

# Checklist of Platyhelminthes, Acanthocephala, Nematoda and Arthropoda parasitizing penguins of the world

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**ABSTRACT:** A list of 108 species of metazoans parasites reported from penguins (Sphenisciformes) is provided, with information on their hosts, habitat and distribution. A total of 22 digeneans, 10 cestodes, 6 acanthocephalans, 31 nematodes, 15 mites and ticks, 25 insects have been found on 18 species of penguins, with most parasites reported from *Eudyptula minor*. A host-parasite list is also provided.

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## INTRODUCTION

Penguins are seabird animals that live only in the Southern Hemisphere. They breed in climates that range from  $-60^{\circ}\text{C}$  to  $+40^{\circ}\text{C}$ , breeding farther south than any other birds, up to the latitude of  $77^{\circ}33'$  S. They also breed right on the Equator in the Galápagos Island. Penguins can be found around South America, southern Africa, Australia, New Zealand, and the islands of the subantarctic (Davis 2007).

There are six clearly defined genera of extant penguins: *Aptenodytes*, *Eudyptes*, *Eudyptula*, *Megadyptes*, *Pygoscelis* and *Spheniscus*, all from the same family Spheniscidae. WoRMS (2013) recognized 18 valid species of penguins. Some species are reconized by some authors as valid but others as subspecies only (Marchant and Higgins 1990; Sibley *et al.* 1990; del Hoyo *et al.* 1992).

The wild penguins are commonly parasitized by ectoparasites such as fleas (Siphonaptera), lice (Phthiraptera), mites and ticks (Acari) (Murray *et al.* 1991; Clarke and Kerry 1993), which may act as vectors of many diseases. Several endoparasites such as trematodes, cestodes, acanthocephalans, nematodes and coccidian can also be found on these organisms (Clarke and Kerry 1993; Duignan 2001; Barbosa and Palacios 2009), causing damages more or less serious to the host health. Information regarding to parasites and their associated hosts may be useful to studies on biodiversity, biogeography and also on host phylogeny.

Here we provide a checklist of the metazoan parasites reported from penguins including the information on parasite distribution and site of infection. The information is presented as parasite-host and host-parasite lists.

## MATERIALS AND METHODS

This bibliographic review of metazoan parasites reported from penguins was based on the information collected from two main sources. Firstly, searches of the Host-Parasite Catalogue of the Natural History Museum in London for 1920–1997 and, for the years 1988–2003, the

Host-Parasite Database, a partial implementation of which is now available on-line (Gibson *et al.* 2005). Secondly, searches of the Zoological Record, Biological Abstracts and Helminthological Abstracts, Web of Knowledge, Google Scholar and the Scopus databases were undertaken up to October, 2013.

The checklist follows the parasite classification and systematic arrangement of Gibson *et al.* (2002) and Jones *et al.* (2005) for Digenea; Khalil *et al.* (1994) for Cestoda; Anderson *et al.* (2009) for Nematoda; Amin (2013) for Acanthocephala; Gugliemone *et al.* (2010) for Acari; and Clay (1967) for Insecta with some modifications based on recent records.

The species of parasites are presented in alphabetical order, followed by hosts with its respective site of infection and localities, and the references in chronological order. We adopted the 18 recognized species by Birdlife International and International Union for Conservation of Nature (IUCN), the global organization which is the sponsor of the Red List of Threatened Species (Birdlife International 2013; IUCN 2010).

The parasite species names have been updated to agree with the recent literature, but inclusion in the parasite or host lists does not imply that the authors necessarily agree with their validity.

This compilation is presented as parasite-host and host-parasite lists. We have attempted to include information from all published reports.

## RESULTS

An extensive survey of literary data, supplemented by original data on helminths of Sphenisciformes, has revealed records of 110 species of metazoan parasites (85 identified to the species level) of the following groups: Digenea (22 spp.), Cestoda (10 spp.), Acanthocephala (7 spp.), Nematoda (31 spp.), Acarina (15 spp.), Phthiraptera (17 spp.), Siphonaptera (8 spp.).

*Eudyptula minor* presents the most rich parasite fauna with 30 species followed by *Spheniscus magellanicus* (28

species) and *Eudyptes chrysocome* (23 species) whereas only five metazoan parasites were reported for *Eudyptes moseleyi* and *Spheniscus mendiculus*.

#### PARASITE-HOST LIST

#### PHYLUM PLATYHELMINTHES

#### Class Trematoda

#### Order Diplostomida Olson, Cribb, Tkach, Bray & Littlewood, 2003

##### Family Cyathocotylidae Mühling, 1898

##### *Mesostephanus odhneri* (Travassos, 1924) Lutz, 1935

*Spheniscus magellanicus*, intestine, Rio de Janeiro and Sergipe, Brazil (Brandão *et al.* 2013)

##### Family Diplostomidae Poirier, 1886

##### *Posthodiplostomum macrocotyle* Dubois, 1937

*Spheniscus magellanicus*, intestine, Rio Grande do Sul, Brazil (Brandão *et al.* 2013)

##### Family Strigeidae Railliet, 1919

##### *Cardiocephaloides physalis* (Lutz, 1926)

*Spheniscus demersus*, duodenum, St. Croix Island, East Coast of South Africa (Horne *et al.* 2011; Randall and Bray 1983)

*Spheniscus humboldti*, unspecified site of infection, Playas V Región, Chile (Mann 1992)

*Spheniscus magellanicus*, intestine, Rio Grande do Sul, Rio de Janeiro, Sergipe, Ubatuba beach, São Paulo, Brazil (Lutz 1926; Fortes and Soares 1986; Prado *et al.* 2011; Brandão *et al.* 2013); Patagônia, Argentina (Diaz *et al.* 2010; Szidat 1964; Dubois 1968; Yamaguti 1971; Boero *et al.* 1972b; Diaz *et al.* 2010); Uruguay (Lutz 1926; Pazos *et al.* 2003); Arauco, Dichato, Chile (Gonzalez-Acuña *et al.* 2008a)

##### *Cardiocephaloides* sp.

*Spheniscus magellanicus*, small intestine, Peninsula de Valdés, Chubut Province, Argentina (Pazos *et al.* 2003)

##### *Cotylurus variegatus* Creplin, 1823

*Spheniscus humboldti*, unspecified site of infection, Poland (Sulgostowska and Czaplinska 1987)

#### Order Plagiorchiida La Rue, 1957

##### Family Echinostomatidae Looss, 1899

##### *Echinostoma* sp.

*Eudyptula minor*, intestine, Northland, New Zealand (Crockett and Kearns 1975)

##### *Stephanoprora uruguayense* Holcman-Spector & Olagüe, 1989

*Spheniscus magellanicus*, intestine, Rio de Janeiro and Rio Grande do Sul, Brazil (Brandão *et al.* 2013)

