

AUSTRALASIAN ANTARCTIC EXPEDITION

1911-14.

UNDER THE LEADERSHIP OF SIR DOUGLAS MAWSON, O.B.E., B.E., D.Sc., F.R.S.

SCIENTIFIC REPORTS.
SERIES C.—ZOOLOGY AND BOTANY.

Edited by Professor T. Harvey Johnston,
University of Adelaide.

VOL. II. PART 3.

TICKS (IXODOIDEA)

BY

PROFESSOR T. HARVEY JOHNSTON,
UNIVERSITY OF ADELAIDE.

PRICE: THREE SHILLINGS.

Wholly set up and printed in Australia by
DAVID HAROLD PAISLEY, GOVERNMENT PRINTER, SYDNEY, NEW SOUTH WALES, AUSTRALIA.

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1937.

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REPORT ON THE TICKS (IXODOIDEA)

OF THE

AUSTRALASIAN ANTARCTIC EXPEDITION.

By T. HARVEY JOHNSTON, Professor of Zoology, University of Adelaide.

INTRODUCTION.

My colleague, Professor Sir Douglas Mawson, F.R.S., leader of the Australasian Antarctic Expedition (1911-1914), asked me to write a report on the ticks collected, in order that the records may be noted in the official series published by the Expedition and now approaching completion.

The material, all of which was obtained at Macquarie Island by H. Hamilton, one of the biologists, was entrusted to the late Professor L. Harrison, who took it to Cambridge with him. He evidently passed it on for examination to Professor G. H. Nuttall, F.R.S., who recorded (1916) the determinations, along with those of other ticks sent from various parts of the world.

Most of the specimens, nearly all of which were females, were identified as *Ixodes putus* (Cambridge), and the remainder as *I. auritulus* Neumann. As hosts of *I. putus* there were mentioned:—the Royal penguin, *Catarrhactes schlegeli*; King penguin, *Aptenodytes patachonica*; Rockhopper penguin, *Pygoscelis papua*; Victoria penguin, *Catarrhactes pachyrhynchus*; and the sooty albatross, *Phoebetria fuliginosa*. *I. auritulus* was reported from the King penguin, *Aptenodytes patachonica*, and the skua, *Megalestris antarctica*.

The names given for the bird hosts are the same as those mentioned by Mawson (1915, 306; 1923) and Ainsworth (1915). Since some of these names were based on misdeterminations, and since the report on the birds collected by the expedition has not yet appeared, the opportunity is now taken to correct these errors.*

The penguin indicated by Nuttall as the rockhopper, *Pygoscelis papua*, and by Mawson and Ainsworth as the "gentoo or rockhopper," is the gentoo, *Pygoscelis papua*. If a varietal name be recognised, then it is *P. papua taeniata*. The Victoria penguin, *Catarrhactes pachyrhynchus*, of these authors, is the true rockhopper, *Eudyptes chrysocome*

* R. A. Falla's report on the birds of this expedition together with those collected by the British, Australian, and New Zealand Antarctic Research Expedition (1929-1931) has just been published. (B.A.N.Z. Antarct. Res. Exp., Rep. Ser. P, 2, August, 1937, 288 pp.)

(syn. *E. cristatus*). The true Victoria penguin, which it resembles, occurs on the coasts of southern New Zealand, Stewart Island, the Chathams, and the Snares, but not on Macquarie. Alexander (1928) does not list the last named as one of the habitats of the rockhopper, but during the visit of the British, Australian and New Zealand Antarctic Research Expedition to the island in 1930, we found the species still occupying the "rookery" at the northern end of the island, referred to by Mawson. The Royal penguin that is so abundant on the island, is *Eudyptes schlegeli*.

The sooty albatross which nests on Macquarie, is not *Phoebertia fuliginosa*, but the "light-mantled sooty," *Phoebertia palpebrata* (Mawson, 1915, 2, plate opp. p. 190). Alexander lists it as variety *huttoni*, whose range includes also the Antipodes, Auckland and Campbell Islands. *Megalestris antarctica* is a synonym of *Catharacta lonnbergi*.

SPECIES RECORDED FROM THE ANTARCTIC AND SUBANTARCTIC.

As no attempt seems to have been made, as yet, to compile a list of the Ixodoidea recorded from the Antarctic and Subantarctic, it may be of use to do so. It is not proposed to indicate the limits of these regions, and there have been included amongst the hosts, in addition, the penguins occurring in South Africa, Southern Australia and Southern New Zealand, as well as some petrels whose range extends into the Southern Ocean.

