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TRAPPING OF AIR-BORNE INSECTS IN THE PACIFIC-ANTARCTIC AREA, 1

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Abstract: Trapping reported upon was done during 1961-62 on a U. S. Navy weather ship, a military transport ship and from a trap operated in Navy Super-Constellation airplanes, primarily over the Pacific and Antarctic oceans. Insects trapped numbered 2,160, of which 2,124 were taken in the temperate and subtropical western Pacific, 6 in sub-Antarctic seas, all from ships, and 30 in the Super-Constellation airplane trap in the Antarctic and Pacific and over continental United States.

Introduction: This report[1,2] concerns results of the air-borne insect trapping program during 1961-1962. The following are reported in this installment, including results of work during the Antarctic 1961-62 season, airplane trapping from September 1961 to August 1962, and ship trappping in the Pacific in early 1962. In addition to the listed authors, trapping was also done by D. Wohlschlag and Ronald Yamamoto.

USS Vance. New Zealand - Campbell I. - New Zealand, Nov.-Dec. 1961, J. L. Gressitt.

USNS Barrett. Hawaii - Japan - Korea - Okinawa - Philippines-Hawaii, May 1962, C. M. Yoshimoto.

Navy VX-6 Super-Constellation. Rhode Island-Hawaii-New Zealand-Antarctica, etc., Sept. 1961-Apr. 1962, C. J. Mitchell and D. Wohlschlag.

Navy EWBSP Super-Constellation. Hawaii-Midway-Hawaii, May-Aug. 1962, Ronald Yamamoto.

Other current trapping, including that in the Atlantic, Pacific and Antarctic oceans by W. A. Steffan on the USNS Eltanin, research vessel of the U. S. Antarctic Research Program (USARP); by E. Holzapfel in the Pacific on the Scripps Institution of Oceano-

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2. See immediately preceding reports:

"Trapping of air-borne insects in the Antarctic area (part 2)", by J. L. Gressitt, R. E. Leech, T. S. Leech, J. Sedlacek and K. A. J. Wise. 1961, Pacific Ins. **3**: 559-62.

"Trapping of air-borne insects on ships on the Pacific (part 4)", by C. M. Yoshimoto and and J. L. Gressitt. 1961, Pacific Ins. **3**: 556-58.

"A high speed airplane trap for air-borne organisms", by J. L. Gressitt, J. Sedlacek, K. A. J. Wise and C. M. Yoshimoto. 1961, Pacific Ins. **3**: 549-55, 3 figs.

"Air-borne insects from the Galathea Expedition", by C. M. Yoshimoto, J. L. Gressitt and T. Wolff. 1962, Pacific Ins. **4**: 269-91, 4 figs.

"Air-borne insects trapped on "Monsoon Expedition", by J. L. Gressitt, J. Coatsworth and C. M. Yoshimoto. 1962, Pacific Ins. **4**: 319-23, map.

graphy's ship "Spencer F. Baird"; by K. A. J. Wise on USS Vance south of New Zealand; and by G. A. Samuelson on the USS Durant between Hawaii, Society Islands and Kermadec Islands, will be reported upon later.

Methods: Trapping methods aboard the ship were previously reported in part (Yoshimoto & Gressitt, 1960, Pacific Ins. 2: 239, 245). Extensive use was made of the nylon nets on steel rings of 1 m and 75 cm in diameter. These were strung in series on steel cables or lines from mast arms to deck railings of the ships (Gressitt, 1961, Pacific Ins. Monograph 2: fig. 20, a). In 1962, electric power suction traps were used aboard ship for the first time on our program. The first two suction traps produced were operated concurrently at sea by Yoshimoto on the "Barrett" in 1962. The smaller one is 2 m high, with a cylinder 25 cm in diameter with a square base of 75 cm on each side, and is powered by a 1/20 horse power roof ventilator motor with a 24.4 cm fan. This trap did not prove to be very efficient, and was far less productive than the larger suction trap.

