidae and Fregatidae. Among them, skins of Pelecanidae were absent in MNRJ.

The following pelecaniform birds were examined: *Phaethon aethereus* Linnaeus, 1758 (n = 4), *P. lepturus* Daudin, 1802 (n = 6) (Phaethontidae), *Morus serrator* Gray, 1843 (n = 3), *Sula dactylatra* Lesson, 1831 (n = 12), *S. leucogaster* (Boddaert, 1783) (n = 7), *S. sula* (Linnaeus, 1766) (n = 21) (Sulidae), *Phalacrocorax brasilianus* (Gmelin, 1789) (n = 16) (Phalacrocoracidae), *Anhinga anhinga* (Linnaeus, 1766) (n = 18) (Anhingidae), *Fregata ariel* (Gray, 1845) (n = 4), *Fregata magnificens* Mathews, 1914 (n = 14), and *F. minor* (Gmelin, 1789) (n = 19) (Fregatidae). Results of our examination are presented in the following order: number of mite specimens, host species fol-

lowed by the accession number of MNRJ in parentheses, locality, date, and collector. References of previous records of feather mites from corresponding host species are provided in the end of sections "other hosts".

SYSTEMATICS

Superfamily Pterolichoidea
Trouessart et Mégnin, 1884
Family Freyanidae Dubinin, 1953
Subfamily Michaelichinae
Gaud et Mouchet, 1959
Genus *Michaelia* Trouessart, 1884
Michaelia sp.

Material examined. 9 females ex *Phalacrocorax brasilianus* (MNRJ #43649), Brazil, Rio de Janeiro, São Cristóvão, Quinta da Boa Vista, 01 October 2002, J.B. Nacinovic coll.

Remark. Although only females of this mite were collected, they likely represent an undescribed species.

Genus *Sulanyssus* Dubinin, 1953
Sulanyssus dubinini Gaud et Atyeo, 1982

Hosts. *Sula leucogaster plotus* (Forster, 1844) (type host), *S. neboxii* Milne-Edwards, 1882, *S. dactylatra*, *S. sula*, *S. variegata* (Tschudi, 1843) — (Gaud and Atyeo 1982).

Material examined. 5 males, 5 females, and 2 nymphs, ex *Sula dactylatra* (MNRJ #35997), Brazil, Espírito Santo, Ilha Martin Vaz, 20°31'S, 29°19'W, 08 August 1988, J.B. Nacinovic coll.; 1 male and 1 nymph, same host (MNRJ #33377), Brazil, Pernambuco, Fernando de Noronha, 3°51'S, 32°25'W, 27 September 1983, J.B. Nacinovic coll.

***Sulanyssus caputmedusae* (Trouessart, 1886)**

Hosts. *Sula sula rubripes* Gould, 1838 (type host), *S. s. websteri* Rotschild, 1898 — (Trouessart 1886; Gaud and Atyeo 1982).

Material examined. 1 male, ex *Sula sula* (MNRJ #18993), Brazil, Espírito Santo, Ilha de Trindade, 20°31'S, 29°19'W, 12.06.1916, P.P. Peixoto coll.; 3 males, same data (MNRJ #18989).

Remark. In the original description, Trouessart (1886) did not indicate a type host, but simply listed several species of the genus *Sula* Brisson, 1760: "Habitat — Sur les Fous (*Sula bassana*, *S. fiber* (ou *fusca*), *S. piscatrix*, *S. serrator*, *S. cyanops* (ou *dactylatra*), etc.)". Further, Trouessart and Neumann (1888) designated the "forme a" figured in their plate XXVI as the type of this species (*Sulanyssus caputmedusae* sensu Gaud and

Atyeo 1982) and mentioned that it was collected from *Sula piscatrix* (presently *Sula sula rubripes* Gould). Gaud and Atyeo (1982) also stated that this mite was found on *S. s. rubripes* and on *S. s. websteri* Rotschild, 1898.

Genus *Morinyssus* Gaud et Atyeo, 1982
Morinyssus simplex Gaud et Atyeo, 1982

Hosts. *Morus bassanus* (Linnaeus, 1758) (type host), *M. serrator*, *M. capensis* (Lichtenstein, 1823) — (Gaud and Atyeo 1982).

Material examined. 1 male and 1 female ex *M. serrator* (MNRJ #36164), Brazil, Santa Catarina, Ilhas Moleques do Sul, 27°51'S, 48°26'W, 27 June 1987, L.A.R. Bege coll.

