Phthiraptera of petrels and skuas from Gough Island, South Atlantic Ocean

R.W. Furness and R.L. Palma

INTRODUCTION

Ectoparasites occur widely on seabirds and have been studied by a number of authors. The population dynamics of feather lice (Insecta: Phthiraptera) found on aukts was studied by Eveleigh & Threlfall (1976). There have been many studies of systematics (e.g. Edwards 1961, Price & Clay 1972, Palma & Pilgrim 1983, 1984, 1988), host specificity, frequency distribution on hosts, population age-structure and dynamics of feather lice from a wide variety of species of Procellariiformes from South Orkney Islands (Fowler & Price 1987), Scotland (Fowler & Miller 1984, Fowler & Palma 1986, Fowler & Furness 1987, Fowler & Hudson 1988) and Wales (Fowler & Shaw 1989). Phthiraptera can be valuable in throwing light on phylogenetic relationships and geographic origins of birds because particular species of Phthiraptera tend to be found only on one or a few closely-related species of hosts (Rothschild & Clay 1952, Timmermann 1965, Pilgrim & Palma 1982, Zoofrillo 1988, in press).

Gough Island, in the centre of the South Atlantic Ocean (40° 10’S) is a small island about 15 km long, but has enormous populations of many species of procellariiform birds, and many of them (and some at neighbouring Tristan da Cunha with which Gough Island forms an extended archipelago) are endemic subspecies or endemic species (Swales 1965). The procellariiform taxa breeding on the island are Wandering Albatross Diomedea exulans exulans, Yellow-nosed Albatross D. chlororhynchos, Sooty Albatross Phoebetria fusca, Southern Giant Petrel Macronectes giganteus, White-chinned Petrel Procellaria aequinoctialis, Grey Petrel P. cinerea, Great Shearwater Puffinus gravis, Little Shearwater P. assimilis exulans, Broad-billed Prion Pachyptila vittata vittata, Atlantic Petrel Pterodroma incerta, Great-winged Petrel P. macroptera, Soft-plumaged Petrel P. mollis mollis, Kerguelen Petrel Lepusca brevirostris, White-faced Storm-petrel Pelagodroma marina marina, White-bellied Storm-petrel Fregetta grallaria leucogaster, Grey-backed Storm-petrel Garrodia nereis, and Common Diving-petrel Pelecanoides urinatrix dacumae (taxa follow Swales 1965 updated by Harrison 1983 and Burbott 1990). Most of these birds breed on the lower slopes of the island, and many are burrow-nesters. The numbers present on a small area of land are staggering, with many tens of millions of birds visiting the burrows at night (Swales 1965). Furthermore, most species that use burrows appear to compete for the same burrows on a small part of the island around the coastal cliff top fringe where the ground is covered in deep dry and fibrous peat, rather than showing clear species segregation into different burrowing habitats (Swales 1965, pers. obs.) and so there is enormous opportunity for the transfer of ectoparasites between species. In addition to the large numbers of petrels and shearwaters, some 3000 pairs and a further 3000 nonbreeding Tristan Skuas Catharacta skua hamiltoni share the same habitat and feed almost exclusively on the burrow-nesting petrel immatures and adults captured on the surface at night, and on adults and chicks dug out of burrows (Furness 1987).

In view of the extremely high nesting density of seabirds on Gough Island and common use of burrows by several species, one might expect high incidence rates (the mean number of lice per bird) of feather lice and the occurrence of the same species of lice on a variety of hosts. However, because lice are highly host specific the latter is not so, but the information on the lice found on the endemic seabird forms on Gough Island may be of value in assessing relationships between these populations and others elsewhere.

