

## TRAPPING OF AIR-BORNE INSECTS IN THE ANTARCTIC AREA<sup>1</sup>

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*Abstract:* Trapping from ships, planes and on land was done in Antarctic areas as part of a study of natural dispersal. Only a collembolan was trapped on the continent. About 38 insects were taken south of 50° S Lat., including Araneida, Collembola, Psocoptera, Thysanoptera, Homoptera, Heteroptera, Coleoptera, Diptera and Hymenoptera. Twelve of these, besides some fragments, were taken south of 60° S Lat., and these included Araneida, Collembola, Corrodentia, Homoptera, Thysanoptera, and Lepidoptera. The southernmost were at 67°, 71° and 75°, besides the collembolan at 77°.

*Introduction:* This is a preliminary report on a program of trapping air-borne insects in the Antarctic area. This is one phase of studies under the United States Antarctic Research Program (USARP), carried out by the National Science Foundation during the 1959-60 Antarctic summer, with facilities and logistics supplied by the U. S. Naval Support Force, Antarctica (Task Force 43). The air-borne insects trapping is part of a study of natural dispersal of organisms across oceans. This forms one aspect of the program "Zoogeography and evolution of Pacific insects" (see preceding article). It is felt that air currents have been primarily instrumental in transporting organisms across stretches of ocean to populate isolated areas like oceanic islands and Antarctica.

*Methods:* Trapping was done from ships, planes and on land. Ship trapping methods have already been described (see preceding article). The nylon organdy nets were used to the exclusion of other methods on the ships. Nets were supported by round iron rings of 61 cm, 75 cm, 91 cm, and 1 m diameters, or frames 125 cm square. Some nets of the latter size, which were 3 m long, were supported by cords instead of metal frames. Trapping was done on the U. S. S. *Arneb* (AKA-56) between Port Lyttleton, New Zealand and McMurdo Sound (Ross I.), via Little America, in December by Gressitt, between McMurdo and Port Lyttleton and return in January by O'Brien, and between McMurdo and Cape Hallett and return in January-February by O'Brien; on the USNS *Alatna* (TAOG-81), a tanker, between McMurdo and Port Lyttleton in early February by Gressitt, and same in late February by O'Brien; and on the U.S.S. *Glacier* (AGB-4) from McMurdo to Port Lyttleton in January, from Port Lyttleton to the Bellingshausen Sea and Thurston Pen. in February, and along the Palmer Pen. to S. Shetland Is., Falkland Is. and to Buenos Aires

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and Rio de Janeiro in March, by Leech. This represented a total of 91 days of trapping at sea, with an average of 11 nets operated per day. Figuring in daily relative wind speeds, net sizes and time lost through storms and damaged nets, a total of about 4 cubic kilometers of air was screened on the ships.

The airplane trapping was done from De Havilland Otter planes operated by Air Development Squadron Six (VX-6), U. S. Navy. A cantilever frame attached to the floor of the plane projected 1.5 m from the fuselage on each side through the open doorways, with the doors removed. Two fine mesh nitex nets, each 0.11 sq. m in mouth area were extended or retracted by the two endless cables on the frame. After the first 23 flights the nets were lined with nylon organdy in the bottoms, and on the last six flights the net size was doubled. Thirty-eight flights were made (13 by Leech, 12 by O'Brien, and 15 by Gressitt), totalling 58 hours of net streaming. This meant approximately 0.017 cubic kilo-



Fig. 1. a, Two net-frames of 6-frame set at foot of Mt. Discovery, Victoria Land coast, 2 Jan. 1960; left to right: Leech, Lt. B. Hooper (VX-6), W. W. Kirtley (AD-1, VX-6), Gressitt; b, Close-up of left net on frame on Otter plane; Gressitt with Lt. (jg) D. Moxley (VX-6); c, Eight 1-meter nets from fore main mast, U. S. S. Arneb, 15 Dec. 1959; d, Otter plane in flight, nets extended, near Black I., McMurdo, Sound, 6 Feb. 1960 (a, b and d: Official U. S. Navy photos).

Table 1. Trapping of airborne insects aboard U.S.S. *Arneb* (Dec.: Gressitt; Jan.-Feb.: O'Brien)

