Pacific Insects Monograph 25: 121–125 **20 March 1971**

ON THE FOOD HABITS OF CERTAIN ANTARCTIC ARTHROPODS FROM COASTAL VICTORIA LAND AND ADJACENT ISLANDS[1]

By **J. M. Fitzsimons**[2]

Abstract: The food habits of five species of Antarctic arthropods from the Victoria Land coast and nearby islands were studied during the 1965–66 summer season. The springtail *Gomphiocephalus hodgsoni* feeds predominantly on soil fungi. The mites *Nanorchestes antarcticus*, *Stereotydeus mollis*, and *Stereotydeus punctatus* feed largely on soil algae and, less frequently, on fungi. The mite *Coccorhagidia gressitti* is a predator on other soil arthropods. The data suggest that none of the species studied is highly restricted to feeding on specific types of food organisms but is able to utilize various suitable food materials if they are abundant and accessible.

Biogeographers generally agree that the number of species in a taxon decreases with an increase in latitude. Thus, in the less favorable environments of high latitudes where fewer kinds of animals and plants occur, one finds that the trophic relationships between organisms become greatly simplified so that the complicated food webs of the tropics become more linear in polar regions. These generalizations are apparently valid for the truly terrestrial animals of the world's most austere environment, the Antarctic continent.

The present study concerns the food habits of five species of Antarctic arthropods from the

Table 1. Food items taken by *Gomphiocephalus hodgsoni* Carpenter

Locality	Date	Number examined	Gut contents in order of abundance	Percentage of animals with the item	Rock and soil flora in order of abundance
Terra Nova Bay	9.XI.65	4	unidentified algal cells	100	*Prasiola*
			fungal hyphae	100	*Nostoc*
					Protococcus
					non-filamentous cyanophytes
					fungi
Terra Nova Bay	12.XI.65	165	fungi	100	*Prasiola*
			Prasiola	44	*Oscillatoria*
			Oscillatoria	1	*Lyngbya*
			pennate diatoms	1	*Protococcus*
					pennate diatoms
					fungi
Marble Point	22.I.66	100	unidentifiable material	100	non-filamentous cyanophytes
					Phormidium
					Prasiola
					Protococcus
					fungi
Cape Royds	15.II.66	3	unidentifiable material	100	*Prasiola*
					non-filamentous cyanophytes
					Oscillatoria
					fungi

1. Partial results of grant GA-131 from the National Science Foundation (Office of Antarctic Programs) to Bishop Museum.

2. Bishop Museum, Honolulu. Present address: Dept. Zoology & Physiology, Louisiana State University, Baton Rouge, Louisiana 70803.

Table 2. Food items taken by *Nanorchestes antarcticus* Strandtmann

Locality	Date	Number examined	Gut contents in order of abundance	Percentage of animals with the item	Rock and soil flora in order of abundance
Terra Nova Bay	12.XI.65	13	*Prasiola*	92	*Prasiola* *Chlorella?* *Protococcus* fungi
Franklin Island	31.XI.65	27	*Protococcus* pennate diatoms	100 15	*Protococcus* non-filamentous cyanophytes pennate diatoms fungi
Cape Phillips	2.I.66	3	*Protococcus*	100	*Protococcus* fungi
Cape Hallett	3.I.66	5	*Prasiola* *Oscillatoria*	100 20	mosses *Prasiola* *Oscillatoria* non-filamentous cyanophytes fungi
Possession Island	4.I.66	10	*Protococcus*	100	*Protococcus* *Oscillatoria* *Prasiola* *Chlamydomonas* *Ulothrix* fungi
Foyn Island	4.I.66	14	*Protococcus*	100	*Protococcus* *Chlamydomonas* fungi
Football Mountain	5.I.66	1	*Protococcus*	100	*Usnea?* *Protococcus* fungi
Cape Adare	7.I.66	1	*Protococcus*	100	*Protococcus* pennate diatoms fungi
Marble Point	22.I.66	4	non-filamentous cyanophytes	100	non-filamentous cyanophytes *Phormidium* *Prasiola* *Protococcus* fungi
Conical Point	28.I.66	6	non-filamentous cyanophytes	100	non-filamentous cyanophytes fungi
Hut Point Peninsula	1.II.66	4	non-filamentous cyanophytes	100	non-filamentous cyanophytes *Nostoc* *Oscillatoria* fungi
Cape Crozier	3.II.66	2	*Prasiola*	100	*Prasiola* *Oscillatoria* pennate diatoms fungi
Cape Royds	15.II.66	7	*Prasiola* unid. cyanophyte (*Oscillatoria*)	100 14	*Prasiola* non-filamentous cyanophytes *Oscillatoria* fungi