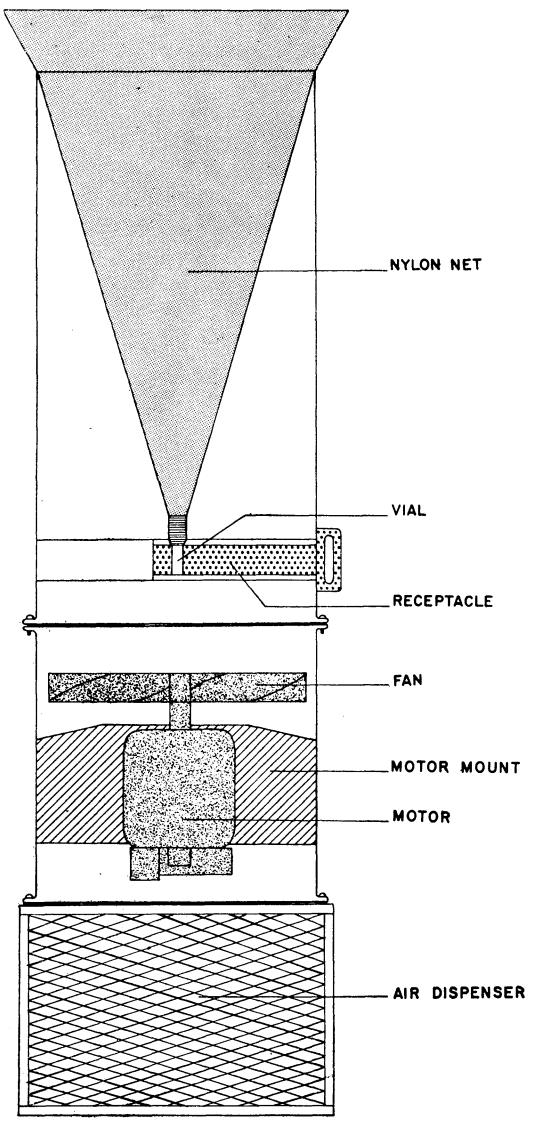

Fig. 1. Suction trap.

The large suction trap (fig. 1) is 2.5 m high, and the large aluminum cylinder is 90 cm in diameter housing a conical nitex (#308) net. The net tapers into a vial placed in the solid sliding plastic receptacle. This pushes the replaceable vial into contact with the cylinder fastened to the lower end of the net cone. The air passes through the vial opening where a nitex screen is fastened to fit its circumference. Below this trap cylinder is the tubeaxial fan with an 1-horse power, 1-phase, 115–230 volts, 9.9–4.9 amps., 60 cycle electric motor mounted in the fan-motor housing unit. This is bolted to the aluminum cylinder and the metal frame base air dispenser. The large suction trap draws approximately 6,800 cubic meters of free air per hour through the net, and all the insects and other particles in this are funnelled into the replaceable vial of the recepticle. At air speed above 22 knots it was found that

the fan tended to reverse its motion. This was caused by an upward draft of air from the air dispensing unit beneath, rendering the trap non-functional. During the voyage, a heavy canvas cloth was wrapped around the dispensing unit. This helped neutralize the wind disturbance. It is expected that modification of the air dispenser will eliminate this problem.

In the sub-Antarctic ship trapping, only the nylon nets on steel rings were used. In the main, nets of 75 cm in diameter were used, generally 8–12 nets at one time.

The trap in the Super-Constellation airplane has already been described (Pacific Ins. 3: 549–55). During this second year, the trap was flown about 122,577 statute miles on the U. S. Antarctic Research Program and 12,000 statute miles along the Hawaiian Chain by the Early Warning Barrier Squadron Pacific. Thus the trap has now been operated for a total of 250,241 statute miles during its first two years of use.

Results: Pollen, mineral and plant samples were taken by using glycerin-jelly slides exposed in the airplane trap. Dr. Lucy Cranwell, University of Arizona, is presently analyzing the pollen samples. Mineral contents were sent to Dr. Francis W. Wright, Harvard University and plant debris is awaiting analysis.

On the Antarctic Continent, land-based nets were flown as before (see Pacific Ins. 2: 245) in the McMurdo Sound area, but with no positive results.

As is to be expected, trapping in temperate and tropic areas near Asia was far more productive of specimens than that in Antarctic areas and at high altitudes on the Super-Constellation plane. The trapping results are enumerated in the tables. Table 1 presents results of trapping on the U. S. S. Vance, south of New Zealand with 6 specimens.