Date	Wind Direction	Starting		Ending		No. Specimens	Order	Family
		S Lat.	E Long.	S Lat.	E Long.			
1959		Port Lyttleton						
Dec. 5	NNE	43° 15'	172° 45'	44° 06'	173° 18'E	1	Corrodentia	Caeciliidae
						1	Thysanoptera	Thripidae
						5	Hemiptera	Aphididae
						1	Neuroptera	Hemerobiidae?
						1	Lepidoptera	Gelechiidae?
						1	Diptera	Ceratopogonidae
						2	"	Dolichopodidae
						1	"	Ephydriidae?
						4	"	Sphaeroceridae (2 spp)
						3	"	Agromyzidae
						1	"	Calliphoridae
						2	Hymenoptera	Ichneumonidae
						2	"	Braconidae
Dec. 5-6	NNE	44° 06'	173° 18'	47° 00'	173° 36'	1	Diptera	Ephydriidae
						16	Hemiptera	Aphididae (2 spp)
						1	Coleoptera	Cucujidae
						1	Diptera	Tipulidae? (thorax)
						1	"	Mycetophilidae
						3	"	Ephydriidae?
						8	"	Sphaeroceridae
						1	Hymenoptera	Ichneumonidae
						1	"	Braconidae
						1	"	Pteromalidae
Dec. 6	NNE	48°	173° 45'	49°	173° 55'	1	Neuroptera	Hemerobiidae
						4	Hemiptera	Aphididae (2 spp)
						2	Thysanoptera	Thripidae
						2	Diptera	Mycetophilidae
						2	(fish scales 3×5mm)	
Dec. 7	N	49° 50'	173° 56'	53° 48'	174° 42'	3	Thysanoptera	Thripidae
						1	Hemiptera	Aphididae - black
						1	Diptera	Chironomidae
						1	"	Ephydriidae
						1	Hymenoptera	Formicidae
Dec. 7	NNW	54°	175°	55°	175°	2	Hemiptera	Aphididae (black)
						1	Corrodentia	Liposcelidae?
						1	Lepidoptera	Microlepidoptera
						1	Orthoptera	Blattidae? (leg)
Dec. 23-26	SW	77°	166°	77°	166°	1	insect	integument
1960								
Jan. 1		off Beaufort I.		(77°	166° 20')	1	Coleoptera	portion of elytron
Jan. 5		59° 06'	175° 48'			1	Araneida	leg
Jan. 7		47° 12'	174° 02'			1	Hemiptera	head and thorax
						1	Diptera	wing and part of thorax
						1	"	tibia?
Jan. 24		43° 48'	173° 13'	50° 08'	174° 07'	1	Coleoptera	? (abdomen)
						2	"	Mycetophagidae?
						1	"	Coccinellidae
						1	Hemiptera	Coreidae? (head & abdomen)

Table 1, continued

					1	Diptera	Ceratopogonidae (head, part of abdomen)
					1	"	Drosophilidae? (head)
					1	"	Acalyptratae (head, abdomen)
					2	"	Mycetophagidae? (thorax, abdomen)
					1	Hymenoptera	Pteromalidae? (thorax, abdomen)
					1	Foraminifera	—
Jan. 24-26	50° 08'	174° 07'	58° 32'	175° 55'	1	Hemiptera	elytron
					1	Diptera	Nematocera? (thorax, abdomen)
					1	Hymenoptera	Pteromalidae?
Jan. 27	58° 32'	175° 55'	67° 08'	175° 55'	2	Corrodentia	Liposcelidae
					1	Thysanoptera	Thripidae (thorax, abdomen)
					1	Hemiptera	Coccidae nymph
					1	Hymenoptera	ant head
					1	Lepidoptera	scale from wing or abdomen
					1	"	Antenna (portion)
Feb. 3	Cape Hallet (72° 20')				1	Blattaria	Blattidae
Feb. 7	75°	166°	74° 20'	166°	1	Coleoptera	fragment of elytra
					1	Diptera	leg, thorax

Table 2. Trapping aboard USNS *Alatna* (Gressitt)

Date	Wind Direction	Starting		Ending		No. Specimens	Order	Family
		S Lat.	E Long.	S Lat.	E Long.			
1960								
Feb. 14	N	45°	173°	44°	173° 20'	1	Thysanoptera	Thripidae?
						1	Diptera	Ephydriidae
Feb. 15	N	44°	173° 20'	43° 40'	173°	2	Thysanoptera	Thripidae
						1	Diptera	thorax and abdomen
						1	"	Agromyzidae
						1	Hymenoptera	ant?
						1	?	leg

Table 3. Trapping aboard U.S.S. *Glacier* (Leech)

1960								
Date	Wind Direction	S Lat.	E Long.	S Lat.	E Long.	No. Specimens	Order	Family
Jan. 11	W	68° 44'	170° 08' E	67°	171° E	1	Collembola	Poduridae
Feb. 9	S	50° 21'	171° 24' W	52° 46'	176° 01' W	1	Hemiptera	1st instar nymphal skin
Feb. 9	S	52° 46'	176° 01' W	55° 16'	172° 06' W	1	"	Jassidae
						1	Hymenoptera	Ichneumonidae
						1	"	Eulophidae
						1	"	abdomen of Ichneumonidae
						1	Araneidae	? Lycosidae (spiderling)
						1	"	Salticidae
Feb. 16	WSW	71° 50'	97° W	71° 50'	97° 30' W	1	Lepidoptera	Nymphalidae (Vanessa)
Feb. 28	SE	70° 49'	96° 48' W	68° 29'	85° 31' W	1	Collembola	Tomoceridae
Feb. 29	WSW	68° 29'	85° 31' W	66° 44'	75° 23' W	1	Lepidoptera	Gelechioidea