This paper reports the identities and numbers of Phthiraptera obtained from a variety of seabirds from Gough Island in 1985. The birds were caught and deloused by Furness and the lice identified by Palma.
METHODS
Between 30 October and 16 November 1985 brood-nesting Procellariiformes and skuas were attracted at night to a handheld quartz-halogen spotlight powered by a 9V motorcycle battery. All birds sampled were caught with a hand-net on the ground on a densely-burrowed area of the lower slopes of Gough Island close to the weather station in the south-east corner of the island. An attempt was made to sample a variety of species but sample sizes reflect to some extent the relative abundances of the different species in that area. Each bird captured was examined in the hand and only adult birds were retained for delousing. Birds were taken individually to the laboratory and deloused in a plastic bucket (approx. 81) for 20 min, as described by Fowler & Cohen (1983). The anaesthetic used was 15 cm³ chlordane and the bucket was kept at laboratory temperature (ca. 20°C) to ensure rapid removal of lice. The high temperature causes the chlordane to evaporate quickly and to diffuse through the feathers. After the removal of the bird, lice were picked from the bucket using a fine dissection paintbrush and insect forceps, and were stored in 70% alcohol. No magnification was used to aid searching for lice in the bucket and so some first instars may have been missed. Lice on the head and neck regions would not be sampled by this method.

Because the time taken to capture, transport, delouse, release the bird and sort the lice, it was not possible to delouse more than three or four birds per night. Lice were also taken by hand-sorting through the head and neck feathers of one adult. Wandering Albatross caught at its nest. Altogether, lice were collected from 11 Soft-plumaged Petrels, 10 Broad-billed Prions, 7 Atlantic Petrels, 4 Common Diving-petrels, 4 White-faced Storm-petrels, 1 White-bellied Storm-petrel, 4 Tristan Skuas, 3 Kerguelen Petrels, 3 Great Shearwaters, and 1 Little Shearwater. Identifications were made by R.L. Palma by comparison with a reference collection in the National Museum, Wellington, N.Z. All the specimens from this study are kept in that collection.

RESULTS
Lice were collected from all seabird species examined. The extraction efficiency of the method is not known and so numbers removed from individual birds represent an unknown proportion of the total coparasite burden. The lice removed were from the body and wings and not from the head of the birds, which was not subjected to hand-sorting except for the Wandering Albatross. Two of three Kerguelen Petrels processed gave no lice, but every other bird produced at least one louse and up to 125. Some 24 species of feather lice were identified, representing 12 different genera.

TABLE I. SUMMARY STATISTICS FOR FEATHER LOUSE INFESTATION OF SEABIRDS AT GOUGH ISLAND

<table>
<thead>
<tr>
<th>Seabird species</th>
<th>Number of lice deloused</th>
<th>Number of lice with lice</th>
<th>Lice per bird number</th>
<th>Lice per bird mean</th>
<th>Lice per bird range</th>
<th>Number of lice species</th>
<th>Number of each louse species as percentage of the total lice present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kerguelen Petrel</td>
<td>3</td>
<td>1</td>
<td>4.7</td>
<td>0.14</td>
<td>1</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Little Shearwater</td>
<td>1</td>
<td>1</td>
<td>27</td>
<td>-</td>
<td>2</td>
<td>70, 30</td>
<td></td>
</tr>
<tr>
<td>Great Shearwater</td>
<td>3</td>
<td>3</td>
<td>14.3</td>
<td>9-25</td>
<td>3</td>
<td>40, 37, 23</td>
<td></td>
</tr>
<tr>
<td>White-bellied Storm-petrel</td>
<td>1</td>
<td>1</td>
<td>8</td>
<td>-</td>
<td>2</td>
<td>88, 12</td>
<td></td>
</tr>
<tr>
<td>Common Diving-petrel</td>
<td>4</td>
<td>4</td>
<td>9.5</td>
<td>6-17</td>
<td>3</td>
<td>68, 29</td>
<td></td>
</tr>
<tr>
<td>White-faced Storm-petrel</td>
<td>4</td>
<td>4</td>
<td>17.0</td>
<td>7-34</td>
<td>2</td>
<td>94.6</td>
<td></td>
</tr>
<tr>
<td>Broad-billed Prion</td>
<td>10</td>
<td>10</td>
<td>49.4</td>
<td>4-125</td>
<td>4</td>
<td>99, 0.5, 0.2, 0.2</td>
<td></td>
</tr>
<tr>
<td>Atlantic Petrel</td>
<td>7</td>
<td>7</td>
<td>27.3</td>
<td>9-85</td>
<td>4</td>
<td>48, 33, 18.1</td>
<td></td>
</tr>
<tr>
<td>Soft-plumaged Petrel</td>
<td>11</td>
<td>11</td>
<td>52.0</td>
<td>23-84</td>
<td>5</td>
<td>42, 37, 19, 2, 0.2</td>
<td></td>
</tr>
<tr>
<td>Tristan Skua</td>
<td>4</td>
<td>4</td>
<td>40.2</td>
<td>10-68</td>
<td>2</td>
<td>99.1</td>
<td></td>
</tr>
</tbody>
</table>