Superfamily Analgoidea
Trouessart et Mégnin, 1884

Family Alloptidae Gaud, 1957
Subfamily Alloptinae Gaud, 1957
Genus *Laminalloptes* Dubinin, 1955
Laminalloptes minor (Trouessart, 1885)

Hosts. *Phaethon aethereus* (type host), *P. lepturus catesbyi* Brandt, 1840, *P. rubricauda* Boddaert, 1783 — (Atyeo and Peterson, 1967).

Material examined. 4 males ex *Phaethon lepturus* (MNRJ #34200), Brazil, Pernambuco, Fernando de Noronha, Praia do Boldró, 3°51'S, 32°25'W, 18 June 1986, J.B. Nacinovic coll.; 2 males, 7 females, and 2 nymphs, same host and collector (MNRJ #33379), Brazil, Pernambuco, Fernando de Noronha, Praia do Boldró, 3°51'S, 32°25'W, 27 September 1983; 1 female, same host and collector (MNRJ #34199), Brazil, Pernambuco, Fernando de Noronha, Dois Irmãos, 17 June 1986; 5 males, same host and collector (MNRJ #34201), Brazil, Pernambuco, Fernando de Noronha, Baía dos Porcos, 18 June 1986. 4 males, ex *Phaethon aethereus* (MNRJ #31052), Brazil, Bahia, Abrólhos, Ilha de Santa Barbara, 27 September 1969, A.G.M. Coelho coll.; 4 males, same host (MNRJ #7583), no further data; 1 male, same host (MNRJ #7581), "tropics", no further data.

***Laminalloptes phaetontis* (Fabricius, 1775)**

Hosts. *Phaethon aethereus* (type host), *P. lepturus*, *Fregata minor*, *F. aquila* (Linnaeus, 1758) — (Atyeo and Peterson 1967).

Material examined. 7 males and 4 females, ex *Phaethon lepturus* (MNRJ #33379), Brazil, Pernambuco, Fernando de Noronha, 3°51'S, 32°25'W, 27 September 1983, J.B. Nacinovic coll.; 2 females, same host (MNRJ #34200), Bra-

zil, Pernambuco, Fernando de Noronha, Praia de Boldró, 3°51'S, 32°25'W, 18 June 1986, J.B. Nacinovic coll.; 1 male and 4 females, same host, date and collector (MNRJ #34201), Brazil, Pernambuco, Fernando de Noronha, Baía dos Porcos, 18 June 1986, J.B. Nacinovic coll.; 1 male ex *Phaethon aethereus* (MNRJ #31052), Brazil, Bahia, Abrólhos, Ilha de Santa Barbara, 27 September 1969, A.G.M. Coelho coll.; 1 male, same host (MNRJ #7583), no further data; 2 males, same host (MNRJ #7581), "tropics", no further data.

***Laminalloptes simplex* (Trouessart, 1885)**

Hosts. *Phaethon aethereus* (type host), *P. lepturus*, *P. rubricauda* — (Atyeo and Peterson 1967).

Material examined. 1 male ex *Phaethon lepturus* (MNRJ #34200), Brazil, Pernambuco, Fernando de Noronha, Praia de Boldró, 3°51'S, 32°25'W, 18 June 1986, J.B. Nacinovic coll.; 14 males and 2 females, same host and collector (MNRJ #34199), Brazil, Pernambuco, Fernando de Noronha, Dois Irmãos, 17 June 1986; 8 males ex *Phaethon aethereus* (MNRJ #31052), Brazil, Bahia, Abrólhos, Ilha Santa Barbara, 27 September 1969, A.G.M. Coelho coll.

Genus *Onychalloptes* Peterson et Atyeo, 1968
***Onychalloptes microphaeton* (Trouessart, 1885)**

Hosts. *Phaethon aethereus* (type host), *P. lepturus*, *P. rubricauda* — (Peterson and Atyeo 1968).

Material examined. 1 male ex *Phaethon lepturus* (MNRJ #7581), tropics, no further data.

Family Xolalgidae Dubnin, 1953

Subfamily Ingrassiinae Gaud et Atyeo, 1981

Genus *Ingrassia* Oudemans, 1905

***Ingrassia aequinoctialis* (Trouessart, 1899)**

Hosts. *Phaethon aethereus*, *P. rubricauda* — (Trouessart 1899; Mironov 2004).

Material examined. 1 male ex *Phaethon lepturus* (MNRJ #34199), Brazil, Pernambuco, Fernando de Noronha, Dois Irmãos, 17 June 1986, J.B. Nacinovic coll.