##### Family Heterophyidae Leiper, 1909

##### *Ascocotyle (Ascocotyle) felipei* Travassos, 1928

*Spheniscus magellanicus*, intestine, Argentina (Boero *et al.* 1972b)

##### *Ascocotyle (Phagicola) longa* Ransom, 1920

*Spheniscus magellanicus*, intestine, Rio de Janeiro,

Brazil (Brandão *et al.* 2013)

##### *Ascocotyle (Phagicola)* sp.

*Spheniscus magellanicus*, intestine, Rio de Janeiro, Brazil (Brandão *et al.* 2013)

##### *Galactosomum angelae* Pearson, 1973

*Eudyptula minor*, small intestine, Kangaroo Island, South Australia (Pearson 1973; Obendorf and McColl 1980)

##### *Galactosomum* sp.

*Eudyptula minor*, unspecified site of infection, Tiritiri Island, Auckland, New Zealand (McKenna 2009)

##### Family Hirudinellidae Dollfus, 1932

##### *Hirudinella clavata* (Menzies, 1791)

*Spheniscus humboldti*, unspecified site of infection, Poland (Sulgostowska and Czaplinska 1987)

##### Family Opisthorchiidae Looss, 1899

##### *Metorchis coeruleus* Braun, 1902

*Spheniscus demersus*, gall bladder and biliary ducts, unspecified locality (Heinemann 1936)

##### *Metorchis orientalis* Tanabe, 1920

*Spheniscus demersus*, gall bladder and biliary ducts, unspecified locality (Heinemann 1936)

##### *Metorchis pinguinicola* Skrjabin, 1913

*Spheniscus demersus*, gall bladder and biliary ducts, South Africa, Russia (Skrjabin 1913; Heinemann 1936)

##### *Metorchis tener* Kowalewski, 1903

*Spheniscus demersus*, gall bladder and biliary ducts, unspecified locality (Heinemann 1936)

##### *Metorchis xanthostomus* Creplin, 1846

*Spheniscus demersus*, gall bladder and biliary ducts, unspecified locality (Heinemann 1936)

##### Family Psilostomidae Looss, 1900

##### *Ribeiroia ondatrae* (Price, 1931)

*Spheniscus magellanicus*, unspecified site of infection, La Plata Zoological Garden (Boero *et al.* 1972b)

##### Family Prosthogonimidae Lühe, 1909

##### *Mawsonotrema eudyptulae* Angel, 1973

*Eudyptula minor*, liver, Goolwa, Brighthon beach, Victoria Coast, South Australia (Angel 1973; Harrigan 1991); Tasmania, Australia (Mawson *et al.* 1986)

##### Family Rencolidae Dollfus, 1939

##### *Rencicola sloanei* Wright, 1954

*Eudyptes chrysolophus*, unspecified site of infection, Edinburgh Zoo (Stunkard 1964)

*Eudyptes moseleyi*, kidney, British Zoo and South Georgia (Wright 1954)

*Pygoscelis antarctica*, kidney, British Zoo (Wright 1954)

*Pygoscelis papua*, kidney, Edinburgh Zoo (Campbell and Sloane 1943; Stunkard 1964)

*Spheniscus demersus*, kidney, Edinburgh Zoo (Campbell and Sloane 1943; Stunkard 1964); kidney, East Coast of South Africa (Horne *et al.* 2011)

##### *Rencicola* sp.

*Eudyptula minor*, liver, Victoria Coast, Australia (Obendorf and McColl 1980); eggs in the gall bladder,

Tasmania, Australia (Mawson *et al.* 1986)

**Class Cestoda****Unidentified cestode**

*Eudyptes schlegeli*, unspecified site of infection, Tasmania, Australia (Mawson *et al.* 1986)

**Order Cyclophyllidea van Beneden in Braun, 1900****Family Dilepididae Railliet & Henry, 1909*****Parorchites zederi* Baird, 1853**

*Aptenodytes forsteri*, intestine, Antarctica (Prudhoe 1969; Holloway and Cunningham 1992)

*Pygoscelis antarctica*, intestine, Deception Islands, South Shetlands (Vidal *et al.* 2012)

*Pygoscelis papua*, intestine, South Shetlands, Antarctica (Ippen *et al.* 1981; Cielecka *et al.* 1992; Georgiev *et al.* 1996); King George Island, Antarctica (Diaz *et al.* 2013)

**Order Tetrabothriidea Baer, 1954****Family Tetrabothriidae Linton, 1891*****Tetrabothrius eudyptidis* Loennberg, 1896**

*Eudyptes chrysocome*, intestine, Falkland Islands (Keymer *et al.* 2001)

*Spheniscus humboldti*, large intestine, San Antonio, Chile (González-Acuña *et al.* 2008a)

*Spheniscus magellanicus*, large intestine, Cobquecura, Chile (González-Acuña *et al.* 2008a)

***Tetrabothrius joubini* Railliet & Henry, 1912**

*Pygoscelis antarctica*, unspecified site of infection, South Shetlands (Cielecka *et al.* 1992); South Shetlands (Georgiev *et al.* 1996)

***Tetrabothrius lutzi* Parona, 1901**

*Eudyptula minor*, unspecified site of infection, Tasmania, Australia (Prudhoe 1969)

*Spheniscus magellanicus*, intestine, Peninsula Valdés, Argentina (Pazos *et al.* 2003; Diaz *et al.* 2010); intestine, Talcahuano, Cobquecura, Chile (González-Acuña *et al.* 2008a); small intestine, Zoo La Plata, Argentina (Boero *et al.* 1972a); intestine, Ilha Comprida, São Paulo, Brazil (Prado *et al.* 2011)

***Tetrabothrius pauliani* Joyeux & Baer, 1954**

*Aptenodytes patagonicus*, unspecified site of infection, Antarctica (Prudhoe 1969)

*Pygoscelis antarctica*, intestine, Deception Island, South Shetlands (Vidal *et al.* 2012); small intestine, South Shetlands (Georgiev *et al.* 1996); intestine, Bouvet Island, South Atlantic Ocean (Andersen and Lysfjord 1982)

*Pygoscelis papua*, unspecified site of infection, Sub Antarctica (Prudhoe 1969)

***Tetrabothrius pellucidus* Nybelin, 1929**

*Spheniscus magellanicus*, unspecified site of infection, Juan Fernández, Chile (Nybelin 1929)

***Tetrabothrius wrightii* Leiper & Atkinson, 1914**

*Aptenodytes forsteri*, unspecified site of infection, unspecified locality (Prudhoe 1969)