Table 3. Food items taken by *Stereotydeus mollis* Wom. & Str.

Locality	Date	Number examined	Gut contents in order of abundance	Percentage of animals with the item	Rock and soil flora in order of abundance
Franklin Island	31.XI.65	4	*Protococcus* fungi?	100 100	*Protococcus* non-filamentous cyanophytes pennate diatoms fungi
Marble Point	22.I.66	6	*Protococcus*	100	non-filamentous cyanophytes *Phormidium* *Prasiola* *Protococcus* fungi
Conical Point	28.I.66	2	non-filamentous cyanophytes	100	non-filamentous cyanophytes fungi
Hut Point Peninsula	1.II.66	7	non-filamentous cyanophytes	100	non-filamentous cyanophytes *Nostoc* *Oscillatoria* fungi
Cape Crozier	3.II.66	3	*Prasiola* pennate diatoms	100 33	*Prasiola* *Oscillatoria* pennate diatoms fungi
Cape Royds	15.II.66	3	*Prasiola*	100	*Prasiola* non-filamentous cyanophytes *Oscillatoria* fungi

Table 4. Food items taken by *Stereotydeus punctatus* Strandtmann

Locality	Date	Number examined	Gut contents in order of abundance	Percentage of animals with the item	Rock and soil flora in order of abundance
Cape Hallett	3.I.66	9	*Prasiola*	44	moss *Prasiola* *Oscillatoria* non-filamentous cyanophytes fungi
Possession Island	4.I.66	12	*Protococcus*	83	*Protococcus* *Oscillatoria* *Prasiola* *Chlamydomonas* *Ulothrix* fungi
Foyn Island	4.I.66	6	*Protococcus*	100	*Protococcus* *Chlamydomonas* fungi
Cape McCormick	6.I.66	3	*Protococcus* fungi?	100 33	*Prasiola* *Protococcus* fungi
Cape Adare	7.I.66	1	*Protococcus*	100	*Protococcus* pennate diatoms fungi

Table 5. Food items taken by *Coccorhagidia gressitti* Wom. & Str.

Locality	Date	Number examined	Gut contents	Percentage of animals with the item
Possession Island	10.I.66	6	mite fragments	67
Cape Hallett	4.I.66	Observed by E. Gless (field assoc., Bishop Mus.) to be carnivorous on *Stereotydeus punctatus* (Gless 1967: 321).		

Victoria Land coast and neighboring islands. The springtail *Gomphiocephalus hodgsoni* Carpenter, 1908, has been found from Mt. George Murray nunatak south to Minna Bluff (Wise & Spain 1967). The Penthalodid mite *Stereotydeus mollis* Womersley & Strandtmann, 1963, occurs along the coast from Terra Nova Bay to Minna Bluff, and a related species, *Stereotydeus punctatus* Strandtmann, 1967, is known from the Cape Hallett area of northern Victoria Land (Gressitt & Shoup 1967; Strandtmann 1967). The large Prostigmatid *Coccorhagidia gressitti* Womersley & Strandtmann, 1963, is recorded from Cape Hallett, Foyn Island (Gressitt & Shoup 1967), and Possession Island (personal observation). *Nanorchestes antarcticus* Strandtmann, 1963, the southernmost occurring arthropod, has a broad distribution from 85° 32′ S to Cape Adare and certain Subantarctic islands (Gressitt & Shoup 1967). Live specimens of these species were taken at 14 localities from Cape Adare south to Hut Point Peninsula, Ross Island, during the 1965–66 summer season. The gut contents of the animals were examined microscopically at the biolaboratory of McMurdo Station, Ross Island, and aboard the Icebreaker U.S.S. Burton Island. The results of these examinations are compiled in Tables 1–5.

