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Preliminary Report on Soil Macrofauna from the Northern Mariana Islands, Micronesia

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Abstract Soil macrofauna of the northern Mariana Islands was investigated, based on the specimens collected by hand sorting. Araneae were collected from all the sampling sites. Isopoda, Hymenoptera, Gastropoda, Diplopoda and adult Coleoptera occurred frequently. The *Cocos* plantations contained fewer animal groups than the native forests.

Key words: Soil macrofauna, *Cocos* forest, northern Mariana Islands.

The northern Mariana Islands are located in the western Pacific between 16°22′N and 20°32′N. Detailed investigations of soil animals have not been conducted on the northern Mariana Islands, except for some taxonomic revisions (e.g., Ross, 1955; Chapin, 1957; Thornton *et al.*, 1972) and collection record of an earthworm, *Dichogaster* sp. from Maug (Eldredge *et al.*, 1977).

During an expedition to the northern Marianas in May to June, 1992, I collected the soil macrofauna by hand sorting and use of the Tullgren funnel. In this report, composition of soil animals obtained by hand sorting are briefly described.

Sampling Sites and Methods

One to four sampling sites were selected on each island. Detailed locations are shown in Fig. 1 and described below.

An-1: North west coast of Anatahan Is., alt. 10 m, *Cocos nucifera*-forest, 11 May.

An-2: North west valley of Anatahan Is., alt. 185 m, *Hibiscus tiliaceus*-forest, 11 May.

An-3: South west slope of Anatahan Is., alt. 60 m, *Pandanus tectorius*-forest, 12 May.

An-4: South west slope of Anatahan Is., alt. 365 m, *Elaeocarpus joga*-forest, 13 May.

S-2: North slope of Sarigan Is., alt. 270 m, *Aglaia marianensis*-forest, 15 May.

S-3: Center of Sarigan Is., alt. 300 m, *Artocarpus altilis*-forest, 15 May.

G-1: South west valley of Guguan Is., alt. 60 m, *Pisonia grandis*-forest, 17 May.

G-2: South west peak of Guguan Is., alt. 220 m, *Terminaria catappa*-forest, 17 May.

Al-1: South west slope of Alamagan Is., alt. 365 m, *Hibiscus tiliaceus*-forest, 19 May.

Al-2: South west slope of Alamagan Is., alt. 250 m, *Artocarpus altilis*-forest, 19 May.

Al-3: South west coast of Alamagan Is., alt. 5 m, *Hibiscus tiliaceus*-forest, 9 June.

P-1: West coast of Pagan Is., alt. 55 m, *Aglaia marianensis*-forest, 24 May.

P-2: South west slope of Pagan Is., alt. 225 m, *Elaeocarpus joga*-forest, 25 May.

P-3: South west coast of Pagan Is., alt. 10 m, *Pandanus tectorius-Hibiscus tiliaceus*-forest, 25 May.

Ag-1: West valley of Agrihan Is., alt. 35 m, *Hibiscus tiliaceus*-forest, 28 May.

Ag-2: North west slope of Agrihan Is., alt. 220 m, *Elaeocarpus joga*-forest, 29 May.

Ag-3: North west coast of Agrihan Is., alt. 10 m, *Barringtonia asiatica*-forest, 29 May.

Ag-4: Center of Agrihan Is., alt. 400 m, *Blumea* sp.-community, 31 May, T. Furuki coll.

As-1: West slope of Asuncion Is., alt., 190 m, *Neiosperma oppositifolia-Ficus tinctoria* var. *neoebudarum*-forest, 1 June.

As-2: West slope of Asuncion Is., alt. 50 m, *Cocos nucifera*-forest, 1 June.

M-1: Ridge of East Island of Maug Islands, alt. 120 m, *Hibiscus tiliaceus-Ficus tinctoria* var. *neoebudarum*-forest, 2 June.

M-2: Ridge of West Island of Maug Islands, alt.