*Aptenodytes patagonicus*, small intestine, Crozet Archipelago (Fonteneau *et al.* 2011)

*Eudyptes chrysocome*, intestine, Falkland Islands (Keymer *et al.* 2001)

*Pygoscelis adeliae*, unspecified site of infection,

unspecified locality (Leiper and Atkinson 1914)

***Tetrabothrius* sp.**

*Eudyptes moseleyi*, intestine, Bouvet Island, Antarctica (Andersen and Lysfjord 1982)

*Eudyptula minor*, small intestine, Victoria Coast (Obendorf and McColl 1980); New South Wales and South Australia, Australia (Mawson *et al.* 1986); Tiritiri Island, New Zealand (McKenna 2009)

*Pygoscelis adeliae*, intestine, Ardley Island, peninsula Fildes, Rey Jorge Island, South Shetland, Antarctica (Fredes *et al.* 2008)

*Pygoscelis papua*, intestine, Peninsula Munita, Paraiso Bay, Antarctica (Fredes *et al.* 2007)

*Spheniscus humboldti*, unspecified site of infection, Chile (Mann 1992; Gonzalez-Acuña *et al.* 2008a)

**Unidentified Tetrabothriidae**

*Aptenodytes patagonicus*, unspecified site of infection, Tasmania, Australia (Mawson *et al.* 1986)

*Eudyptula minor*, unspecified site of infection, Victoria Coast, Australia (Mawson *et al.* 1986)

**PHYLUM ACANTHOCEPHALA****Unidentified acanthocephalan**

*Megadyptes antipodes*, stomach, New Zealand (Ranum and Wharton 1996)

**Class Palaeacanthocephala Meyer, 1931****Order Polymorphida Petrochenko, 1956****Family Polymorphidae Meyer, 1931*****Corynosoma bullosum* (v. Linstow, 1892)**

*Pygoscelis papua*, small intestine, Elephant Island, Antarctica (Hoberg 1986); intestine (immature), King George Island, Antarctica (Diaz *et al.* 2013)

***Corynosoma hamanni* Linstow, 1892**

*Pygoscelis adeliae*, intestine, Antarctica (Holloway and Bier 1967)

*Pygoscelis papua*, immature in intestine, King George Island, Antarctica (Diaz *et al.* 2013)

***Corynosoma pseudohamanni* Zdzitowiecki, 1984**

*Pygoscelis antarctica*, intestine, South Shetland, Antarctica (Dimitrova *et al.* 1996)

*Pygoscelis adeliae*, intestine, Antarctica (Zdzitowiecki 1991)

***Corynosoma shackletoni* Zdzitowiecki, 1978**

*Pygoscelis papua*, small intestine, King George Island and Elephant Island, Antarctica (Hoberg 1986); intestine, King George Island, Antarctica (Diaz *et al.* 2013)

***Corynosoma* sp.**

*Eudyptula minor*, intestine, South Australia (Mawson *et al.* 1986); Tiritiri Island, New Zealand (McKenna 2009)

*Pygoscelis antarctica*, immature in gastrointestinal tract, South Shetlands, Antarctica (Vidal *et al.* 2012)

*Pygoscelis papua*, intestine, Macquarie Island, between New Zealand and Antarctica (Edmonds 1954)

*Spheniscus magellanicus*, stomach and intestine, Península de Valdez, Argentina (Boero *et al.* 1972b; Diaz *et al.* 2010)

**PHYLUM NEMATODA****Unidentified nematode**

*Eudypytula minor*, unspecified site of infection, Victoria Coast, Australia (Mawson *et al.* 1986)

**Class Adenophorea Chitwood, 1958****Order Enoplida Filipjev, 1929****Superfamily Trichinelloidea Railliet, 1916****Family Trichuridae Railliet, 1915*****Capillaria* sp.**

*Eudypytula minor*, unspecified site of infection, Tiritiri Island, New Zealand (McKenna 2009)

**Class Chromadorea Inglis, 1983****Order Ascaridida Skrjabin & Shulz, 1940****Superfamily Ascaridoidea Railliet & Henry, 1915****Family Anisakidae Skrjabin & Karokhin, 1945*****Anisakis* sp.**

*Eudypytula minor*, larvae, unspecified site of infection, New South Wales and South Australia, Australia (Johnston and Mawson 1942)

***Contracaecum antarcticum* Johnston, 1938**

*Pygoscelis adeliae*, unspecified site of infection, subantarctic (Mawson 1953)

***Contracaecum eudyptes* Johnston & Mawson, 1953**

*Eudyptes chrysocome*, digestive tract, Auckland Island, New Zealand (Johnston and Mawson 1953)

*Megadyptes antipodes*, digestive tract, Australia (Johnston and Mawson 1953)

***Contracaecum eudyptulae* Johnston & Mawson, 1953**

*Eudypytula minor*, digestive tract, Australia (Johnston and Mawson 1942)

***Contracaecum heardi* Mawson, 1953**

*Aptenodytes forsteri*, unspecified site of infection, Heard Island, Australia (Mawson 1953)

*Aptenodytes patagonicus*, unspecified site of infection, Heard Island, Australia (Mawson 1953); oesophagus and stomach, Crozet Archipelago (Fonteneau *et al.* 2011)

*Eudyptes chrysolophus*, unspecified site of infection, Heard Island, Australia (Mawson 1953)

*Pygoscelis papua*, unspecified site of infection, Heard Island, Australia; Crozet Archipelago (Johnston and Mawson 1942)

*Spheniscus magellanicus*, gastrointestinal tract, Pelluhe, Chile (González-Acuña *et al.* 2008a)

***Contracaecum osculatum* (Rudolphi, 1802)**

*Aptenodytes forsteri*, immature, unspecified site of infection, Antarctic Region (Johnston and Mawson 1945)

*Pygoscelis adeliae*, immature, unspecified site of infection, Antarctic Region (Mawson 1953)

***Contracaecum pelagicum* Johnston & Mawson, 1942**

*Spheniscus humboldti*, gastrointestinal tract, Penco, Cobquecura, San Antonio, Chile (González-Acuña *et al.* 2008a)

*Spheniscus magellanicus*, oesophagus, stomach and

intestine, Baía de Guanabara, Niteroi, Rio de Janeiro (Santos 1984, Campos *et al.* 2013); São Paulo (Prado *et al.* 2011); Vitória, Espírito Santo (Ederli *et al.* 2009), Brazil; Península de Valdez, Argentina (Pazos *et al.* 2003; Garbin *et al.* 2007; Diaz *et al.* 2010);

***Contracaecum plagiaticium* Lent & Freitas, 1948**

*Spheniscus magellanicus*, oesophagus, stomach and intestine, Rio de Janeiro (Campos *et al.* 2013)

