

TRAPPING OF AIR-BORNE INSECTS ON SHIPS ON THE PACIFIC (Part 3)¹

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Abstract: Trapping was done on several ships in various parts of the Pacific between N. America and Asia. A few hundred specimens were taken, of which about 25 were taken more than 400 km from a continent or continental island. Most of them were Hymenoptera, Diptera, Coleoptera and Hemiptera.

Introduction: This is the third of a series of papers giving preliminary reports on trapping of air-borne insects from ships. A complete report cannot be given until the specimens are identified. This presents a difficult problem, as most of the insects represent groups of minute insects which are poorly known, and also many of the specimens are damaged. It is desirable to learn the probable points of origin of the trapped insects, but much taxonomic work by specialists in the difficult groups is a prerequisite to attaining this information. Prior reports on trapping were made by Gressitt and Nakata (1958, *Hawaiian Ent. Soc., Proc.* 16: 363-5) and Yoshimoto and Gressitt (1959, *op. cit.* 17: 150-55). This paper covers the results of work done in 1959. During 1959 an entomologist was able to operate the traps at sea for the first time as the Office of Naval Research made it possible for Yoshimoto to travel aboard the ships "David C. Shanks" and "Barrett" between Hawaii and the Philippine Is. and return.

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Methods: Several types of traps have been used in this study. First, a cubical alu-

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minum frame trap ("screen trap") with adhesive material painted on screens on 5 sides (Gressitt & Nakata, 1958). Less use was made of this type toward the end of 1959. The fixed wind sock trap (Yoshimoto & Gressitt, 1959, fig. 1) has a muslin sleeve with deta-