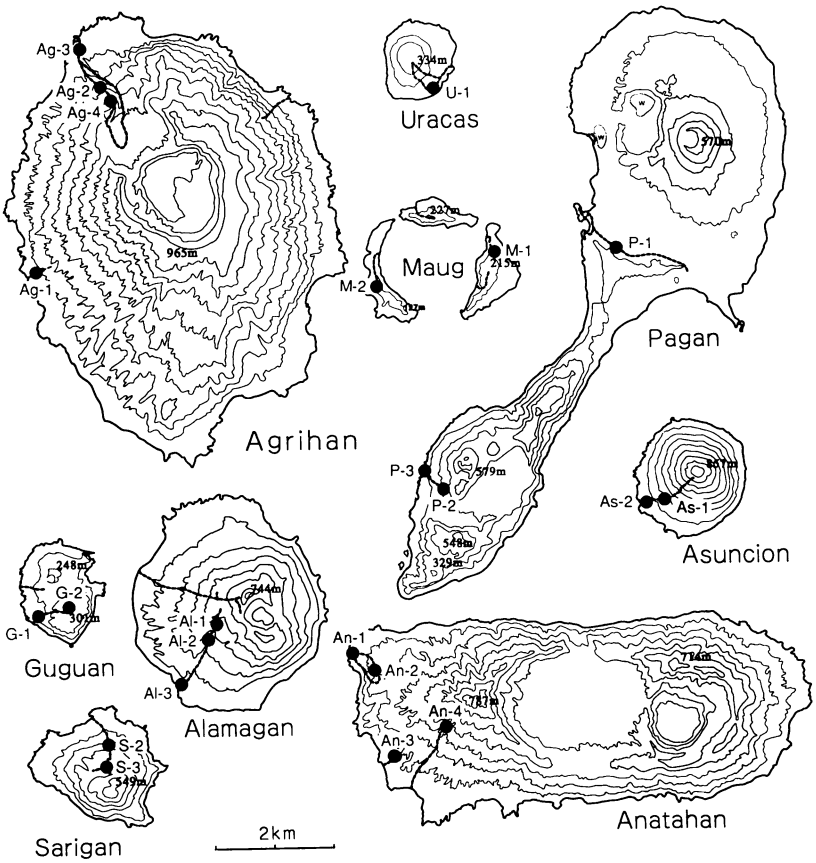

Fig. 1. Sampling sites for soil animals in the northern Mariana Islands.

105 m, *Pandanus tectorius*-forest, 5 June.
U-1: South coast of Uracas Is., alt. 50 m, *Pteris fauriei-Ipomoea pes-caprae* ssp. *brasiliensis*-community, 6 June.

A small quadrat (25 cm × 25 cm) was set on the forest floor at each site. Leaf litter and soil to a depth of 0.5 cm in each quadrat was put into a the polyethylene bag and taken to the base ship, Stella I. In the ship, soil animals larger than 2 mm in body length were collected by hand without the aid of a binocular microscope, and preserved in 70% ethyl alcohol solution. The animals were sorted to life form group level (Kitazawa, 1981).

From the same sites, litter samples were collected for processing by the Tullgren funnel technique. Tullgren samples were composed of 80% ground litters and 20% of on arboreal "soil" such as litter among the branches, mosses and lichens. Samples were extracted by the funnel technique for 48 hours in the ship.

The results of the Tullgren procedure have been reported separately in this volume.

Results and Discussion

Twenty-one animal groups were collected by hand sorting (Table 1). Araneae were collected from all the sites. Isopoda, Hymenoptera, Gastropoda, Diplopoda and adult Coleoptera were occurred frequently. Almost all the of Hymenoptera were ants, the species composition of which has been separately reported by Terayama *et al.* (1994), whose report concerned hand-sorted samples. Minute snails, such as *Gastrocopta* and *Lamellidea*, were the main components of the Gastropoda. Staphylinidae were the dominant adult Coleoptera. Carnivorous arthropods, Pseudoscorpiones and Chilopoda were rarely collected, but Dermatoptera were relatively abundant compared with the two

Table 1. Soil macrofauna present at each collection station in the northern Mariana Islands.