***Contracaecum prevosti* Tchérprakoff, 1966**

*Aptenodytes forsteri*, stomach, Antarctica (Tchéprakoff 1966)

***Contracaecum spheniscus* Boero & Led, 1970**

*Eudyptes chrysocome*, intestine, Argentina (Boero *et al.* 1972b)

*Spheniscus magellanicus*, unspecified site of infection, La Plata's Zoo, Argentina (Garbin *et al.* 2007); intestine, Argentina (Boero and Led 1970; Boero *et al.* 1972b)

***Contracaecum spiculigerum* (Rudolphi, 1809)**

*Eudypytula minor*, stomach, Victoria Coast, Tasmania and South Australia, Australia (Obendorf and McColl 1980; Mawson *et al.* 1986)

***Contracaecum variegatum* (Rudolphi, 1809)**

*Spheniscus demersus*, unspecified site of infection, South Africa (Fagerholm *et al.* 1996)

***Contracaecum* sp.**

*Aptenodytes forsteri*, unspecified site of infection, Heard Island, Antarctica (Mawson 1953)

*Aptenodytes patagonicus*, unspecified site of infection, Heard Island, Antarctica (Mawson 1953)

*Eudyptes chrysocome*, unspecified site of infection, Heard Island, Antarctica (Mawson 1953)

*Eudyptes pachyrhynchus*, unspecified site of infection, Tasmania, Australia (Mawson *et al.* 1986)

*Eudypytula minor*, intestine, Victoria Coast, Southern Australia (Harrigan 1991; Weeks 1982)

*Pygoscelis papua*, stomach, Isla Ardley, península Fildes, isla Rey Jorge, Arquipélago Shetland del Sur, Antarctica (Fredes *et al.* 2006); stomach, Munita-Bahía Paraíso (Fredes *et al.* 2007)

*Spheniscus humboldti*, gastrointestinal tract, Pelluhe, Chile (González-Acuña *et al.* 2008a)

*Spheniscus magellanicus*, unspecified site of infection, South Africa (Fagerholm *et al.* 1996); oesophagus and stomach, Península Valdez, Mar del Plata, Argentina (Pazos *et al.* 2003)

***Stomachus* sp.**

*Eudyptes schlegeli*, stomach, Macquarie Island, Australia (Mawson 1953)

*Pygoscelis papua*, stomach, Macquarie Island, Australia (Mawson 1953)

***Terranova piscium* (Johnston & Mawson, 1943)**

*Eudyptes schlegeli*, unspecified site of infection, Macquarie Island, Australia (Mawson 1953)

***Terranova* sp.**

*Eudyptes schlegeli*, unspecified site of infection, Macquarie Island, Australia (Mawson 1953)

**Unidentified anisakid larvae**

*Eudyptes chrysocome*, unspecified site of infection, Tasmania, Australia (Mawson *et al.* 1986)

**Family Ascarididae Baird, 1853*****Ascaridia* sp.**



*Spheniscus magellanicus*, gastrointestinal tract, Penco, Chile (González-Acuña *et al.* 2008a)

### Order Spirurida Chitwood, 1933

#### Unidentified microfilariae

*Spheniscus mendiculus*, blood, Galápagos Islands (Merkel *et al.* 2007)

### Superfamily Acuarioidea (Railliet, Henry & Sisoff, 1912)

#### Family Acuariidae Railliet, Henry & Sisoff, 1912

##### *Cosmocephalus obvelatus* (Creplin, 1825)

*Eudypetes chrysocome*, oesophagus, Saporu Zoo, Japan (Azuma *et al.* 1988)

*Spheniscus magellanicus*, oesophagus, Chabut, Argentina (Diaz *et al.* 2001)

##### *Cosmocephalus* sp.

*Spheniscus humboldti*, unspecified site of infection, Playas V Región, Chile (Mann 1992)

##### *Stegophorus macronectes* (Johnston & Mawson, 1942)

*Eudypetes chrysocome*, unspecified site of infection, Heard Island, Antarctica (Mawson 1953)

*Eudypetes chrysolophus*, unspecified site of infection, Heard Island, Antarctica (Mawson 1953)

*Pygoscelis antarctica*, stomach, Deception Island, South Shetlands, Antarctica (Vidal *et al.* 2012)

*Pygoscelis papua*, unspecified site of infection, Heard Island, Antarctica (Mawson 1953); oesophagus and stomach, King George Island, Antarctica (Diaz *et al.* 2013)

##### *Streptocara* sp.

*Pygoscelis adeliae*, stomach, Ardley Island, peninsula Fildes, Rey Jorge Island, South Shetland, Antarctica (Fredes *et al.* 2008)

*Pygoscelis papua*, stomach, Ardley Island, peninsula Fildes, Rey Jorge Island, South Shetland, Antarctica (Fredes *et al.* 2006)

##### *Synhaemantus* sp.

*Eudypetes chrysocome*, stomach, Falkland Island, South Atlantic (Keymer *et al.* 2001)

### Superfamily Filarioidea Maggenti, 1982

#### Unidentified Filarioidea

*Eudypetula minor*, heart, South Australia (Mawson *et al.* 1986)

### Superfamily Habronematoidea Railliet & Henry, 1915

#### Family Tetrameridae Travassos, 1924

##### *Tetrameres wetzeli* Schmidt, 1965

*Aptenodytes patagonicus*, oesophagus and stomach, Crozet Archipelago, Antarctica (Fonteneau *et al.* 2011)

*Eudypetes chrysocome*, proventriculus, Kerguelen Islands, Antarctica (Schmidt 1965)

*Pygoscelis papua*, glandular stomach, King George Island, Antarctica (Diaz *et al.* 2013)

#### Family Onchocercidae (Leiper, 1911)

##### *Dirofilaria immitis* (Leidy, 1856)

*Spheniscus humboldti*, heart, Japan Zoo (Sano *et al.* 2005)

#### *Paronchocerca straeleni* Chabaud & Ball, 1964

*Spheniscus mendiculus*, heart, Galápagos (Chabaud and Ball 1964)

### Superfamily Strongyloidea Railliet & Henry, 1915

#### Family Syngamidae Leiper, 1912

##### *Cyathostoma phenisci* Baudet, 1937

*Spheniscus demersus*, tracheae and air sacs, South Africa (Kanarek *et al.* 2013)

### PHYLUM ARTHROPODA

### Class Arachnida Lamarck, 1815

#### Order Acarina Nitzsch, 1818

#### Family Argasidae Canestrini, 1890

##### *Ornithodoros (Alectorobius) amblus* Chamberlin, 1920

*Spheniscus humboldti*, nests, Peru (Hoogstraal *et al.* 1985; Smith *et al.* 2008)