Remark. In the original description, Trouessart (1899) did not designate a type host, and mentions three host species for this mite: "*P. aethereus*, *P. candidus* [presently *P. aethereus*], *P. phoenicurus* [presently *P. rubricauda*] des mers tropicales". *Phaethon lepturus* is a new host record for this mite species.

DISCUSSION

Nine feather mite species from three families, Freyanidae, Alloptidae and Xolalgidae, were recovered from six bird species of the order Pelecaniformes: *Phaethon lepturus*, *P. aethereus*, *Morus serrator*, *Sula dactylatra*, *S. sula*, and *Phalacrocorax brasilianus*. *Michaelia* sp. is recorded for the first time on *P. brasilianus*. Other species were previously recorded, either from the type host (*Laminalloptes phaetontis*) or non-type hosts (other species) (Atyeo and Peterson 1967, 1992; Gaud and Atyeo 1982). All mite species reported in the present study are recorded for the first time in Brazil. Examination of several bird species (i.e., *S. leucogaster*, *A. anhinga*, *F. ariel*, *F. magnificens*, and *F. minor*) yielded no mites. The fact that a few analyzed birds (13 of 124 skins, and 6 of 12 bird species) resulted in positive collection of feather mites can be probably seen as an accident; previous works showed that these birds bear a diverse fauna of feather mites (Bonnet 1924; Atyeo and Peterson 1967; Peterson and Atyeo 1968; Dabert and Ehrnsberger 1998; Madden and Harmon 1998; Mironov 2000; Mironov and Pérez 2000; Fain and Bochkov 2003), except for *A. anhinga*, which has no feather mites recorded to this date. In addition, seabirds sent to museums are usually found dead on the beach after having spent several hours being washed out by the waves (J.B. Nacinovic, pers. comm.), which could remove many of their ectosymbionts.

ACKNOWLEDGEMENTS

To Marcos A. Raposo and Jorge B. Nacinovic (Museu Nacional do Rio de Janeiro, Brazil), for allowing MPV to collect ectoparasites from the study skins, and to Nicolau M. Serra-Freire (Instituto Oswaldo Cruz, Brazil) for the initial laboratory support. This study was supported partially by the FAPESP — São Paulo Research Foundation (to FAH: 2011/50145-0; to MPV: 2011/11420-5 and 2012/06951-4), and by Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) scholarship to LGAP.

REFERENCES

- Atyeo, W.T. and Peterson, P.C. 1967. The feather mite genus *Laminalloptes* (Proctophyllodidae: Alloptinae). *Journal of the Kansas Entomological Society*, 40 (4): 447–458.
- Atyeo, W.T. and Peterson, P.C. 1992. Feather mites (Acarina, Analgoidea, Alloptidae) of frigatebirds