Table 2 presents results of net and suction trap collections on the U. S. N. S. Barrett in the western Pacific. A total of 2,124 specimens were trapped during the 30 day voyage, 1,979 in the nylon nets and 145 in the suction traps. A large number of insects caught near Japan, Korea, China and Okinawa represent insect families of Aphididae (probably 2 spp.), Agromyzidae (*Phytomyza atricornis* Meigen), Drosophilidae (*Scaptomyza disticha* Duda, *Chymomyza* sp.) and Chironomidae. In the Philippines area, a hymenopterous family, Agaontidae, was most conspicuous while other diversified families of insects were represented by fewer specimens in the collection.

Table 3 presents results of the airplane trap on the Antarctic Program. Between Canton and the Hawaiian Islands, a lygaeid bug was taken at an altitude of 4,960 m at which the nearest land was Johnston Island approximately 248 km away. Another interesting catch was a wing of a lygaeid bug, probably of *Nysius huttoni* caught near the Antarctic Continent (66°–59° S. Lat.) at 4,000 m. Table 4 presents results of the same trap along the Hawaiian Chain.

Volume of air screened in the ship trapping operations here reported is about 0.6 cubic kilometers.

An interesting catch not earlier reported was that of an adult spider on the Antarctic Continent at Marble Point, Victoria Land coast 77° 13′ S. Lat. 163° 45′ E. Long. on 23 December 1959 by C. W. O'Brien. This was taken in land-based aerial nets near the shore. The specimen was misplaced earlier and has not yet been identified, but presumably might have been blown from New Zealand or Australia.

Table 1. Trapping aboard U. S. S. Vance (Gressitt).

1961	Wind direction, velocity (knots)	Starting S. Lat.	Starting E. Long.	Ending S. Lat.	Ending E. Long.	No. Specimens	Order	Family
Nov. 20	230°/15	48°00′S	170°40′E	51°00′S	170°00′E	4	Diptera	Sphaeroceridae (*Leptocera* sp.?)
Dec. 23	270°/10	50°00′S	170°00′E	48°00′S	170°40′E	1	Diptera	Scaptopsidae
						1	Homoptera	Aphididae

Table 2. Preliminary determination of insects, USNS Barrett.

No.	May 1962	Wind direction, velocity	Starting Lat.	Starting Long.	Ending Lat.	Ending Long.	Approx. dist., nearest land, in km	No. Specimens	Order	Family	Species
On bridge	2	120°/11	21°42′N	160°00′W	23°22′N	163°00′W	315°/12.4 Nihoa I.	2*	Homopt.	Delphacidae	*Perkinsiella saccaricida* Kirkaldy
Net-11	9	80–120°/ 10–22	34°20′N	144°56′ E	34°03′N	142°01′ E	275°/124 Honshu I.	2	Dipt.	Agromyzidae	♂, ♀, *Phytomyza atricornis* Meigen
Suction A21								1*		Aphididae	
Nets-12	10	9°/8	34°03′N	142°01′ E	34°50′N	139°52′ E	Outside of Tokyo Bay	*			
Suction B24	12	185°/18					332°/24.8 Shikoku I.	1	Coleopt.	Coccinellidae	
								4*	Homopt.	Aphididae	
								1	Dipt.	Chironomidae	
								1		Cecidomyidae	
Nets-13								1	Hymenopt.	Cynipoidea	♀ *Kleidotoma japonica* Huzimatu?
								4		Braconidae	
								2		Eulophidae	
								2	Dipt.		
								1	Homopt.	Tettigellidae	
								530+*		Aphididae	
								2	Dipt.	Ceratopogonidae	
								2*	Dipt.	Agromyzidae	♀ *Phytagomyza populi* Kalt.
								*			♀ *Liriomyza* sp.
								1		Ephydridae	
Suction A24								2*	Homopt.	Aphididae	
Nets-14	13	310°/7	34°37′N	139°06′ E	32°43′N	134°39′ E	135°/21.7 Kyushu	4	Dipt.	Culicidae	
			31°08′N	131°05′ E	32°13′N	127°43′ E		1		Anthomyiidae	
								9		Sphaeroceridae	
								8		Ephydridae	
								88*		Agromyzidae	30♂, 58♀, *Phytomyza atricornis*