meters or 1,700,000 cubic meters of air screened by airplane. Flights were made in several directions from Naval Air Facility, McMurdo Sound. Early in the season most of the flights were around Ross I., over the Ross Ice Shelf, around Minna Bluff, around White I. and Black I., or northward along the Victoria Land coast. Later in the season the flights were into the Taylor, Wright and Victoria Dry Valleys, and in the Cape Chocolate—Mt. Discovery—Black I. areas. The flights were negative for insects, but plant fragments, mainly algae and mosses, were often taken, besides fine sand and debris.

The land trapping involved nylon nets of the same types used on the ships. These were suspended by nylon cord from frames erected of wired bamboo and held erect by nylon cords anchored with rocks. Others were suspended from rings attached to guy wires of radio poles. Nets were arranged, as on ships, so they could function with 360° rotation to allow for shifting of wind directions. Sets of 10–12 nets each were maintained at three localities away from the McMurdo installation, and from 20–60 were operated at and near McMurdo (between Cape Armitage and Hut Point, SW Ross I.), including the side of Observation Hill. The original out-stations were Cape Royds, Cape Crozier (both Ross I.), and Marble Pt. (Victoria Land coast). In early January the Cape Crozier site was abandoned, and one established in its place at the foot of Mt. Discovery (between Brown I. and Minna Bluff). These sites were visited once or twice a week by helicopter when weather permitted. When bad weather delayed visits, nets were sometimes found damaged, or frames blown down, by strong winds. Besides McMurdo, the nets at Cape Royds received more frequent attention through the kindness of Ewen Young and Roland Taylor, biologists on the New Zealand program. Slightly over one day of land trapping was done at Cape Hallett by O'Brien (8 nets). Considering periods when nets were torn open, or blown down, about 12 cubic kilometers of air were screened in the land nets. One local species of podurid springtail was trapped at Marble Pt., 16 Dec. The only other insects trapped were fragments which may have come out of packing crates at McMurdo or from the open ship holds. Local marine amphipods, parts of plants, sand, debris, penguin and skua feathers, and excrement were taken in varying amounts, the feathers and excrement in great quantities at the rookeries at Cape Crozier and Cape Royds.

*Results:* Records listed in the tables are all from the trapping aboard ships. One springtail in land nets is mentioned above. Results from north of the Falkland Is. are not included. The final report of these trapping results must be made later, after the species are identified. Only then can their probable points of origin be established. Apparently the McMurdo Sound area is not very favorable for this type of study, because the prevailing winds there are from the south. Insects to be trapped there would have to be blown very great distances by circuitous routes. At this time the Antarctic air circulation is rather poorly understood.

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### BISHOP MUSEUM FIELD WORK

Early in 1960 Mr. T. C. Maa collected in New Guinea, the Bismarcks and Bougainville I. Between April and June Dr. and Mrs. L. W. Quate collected in Vietnam and Laos and Mr. R. E. Leech is continuing in Laos after more than 2 months in Vietnam, being joined for periods by Mr. Lim Boo Liat and Mr. M. Nadchatram of the Institute of Medical Research, Kuala Lumpur, Malaya, and others. In the South Pacific following the Antarctic season, Dr. J. L. Gressitt collected briefly in New Zealand and New Caledonia; and Mr. C. W. O'Brien in New Zealand, and now for a longer period in the British Solomon Islands. Mr. W. W. Brandt left New Guinea early in 1960, and is working in the New Hebrides following leave in Canberra. He will proceed next to the British Solomon Islands for an extended stay.

Preparations are being made for further work in Antarctic and Subantarctic areas, and next season at least 4 entomologists will participate in the Bishop Museum program, including Dr. C. M. Yoshimoto and Mr. R. E. Leech. Plans are also being made for further trapping of air plankton over the tropical Pacific.

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### PACIFIC INSECT MONOGRAPHS

Bishop Museum announces a new adjunct series associated with PACIFIC INSECTS, to be called "Pacific insects monographs". It will be devoted to large, more or less monographic papers on particular groups from the Pacific area, in the broad sense, and perhaps occasionally catalogs or other studies too large to be included in the journal. Issues will be numbered consecutively and will appear at irregular intervals. They will not be included in subscriptions to the journal. The first issue will be:

The Chrysomelidae of China and Korea (Coleoptera), Part 1. By J. L. Gressitt and S. Kimoto. Price \$4.00 (or £1/9/-or ¥1400.). It will appear within the next few months and will cover the first half of the family Chrysomelidae in the broad sense.

The second issue will concern the Tabanidae of Japan, Korea and the Ryukyu Islands and will be by W. P. Murdoch. It will appear not long after the first issue and the price will probably be similar.