	An-1	An-2	An-3	An-4	S-2	S-3	G-1	G-2	Al-1	Al-2	Al-3	P-1	P-2	P-3	Ag-1	Ag-2	Ag-3	Ag-4	As-1	As-2	M-1	M-2	U-1
Turbellaria		+														+	+						
Gastropoda		+	+				+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	
Oligochaeta	+	+	+	+							+	+		+									
Pseudoscorpiones														+								+	
Araneae	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Isopoda		+	+		+		+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	
Amphipoda						+								+			+						
Diplopoda		+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+					
Chilopoda											+	+											
Blattaria		+	+			+				+	+	+			+	+	+				+		
Embioptera			+																				
Psocoptera	+		+	+								+		+					+		+		
Dermaptera		+							+						+	+	+						
Hemiptera										+					+	+	+		+				
Thysanoptera														+									
Coleoptera (larva)			+					+	+						+	+	+						
Coleoptera (adult)		+	+	+		+	+		+	+			+		+	+	+	+			+	+	+
Diptera (larva & pupa)				+			+	+									+						
Hymenoptera			+	+	+	+	+		+		+	+	+	+	+	+	+	+	+		+	+	+
Lepidoptera (larva)		+					+	+	+						+	+	+	+			+	+	+
Orthoptera							+							+									

former groups. Amphipoda were found at three sites only. Turbellaria and/or Embioptera were collected from the forest floor of the islands.

These results concerning the soil macrofauna of the northern Mariana Islands can be compared with that of the the subtropical western Pacific Islands, such as the Ogasawara and the Ryukyu Islands. The Ogasawara Islands are located to the north of the northern Marianas, and are oceanic islands with a volcanic origin. The Ryukyu Islands are situated at the east end of the Asian continent, and are continental islands connected by to that continent during the ace ages.

Aoki and Harada (1978) reported that in the Ogasawara Islands, Isopoda, Diplopoda, Hymenoptera and Araneae were collected at all stations investigated, and Chilopoda, Coleoptera and Pscoptera frequently occurred. Isopoda formed 3/4 of the total number of individuals in the soil macrofauna, and Amphipoda about 10% of them (Aoki and Harada, 1978). This isopod-dominated pattern is similar in the Ogasawaras and the northern Marianas. Apart from the frequent occurrence of Chilopoda in the Ogasawaras, the pattern of soil macrofauna was similar among these islands.

In the Ryukyus, Isopoda, Hymenoptera, Isoptera, Araneae, Coleoptera and Oligochaeta were dominant density (Abe and Watanabe, 1983). Compared with the northern Marianas, soil macrofauna of the Ryukyus can be characterized by the dominance of Isoptera and the scarcity of Diplopoda and Dermatoptera, unlike that the northen Marianas.

In the northern Marianas, two to fourteen animal groups were found at each site (Table 1). The number of groups per site changed according to the vegetation. *Cocos* plantations had only two to three animal groups. *Elaeocarpus* forests, which may be a climax forest in these islands, had only six to eleven groups, and did not exhibit the most diverse fauna.

Further detailed analyses of the soil macrofauna from the northern Marianas, such as number of individuals and the biomass present, will be reported in another paper.

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References

Abe, T. and H. Watanabe. 1983. Soil macrofauna in a subtropical rain forest and its adjacent cassava plantation in Okinawa—with special reference to the activity of termites. Physiol. Ecol. Japan 20: 101–114.

Aoki, J. and H. Harada. 1978. Investigations on soil fauna of the Bonin Islands. I. Soil arthropod communities. Mem. Natn. Sci. Mus. Tokyo (11): 91–106.

Chapin, E. A.. 1957. Scorpionida. Ins. of Micronesia 3(2): 65–70.

Eldredge, L. G., R. T. Tsuda, P. Moore, M. Chernn and S. Neudecker. 1977. A natural history of Maug, northern Mariana Islands. Univ. Guam Mar. Lab. Tech. Rep. (43): 1–87.

Kitazawa, Y. 1981. Relation of human impact upon terrestrial ecosystems to change in small soil animal community in the island of Kumejima, Ryukyus. *In* Ikehara, S. (ed.), Man's Impact on the Island Ecosystem in the Ryukyu Islands, II: 193–203.

Ross, E. S. 1955. Embioptera. Ins. of Micronesia 8(1): 1–8.

Terayama, M., S. Miyano and T. Kurozumi. 1994. Ant fauna of the northern Mariana Islands, Micronesia. *In* Asakura, A. and T. Furuki (eds.), Biological Expedition to the Northern Mariana Islands, Micronesia. Nat. Hist. Res., Special Issue (1): 231–236.

Thornton, I. W. B., S. S. Lee and W. D. Chui. 1972. Pscoptera. Ins. of Micronesia 8(4): 1–144.