The numbers of feather lice of each species, age class and sex collected from each bird are shown in Appendix 1. Excluding the single Wandering Albatross, 1615 feather lice were extracted from the total of 48 birds.

Broad-billed Prions and Tristan Skuas had a large number of lice per bird but a low species diversity, whereas Soft-plumaged Petrels were host to both large numbers and a wide species diversity of lice. Kerguelen Petrels were noticeably lacking in lice (Table I).

Despite the fact that many seabirds (especially prions, Soft-plumaged Petrels, Atlantic Petrels, Little Shearwaters, Common Diving-petrels and storm-petrels) were sharing a common nesting habitat, breeding at unusually high density, and often co-occurring in burrows, there was a remarkable lack of shared louse species (Table II). Only two seabird species were common hosts to several louse species: the Atlantic Petrel and its congener the Soft-plumaged Petrel were both host to Naubates ponderomac, Haliperaeus procullae, Trabelecus schillingi and Austromonopop popelinii. Furthermore, the abundances of these three lice on the two host species were very similar (Table III). Tristan Skuas carried two species of feather louse. Haffnera grandis was numerous on

TABLE II. INFESTATION RATES AND MEAN NUMBERS OF LICE EXTRACTED PER BIRD FOR DIFFERENT SPECIES OF FEATHER LICE AND SEABIRDS ON GOUGH ISLAND