The habits of the southern oceanic birds are such that it is only on certain occasions that ticks are likely to be able to attack new hosts, or that larval ticks may be able to have access to any host. It is only during the nesting period which occurs during a short period of the year, that this can happen. At least some of the ticks feed while the birds are in the nest and, when replete, hide in the burrow in which the bird is caring for the eggs or young. These ticks eventually lay their eggs in such situations, and the resulting larvae attack the adult or young bird. Once the nesting season is over, then the burrows are not visited again until the next breeding season. It should be mentioned, however, that the season varies according to the species of bird, so that nesting may be in progress on any particular island or locality for many months of the year. As the burrows of several species may be very close together, it is likely that ticks may migrate from one to another. Even in the case of those southern birds which do not occupy burrows, *e. g.*, giant petrels, albatrosses, gulls, terns, skuas, cormorants, etc., infection can be spread in much the same way. Some of these birds are social and others solitary during breeding. Penguins are social (though far from sociable) when in their "rookeries" (or burrows in the case of the species in Southern Australia).

Some of the ticks referred to in the following part of this report are mentioned by Ferguson (1925) and by Fielding (1927). Acknowledgment is made of the assistance obtained from the publications of Neumann, Nuttall and Warburton.

Both families of the Ixodoidea are represented amongst the ticks recorded in this report; the Ixodidae by species of only one genus, *Ixodes*; and the Argasidae by one species of each of the two genera, *Ornithodoros* and *Argas*.

IXODES PUTUS (Cambridge) Neumann.

This widely distributed parasite of oceanic birds was described originally as *Hyalomma puta* by Cambridge (1876, 1878), from material collected in Kerguelen from a penguin, *Pygoscelis taeniatus* (= *P. papua* var. *taeniata*), by Eaton of the Transit of Venus Expedition. Neumann (1899, 125) transferred it to *Ixodes* and gave a further account of it, based on material from several localities. Later (1902, 115, 117; 1904, 444) he made it the type of *Ceratixodes*, which he subsequently (1911, 29) regarded as a sub-genus of *Ixodes*. *Ceratixodes* is not recognised by Nuttall and Warburton (1911, 108) as being valid. The biology of the species has been studied by Nuttall (1913, 74-86; 1915, 437-8) whose account was based on material from Welsh guillemots. He described the larval stage in 1912 (p. 60).

Neumann (1899, 125) recorded the tick from a number of additional localities, based largely on specimens in the Paris Museum, but without any mention of hosts. The material was obtained from St. Pierre et Miquelon, King I (? British Columbia), Campbell I (Filhol Collection), Island of St. Paul in Alaska, and Cape Horn. *Ixodes borealis* Kr. and Neum. from Arctic birds (Behring Island, Vega Expedition) was included in the synonymy. One of the two islands named St. Paul, mentioned as localities for *I. puta*, is probably the French possession in the Southern (or Southern Indian) Ocean, which is utilised by sea birds as a nesting site, and from which specimens might be expected to reach Paris Museum. The other island is in the Behring Sea.

Similar information was incorporated by Neumann in subsequent papers (1901, 283; 1902, 115), and data relating to the ticks taken by the Belgian Antarctic Expedition were added. His report on the "Belgica" collection (1903, 36) mentioned that *I. puta* was the only species obtained and that it was taken from *Spheniscus magellanicus* and *Phalacrocorax magellanicus* from Chilean Tierra del Fuego, and from *P. carunculatus* from Staten Island, Argentine Tierra del Fuego. He also referred to the earlier records of the species from *Pygoscelis* (Kerguelen) and from northern guillemots (*Uria troile*), and indicated that the cormorants—especially *Phalacrocorax graculus* L., which had a very wide range including the Arctic and Antarctic, as well as the intervening regions of Brazil and Africa,—might have been the distributing agent of the species. Evans (1906) in a paper referring to *Ixodes borealis* (which he regarded as distinct from *I. puta*) pointed out Neumann's error regarding the range of *P. graculus*; and the latter author (1907, 231) then modified his former statement. In 1907 Evans recognised the identity of the two species (1907, 36) of ticks.