GUT CONTENT CULTURES

Ten specimens each of *G. hodgsoni*, *S. mollis*, and *N. antarcticus* from Marble Point were surface cleaned in three washes of 70% ethanol. They were subsequently crushed and smeared across petri dishes containing dextrose agar and Provasioli and Pintner media. Three animals of each species were surface cleaned and dropped intact onto the nutritive agar; another three were placed in culture dishes without cleaning.

Table 6. Results of gut content cultures for 10 specimens each of 3 species of arthropods taken from Marble Point, Victoria Land

Species	surface cleaned, crushed	surface cleaned, intact	not cleaned, intact
Gomphiocephalus hodgsoni	10 with coccoid bacteria* colonies 6 with fungal growth	no growth	3 with fungal growth
Nanorchestes antarcticus	6 with growths of non-filamentous cyanophytes 3 with coccoid bacteria* 4 with no growth	no growth	no growth
Stereotydeus mollis	10 with coccoid bacteria* 4 with *Prasiola* 4 with non-filamentous cyanophytes 2 with fungal growth 2 with no growth	no growth	no growth

*It is assumed that these bacteria are resident in the gut of the animals since they were also present in starved animals.

DISCUSSION

Wise et al. (1964) conclude that *Gomphiocephalus hodgsoni* from Marble Point exhibit a "preference for moss and *Penicillium* sp. rather than other plants." During the 1965–66 summer season specimens which were collected in mosses at Marble Point and other localities had no detectable fragments of these plants either in gut contents or their cultures. Springtails which were kept in petri dishes with living mosses for nearly a month apparently never fed on these plants. Pryor (1962) reports moss spores from the guts of the springtail *Isotoma klovstadi* at Cape Hallett, where it is often seen on the surface of moss beds, but he noted that *G. hodgsoni* is not as active on the surface as other species of springtails. At least three different species of phycomycetes were distinguishable among the gut content cultures of *G. hodgsoni* from Marble Point; cultures of the soil from which the springtails were taken indicate that these fungal forms are abundant there in the soil and under stones. This suggests that *G. hodgsoni* feed predominantly upon common soil fungi; however, the presence of algae in the gut of springtails from Terra Nova Bay may indicate a flexibility in trophic habits in which they feed opportunistically on several types of plant materials that are readily available.

It seems apparent that the mites *Nanorchestes antarcticus*, *Stereotydeus punctatus*, and *Stereotydeus mollis* are phytophagous predominantly on algae, and that *S. mollis* at least may occasionally feed upon soil fungi. The data imply that the type of algae taken by the animals is largely determined by its abundance and availability, rather than by any preferential selection by the arthropods.

Because of its form and behavior, *Coccorhagidia gressitti* has previously been suspected of being predaceous from laboratory observations at Hallett Station by E.E. Gless (1967) and the gut contents of specimens from Possession Island confirm its predatory habit.

LITERATURE CITED

Gless, E. E. 1967. Notes on the biology of *Coccorhagidia gressitti* Womersley and Strandtmann. Antarctic Res. Ser. **10:** 321–23.

Gressitt, J. L. & J. Shoup. 1967. Ecological notes on free-living mites in North Victoria Land. Antarctic Res. Ser. **10:** 307–20.

Pryor, M. E. 1962. Some environmental features of Hallett Station, Antarctica, with special reference to soil arthropods. *Pacif. Ins.* **4**(3): 681–728.

Strandtmann, R.W. 1967. Terrestrial Prostigmata (Trombidiform mites). Antarctic Res. Ser. **10:** 51–80.

Wise, K. A. J., C. E. Fearon & O. R. Wilkes. 1964. Entomological investigations in Antarctica, 1962–63 season. *Pacif. Ins.* **6**(3): 541–70.

Wise, K. A. J. & A. Spain. 1967. Entomological investigations in Antarctica, 1963–64 season. *Pacif. Ins.* **9**(2): 271–93.