<table>
<thead>
<tr>
<th>Host</th>
<th>Number of lice deloused</th>
<th>Incidence rate</th>
<th>Infestation rate mean</th>
<th>Infestation rate variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Docophoroides brevis</td>
<td>1</td>
<td>100</td>
<td>5.0</td>
<td>-</td>
</tr>
<tr>
<td>Bedfordella anica</td>
<td>3</td>
<td>33</td>
<td>14.0</td>
<td>-</td>
</tr>
<tr>
<td>Haliperaeus manndae</td>
<td>1</td>
<td>100</td>
<td>19.0</td>
<td>-</td>
</tr>
<tr>
<td>H. gracis</td>
<td>3</td>
<td>100</td>
<td>3.3</td>
<td>6.3</td>
</tr>
<tr>
<td>H. fulvus pacificus</td>
<td>4</td>
<td>75</td>
<td>2.8</td>
<td>7.6</td>
</tr>
<tr>
<td>H. pelagicus</td>
<td>1</td>
<td>100</td>
<td>16.0</td>
<td>116.0</td>
</tr>
<tr>
<td>H. procullae</td>
<td>1</td>
<td>100</td>
<td>1.0</td>
<td>-</td>
</tr>
<tr>
<td>H. procullae</td>
<td>1</td>
<td>100</td>
<td>9.0</td>
<td>108.0</td>
</tr>
<tr>
<td>Trabelecus mirabilis</td>
<td>11</td>
<td>21.9</td>
<td>86.3</td>
<td>-</td>
</tr>
<tr>
<td>T. helvomac</td>
<td>1</td>
<td>100</td>
<td>8.0</td>
<td>-</td>
</tr>
<tr>
<td>T. schillingi</td>
<td>11</td>
<td>100</td>
<td>5.3</td>
<td>24.3</td>
</tr>
<tr>
<td>T. schillingi</td>
<td>11</td>
<td>100</td>
<td>6.4</td>
<td>1.0</td>
</tr>
<tr>
<td>Austromonopop popelinii</td>
<td>11</td>
<td>100</td>
<td>9.7</td>
<td>61.4</td>
</tr>
<tr>
<td>A. popelin</td>
<td>10</td>
<td>20</td>
<td>0.2</td>
<td>-</td>
</tr>
<tr>
<td>A. popelin</td>
<td>7</td>
<td>29</td>
<td>0.4</td>
<td>0.6</td>
</tr>
<tr>
<td>A. jasquieri</td>
<td>11</td>
<td>64</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>A. scierrii</td>
<td>4</td>
<td>25</td>
<td>1.0</td>
<td>-</td>
</tr>
<tr>
<td>Naubates harrisoni</td>
<td>4</td>
<td>25</td>
<td>0.2</td>
<td>-</td>
</tr>
<tr>
<td>N. prion</td>
<td>3</td>
<td>100</td>
<td>5.7</td>
<td>4.3</td>
</tr>
<tr>
<td>N. ponderomac</td>
<td>10</td>
<td>100</td>
<td>49.0</td>
<td>1623.8</td>
</tr>
<tr>
<td>N. ponderomac</td>
<td>7</td>
<td>100</td>
<td>13.0</td>
<td>195.7</td>
</tr>
<tr>
<td>Pelagodera nigro</td>
<td>4</td>
<td>75</td>
<td>6.5</td>
<td>43.7</td>
</tr>
<tr>
<td>S. desti</td>
<td>2</td>
<td>25</td>
<td>1.0</td>
<td>-</td>
</tr>
<tr>
<td>Haffnera grandis</td>
<td>3</td>
<td>100</td>
<td>0.1</td>
<td>-</td>
</tr>
<tr>
<td>Ancistrura sp.</td>
<td>4</td>
<td>100</td>
<td>40.0</td>
<td>732.7</td>
</tr>
<tr>
<td>Longimenopop sp.</td>
<td>10</td>
<td>10</td>
<td>0.1</td>
<td>-</td>
</tr>
<tr>
<td>Soft-plumaged Petrel</td>
<td>11</td>
<td>9</td>
<td>0.1</td>
<td>-</td>
</tr>
<tr>
<td>Tristan Skua</td>
<td>1</td>
<td>100</td>
<td>7.0</td>
<td>-</td>
</tr>
</tbody>
</table>
all four birds processed but no species of Haffneria was found on any of the procellariiforms. One specimen of Austromonopon fasciaticatum was found on one of the skua. Although Austromonopon occurred on Common Diving-petrels, prions, Soft-plumaged Petrels and Atlantic Petrels, those birds carried different species of Austromonopon (Table II).

Sample sizes were too small to attempt the construction of frequency distributions. However, except for the very rare louse species, the variance:mean ratios were statistically significantly greater than unity (Table II) indicating that lice were contagiously, rather than randomly, dispersed among their hosts (p<0.05; chi² tests for random dispersion). This observation is in accordance with previous studies on seabird ectoparasites where a negative binomial has been shown to be the underlying model of dispersion (Fowler & Price 1987).

Table III. Frequencies of five different genera of feather lice among the total community of lice on Atlantic Petrels, Soft-plumaged Petrels and Kerguelen Petrels at Gough Island.