Some of the host names used by Neumann call for comment. *Phalacrocorax graculus* L. (or *P. aristotelis*) has a range, according to Alexander, extending from Iceland and Northern Europe to Morocco and is the "shag" or Green Cormorant of British coasts. Gray in his Handlist of Birds, quoted the species as a synonym of *P. cristatus* Fabr. and mentioned that Illiger's *graculus* was *P. capensis*. The most widely distributed species, and perhaps the one to which Neumann intended to refer, is *P. carbo* L., the large cormorant of the British Isles, its range, including that of its subspecies or varieties, extending from Greenland, Iceland and Northern Europe to South Africa, Australia, Tasmania, New Zealand and the Chatham Islands (Alexander, 1928). *P. carunculatus* is restricted to southern New Zealand and its subantarctic islands, including Campbell Island (subsp. *campbelli*) from which locality Filhol had collected the ticks identified by Neumann as *I. putus*. Since penguins and albatrosses, in addition to cormorants, breed on that island, and all of these are reported as hosts for the tick, it would be unwise to make a suggestion as to which of these birds was the likely host of Neumann's material. The bird referred to by him as *P. carunculatus* from Staten Island, must have been either *P. magellanicus* or, more probably, *P. atriceps*, the three species being closely related and exhibiting considerable similarity in colouration. The report on the birds of the "Belgica" Expedition is not available for reference, but Mr. T. Iredale, of the Australian Museum, stated, in reply to a query, that the bird in question belonged to *P. atriceps*.

In 1905 Lahille recorded the tick from *P. verrucosus* and *Spheniscus magellanicus* from Tierra del Fuego (Navarin and Tussac I. respectively). In regard to the former of these two hosts, which was mentioned also by Lahille, Neumann and Nuttall (see later in this report), it should be pointed out that this species is restricted to the Kerguelen area, but is represented in the American sector of the Antarctic by *P. atriceps*, whose range includes Tierra del Fuego, Falklands, South Georgia, South Shetlands and Graham's Land. *P. magellanicus* is restricted to the Falklands and adjacent parts of Patagonia.

Two years later, Neumann (1907, 229) referred to some of the earlier references to the parasite, mentioning the hosts and localities already given by him (1899). He had previously (1902) indicated that *I. fimbriatus*, in addition to *I. borealis* Kramer and Neumann, 1883, from Arctic birds, was a synonym of *I. putus*.

In his Monograph (1911, 29, 30) Neumann gave as hosts *Phalacrocorax verrucosus*, *Uria troile*, *Pygoscelis taeniatus*, *Spheniscus magellanicus*, and *Fratercula arctica*, the second and fifth being arctic birds. He stated that the host list probably included the greater part of the Palmipeds of the Arctic and Antarctic regions. The localities given by him are Alaska, Behring Island, St. Pierre et Miquelon, King Island; Cape Horn, Kerguelen, Campbell I., the Falklands, Beagle Strait (Tierra del Fuego), Gerlache Strait (Graham Land); England and Scotland. It will be noticed that he omitted *P. carunculatus* and included *P. verrucosus*, both of these records, as we have shown, being erroneous.

In his very brief report of the ticks taken by the Second French Antarctic Expedition, Neumann (1913, 197) recorded *I. (Ceratiixodes) putus* from *Phalacrocorax atriceps* (Port Lockroy in the Palmer Archipelago, Graham Land); *P. vigua* (Magellan Strait); and *Diomedea exulans* (Deception Island, South Shetlands). Gain (1913, 156) in his account of the birds collected by that Expedition, referred to the occurrence of the tick on the last-named bird. Speiser (1909) recognised the genus *Ceratiixodes* and recorded *C. putus* from *Phoebetria fuliginosa* from Possession Island in the Crozets, and from the Southern Ocean. Nuttall (1911, 61) quoted as hosts *Phalacrocorax verrucosus*, *Spheniscus magellanicus*, *Pygoscelis taeniatus*, and *Penguin* sp. Nuttall and Warburton (1911) re-examined Cambridge's type material and referred to the various localities (p. 260-1), mentioning as one of them "King Island (? Tasmania)," as also did Ferguson (1925).

Nuttall (1911, 97) suggested that *I. apteridis* Maskell, 1897, and *I. aptericola* Maskell, 1897, from *Apteryx mantelli* and *A. australis*, respectively (New Zealand), were perhaps synonyms of *I. putus*. Nuttall and Warburton (1911, 282) placed Maskell's two forms amongst the condemned and doubtful species and mentioned that the descriptions and figures were too poor to permit of determining even the genus. They stated that the two might perhaps be identical and that the figure of *I. apteridis* represented a capitulum of the type possessed by *I. putus*. Nuttall stated subsequently (1916, 317) that Maskell's two species were probably synonymous with *I. anatis* Chilton*, and if proved to be so, then *I. apteridis* would have priority.