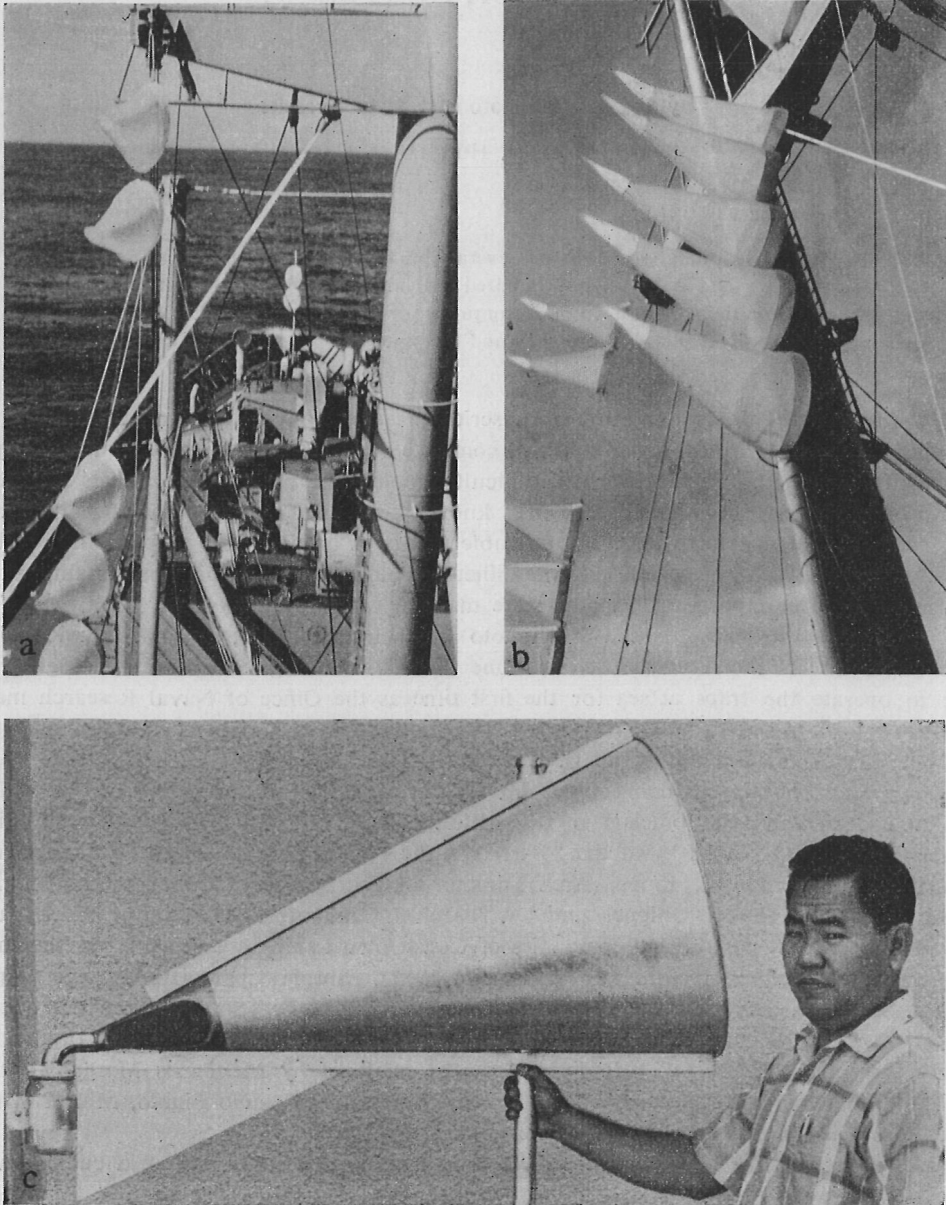


Fig. 1. a, View forward, showing 5 nets in foreground and 2 in bow on military transport; b, Eleven of 14 nets (75 cm) flying from fore mast; c, Aluminum funnel trap with glass jar and wind vane attachments; Yoshimoto.

chable nylon cone, the former supported at mouth by a heavy metal ring with flanges which permit rotation on a vertical axis (pipe lashed to a railing). The free wind sock net is an elongate cone-shaped net (fig. 1 a, b) which has an opening 75 cm in diameter and is 1.5 meters long (or 1×2 m). The mouth is made of heavy muslin, to which a nylon cone is sewn. A recent modification has a separate, removable apex which is attached by buttons or snaps. A ring made of galvanized wire, gauge 10, supports the muslin base and has 2 small metal rings on opposite sides. These are attached by metal snaps to cables or lines which extend over a pulley on the foremast cross-bar or other appropriate place. The metal "funnel trap" (fig. 1, c) is 60 cm in diameter at the opening and is 1 m long. The apex of the trap is curved and has a jar cap soldered on the tip; the jar, partly filled with alcohol-glycerin, is screwed on the jar cap. A clamp holds the jar in position. A fin riveted to the cone keeps the mouth of the funnel facing into the wind. Very fine brass screening on parts of cone apex and neck permit escape of air. The trap revolves on the aluminum pipe support.

Procedure: During 1959, trapping was done on ships of the Bureau of Commercial Fisheries, Hawaii Area (then Pacific Oceanic Fisheries Investigations), U. S. Fish and Wildlife Service (P.O.F.I.), U. S. Coast Guard (U.S.C.G.), and Military Sea Transport Service (M.S.T.S.) operating out of Honolulu. The P. O. F. I. ships "Hugh M. Smith" (cruise 51) and "Charles H. Gilbert" (cruise 44) operated in the open sea within 700 km of the Hawaiian Is. The "Smith" (cruise 52) sailed from Hawaii to Baja California near the

Table I. Insects Caught in Ship Traps

(Specimens taken on adhesive screen traps are marked with an asterisk, those taken in the aluminum funnel trap with a dagger, those taken in the wind sock traps are unmarked)