<table>
<thead>
<tr>
<th>Genus of louse</th>
<th>Atlantic Petrel</th>
<th>Soft-plumaged Petrel</th>
<th>Kerguelen Petrel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naubates</td>
<td>48%</td>
<td>37%</td>
<td>0%</td>
</tr>
<tr>
<td>Halipeurus</td>
<td>33%</td>
<td>42%</td>
<td>0%</td>
</tr>
<tr>
<td>Trabeculus</td>
<td>18%</td>
<td>19%</td>
<td>0%</td>
</tr>
<tr>
<td>Austromonopon</td>
<td>1%</td>
<td>2%</td>
<td>0%</td>
</tr>
<tr>
<td>Bedfordiella</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>Total number of lice</td>
<td>191</td>
<td>572</td>
<td>14</td>
</tr>
<tr>
<td>Number of birds</td>
<td>7</td>
<td>11</td>
<td>3</td>
</tr>
</tbody>
</table>

Discussion

The samples of seabirds from Gough Island showed Phthiraptera infestation rates (% of hosts infected) of 100% except in the case of the Kerguelen Petrel, with some 20-50 lice on most individual birds. These incidence rates and infestation rates are very similar to those reported for Manx Shearwaters Puffinus puffinus in Wales where all 240 birds sampled carried lice with a mean of 53 per bird (Fowler & Shaw 1989). Fowler & Price (1987), Fowler & Miller (1984) and Fowler & Hodson (1988), who used exactly the same de-lousing method, found infestation rates and incidence rates of feather lice of 98% and 5.8 per bird for British Storm-petrels Hydrobates pelagicus, 85% and 6.6 per bird for Wilson’s Storm-petrels Oceanites oceanicus, 80% and 2.7 per bird for Northern Fulmars Fulmarus glacialis and 63% and 1.5 per bird for Leach’s Petrels Oceanodroma leucorhoa, which are rather lower figures than found among the seabirds on Gough Island, except for the Kerguelen Petrel. These data may suggest that feather lice are less frequent on storm-petrels than on the larger procellariiforms, and there seems to be a hint of this in our data (Table I). Alternatively, the high infestation and incidence rates of lice on Gough seabirds may reflect the particularly high nesting densities of seabirds there. The Kerguelen Petrel is something of an exception in this regard in that it nests rather thinly on the wet upper slopes of the Gough mountains. It is the only burrow-nester in that habitat on Gough since almost all the other species occupy the relatively restricted area of dry and flatter peatland on the coastal cliff-top fringes.

The high degree of host-specificity of the many feather louse species is clear evidence of their inability to colonise alternative hosts since the Gough Island seabirds come into physical contact frequently on the surface, and nonbreeders in particular often enter burrows tenanted by other species. Furthermore, the 3000 pairs of skuas must kill about one million burrowing procellariiforms each year (Furness 1987). Since they leave the carcasses of their kills within their territories over the area occupied by burrowing birds, some tens of millions of feather lice must be left on dead hosts each year and may attempt to locate a new host. Most birds killed by skua are prions, storm-petrels, Soft-plumaged Petrels or Atlantic Petrels, and a few Kerguelen Petrels, Common Diving-petrels and shilswarares are also taken (Furness 1987). Despite most of these prey having dozens of feather lice on them, it would appear that these abundant lice of petrels are unable to thrive on the skua eating the petrels. Lice from petrels must transfer onto skuas on Gough but clearly skuas are not satisfactory hosts for them to become established.

The close similarity between the feather lice of Soft-plumaged Petrels and Atlantic Petrels suggests a recent evolutionary divergence between the species. By contrast, the Kerguelen Petrel has a rather different louse association with one species of Bedfordiella and no Naubates, Halipeurus, Trabeculus or Austromonopon on the three specimens we processed. The Kerguelen Petrel is very similar in superficial appearance to the two Pierodroma species and used to be classified in that genus, but recently it has been put into a genus of its own (Lagenus), more closely related to the fulmarine petrels, largely on the basis of its unique intestinal morphology (Imber 1985). This classification is also supported by evidence from feather lice. As we found on birds from Gough Island, Kerguelen Petrels collected elsewhere have carried Bedfordiella but no Naubates, Halipeurus, or Trabeculus (Timmermann 1965, Pilgrim & Palma 1982, Palma & Pilgrim 1983), although Austromonopon popelliae has been found on Kerguelen Petrels where they share the same nesting habitat as White-chinned Petrels, and Imber (1985) suggested that this may be the result of a secondary infestation on Kerguelen Petrels.