Nuttall (1916) extended considerably our knowledge of the range of *I. putus*, but introduced some errors regarding certain localities mentioned by Neumann. He gave as Australasian, Bering Island, King Island and Kerguelen. The first is Alaskan, the second has been indicated by Neumann (1902, 115) as being probably in British Columbia, while Kerguelen has no Australian affinities. These errors have been incorporated by Fielding (1927, 37), who has also erroneously included in his list of Australasian hosts of ticks (p. 93-7) many birds and reptiles, and also ticks from other regions.

Nuttall (1916), as mentioned earlier in this report, identified *I. putus* from the following birds from Macquarie Island—*Phoebetria fuliginosa* (= *P. palpebrata*), *Catarrhactes pachyrhynchus* (= *Eudyptes chrysocome*), *Catarrhactes* (= *Eudyptes*) *schlegeli*, *Aptenodytes patagonica*, and *Pygoscelis taeniatus* (= *P. papua*); also from *Diomedea exulans* from Antipodes I.; from the ground in the vicinity of a penguin (*Eudyptes*) rookery, Kerguelen (Deutsche Tiefsee Expedition); and from Possession Island, Victoria Land, Antarctica (specimen from Berlin Museum).

The writer has not been able to verify the possibility of any ticks having been found on Possession Island, Victoria Land, on the date mentioned (25 December, 1901). This date suggests the British National Antarctic Expedition of Scott in the "Discovery,"

* The bird host of *Ixodes anatis* Chilton is *Anas superciliosa*, which ranges over Australia as well as New Zealand, and occurs (though not specifically recorded previously) on Macquarie Island, but no ticks have as yet been taken from it in the last-named locality. Nuttall (1916, 317) has re-described the species from the type material as well as from some specimens taken from an *Apteryx*.

but the ship did not leave Lyttleton until 24th December, arriving at Cape Adare on 9th January, 1902, and passing by Possession Island (according to the chart) on 11th. The vessel was again in the vicinity of the island on 24 February, 1904; when homeward bound. Sir J. Clark Ross landed on the island on 12 January, 1841 (Mill, 1905) and the next landing was not made until 19 January, 1895, when Kristensen and Bull went there in the "Antarctic." This latter ship was in the pack ice in the vicinity during December, 1894, and early January, 1895, according to Bull's account (1896). The "Southern Cross" under Borchgrevink was in the neighbourhood of the island from February, 1899, to February, 1900, having wintered at Cape Adare. Some of the parties belonging to Scott's second ("Terra Nova") Expedition, were also near the island or Cape Adare, in 1911 and 1912. Shackleton's Expedition in the "Nimrod" did not land in that area, but went further south. None of these expeditions makes any reference to the presence of ticks in the Antarctic. It seems likely, then, that some mistake has been made in regard to the locality or date mentioned. The most probable explanation is that the specimen was taken by the German Antarctic ("Gauss") Expedition during its short visit to Possession Island in the Crozets on the date mentioned. This group of islands has a similar avifauna to Kerguelen, its nearest neighbour. The following facts support that view:—*I. putus* is the only species mentioned as having been taken by that expedition, specimens having been obtained from *Phoebetria fuliginosa** in the Southern Ocean on 17 December, 1901, and at Possession Island, Crozets, on 25 December, 1901; and, besides, the material examined by Nuttall came from the Berlin Museum.

Hirst (1916, 75) referred to *I. putus* from various localities, amongst them being South Georgia (from a sooty albatross, Nov., 1913); Macquarie Island (from a shag); and from the "Challenger" collection (from a southern black-backed gull—no locality mentioned). The albatross must have been *Phoebetria palpebrata* (var. *murphyi*) which breeds at South Georgia; and the shag, *Phalacrocorax traversi*. The gull was *Larus dominicanus*, which is widely distributed in southern latitudes. The localities visited by the "Challenger" and lying within the range of this species of gull, are Cape Colony, Marion Island, Crozets, Kerguelen, Heard Island, New Zealand, southern South America, and the Falklands.

IXODES EUDYPTIDIS *Maskell*.