##### *Ornithodoros (Alectorobius) capensis* Neumann, 1901

*Eudypetula minor*, nests, coast of Victoria, Australia (Kohls 1957; Murray *et al.* 1991)

*Spheniscus demersus*, nests, islands off Cape Province, South Africa (Kohls 1957; Hoogstraal *et al.* 1985)

##### *Ornithodoros (Alectorobius) spheniscus* Hoogstraal, Wassef, Hays & Keirans, 1985

*Spheniscus humboldti*, resting area and caves inhabited by the species, Peru (Hoogstraal *et al.* 1985); unspecified site of infection, Chile (González-Acuña *et al.* 2008b)

##### *Ornithodoros (Alectorobius) yunkerii*

*Spheniscus mendiculus*, nest, Galapagos islands (Keirans 1984; Hoogstraal *et al.* 1985, Dietrich *et al.* 2010)

#### Family Dermanyssidae Kolenati, 1859

##### *Liponyssoides eudypetulae* Fain & Holloway, 1993

*Eudypetula minor*, nest, New Zealand (Fain and Galloway 1993; Bishop and Heath 1998)

#### Family Haemogamasidae Oudemans, 1939

##### *Eulaelaps* sp.

*Eudypetula minor*, unspecified site of infection, New Zealand (Wilson 1964; Bishop and Heath 1998)

#### Family Ixodidae Murray, 1877

##### *Amblyomma parvitarsum* Neumann, 1901

*Spheniscus magellanicus*, unspecified site of infection, Praia do Cassino, Rio Grande do Sul, Brazil (Becker *et al.* 1997)

##### *Ixodes auritulus* group

*Aptenodytes patagonicus*, unspecified site of infection, New Zealand (Dumbleton 1953; Bishop and Heath 1998; Dietrich *et al.* 2010)

*Eudypetes robustus*, unspecified site of infection, New Zealand (Heath 2010; Dietrich *et al.* 2010)

*Eudypetula minor*, unspecified site of infection, New Zealand (Bishop and Heath 1998; Dietrich *et al.* 2010)

*Megadyptes antipodes*, unspecified site of infection,

New Zealand (Bishop and Heath 1998; Dietrich *et al.* 2010)

***Ixodes eudyptidis* Maskell, 1885**

*Eudyptes pachyrhynchus*, unspecified site of infection, New Zealand (Dumbleton 1953; Bishop and Heath 1998; Dietrich *et al.* 2010)

*Eudyptula minor*, unspecified site of infection, Australia (Murray *et al.* 1991)

*Megadyptes antipodes*, unspecified site of infection, New Zealand (Heath 2010)

***Ixodes kohlsi* Arthur, 1955**

*Eudyptula minor*, nests, Australia (Arthur 1955); external ear canal, Victoria Coast, Australia (Obendorf and McColl 1980)

***Ixodes percavatus* Neumann, 1906**

*Eudyptula minor*, nest, Australia (Arthur 1955; Dietrich *et al.* 2010)

***Ixodes uriae* White, 1852**

*Aptenodytes fosteri*, unspecified site of infection, Macquarie Island, Australia (Major *et al.* 2009)

*Aptenodytes patagonicus*, neck and head (adults) and lower parts (larvae), Possession Island, Crozet Archipelago, southern Indian Ocean (Frenot *et al.* 2001; Gauthier-Clerc *et al.* 2003); Macquarie Island, Australia (Major *et al.* 2009); New Zealand (Dumbleton 1953; Bishop and Heath 1998)

*Eudyptes chrysocome*, unspecified site of infection, New Zealand (Bishop and Heath 1998); Macquarie Island, Australia (Major *et al.* 2009)

*Eudyptes chrysolophus*, unspecified site of infection, Subantarctic (Nuttall 1984)

*Eudyptes pachyrhynchus*, unspecified site of infection, New Zealand (Dumbleton 1953; Bishop and Heath 1998)

*Eudyptes robustus*, unspecified site of infection, New Zealand (Dumbleton 1961; Murray *et al.* 1991; Bishop and Heath 1998)

*Eudyptes sclateri*, unspecified site of infection, New Zealand (Dumbleton 1953; Bishop and Heath 1998)

*Eudyptes schlegeli*, unspecified site of infection, Macquarie Island, Australia (Murray *et al.* 1967; Nuttall 1984; Murray *et al.* 1991)

*Eudyptula minor*, unspecified site of infection, New Zealand (Murray *et al.* 1991; Bishop and Heath 1998)

*Megadyptes antipodes*, unspecified site of infection, New Zealand (Dumbleton 1953; Bishop and Heath 1998)

*Pygoscelis adeliae*, Antarctic Peninsula (Benoit *et al.* 2009)

*Pygoscelis papua*, unspecified site of infection, Australia, New Zealand and subantarctic Islands (Murray *et al.*, 1991)

*Spheniscus magellanicus*, plumage, Falklands (Keymer *et al.* 2001)

***Ixodes* sp.**

*Eudyptes chrysocome*, plumage, Falklands (Keymer *et al.* 2001)

**Family Laelaptidae Berlese, 1892**

***Haemolaelaps* (= *Androlaelaps*) *pachyptilae* Zumpt & Till, 1956**

*Eudyptula minor*, nest, New Zealand (Fain and Galloway 1993; Bishop and Heath 1998)

**Family Xolalgidae Dubinin, 1953**

***Ingrassia eudyptula* Mironov & Proctor, 2008**

*Eudyptula minor*, skin, Australia (Mironov and Proctor 2008)

**Class Insecta Linneus, 1758**

**Order Phthiraptera Haeckel, 1896**

**Family Philopteridae Burmeister, 1830**

***Austrogoniodes antarcticus* Harrison, 1937**

*Pygoscelis adeliae*, unspecified site of infection, George V Coast; Ross I, Antarctica (Harrison 1937); New Zealand (Pilgrim and Palma 1982)

***Austrogoniodes bicornutus* Kéler, 1954**

*Eudyptes chrysolophus*, unspecified site of infection, Heard Island, Antarctica (Kéler 1954)

***Austrogoniodes bifasciatus* (Piaget, 1885)**

*Pygoscelis adeliae*, unspecified site of infection, George V Coast, Antarctica (Clay 1967)

*Spheniscus humboldti*, unspecified site of infection, Chile; New Zealand (Banks and Palma 2003)

*Spheniscus magellanicus*, unspecified site of infection, Saquarema/RJ, Brazil (Valim *et al.* 2004); Praia do Pontal, Arraial do Cabo/RJ, Brazil (Rodrigues-Guimarães *et al.* 2009); São Paulo, Brazil (Guimarães 1938); Praia do Cassino/ Rio Grande do Sul, Brazil (Valim *et al.* 2009; Brum and Becker 2002); Isla Hornos, Chile; Gypsy Cove, East Falkland Island (Banks and Palma 2003); Argentine Zoo (Clay 1967); Santo Deseado, Argentina (Guimarães 1938); Massatierra, Juan Fernandez, Chile (Thompson 1938); Falkland Island, South Atlantic (Keymer *et al.* 2001)

