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**NANORCHESTES ANTARCTICUS STRANDTMANN (PROSTIGMATA)**

**FROM ANTARCTIC ICE**

**by**

William Block *

**ABSTRACT**

*Nanorchestes antarcticus* Strandtmann 1967 (Prostigmata : Pachygnathidae) is reported in ice samples from the MacLeod Glacier on Signy Island in the maritime Antarctic. Its occurrence in glacier ice is discussed in relation to features of its biology.

**RESUME**

*Nanorchestes antarcticus* Strandtmann 1967 (Prostigmata : Pachygnathidae) a été récolté dans des échantillons de glace du Glacier MacLeod à Signy Island dans l'Antarctique Maritime. Sa présence dans la glace du glacier est discuté en fonction de sa biologie.

**INTRODUCTION**

There have been no reports of mites or other micro-arthropods from Antarctic ice samples. A considerable variety of insects were collected by Edwards (1970) as fallout fauna on the Gulkana Glacier in Alaska as well as on snow patches (Kaisila, 1952, Edwards, 1972, Edwards & Banko, 1976), but the Acari content of these samples was negligible. This note reports the occurrence of a single species of prostigmatid mite in ice cores taken from the MacLeod Glacier on Signy Island, South Orkney Islands in the Antarctic. No Acari or other arthropods were found in ice samples collected at two other Antarctic sites.

**METHODS**

Three glacier sites were sampled, two being located at Signy Island (60°44' S, 45°36' W) in the maritime Antarctic, and the third on sub-Antarctic South Georgia (54°16' S, 46°30' W). On Signy Island 17 samples were collected from an area of the Orwell Glacier on 27 March 1972,

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and 17 samples from the MacLeod Glacier on 29 March 1972. At South Georgia, six samples were obtained from the Hodges Glacier above Grytviken, Cumberland East Bay on 12 April 1972. Details of the samples and collection sites are given in Table 1.

**Table 1.** — Details of collection sites and ice samples for micro-arthropods.

<table>
<thead>
<tr>
<th>Location</th>
<th>Glacier</th>
<th>Altitude (m)</th>
<th>Weight of ice (kg)</th>
<th>Yield of siliceous dust (mg l⁻¹)</th>
<th>Spherules</th>
<th>Acari</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signy Island</td>
<td>Orwell</td>
<td>60</td>
<td>10.20</td>
<td>8.0</td>
<td>Absent</td>
<td>Absent</td>
</tr>
<tr>
<td>Signy Island</td>
<td>MacLeod</td>
<td>200</td>
<td>10.57</td>
<td>2.6</td>
<td>Present</td>
<td>Present (30 specimens)</td>
</tr>
<tr>
<td>South Georgia</td>
<td>Hodges</td>
<td>495</td>
<td>5.91</td>
<td>6.7</td>
<td>Absent</td>
<td>Absent</td>
</tr>
</tbody>
</table>

Samples were collected on each site within an area of 5 m². Surface ice was removed to a depth of 20 cm on the Signy Island glaciers, and surface slush to a depth of 65 cm on the Hodges Glacier. Ice blocks ca. 25 cm deep and 10 × 10 cm section were cut by ice axe from both Signy Island sites, and circular cores 10 cm diameter and 25 cm deep were removed with an ice drill from the South Georgia site. Surface contamination of the samples was reduced as much as possible by handling with sterilized gloves. Each sample was sealed into a stout, sterile polythene bag, individually wrapped with aluminium foil, and rapidly transported to the nearby British Antarctic Survey station, where they were placed in a refrigerator at — 15°C. The samples were transported by ship to the U.K. in sterile polythene containers at a temperature of — 18°C.

At Leicester University a technique for the recovery of dust and other particles from such samples was utilized, which also detected micro-arthropods. In the laboratory each sample was weighed, washed in warm distilled water, and placed in a sterile polythene tent to melt at room temperature. The washings were discarded, but the meltwater was allowed to pass through a 0.45 μ pore filter, each filter being stored in a sterile, dust-proof box for later examination. A clean filter exposed in the tent during melting as a control for each sample showed no contamination. Each filter was examined separately for arthropod material using × 100 magnification. Mites were removed from the filters with a fine needle, and mounted in Hoyers on a microscope slide to allow recovery to their natural form.

**Results and discussion**

Arthropods, all Acari, were detected only on filters of the MacLeod Glacier samples, seven samples yielding mites. The specimens were either transparent pale green in colour or opaque red, the latter often staining the filter. A total of 30 mites were recovered. The maximum number of mites per filter was 12 with a mean of 4.3 per filter, and an overall mean for the MacLeod Glacier site of 1.8 individuals per sample. The latter figure allows an estimate of 180 individuals per m² to be derived. All the specimens were Nanorchestes antarcticus Strandtmann and all were juveniles. Both larvae (3) and nymphae (1 protonymph, 4 deutonymphs and 6 tritonymphs) were identified using Lindsay (1972), the remainder could not be determined to life stage.