This tick was described originally (Maskell, 1885) as having been collected from a penguin at Dusky Sound in southern New Zealand. The species which breed in the vicinity are, according to Alexander, *Megadyptes antipodes* and *Eudyptes pachyrhynchus*, as well as the two little penguins, *Eudyptula minor* and *E. albosignatus*, though on rare

* Reichenow in his report of the birds collected by the "Gauss" did not give dates. He referred to *P. fuliginosa*, with *P. palpebrata* and *cornicoides* as synonyms, regarding the light-mantled sooty albatross as being merely a colour or age variety (Deutsche Sud-Polar Exp., 9, Zool. 1, 1908, 477, 542, 551). Enderlein in describing the insect parasites collected by that expedition (10, Zool. 2, 1909, 411, 453) gave as locality for the specimen taken on 17 December, 1901, "north-west of Prince Edward Island." The Crozets' bird was almost certainly *Phoebetria palpebrata*, as this is the species which breeds there, while the specimens taken to the north-west of Prince Edward Island may have been either the true *P. fuliginosa* (= *P. fusca*) or *P. palpebrata*.

occasions a few other species may be represented in New Zealand waters by stragglers. Nuttall and Warburton (1911, 291) stated that, judging from the bad figures, it was possible that *I. eudyptidis* might be *I. putus*.

Neumann (1899, 128) re-described the species from New Zealand material, and also a new one, *I. intermedius* (1899, 132), from a New Zealand *Phalacrocorax* sp. He also described from that locality *I. praecoxalis* (1899, 121; 1902, 119) from the petrel, *Aestrelata cooki*, a bird which ranges into the Southern Ocean (= *Pterodroma cooki*) and mentioned that the examination of a male might lead to the suppression of one or two of these species. Later (1904, 451), he regarded this species and *I. praecoxalis* as synonyms of *I. eudyptidis*. Nuttall and Warburton (1911, 217) were not satisfied regarding the correctness of Neumann's action in identifying his specimens with Maskell's species, and accordingly renamed *I. eudyptidis* Maskell of Neumann, 1899, as *I. neumanni*, basing their account on the material from New Zealand previously studied by Neumann. The latter (1911, 21) gave as hosts for the parasite, *Eudyptes* sp., *Phalacrocorax* sp. and *Aestrelata cooki*, all from New Zealand. In 1916, Nuttall (1916, 320) published the results of his examination of a cotype of Maskell's species, and then reinstated the latter, with *I. neumanni* added to its synonymy. He also recorded it (1916, 327) from *Sterna antarctica* from New Zealand; the little penguin, *Eudyptula minor*, from the coast of New South Wales; and a penguin (which Professor Cleland who collected it, informed me was *E. minor*) from Flinders I., Bass Strait.

Ferguson (1925, 29) mentioned that Neumann had identified as *I. eudyptidis*, some ticks collected by Dr. Cleland from *E. minor* from West Australia, but that at least one of these specimens was *I. percavatus* (Nuttall's identification). The two species are very closely related.

IXODES AURITULUS Neumann.

This tick was at first identified by Neumann (1899) as *I. thoracicus* Koch, but was subsequently regarded as distinct and was named *I. auritulus* by him (1904, 45). The material came from an undetermined bird from Punta Arenas, Tierra del Fuego. Later, he identified it (1907, 17) from material taken from a bird at Booth-Wandel I., Graham Land. In his monograph (1911, 20) he did not give additional information. Nuttall and Warburton (1911, 189) reported it from *Trupialis militaris** from Tierra del Fuego. Nuttall (1916, 312) gave a further account of the species from specimens in the British Museum from various American localities, including the material collected from *Trupialis militaris* from Tierra del Fuego. He also determined it amongst the ticks taken at Macquarie Island by the Mawson Expedition from the king penguin, *Aptenodytes patagonica*, and the skua, *Megalestris antarctica* (= *Catharacta lonnbergi*).

* Gray, Handlist of Birds (British Museum), II, 1870 34-5, refers to two birds *Leistes* (syn. *Trupialis* Bp 1850 nec. Merr. 1826), *militaris* L. nec. Filippi), from the hotter parts of South America, and *Sturnella* or *Pezites* (syn. *Trupialis* Bp. 1850) *militaris* L. from the southern portion of the continent and from the Falkland Islands.

IXODES PERCAVATUS *Neumann.*

This species was described by Neumann (1906, 200; 1911, 21) from Nightingale Island (Tristan d'Acunha), but no host was mentioned by him or by Nuttall and Warburton (1911, 221). As Tristan d'Acunha is utilised by a number of subantarctic petrels and albatrosses as a breeding locality, it is probable that *I. percavatus* may be found on birds in the Southern Ocean.