***Austrogoniodes brevipes* (Giebel, 1876)**

*Aptenodytes patagonicus*, unspecified site of infection, Kerguelen Islands, southern Indian Ocean (Kéler 1952)

***Austrogoniodes concii* (Kéler, 1952)**

*Eudyptes chrysocome*, unspecified site of infection, Crozet Island, southern Indian Ocean; Heard Island, Antarctica; Tristan da Cunha, Gough Island, south Atlantic Ocean; Australia; New Zealand (Kéler 1952)

*Eudyptes chrysolophus*, unspecified site of infection, Antipodes Island, New Zealand (Clay 1967)

*Eudyptes moseleyi*, unspecified site of infection, Tristan da Cunha (Kéler 1952; Hänel and Palma 2007)

*Eudyptes pachyrhynchus*, unspecified site of infection, Otago, New Zealand (Kéler 1952); Tasmania (Green and Palma 1991)

*Eudyptes robustus*, unspecified site of infection, New Zealand (Pilgrim and Palma 1982)

*Eudyptes sclateri*, unspecified site of infection, Antipodes and Campbell Island, New Zealand (Clay 1967)

*Megadyptes antipodes*, unspecified site of infection, New Zealand (Pilgrim and Palma 1982)

***Austrogoniodes cristati* Kéler, 1952**

*Eudyptes chrysocome*, unspecified site of infection, Tristan da Cunha (Kéler 1952); Falkland Island, South Atlantic (Keymer *et al.* 2001); Zoo Hamburg (Eichler 1941); Heard Island, Antarctica; Tristan da Cunha, south Atlantic Ocean; Macquarie Island, Australia; Antipodes Island, New Zealand (Clay 1967); Tasmania (Green and Palma 1991)

*Eudyptes chrysolophus*, unspecified site of infection, New Zealand (Pilgrim and Palma 1982)

*Eudyptes moseleyi*, unspecified site of infection, Tristan da Cunha, South Atlantic Ocean (Kéler 1952)

*Eudyptes pachyrhynchus*, unspecified site of infection, New Zealand (Pilgrim and Palma 1982)

*Eudyptes robustus*, unspecified site of infection, New Zealand (Pilgrim and Palma 1982)

*Eudyptes schlegeli*, unspecified site of infection, Macquarie Island, Australia (Clay 1967); New Zealand (Pilgrim and Palma 1982); Tasmania (Green and Palma 1991)

*Eudyptes sclateri*, New Zealand (Clay 1967)

#### ***Austrogoniodes demersus* (Kéler, 1952)**

*Eudyptes chrysolophus*, unspecified site of infection, Argentine Zoo probably contamination (Clay 1967)

*Eudyptes schlegeli*, unspecified site of infection, Argentine Zoo probably contamination (Clay 1967)

*Spheniscus demersus*, unspecified site of infection, Dassen and Dyer Island, South Africa (Kéler 1952; Banks and Palma 2003)

*Spheniscus magellanicus*, unspecified site of infection, Argentine Zoo probably contamination (Clay 1967)

*Spheniscus mendiculus*, unspecified site of infection, Rábida and Isabela Island, Galápagos (Banks and Palma 2003)

#### ***Austrogoniodes gressitti* Clay, 1967**

*Eudyptes chrysolophus*, unspecified site of infection, South Shetlands, Antarctica (Clay 1967)

*Pygoscelis antarctica*, unspecified site of infection, Anvers Island and South Shetlands, Antarctica (Clay 1967)

*Pygoscelis papua*, unspecified site of infection, South Georgia and Antarctica (Clay 1967)

#### ***Austrogoniodes hamiltoni* Harrison, 1937**

*Eudyptes chrysolophus*, unspecified site of infection, Macquarie Island, Australia (Harrison 1937); Antipodes Island, New Zealand (Clay 1967)

*Eudyptes pachyrhynchus*, unspecified site of infection, Macquarie Island, Australia (Harrison 1937)

*Eudyptes robustus*, unspecified site of infection, Macquarie Island, Australia (Palma and Horning 2002)

*Eudyptes schlegeli*, unspecified site of infection, Macquarie Island, Australia (Clay 1967); Tasmania (Green and Palma 1991)

*Eudyptes sclateri*, unspecified site of infection, Macquarie Island, Australia (Clay 1967)

#### ***Austrogoniodes keleri* Clay, 1967**

*Eudyptes chrysolophus*, unspecified site of infection, Falkland Island (Clay 1967; Keymer *et al.* 2001)

*Eudyptes chrysolophus*, unspecified site of infection, South Shetlands (Clay 1967)

*Pygoscelis papua*, unspecified site of infection, Falkland Island, London Zoo (Clay 1967)

#### ***Austrogoniodes macquariensis* Harrison, 1937**

*Eudyptes chrysolophus*, unspecified site of infection, Macquarie Island, Australia (Harrison 1937); Zoo Hamburg (Eichler 1941); Falkland Island, South Atlantic (Keymer *et al.* 2001)

*Eudyptes chrysolophus*, unspecified site of infection, Heard Island, Antarctica; South Shetlands (Clay 1967)

*Eudyptes pachyrhynchus*, unspecified site of infection, Macquarie Island, Australia (Clay 1967)

*Eudyptes robustus*, unspecified site of infection,

Macquarie Island, Australia (Palma and Horning 2002)

*Eudyptes schlegeli*, unspecified site of infection, Macquarie Island, Australia (Harrison 1937)

*Pygoscelis antarctica*, unspecified site of infection, South Georgia Zoo; South Shetlands (Clay 1967)

*Pygoscelis papua*, unspecified site of infection, Falkland Island, South Atlantic; London Zoo (Clay 1967)

#### ***Austrogoniodes mawsoni* Harrison, 1937**

*Aptenodytes forsteri*, unspecified site of infection, McMurdo Sound, Antarctica (Harrison 1937); New Zealand (Pilgrim and Palma 1982)

#### ***Austrogoniodes struthus* Harrison, 1915**

*Eudyptes chrysolophus*, unspecified site of infection, London Zoo (Clay and Rothschild 1938)

*Eudyptes chrysolophus*, unspecified site of infection, London Zoo (Clay and Rothschild 1938)

*Eudyptes schlegeli*, unspecified site of infection, Macquarie Island, Australia (Harrison 1937)