							784*		Drosophilidae	342♂, 442♀, *Scaptomyza disticha* Duda
							12*	Homopt.	Aphididae	4♂, 12♀, *Chymomyza* sp.
							12*	Lepidopt.	Blastobasidae	
Nets-15		320°/4	32°13′N	127°43′ E	33°23′N	126°00′ E	270°/4.7 Cheju Do	512*	Dipt.	Drosophilidae	209♂, 300♀, *Scaptomyza disticha*
											♂, 2♀ *Scaptomyza graminum* Fallen
								7*	Homopt.	Aphididae	
								3*	Lepidopt.	Blastobasidae	
Nets-16		150°/11	33°23′N	126°00′ E	34°31′N	125°37′ E	270°/7.4 S. Korea	1	Homopt.	Psyllidae	
Suction A25	13	320°/4	32°13′N	127°43′ E	33°23′N	126°00′ E	270°/4.7 Cheju do	1	Homopt.	Aphididae	
								1	Dipt.	Ephydridae	head and wing
								1		Agromyzidae	wing
Suction B25								6*	Dipt.	Drosophilidae	4♂, 2♀, *Scaptomyza disticha*
								1*		Agromyzidae	♀, *Phytomyza atricornis*
								1		Sphaeroceridae	
								1*	Homopt.	Aphididae	
								1*	Hymenopt.	Braconidae	
Suction B26		150°/11	33°23′N	126°00′ E	34°31′N	125°37′ E	270°/7.4 S. Korea	5*	Dipt.	Drosophilidae	3♂, 2♀, *Scaptomyza disticha*
								3*		Agromyzidae	♂, 2♀, *Phytomyza atricornis*
								1*	Lepidopt.	Noctuidae	
Nets-17	14	330°/12	34°31′N	125°37′ E	37°05′N	126°18′ E	3.1 Entrance to Inchon	14	Dipt.	Drosophilidae	9♂, 5♀, *Scaptomyza disticha*
								19		Agromyzidae	7♂, 12♀, *Phytomyza atricornis*
								5		Ephydridae	
								1		Cecidomyidae	
								2		Chironomidae	*Chironomus* sp.
								1		Ceratopogonidae	
								1		Araneida	spiderling
Suction A-27	14							1*	Lepidopt.	Noctuidae	
Suction B27								4	Dipt.	Drosophilidae	2♂, 2♀, *Scaptomyza disticha*
Nets-18	15	330°/10	37°05′N	126°18′ E	33°16′N	125°52′ E	80°/8.7 Cheju Do	43	Dipt.	Agromyzidae	29♂, 14♀, *Phytomyza atricornis*
								1		Chironomidae	*Chironomus* sp.
								5		Chironomidae	
								1		Mycetophilidae	♀ *Exechia* sp.
								1		Culicidae	

Nets-18	15	330°/10	37°05′N	126°18′ E	33°16′N	125°52′E	80°/8.7 Cheju Do	1		Ceratopogonidae	♀ *Culicoides arakawae* (Arakawa)
								11		Drosophilidae	♂, 4♀, *Chymomyza* sp.
								11			♂, 5♀, *Scaptomyza disticha*
								1		Syrphidae	*Melanostoma* sp.
								4	Hymenopt.	Eulophidae	
								1		Encyrtidae	
Suction A28								3	Homopt.	Aphididae	
								2	Dipt.	Ceratopogonidae	
								5		Chironomidae	
								3		Chloropidae	2♂, ♀, *Chlorops* sp.
								1		Agromyzidae	♂ *Phytomyza atricornis*
								5	Dipt.	Ephydridae	
								1		Acalyptrate	
								4		Anthomyiidae	2 spp.
								1	Hymenopt.	Ichneumonidae	
								1		Encyrtidae	
Suction B28								2	Dipt.	Agromyzidae	♂, ♀, *Phytomyza atricornis*
								1		Chloropidae	♀ *Chlorops* sp.
Nets-19		300°/10	33°16′N	125°52′ E	31°22′N	126°17′ E	270°/155 China	12	Homopt.	Aphididae	
								2	Hemipt.		
								1	Dipt.	Chironomidae	
								1		Ephydridae	
								1		Drosophilidae	♂ *Scaptomyza disticha*
								3		Agromyzidae	♂, 2♀, *Phytomyza atricornis*
								2	Hymenopt.	Eulophidae	
								1	Araneida		spiderling
Suction A29								1	Dipt.	Chloropidae	♂ *Chlorops* sp.
								1		Agromyzidae	♂ *Phytomyza atricornis*
Suction B29								1	Homopt.	Aphididae	
								5	Dipt.	Chironomidae	
								2		Agromyzidae	2♀ *Phytomyza atricornis*
								1	Hymenopt.	Encyrtidae	
								1		Eulophidae	
Nets-20		315°/11	31°22′N	126°17′ E	30°07′N	126°39′ E	120°/90 Tokara Shima	4	Homopt.	Aphididae	exuviae of 1st instar nymph
								1	Homopt.		
								1	Dipt.	Ephydridae	
								3		Drosophilidae	2♂, ♀ *Scaptomyza disticha*
								1	Hymenopt.	Eulophidae	
								1	Dipt.	Chironomidae	
Suction A30								2		Ephydridae	
								4		Agromyzidae	3♀ *Phytomyza atricornis*