Nuttall (1916, 329) identified the species from the little penguin, *Eudyptula minor* from Fremantle, West Australia (Cleland Collection). Ferguson (1925, p. 28) mentioned that the specimen on which this identification by Nuttall (1916) was based, was amongst those forwarded to Neumann by Professor Cleland and determined by him as *I. eudyptidis*. The latter is a closely related species whose identity was not satisfactorily fixed until Maskell's cotype material was examined by Nuttall (1916, 321). Fielding (1927, 46) also referred to the parasite.

IXODES MASKELLI *Kirk.*

Described from *Diomedea exulans* from New Zealand (Kirk, 1887, 65). The type has been lost, Nuttall and Warburton (1911, 286) and Nuttall (1916, 317) declaring that the species is indeterminable from the description. Neumann (1911, 131) had previously stated that it was not an *Ixodes*.

IXODES UNICAVATUS *Neumann.*

This species was described originally (1908) from a cormorant from Scotland. but was identified by Nuttall (1916, 334) from an albatross, *Diomedea exulans*, from Antipodes Island.

IXODES LORICATUS *Neumann.*

Recorded by Neumann (1899, 139) from two South American marsupials (opossums). Later (1901, 285) he mentioned Tierra del Fuego as a locality, no host being indicated. In 1911 (p. 18) he gave the names of three opossums as hosts, and also several localities, but the additional species given is the only one of those mentioned which ranges to Patagonia. This is *Didelphys aurita* or *virginiana* (= *D. marsupialis* L. according to Lydeker, Marsupials and Monotremes, in The Naturalist's Library, 1894), of which several varieties have been described. Two other ticks were recorded by Neumann (1911) from this widely distributed opossum, viz., *I. ricinus* L. (from the United States) and *I. angustus* Neum. 1901 (from variety *azarae* Temm., Buenos Aires). Nuttall and Warburton (1911, 195, 266) pointed out that *I. angustus* Neum. 1901 (nec 1899) is a synonym of *I. loricatus*, but Neumann (1910, 172-3) had just previously recognised the identity of the two. The latter gave a key (p. 163) to distinguish this species from *I. auritulus* and *I. elegans*.

ORNITHODOROS TALAJE var. CAPENSIS Neumann.

Of the three varieties recognised by Neumann, one occurs in Latin America; another (not recognised by Nuttall and Warburton) from the Old World; while the third, var. *capensis*, was described by him (1901, 258) from penguin nests on islands off the west coast of Cape Colony. The only species of penguin breeding there is *Spheniscus demersus*. He subsequently (1907) recorded it from the Cargados Carajos (= Garayos) group to the north of Mauritius.

Nuttall and his colleagues (1908, 61) identified the variety amongst material collected by the Challenger in 1876 from birds' nests on the St. Paul Rocks which lie in the Atlantic, just north of the Equator. Speiser (1905, 600) reported that the "Gauss" obtained specimens of the variety at Ascension Island. Later, Neumann (1911, 126) stated that the hosts were "Alcidae (gen. ?)," but this family does not occur in the southern hemisphere, where it is replaced by the Spheniscidae (penguins). The Cargados group, St. Paul Rocks and Ascension are all well to the north of the range of the African penguin, though petrels breed on them.

Ferguson (1925, 25) stated that a specimen of this "variety or distinct species (*capensis*)" was taken by Dr. J. B. Cleland from the little penguin *Eudyptula minor*, in Western Australia. This identification is probably the authority for Fielding to include it amongst the Australian ticks, though both he and Ferguson definitely list the form as *O. talaje*. Fielding's account (1927, 28) is a transcription of Nuttall and Warburton's description (1908, 60) of *O. talaje*, and not of the variety *capensis*.

Nuttall (1911, 51) mentioned that he believed that *O. talaje capensis* from the nests of penguins and other birds would be found to have a life history similar to that of *Argas persicus* and *A. reflexus*. The adults and nymphs of these species feed on their bird hosts when the latter are asleep in the dark, and retreat into crevices during daylight, whereas the larval stages are parasitic on the birds for many days.

Bedford (1931, 230) described a South African tick, *Nuttalliella namaqua*, as belonging to a new genus and species. A single engorged female was found under a stone in Little Namaqualand, the host being perhaps a bird, perhaps a rock rabbit. The species was believed to be intermediate between the Argasidae and Ixodidae, but rather closer to the latter. An examination of his account and figures indicates that his species is an undoubted member of the Argasidae and is most probably a synonym of *Ornithodoros talaje* var. *capensis*. The body form resembles *O. moubata*, but the tarsi are different and the marked dorsal grooves present on that species are absent from Bedford's tick. Until evidence to the contrary is forthcoming, *Nuttalliella* should be regarded as a synonym of *Ornithodoros* and *N. namaqua* as belonging to *O. capensis*.