*Eudyptes sclateri*, unspecified site of infection, Macquarie Island, Australia (Harrison 1937)

*Spheniscus demersus*, unspecified site of infection, London Zoo (Clay and Rothschild 1938)

*Spheniscus mendiculus*, unspecified site of infection, Galápagos (Harrison 1937)

#### ***Austrogoniodes vanalphenae* Banks & Palma, 2003**

*Megadyptes antipodes*, unspecified site of infection, New Zealand (Banks and Palma 2003)

#### ***Austrogoniodes waterstoni* (Cummings, 1914)**

*Eudyptes sclateri*, unspecified site of infection, Macquarie Island, Australia (Harrison 1937)

*Eudyptula minor*, unspecified site of infection, Furneaux Island, Australia (Kéler 1952); inaccessible sites to the bird, Victoria Coast, Australia (Obendorf and McColl 1980); New Zealand (Pilgrim and Palma 1982); Tasmania (Green and Palma 1991)

#### ***Austrogoniodes* sp.**

*Eudyptes chrysolophus*, unspecified site of infection, Falklands (Keymer *et al.* 2001)

*Eudyptes moseleyi*, unspecified site of infection, Tristan da Cunha (Hänel and Palma 2007)

#### ***Nesiotinus demersus* Kellogg, 1903**

*Aptenodytes patagonicus*, unspecified site of infection, Kerguelen Islands, Southern Indian Ocean (Kéler 1952); New Zealand (Pilgrim and Palma 1982); Macquarie Island, Australia (Banks *et al.* 2006)

### **Order Siphonaptera Latreille, 1825**

#### **Family Pygiopsyllidae Wagner, 1939**

##### ***Pagipsylla galliralli* (Smit, 1965)**

*Eudyptes schlegeli*, nest, New Zealand (Smit 1979; Bishop and Heath 1998)

#### **Family Rhopalopsyllidae Oudemans, 1909**

##### ***Parapsyllus australiens* Rothschild, 1909**

*Eudyptula minor*, unspecified site of infection, Victoria Coast, Australia (Obendorf and McColl 1980)

##### ***Parapsyllus heardi* de Meillon, 1952**

*Eudyptes chrysolophus*, unspecified site of infection, Australia, New Zealand and subantarctic Islands (Murray *et al.* 1991)



**Parapsyllus humboldti** Jordan, 1942

*Spheniscus humboldti*, on the birds and in their nests, Peru (Smith et al. 2008)

**Parapsyllus jacksoni** Smit, 1965

*Eudyptula minor*, unspecified site of infection, New Zealand (Smit 1964; Bishop and Heath 1998)

**Parapsyllus longicornis** (Enderlein, 1901)

*Eudyptes chrysocome*, unspecified site of infection, Australia, New Zealand and subantarctic Islands (Murray et al. 1991); Falklands (Keymer et al. 2001)

*Eudyptula minor*, unspecified site of infection, Australia, New Zealand and subantarctic Islands (Smit 1964; Murray et al. 1991; Bishop and Heath 1998)

*Megadyptes antipodes*, unspecified site of infection, Australia, New Zealand and subantarctic Islands (Murray et al. 1991)

**Parapsyllus magellanicus** Jordan, 1938

*Eudyptes chrysocome*, unspecified site of infection, New Zealand (Smit 1965; Bishop and Heath 1998); Macquarie Island, Australia and Kerguelen Islands (Smit 1970)

*Eudyptes chrysolophus*, unspecified site of infection, Marion Island (Smit 1970)

*Spheniscus magellanicus*, unspiced site of infection, Falkland Island (Smit 1970)

**Parapsyllus** sp.

*Eudyptes chrysocome*, unspecified site of infection, Falklands (Keymer et al. 2001)

*Spheniscus magellanicus*, unspecified site of infection, Falklands (Keymer et al. 2001)

**HOST-PARASITE LIST****Family Spheniscidae Bonaparte, 1831**

**Aptenodytes forsteri:** (C) *Parorchites zederi*, *Tetrabothrius wrightii*; (N) *Contraecaecum heardi*, *C. osculatum*, *C. prevosti*, *Contraecaecum* sp.; (AC) *Ixodes uriae*; (P) *Austrogonioides mawsoni*

**Aptenodytes patagonicus:** (C) *Tetrabothrius pauliani*; *T. wrightii*, Unidentified Tetrabothridae; (N) *Contraecaecum heardi*, *Contraecaecum* sp.; *Tetrameres wetzeli*; (AC) *Ixodes auritulus* group; *I. uriae*; (P) *Austrogonioides brevipes*, *Nesiotinus demersus*

**Eudyptes chrysocome:** (C) *Tetrabothrius eudiptidis*, *T. wrightii*; (N) *Contraecaecum eudyptes*, *C. spheniscus*, *Contraecaecum* sp., *Cosmocephalus obvelatus*, *Stegophorus macronectes*, *Synhaemantus* sp., *Tetrameres wetzeli*, Unidentified anisakid larvae; (AC) *Ixodes uriae*, *Ixodes* sp.; (P) *Austrogonioides concii*, *A. cristati*, *A. hamiltoni*, *A. keleri*, *A. macquariensis*, *A. strutheus*, *Austrogonioides* sp.; (S) *Parapsyllus heardi*, *P. longicornis*, *P. magellanicus*, *Parapsyllus* sp.

**Eudyptes chrysolophus:** (D) *Renicola sloanei*; (N) *Contraecaecum heardi*, *Stegophorus macronectes*; (AC) *Ixodes uriae*; (P) *Austrogonioides bicornutus*, *A. concii*, *A. cristati*, *A. demersus*, *A. gressitti*, *A. keleri*, *A. macquariensis*, *A. strutheus*; (S) *Parapsyllus magellanicus*

**Eudyptes moseleyi:** (D) *Renicola sloanei*; (C) *Tetrabothrius* sp.; (P) *Austrogonioides concii*, *A. cristati*, *Austrogonioides* sp.