Fowler & Shaw (1989) found that adult lice outnumbered nymphs on Manx Shearwaters and that the sex ratio among adults was near unity. In the samples from Gough, sex ratio was close to 1:1 for every louse and seabird combination (Appendix I). Adults considerably outnumbered nymphs for every species except Haffneria grandis where 39 adults and 121 nymphs were counted from the samples. Nymphs outnumbered adults on each of the four skua processed, suggesting that Haffneria was at a seasonal peak of breeding when the birds were sampled in November (Marshall 1981).

It would appear to be a characteristic of Austromonopon that both incidence and infestation rates are low. Of the 13 birds from which this genus of louse was extracted, nine provided only one specimen, three provided two and one gave three. By contrast, Naubates, Halipeurus and Trabeculus tended to show comparatively high infestation rates and large numbers per infected host (Table II).

Acknowledgements

The Royal Society, the South African Scientific Committee for Antarctic Research and the South African Department of Transport funded travel to Gough Island. Dr J. Cooper and Professor W.R. Siegfried of the FitzPatrick Institute, University of Cape Town, kindly made travel to Gough Island possible. We thank Dr Jan Fowler and Bernie Zonfrillo for helpful comments on an earlier draft.

Summary

In November 1985, 1620 feather lice of 24 species were extracted from 49 seabirds of eleven species. Despite high sea temperatures and predatory interactions most species of lice were found on only a single host species. Kerguelen Petrels, recently separated from the genus Pierodroma, had a very different louse fauna from the sympatric Pierodroma species. Soft-plumaged and Atlantic Petrels were the only species to share nearly identical louse communities. With the exception of the Kerguelen Petrel, louse infestations rates and incidence rates were high on all species examined, and lice were dispersed contagiously through the host populations.

References


Seabird


ZONNINRO, B. in press. Relationships of the Pterodroma petrels from the Kerguelen Archipelago inferred from their feather lice. Nordisk Spermatofylettetet.

Robert W. Farnfield, Applied Ornithology Unit, Department of Zoology, University of Glasgow, G20 8QX. U.K. and Percy FitzPatrick Institute of African Ornithology, University of Cape Town, South Africa and Ricardo L. Palma, National Museum of New Zealand, Wellington, New Zealand.

APPENDIX I. LIST OF FEATHER LICE COLLECTED FROM GOURGH ISLAND SEABIRDS IN NOVEMBER 1985. NUMBERS ON EACH BIRD ARE ADULT MALES, ADULT FEMALES, NYMPHS I, NYMPHS II, NYMPHS III.

Seabird Wandering Albatross Diomedea exulans exulans (endemic subspecies)

Louse Docophoroides brevis (Dufour, 1835)

Numbers Bird 1: 0, 1, 2, 0, 3, 0.

Seabird Great Shearwater Puffinus gravis (species breeding almost confined to Tristan archipelago)

Louse Naubates harrisoni Bedford, 1930

Numbers Bird 1: 1, 2, 0, 3, 0, 2.

Louse Saemundssonia desolata Timmermann, 1959

Numbers Bird 7: 1, 0, 0, 0, 0.

Louse Anchistron sp.