Date 1959	Ship	N Lat.	Long.	Distance in Km to Nearest Land	No.	Order	Family
Feb. 25	U.S.C.G.S. Chatauqua	28° 15'- 30° 12'	178° 18'W- 176° 18'E	300-700 Midway	1*	Diptera	—
Feb. 8	U.S.N.S. Patrick	17° 27'- 15° 25'	159° 39'E- 151° 22'E	800-Wake 600-Guam	1* 1*	Coleoptera Diptera	Anthribidae Chironomidae
Mar. 7	P.O.F.I. Smith	23° 58.3'- 23° 58.5'	153° 45' W-' 151° 58.3'W	225-700 Maui	1	Corrodentia	Liposcelidae
Mar. 8	P.O.F.I. Smith	23° 58.8'- 24° 06'	151° 58.3'W- 149° 27.8'W	700-Hawaii	1 1	Hymenoptera "	Formicidae Eulophidae
Mar. 24	P.O.F.I. Smith	18° 03.5'- 20° 12.2'	160° 01.8'W- 157° 19'W	225-Hawaii 250-Kauai	1	"	Formicidae
May 22	P.O.F.I. Smith	27° 21'- 26° 51'	122° 07'W- 121° 32'W	450-550 Baja Calif.	1	"	"
May 24	P.O.F.I. Smith	27° 00'- 27° 14'	120° 18'W- 118° 53'W	400-450 Baja Calif.	1	"	"
May 7	U.S.N.S. Barrett	14° 19'- 15° 25'	159° 56'E- 151° 22'E	525-Eniwetok 600-Guam	1*	Diptera	Sciaridae
Aug. 26	U.S.N.S. Shanks	21° 18'- 20° 10'	162° 54'W- 170° 13'W	400-800 Oahu	1 1*	Coleoptera Araneida	Scolytidae young spider
Aug. 27	"	20° 10'- 20° 45'	170° 13'W- 177° 38'W	400-1000 Johnston	1* 1	" Lepidoptera	young lycosid Gelechiidae?
Sept. 6	"	13° 37'- 13° 24'	137° 31'E- 130° 50'E	360-Yap 600-Samar	3* 6 1†	Homoptera " Heteroptera	Derbidae " Miridae (green sp.)

Table II. Insects in ship traps from Sept. 7 to Dec. 24, 1959.
(See note, Table I, for symbols)

No.	Order	Family	No.	Order	Family
Sept. 7, U.S.N.S. Shanks; Lat. 13°24'N, Long. 130°50'E to San Bernardino Sts; 65-480km off Samar.					
1	Coleoptera	Staphylinidae	1*	Heteroptera	Miridae (green sp.)
1	"	" (alive)	1†	"	" "
15*	Homoptera	Derbidae (same sp.)	6	"	" "
8†	"	" "	2	"	" (2 spp.)
30	"	" " (frag.)	1†	Diptera	Acalyptrate
Sept. 8, U.S.N.S. Shanks; San Bernardino Sts to Port of Manila (all in metal funnel trap).					
1	Araneida	young lycosid	1	Lepidoptera	Noctuidae
4	Corrodentia	Psoquillidae	1	Diptera	Tipulidae
2	Thysanoptera	Thripidae (2 spp.)	4	"	Chironomidae
1	Homoptera	Fulgoridae	3	"	Ceratopogonidae
1	"	Aphididae	4	"	Cecidomyiidae
3	Heteroptera	Miridae (2 spp.)	2	"	Phoridae
1	"	Lygaeidae	2	"	Drosophilidae
1	"	(family ?)	1	"	Chloropidae
1	Coleoptera	Halipidae	2	Hymenoptera	Scelionidae
3	"	Hydrophilidae (2 spp.)	1	"	Platygastridae
1	"	Staphylinidae	1	"	Eurytomidae
1	"	Scaphidiidae	1	"	Chrysidae (alive)
4	"	Coccinellidae	1	"	Formicidae
1	"	Scydmaenidae			
1	"	Tenebrionidae (alive)			
1	"	Scolytidae			
Dec. 12, U.S.N.S. Barrett, Subic Bay, Luzon to San Bernardino Sts (mostly in wind sock nets).					
25	Araneida	spiderlings	2	Diptera	Psychodidae
1	Acarina	Parasitidae	8	"	Ceratopogonidae (3 spp.)
1	Orthoptera	Acrididae	1	"	Sciaridae
1	"	Gryllidae	3	"	Cecidomyiidae
2	Corrodentia	Mesopsocidae	1	"	Empididae
12	Thysanoptera	Thripidae (3 spp.)	3	"	Dolichopodidae
9	Homoptera	Fulgoridae	3	"	Phoridae
2	"	Cicadellidae	7	"	Drosophilidae
2	"	Aphididae	14	"	Ephydriidae (3 spp.)
1	Heteroptera	Veliidae	3	"	Chloropidae
4	"	Corizidae	1	Hymenoptera	Braconidae
1	"	Lygaeidae	5	"	Mymaridae
1	Coleoptera	Carabidae	2	"	Encyrtidae
6	"	Hydrophilidae (3 spp.)	1	"	Elasmidae
2	"	Staphylinidae (2 spp.)	1	"	Agaontidae
2	"	Cucujidae	4	"	Perilampidae
4	"	Coccinellidae (2 spp.)	1	"	Eupelmidae
3	"	Cybocephalidae	16	"	Eulophidae
1	"	Dermentidae	3	"	Trichogrammatidae
1	"	Colydiidae	8	"	Proctotrupidae (3 spp.)
1	"	Ptiliidae	17	"	Scelionidae (3 spp.)
2	"	Chrysomelidae (2 spp.)	2	"	Cynipidae
1	"	Scarabaeidae (Aphodiinae)	5	"	Formicidae
Dec. 24, U.S.N.S. Barrett; Lat. 20°41' N, Long. 160°53' W to Honolulu.					
2	Homoptera	Aphididae	2	Lepidoptera	(Microlepidoptera)
1	Coleoptera	Anobiidae			