ARGAS VESPERTILIONIS *Latreille var.*

Nuttall (1911, 48—footnote) stated that a variety of this species infested penguins at Queenstown, Cape Colony. The bird host of this parasite, which is usually occurs on bats*, must be *Spheniscus demersus*.

The writer has not found any reference to antarctic or subantarctic ticks in the official reports of the following expeditions:—"Discovery," "Terra Nova," German Deep-Sea ("Valdivia"), Subantarctic Islands of New Zealand, Shackleton Expeditions, and the Swedish Antarctic Expedition.

Ixodidae have been recorded in the official reports of the "Belgica" (*I. putus*); First French Antarctic ("Français") Expedition, 1903-5 (*I. auritulus*); the German South Polar ("Gauss") Expedition (*I. putus*); Transit of Venus Expedition to Kerguelen (*I. putus*); Second French Antarctic ("Pourquoi-pas") Expedition, 1908-10 (*I. putus*). Material from the following expeditions has been examined and reported on, along with other ticks:—Challenger (*I. putus*, *Ornithodoros capensis*); Subantarctic Islands of New Zealand (*I. putus*, *I. unicavatus*); German Deep-Sea Expedition (*I. putus*); Australasian Antarctic Expedition (*I. putus*, *I. auritulus*).

Grateful acknowledgment is made of the assistance rendered by Mr. W. A. Rainbow of the Australian Museum, Sydney, in transcribing some of the literature which was not available in Adelaide.

* *Argas vespertilionis* was recorded from North Queensland by F. H. Taylor in 1913. Nuttall and Warburton (1911, 277, 279) stated that *Ixodes vespertilionis* was collected from the bat, *Vesperugo tricolor*, at King Williamstown, South Australia, but the locality is not Australian, it is South African.

LIST OF HOSTS AND TICKS RECORDED FROM ANTARCTIC
AND SUBANTARCTIC REGIONS.

Included are some species of penguins from the adjacent coasts of Australia, New Zealand, and South Africa. The name of the recorder is added in brackets.

PENGUINS.

- Aptenodytes patagonica* (*patagonica*) Miller. King penguin.
Ixodes putus Cambr. Macquarie Island (Nuttall).
Ixodes auritulus Neum. Macquarie Island (Nuttall).
Catarrhactes schlegeli—see *Eudyptes schlegeli*.
Catarrhactes pachyrhynchus of Nuttall 1916—see *Eudyptes chrysocome*.
Eudyptes chrysocome Forster. Rockhopper.
I. putus Cambr. Macquarie Island (Nuttall).
Eudyptes schlegeli Finsch. Royal penguin.
Ixodes putus Cambr. Macquarie Island (Nuttall).
Eudyptes sp.
Ixodes putus Cambr. New Zealand (Neumann); Kerguelen (Nuttall).
Eudyptula minor Forster. Little penguin.*
Ixodes percavatus Neum. West Australia (Nuttall).
Ixodes eudyptidis Mask. New South Wales; Bass Straits (Nuttall).
Ornithodoros capensis Neum. West Australia (Ferguson).
Pygoscelis papua Forster (*taeniatus* Peale). Gentoo or Johnny penguin.
Ixodes putus Cambr. Kerguelen (Cambridge); Macquarie I. (Nuttall).
Spheniscus magellanicus Forster. Magellan penguin.
Ixodes putus Cambr. Tierra del Fuego (Neumann; Lahille).
Spheniscus demersus L. Cape or Jackass penguin.
Ornithodoros capensis Neum. Cape Colony (Neumann; Nuttall).
Argas vespertilionis Latreille var. Cape Colony (Nuttall).
Penguin (unidentified).
Ixodes eudyptidis Mask. New Zealand (Maskell; Neumann; Nuttall).

LARIFORM BIRDS (Gulls, Skuas, Terns).

- Catharacta lonnbergi* Mathews. Southern Skua.
Ixodes auritulus Neum. Macquarie Island (Nuttall).
Larus dominicanus Licht. Kelp gull, Southern black-backed gull.
Ixodes putus Cambr. Challenger, locality? (Hirst).
Megalestris antarctica—see *Catharacta lonnbergi*.
Sterna albistriata Gr. Blackfronted Tern.
Ixodes eudyptidis Mask. New Zealand (Nuttall).
Sterna antarctica Forst.—see *S. albistriata*.