Numbers Bird 10: 0, 1, 0, 0, 0.
<table>
<thead>
<tr>
<th>Seabird</th>
<th>Atlantic Petrel <em>Pterodroma incerta</em> (endemic species)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Louse</td>
<td><strong>Nauhates pterodromi</strong> Bedford, 1930</td>
</tr>
<tr>
<td>Numbers</td>
<td>Bird 1: 2, 5, 0, 1, 5.</td>
</tr>
<tr>
<td></td>
<td>Bird 2: 0, 3, 1, 1, 0.</td>
</tr>
<tr>
<td></td>
<td>Bird 3: 0, 1, 0, 5, 1.</td>
</tr>
<tr>
<td></td>
<td>Bird 4: 2, 3, 1, 0, 0.</td>
</tr>
<tr>
<td></td>
<td>Bird 5: 1, 1, 0, 0, 0.</td>
</tr>
<tr>
<td></td>
<td>Bird 6: 5, 4, 1, 2, 3.</td>
</tr>
<tr>
<td></td>
<td>Bird 7: 4, 26, 0, 7, 6.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Louse</th>
<th><strong>Halipeurus procellariae</strong> (J.C. Fabricius, 1775)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numbers</td>
<td>Bird 1: 5, 4, 4, 1, 1.</td>
</tr>
<tr>
<td></td>
<td>Bird 2: 3, 1, 2, 2, 1.</td>
</tr>
<tr>
<td></td>
<td>Bird 5: 2, 0, 0, 0, 0.</td>
</tr>
<tr>
<td></td>
<td>Bird 6: 4, 1, 1, 1, 1.</td>
</tr>
<tr>
<td></td>
<td>Bird 7: 3, 2, 3, 13, 8.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Louse</th>
<th><strong>Austromenopon popellus</strong> (Piaget, 1890)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numbers</td>
<td>Bird 1: 1, 1, 0, 0, 0.</td>
</tr>
<tr>
<td></td>
<td>Bird 2: 0, 1, 0, 0, 0.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Louse</th>
<th><strong>Trabeculus schillingi</strong> Rudow, 1866</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numbers</td>
<td>Bird 1: 2, 2, 0, 1, 1.</td>
</tr>
<tr>
<td></td>
<td>Bird 2: 2, 6, 0, 0, 0.</td>
</tr>
<tr>
<td></td>
<td>Bird 3: 2, 0, 0, 0, 0.</td>
</tr>
<tr>
<td></td>
<td>Bird 5: 0, 1, 0, 0, 0.</td>
</tr>
<tr>
<td></td>
<td>Bird 6: 1, 3, 0, 0, 0.</td>
</tr>
<tr>
<td></td>
<td>Bird 7: 6, 5, 0, 0, 2.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Seabird</th>
<th>Soft-plumaged Petrel <em>Pterodroma mollis mollis</em> (subspecies largely confined to Tristan group)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Louse</td>
<td><strong>Nauhates pterodromi</strong> Bedford, 1930</td>
</tr>
<tr>
<td>Numbers</td>
<td>Bird 1: 5, 5, 1, 1, 3.</td>
</tr>
<tr>
<td></td>
<td>Bird 2: 8, 8, 1, 9, 7.</td>
</tr>
<tr>
<td></td>
<td>Bird 3: 1, 3, 3, 1, 4.</td>
</tr>
<tr>
<td></td>
<td>Bird 4: 2, 2, 5, 6, 6.</td>
</tr>
<tr>
<td></td>
<td>Bird 5: 1, 8, 0, 4, 3.</td>
</tr>
<tr>
<td></td>
<td>Bird 6: 2, 2, 3, 1, 2.</td>
</tr>
<tr>
<td></td>
<td>Bird 7: 0, 5, 0, 2, 4.</td>
</tr>
<tr>
<td></td>
<td>Bird 8: 2, 6, 1, 6, 6.</td>
</tr>
<tr>
<td></td>
<td>Bird 9: 2, 6, 1, 5, 3.</td>
</tr>
<tr>
<td></td>
<td>Bird 10: 1, 8, 0, 2, 5.</td>
</tr>
<tr>
<td></td>
<td>Bird 11: 2, 11, 10, 11, 6.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Louse</th>
<th><strong>Austromenopon popellus</strong> (Piaget, 1890)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numbers</td>
<td>Bird 2: 0, 1, 0, 0, 0.</td>
</tr>
<tr>
<td></td>
<td>Bird 5: 1, 0, 0, 0, 0.</td>
</tr>
<tr>
<td></td>
<td>Bird 6: 0, 1, 0, 0, 0.</td>
</tr>
<tr>
<td></td>
<td>Bird 7: 2, 0, 0, 0, 0.</td>
</tr>
</tbody>
</table>