It is interesting that mites were found only on one glacier site of the three sampled, that of the MacLeod Glacier on Signy Island. The MacLeod Glacier samples (Table 1) had a relatively
low yield of siliceous dust (2.6 mg 1\(^{-1}\) being rich in chlorite and mica and poor in quartz) compared with the other sites, but they were the only samples to contain spherules (SEARS, 1975). The coincidence of mites and small (2-100 μ) black, magnetic spherules probably of terrestrial (i.e. non-cosmic) origin in the same ice samples suggests a wind borne transport of both materials. The likelihood of surface contamination during field collection was very low. Of the three glaciers sampled the MacLeod site is the most exposed to winds, which are mainly westerly throughout the year, and which pass over the northern tip of the Antarctic Peninsula and southern South America.

GODDARD (1979a) working on the terrestrial Acari of Signy Island did not sample ice habitats, but found *N. antarcticus* regularly in monthly samples from moss turf and carpet communities. Its annual mean density ranged from 1,278 (1973) to 3,376 (1972) individuals m\(^{-2}\) with an overall mean for 27 months of 2,200 individuals m\(^{-2}\). The species lived mainly in the surface layer (0-3 cm) of such habitats with larvae occurring in the austral summer when higher numbers of nymphae were also recorded. The ice population (180 individuals m\(^{-2}\)) for the MacLeod Glacier samples is very low compared to bryophyte areas. However, *N. antarcticus* has been observed in large numbers in barren scree and glacial drift at Signy Island, and it is widely distributed occurring from sea level to rocks on the Island’s summit at 279 m (GODDARD, 1979b).

In continental Antarctica, MATSUDA (1977) working at Syowa station, Enderby Land, found a range of 100-800 individuals m\(^{-2}\) for *N. antarcticus* in algae and soil habitats, whereas in mosses its density varied from 1,000-1,200 individuals m\(^{-2}\). The comprehensive ecological study of *N. antarcticus* in sandy barren situations in the Vestfold Hills near Davis Station (68°34' S, 77°83' E) by ROUNSEVELL (1977) revealed much higher population densities of 12,700-158,600 individuals m\(^{-2}\). There *N. antarcticus* was the only arthropod present.

It is likely that the mites or the original colonizers were blown onto the ice surface at Signy Island either from nearby rock outcrops or from a greater distance. In terms of the former possibility, the nearest rock to the MacLeod Glacier site is Garnet Hill (226 m altitude), approximately 250 m south of the collection area. Several species of arthropods occur under rocks on Garnet Hill (GODDARD, pers. comm.) including the prostigmatids *Tydeus tilbrooki* Strandtmann, *Halotydeus signiensis* Strandmann, *N. antarcticus*, the mesostigmatid *(Gamasellus racovitzaei* (Troussart)) and the collembolan *Cryptopygus antarcticus* Willem. If the specimens of mites frozen into the MacLeod Glacier originated from the Garnet Hill outcrop, it is surprising that only *N. antarcticus* was found in abundance. It is known that this species feeds on the gelatinous red snow alga (*Ochromonas* sp.), and being a very cold tolerant form (FITZSIMONS, 1971, ROUNSEVELL 1977), the mites trapped in such glacier ice may be the remnants of an earlier thriving population in a depression on the glacier surface.

*N. antarcticus* is the most southerly occurring arthropod, having been found in the Horlick Mountains of continental Antarctica at latitude 85°32' S. It is distributed over the whole of the Antarctic region and much of the sub-Antarctic, and appears to have a circum-polar distribution. It is a moderately active species, and when disturbed it can jump many times its own length. GODDARD (1979b) observed a jump of 8 cm. Other Antarctic Prostigmata are also saltatorial, e.g. *Eupodes wiseli* Womersley and Strandtmann (GLESS, 1972), and this may be a contributory factor in the dispersal of such species. FITZSIMONS (1971) concluded that *N. antarcticus* could tolerate a very wide range of environmental temperatures and was active from —23° to +31°C. Metabolically, individual *N. antarcticus* have higher levels of activity at their normal environmental temperatures than temperate forms (BLOCK, 1976), which are comparable to other Antarctic prostigmatids (GODDARD, 1977).

It seems that *N. antarcticus* has the physiological capacity to tolerate and remain active
at low temperatures, which, combined with its small size (length: 147 μ (larva)-280 μ (adult ♂) enables it to colonize, albeit temporarily, glacier areas with suitable food resources as suggested by samples from the MacLeod Glacier on Signy Island. Although mites as small as *N. antarcticus* are likely to be transported considerable distances by wind, just as are similar sized spherical of volcanic or industrial origin, there is scant evidence to date of such aerial transport. In nets flown from aircraft and ships en route to and from the Antarctic the number of Acari trapped are very few compared to insects and other arthropods (Gressitt, et al., 1961). Nevertheless, terrestrial Acari may be a significant component of the passive fallout fauna of ice and snow in Antarctic areas.

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