* West Australian records refer to material collected by Prof. J. B. Cleland in the vicinity of Fremantle.

TUBINARES (Albatrosses, Petrels).

Aestrelata cooki Gray—see *Pterodroma cooki*.

Diomedea exulans L. Wandering albatross.

Ixodes putus Cambr. Antipodes I. (Nuttall); South Shetlands (Neumann; Gain).

Phoebetria fuliginosa Gmelin of Nuttall 1916—see *P. palpebrata*; of Speiser 1909, see *P. fusca* and *P. palpebrata*.

Phoebetria fusca Hilsenb. Sooty Albatross.

Ixodes putus Cambr. Between Cape Colony and Prince Edward I., Southern Ocean (Speiser).

Phoebetria palpebrata Forster. Light-mantled Sooty Albatross.

Ixodes putus Cambr. South Georgia (Hirst); Macquarie I. (Nuttall); Crozets (Speiser).

Pterodroma cooki Gray. Cook's Petrel.

Ixodes eudyptidis Mask. New Zealand (Neumann).

CORMORANTS (Phalacrocoracidae).

*Phalacrocorax atriceps**, Blue-eyed Cormorant.

Ixodes putus Cambr. Tierra del Fuego (Lahille); Palmer Archipelago, Graham Land (Neumann); Staten Island (Neumann).

Phalacrocorax carunculatus Gm. of Neumann—see *P. atriceps*.

Phalacrocorax magellanicus Gm. Magellan Cormorant.

Ixodes putus Cambr. Tierra del Fuego (Neumann).

Phalacrocorax sp.—

Ixodes eudyptidis Maskell. New Zealand (Neumann).

Phalacrocorax traversi Rothschild**. Macquarie I. Shag.

Ixodes putus Cambr. Macquarie I. (Hirst).

Phalacrocorax verrucosus Cab. of Lahille, Neumann and Nuttall—see *P. atriceps*.

Phalacrocorax vigua Vieil.

Ixodes putus Cambr. Magellan Strait (Neumann).

OTHER BIRDS.

Trupialis militaris L.

Ixodes auritulus Neum. Tierra del Fuego (Nuttall).

* Gain (1913, 76) states that this species is the only representative of the *Phalacrocoracidae* in the South American sector of the Antarctic, near the polar circle.

** Falla (1937) has indicated that the correct name of the Macquarie Island cormorant is *Phalacrocorax purpurascens* Brandt.

Unknown bird hosts.

Ixodes putus Cambr. Possession I. (Nuttall) host probably *Phoebetria palpebrata* from the Crozets; Campbell I. (Neumann); St. Paul (Neumann); Falklands (Neumann).

Ixodes auritulus Neum. Tierra del Fuego (Neumann); Graham Land (Neumann).

Ixodes percavatus Neum. Tristan d'Acunha (Neumann).

MARSUPIAL.

Didelphys marsupialis L. (syns. *virginiana* Tiedm., *aurita* Wied.). Common American opossum.

Ixodes loricatus Neum. Tierra del Fuego (Neumann). Perhaps from this host.

SOUTHERN GEOGRAPHICAL DISTRIBUTION OF TICKS REFERRED
TO IN THIS REPORT.

New Zealand (marine birds)—*Ixodes eudyptidis*.

Campbell I.—*Ixodes putus*.

Antipodes I.—*Ixodes putus*.

Macquarie I.—*Ixodes putus*; *Ixodes auritulus*.

Southern and South-western Australia (penguins)—*Ixodes eudyptidis*; *Ixodes percavatus*; *Ornithodoros capensis*.

St. Paul—*Ixodes putus*.

Kerguelen—*Ixodes putus*.

Crozets—*Ixodes putus*.

Southern Ocean between Prince Edward I. and Cape Colony—*Ixodes putus*.

Cape Colony (penguins)—*Ornithodoros capensis*; *Argas vespertilionis* var.

Tristan d'Acunha—*Ixodes percavatus*.

Falkland Is.—*Ixodes putus*.

Tierra del Fuego and adjacent Magellan region—*Ixodes putus*; *Ixodes auritulus*; *Ixodes loricatus*.

South Georgia—*Ixodes putus*.

Graham Land (Antarctica), South Shetlands and Palmer Archipelago—*Ixodes putus*; *Ixodes auritulus*.

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