- (Aves, Pelecaniformes, Fregatidae). *Zoologischer Anzeiger*, 229: 85–95.
- Blanco, G., Tella, J.L., Potti, J., and Baz, A. 2001. Feather mites on birds: costs of parasitism or conditional outcomes? *Journal of Avian Biology*, 32: 271–274.
- Bonnet, A. 1924. Révision des genres *Megninia*, *Mesalges* et genres voisins de la sous-famille des sarcoptides plumicoles. *Bulletin de la Société Zoologique de France*, 49: 146–188, 190–218.
- CBRO 2014. Checklist of the Brazilian Committee of Ornithological Records. Edition 11^a. 11:1–42 [Internet]. Available from <http://www.cbro.org.br/CBRO/pdf/AvesBrasil2014.pdf> Access: [13/01/2015]
- Černý, V. 1967. Catálogo de la fauna Cubana XX — Lista de los ácaros parásitos de aves reportadas de Cuba. *Trabajos de divulgación, Capitolio Nacional, La Habana, Cuba*, 45: 1–23.
- Dabert, J. and Ehrnsberger, R. 1998. Phylogeny of the feather mite family Ptiloxenidae Gaud, 1982 (Acari: Pterolichoidea). *Biosystematics and Ecology Series*, 14: 145–178.
- Del Hoyo, J., Elliot, A., and Sargatal, J. (eds). 1992. *Handbook of the birds of the world*. 696 pp. Vol. 1: Ostrich to Ducks. Barcelona, Lynx Editions.
- Dickinson, E.C. 2003. *The Howard and Moore complete checklist of the birds of the world*. 3rd edition. Princeton: Princeton University Press, 1039 pp.
- Dowling, D.K., Richardson, D.S., and Komdeur, J. 2001. No effect of a feather mite on body condition, survivorship, or grooming behavior in the Seychelles warbler *Acrocephalus sechellensis*. *Behavioral Ecology and Sociobiology*, 50: 257–262.
- Fain, A. and Atyeo, W.T. 1975. *Pelicanoptes onocrotali* n.g., n.sp., an epidermoptid mite from *Pelecanus onocrotalus* (Acarina: Epidermoptidae). *Journal of the Kansas Entomological Society*, 48 (1): 21–26.
- Fain, A. and Bochkov, A.V. 2003. New species of mites parasitic on the skin of birds (Acari: Epidermoptidae and Dermationidae). *Bulletin de la Société royale Belge d'Entomologie*, 139: 121–149.
- Fain, A. and Elsen, P. 1967. Les acariens de la famille Knemidokoptidae producteurs de galle chez les oiseaux. *Acta Zoologica et Pathologica Antverpiensia*, 45: 3–145.
- Galván, I., Barba, E., Piculo, R., Cantó, J.L., Cortés, V., Monrós, J.S., Atiénzar, F., and Proctor, H.C. 2008. Feather mites and birds: an interaction mediated by uropygial gland size? *Journal of Evolutionary Biology*, 21: 133–145.
- Gaud, J. 1953. Sarcoptides plumicoles des oiseaux d'Afrique occidentale et centrale. *Annales de parasitologie humaine et comparée*, 28: 193–226.
- Gaud, J. and Atyeo, W.T. 1982. La famille Freyanidae Dubinin (Sarcoptiformes plumicoles, Freyanoidea). II. Sous-famille Michaeliinae. *Acarologia*, 23 (2): 177–187.
- Gaud, J. and Atyeo, W.T. 1996. Feather mites of the world (Acarina, Astigmata): the supraspecific taxa. *Annales du Musée Royal de l'Afrique Centrale, Sciences Zoologiques*, 277 (1), 1–187 (part I), 277 (2), 1–436 (part II).
- Gaud, J. and Mouchet, J. 1957. Acariens Plumicoles des Oiseaux de Cameroun. I. Proctophyllodidae. *Annales de parasitologie humaine et comparée*, 32: 491–546.
- Krantz, G.W. and Walter, D.E. 2009. *A manual of acarology*. Third Edition. Texas Tech University Press, Lubbock, Texas. 807 pp.
- Madden, D. and Harmon, W.M. 1998. First record and morphology of *Myialges caulotoon* (Acari: Epidermoptidae) from Galapagos Hosts. *Journal of Parasitology*, 84: 186–189.
- Mironov, S.V. 2000. A review of the feather mite genus *Scutomegninia* Dubinin, 1951 (Acarina: Analgoidea: Avenzoariidae). *Acarina*, 8 (1): 9–58.
- Mironov, S.V. 2003. On some problems in the systematics of feather mites. *Acarina*, 11 (1): 3–29.
- Mironov, S.V. 2004. Phylogeny of the feather mite family Xolalgidae (Astigmata: Analgoidea) and evolutionary trends with non-passerine birds. *Phytophaga*, 14: 433–449.
- Mironov, S.V. and Galloway, T.D. 2002. Four new species of feather mites (Acari: Analgoidea). *The Canadian Entomologist*, 134: 605–618.
- Mironov, S.V. and Pérez, T.M. 2000. A new feather mite genus of the family Alloptidae (Astigmata: Analgoidea) from pelicans (Pelecaniformes: Pelicanidae). *Acarina*, 8 (2): 85–90.
- Peterson, P.C. and Atyeo, W.T. 1968. New genera related to the genus *Brephosceles* Hull, 1934 (Acarina: Proctophyllodidae). *Bulletin of the University of Nebraska State Museum*, 8: 217–236.
- Trouessart, E.L. 1886. Diagnoses d'espèces nouvelles de Sarcoptides plumicoles (Analgesinae). *Bulletin de la Société d'études scientifiques d'Angers*, 16: 85–156.
- Trouessart, E.L. and Neumann, M.G. 1888. Diagnoses d'espèces nouvelles de sarcoptides plumicoles (Analgesinae). *Bulletin Scientifique de la France et de la Belgique*, 19: 325–380.
- Valim, M.P., Hernandez, F.A., and Proctor, H.C. 2011. Feather mites of Brazil (Acari: Astigmata: Analgoidea and Pterolichoidea). *International Journal of Acarology*, 37: 293–324.