Island of Guadalupe and to La Jolla, California. A single wind sock trap was aboard each of these ships and was operated by a crew member. The Coast Guard ships traveled from Honolulu to station "Victor" and on to Yokosuka, Japan, each carrying a single screen trap. Screens were changed daily except that while the ship was on station at "Victor" the trap was changed once a week.

On Yoshimoto's trip to Manila on the "Shanks" 2 screen traps, a fixed wind sock trap, a metal funnel trap, and 2 free wind sock nets were in operation every day on the open sea between Honolulu and the Philippines. On the return trip 22 free wind sock nets were used, of which 16 were 75 cm diameter and 6 were 1 m diameter nets.

Results: During the outward passage from Honolulu to Guam in September, a few specimens were taken 300–600 km away from the nearest islands. The winds were moderate to calm, with an occasional slight head wind. The funnel trap was functionless at wind velocities under 5 knots an hour. Many white sand grains, which may have been carried by a NE wind, were collected in the funnel trap 800 km SSW of Wake I. A south breeze, encountered after leaving Guam on Sept. 5, was the fringe of a typhoon which swept NW toward Taiwan. Nearly $\frac{1}{2}$ of the specimens caught in the nets during this time were in fragments. These specimens were caught about 430 km north of the Palau Is. and 800 km east of Samar I. Trapping was discontinued 60 km east of Samar I. except that the funnel trap was operated through the straits between the islands of Samar, Mindoro and Luzon, to within 80 km of Manila. Many specimens were caught in the funnel trap within a few km of land. During the passage of the "Barrett" from Subic Bay, Luzon to San Bernardine Straits, many tiny specimens were caught in the wind sock nets, as well as in the funnel trap. The majority of these specimens were satisfactory. However, from the San Bernardino Straits to Hawaii, trapping conditions were difficult due to a constant rough sea and high wind, and equipment was damaged and almost no specimens were taken.

The majority of the specimens caught in the traps are small to minute insects and other arthropods (0.5–4 mm) and represent the groups Hymenoptera, Diptera, Coleoptera, Homoptera, Heteroptera, Corrodentia, Lepidoptera, Araneida and Acarina. The collections made and pertinent data are given in tables 1 and 2. It is significant that nearly all specimens taken more than 800 km from land were taken during storm periods when strong winds were blowing from the west. No specimens were caught in local squalls or in calm weather at that distance from land. This gives support to the theory that wind currents in stormy periods are the main means of natural transport of terrestrial arthropods to oceanic islands.

FIELD WORK IN ANTARCTICA

Under the United States (USARP) and the New Zealand Antarctic research programs considerable entomological field work was accomplished during the 1958–59 and 1959–60 summer seasons, particularly during the latter.