**Eudyptes pachyrhynchus:** (N) *Contraecaecum* sp.; (AC) *Ixodes eudyptidis*, *I. uriae*; (P) *Austrogonioides concii*, *A. cristati*, *A. hamiltoni*, *A. macquariensis*

**Eudyptes robustus:** (AC) *Ixodes auritulus* group, *Ixodes*

*uriae*; (P) *Austrogonioides concii*, *A. cristati*, *A. hamiltoni*, *A. macquariensis*

**Eudyptes schlegeli:** (C) Unidentified cestode; (N) *Stomachus* sp., *Terranova piscium*, *Terranova* sp.; (AC) *Ixodes uriae*; (P) *Austrogonioides cristati*, *A. demersus*, *A. hamiltoni*, *A. macquariensis*, *A. strutheus*; (S) *Pagipsylla galliralli*

**Eudyptes sclateri:** (AC) *Ixodes uriae*; (P) *Austrogonioides concii*, *A. cristati*, *A. hamiltoni*, *A. strutheus*, *A. waterstoni*

**Eudyptula minor:** (D) *Echinostoma* sp., *Galactosomum angelae*, *Galactosomum* sp., *Mawsonotrema eudyptulae*, *Renicola* sp.; (C) *Tetrabothrius lutzi*, *Tetrabothrius* sp., Unidentified Tetrabothridae; (A) *Corynosoma* sp.; (N) *Anisakis* sp., *Capillaria* sp., *Contraecaecum eudyptulae*, *C. spiculigerum*, *Contraecaecum* sp., Unidentified Filaroidea, Unidentified nematode; (AC) *Eulaelaps* sp., *Haemolaelaps* (= *Androlaelaps*) *pachyptilae*, *Ingrassia eudyptula*, *Ixodes auritulus* group, *I. eudyptidis*, *I. kohlsi*, *I. percavatus*, *I. uriae*, *Liponyssoides eudyptulae*, *Ornithodoros capensis*; (P) *Austrogonioides waterstoni*; (S) *Parapsyllus australiens*, *P. jacksoni*, *P. longicornis*

**Megadyptes antipodes:** (A) Unidentified acanthocephalan; (N) *Contraecaecum eudyptes*; (AC) *Ixodes auritulus* group, *I. eudyptidis*, *I. uriae*; (P) *Austrogonioides concii*, *A. vanalphenae*; (S) *Parapsyllus longicornis*

**Pygoscelis adeliae:** (C) *Tetrabothrius wrightii*, *Tetrabothrius* sp.; (A) *Corynosoma hamanni*, *C. pseudohamanni*; (N) *Contraecaecum antarcticum*, *C. osculatum*, *Streptocara* sp.; (AC) *Ixodes uriae*; (P) *Austrogonioides antarcticus*, *A. bifasciatus*

**Pygoscelis antarctica:** (D) *Renicola sloanei*; (C) *Parorchites zederi*, *Tetrabothrius joubini*, *T. pauliani*; (A) *Corynosoma pseudohamanni*, *Corynosoma* sp.; (N) *Stegophorus macronectes*; (P) *Austrogonioides gressitti*, *A. macquariensis*

**Pygoscelis papua:** (D) *Renicola sloanei*; (C) *Parorchites zederi*, *Tetrabothrius pauliani*, *Tetrabothrius* sp.; (A) *Corynosoma bullosum*, *C. hamanni*, *C. shackletoni*, *Corynosoma* sp.; (N) *Contraecaecum heardi*, *Contraecaecum* sp., *Stegophorus macronectes*, *Stomachus* sp., *Streptocara* sp., *Tetrameres wetzeli*; (AC) *Ixodes uriae*; (P) *Austrogonioides gressitti*, *A. keleri*, *A. macquariensis*

**Spheniscus demersus:** (D) *Cardiocephaloides physalis*, *Metorchis coeruleus*, *M. orientalis*, *M. pinguinicola*, *M. tener*, *M. xanthosomus*, *Renicola solanei*; (N) *Contraecaecum variegatum*, *Cyathostoma phenisci*; (AC) *Ornithodoros (Alectorobius) capensis*; (P) *A. demersus*, *A. strutheus*

**Spheniscus humboldti:** (D) *Cardiocephaloides physalis*, *Cotylurus variegatus*, *Hirudinella clavata*; (C) *Tetrabothrius eudyptidis*, *Tetrabothrius* sp.; (N) *Contraecaecum pelagicum*, *Contraecaecum* sp., *Cosmocephalus* sp., *Dirofilaria immitis*; (AC) *Ornithodoros (Alectorobius) amblus*, *Ornithodoros (Alectorobius) spheniscus*; (P) *Austrogonioides bifasciatus*; (S) *Parapsyllus humboldti*

**Spheniscus magellanicus:** (D) *Ascocotyle (Ascocotyle) felippe*, *A. (Phagicola) longa*, *Ascocotyle (Phagicola)* sp., *Cardiocephaloides physalis*, *Cardiocephaloides* sp., *Mesostephanus odhneri*, *Posthodiplostomum macrocotyle*, *Ribeiroia ondatrae*, *Stephanoprora uruguayense*; (C) *Tetrabothrius eudiptidis*, *T. lutzi*, *T. pellucidus*; (A) *Corynosoma* sp.; (N) *Ascaridia* sp., *Contraecaecum heardi*, *C. pelagicum*, *C. plagiaticium*, *C. spheniscus*, *Contraecaecum* sp.,



*Cosmocephalus obvelatus*; (AC) *Amblyomma parvitarsum*, *Ixodes uriae*; (P) *Austrogoniodes bifasciatus*, *A. demersus*; (S) *Parapsyllus magellanicus*, *Parapsyllus* sp.

***Spheniscus mendiculus***: (N) *Paronchocerca straeleni*, Unidentified microfilariae; (AC) *Ornithodoros (Alectorobius) yunkerii*; (P) *Austrogoniodes demersus*, *A. struthesus*

## DISCUSSION

Endoparasites were the richest group presenting highest richness of species with 68 species of parasites, while ectoparasites were represented by 40 species. The transmission of this group of parasites tends to be favored by the feeding of the penguins, which consists mainly of fishes, squids and krill, the former being one of the main intermediate hosts for these parasites.

*Spheniscus magellanicus* (20), *Eudyptula minor* (16) and *Pygoscelis papua* (14) present the richest helminth communities. These results may be influenced by the distribution of the species and by the effort of the researchers on the knowledge of the parasitic fauna of this species and its health state, seeing that some of them can cause serious damages to the host.

The poorest parasite richness is found in *E. moseleyi* and *S. mendiculus*. *Eudyptes moseleyi* has a restricted breeding range (Davis and Renner 2003), occurring just on seven islands with a total land area of 250 km<sup>2</sup>, and the low number of parasitological studies in this species certainly plays an important role.

The phylogeny is an important factor that shows the relationship among penguins' species and helminths (Poulin and Morand 2004). It is more frequent to find the same species of helminths among penguins of the same genus. Notwithstanding all penguins came from the same family and also share some helminth species. Parasites are useful in information on host ecology, biogeography and phylogeny (Raga et al. 2008; Gardner and Campbell 1992), and also serve as indicators of current and historical ecological relationships (Aznar et al. 2001).

Recently Brandão et al. (2013) added 60% of the Magellanic penguin's parasite fauna known so far, and this is a well studied species of penguin. Thus indicating the necessity of the maintenance of information on the biodiversity of parasites of penguins, mainly at remote places like Antarctica.

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