**PITTHRAPTERA OF PETRELS AND SKUAS**

<table>
<thead>
<tr>
<th>Seabird</th>
<th>White-bellied Storm-petrel <em>Fregata grallaria leucogaster</em> (S. Atlantic and Indian Ocean)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Louse</td>
<td><strong>Halipeurus</strong> (Synnautes) pelagicus (Denny, 1842)</td>
</tr>
<tr>
<td>Numbers</td>
<td>Bird 1: 1, 0, 0, 0, 0.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Seabird</th>
<th>Diving Petrel <em>Pelecus conradi urinatrix dacunhae</em> (endemic subspecies)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Louse</td>
<td><strong>Halipeurus saltus pacificus</strong> Edwards, 1961</td>
</tr>
<tr>
<td>Numbers</td>
<td>Bird 1: 1, 3, 0, 0, 0.</td>
</tr>
<tr>
<td></td>
<td>Bird 2: 1, 0, 0, 0, 0.</td>
</tr>
<tr>
<td></td>
<td>Bird 4: 3, 1, 1, 0, 1.</td>
</tr>
<tr>
<td>Louse Numbers</td>
<td>Pelmatocerandra setosa (Giebel, 1876)</td>
</tr>
<tr>
<td>--------------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td>Bird 1</td>
<td>1, 1, 0, 0, 0</td>
</tr>
<tr>
<td>Bird 3</td>
<td>4, 7, 0, 0, 3</td>
</tr>
<tr>
<td>Bird 4</td>
<td>2, 5, 0, 2, 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Louse Numbers</th>
<th>Austromenopon eliotii Timmermann, 1954</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bird 4</td>
<td>1, 0, 0, 0, 0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Seabird</th>
<th>White-faced Storm Petrel Pelagodroma marina marina (endemic subspecies)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Louse Numbers</td>
<td>Halipeurus (Synautes) pelagicus (Denny, 1842)</td>
</tr>
<tr>
<td>Bird 1</td>
<td>1, 3, 1, 2, 1</td>
</tr>
<tr>
<td>Bird 2</td>
<td>6, 6, 0, 3, 4</td>
</tr>
<tr>
<td>Bird 3</td>
<td>3, 4, 0, 0, 0</td>
</tr>
<tr>
<td>Bird 4</td>
<td>12, 18, 0, 0, 0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Louse Numbers</th>
<th>Saemundssonia marina Timmermann, 1956</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bird 4</td>
<td>4, 0, 0, 0, 0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Seabird</th>
<th>Tristan Great Skua Catharacta skua hamiltoni (endemic subspecies)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Louse Numbers</td>
<td>Haffneria grandis (Piaget, 1880)</td>
</tr>
<tr>
<td>Bird 1</td>
<td>2, 0, 2, 6, 0</td>
</tr>
<tr>
<td>Bird 2</td>
<td>4, 6, 10, 26, 11</td>
</tr>
<tr>
<td>Bird 3</td>
<td>6, 6, 1, 6, 6</td>
</tr>
<tr>
<td>Bird 4</td>
<td>9, 6, 9, 26, 18</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Louse Numbers</th>
<th>Austromenopon fasciaticatum (Piaget, 1880)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bird 2</td>
<td>0, 1, 0, 0, 0</td>
</tr>
</tbody>
</table>