										♀ *Phytomyza plantaginis* Rob.-Des.
							1		Drosophilidae	♀ *Scaptomyza disticha*
							2		Chloropidae	2♂ *Chlorops* sp.
							4	Hymenopt.	Encyrtidae	
Nets-21	16	315°/11	30°07′N	126°39′ E	26°52′N	127°31′ E	25	Homopt.	Aphididae	
						12.4 off Okinawa Shima	2		Psyllidae	
							1		Tettigellidae	
							1	Dipt.	Psychodidae	
							8		Drosophilidae	4♂, 4♀ *Scaptomyza disticha*
							3		Agromyzidae	2♂, ♀, *Phytomyza atricornis*
							1	Dipt.	Ephydridae	
							4	Lepidopt.	Blastobasidae	
Suction A31							1	Homopt.	Aphididae	
							1	Dipt.	Ceratopogonidae	
							12		Chironomidae	2 spp.
							2		Cecidomyidae	
							1		Chloropidae	♀ *Chlorops* sp.
							2		Agromyzidae	2♀ *Phytomyza atricornis*
							1		Ephydridae	
							1		Anthomyiidae	
							3	Hymenopt.	Encyrtidae	
Suction B31							1	Homopt.	Aphididae	
							1	Dipt.	Drosophilidae	♂ *Scaptomyza disticha*
							1	Hymenopt.	Cephidae	
							5		Encyrtidae	
Nets-22	17	220°/16	26°00′N	127°26′ E	24°26′N	125°28′ E	1	Dipt.	Trypetidae	♀ *Dyseuaresta* sp.
						60°/4.3 Tokashiki Shima	3		Agromyzidae	3♀ *Phytomyza atricornis*
							1	Lepidopt.	Noctuidae	
Suction A-32							1	Dipt.	Heliomyzidae	
							1		Agromyzidae	♂ *Phytomyza atricornis*
							2		Ephydridae	
Suction B32							1	Coleopt.	Scolytidae	
							1	Dipt.	Ceratopogonidae	
Stateroom							1*	Coleopt.	Cleridae	
Nets-23	18	90°/14	24°26′N	125°20′ E	21°14′N	121°47′ E	1	Homopt.	Aphididae	(crushed)
						137°/6.2 Y'ami Shima	1	Dipt.	Drosophilidae	(crushed)
Nets-24		90°/20	21°14′N	121°47′ E	19°39′N	120°56′ E	2	Thysanopt.	Thripidae	
						315°/21.7 Calayan I., Philippines	1	Dipt.	Phoridae	
							3		Ceratopogonidae	
							21	Hymenopt.	Agaontidae	(3 spp.)
							2		Eulophidae	
							1		Encyrtidae	
On bridge							1	Coleopt.	Cleridae	
							1		Curculionidae	

Nets-25		90°/12	19°39′N 120°56′ E	18°35′N 120°27′ E	315°/7.4 Luzon I.	1	Thysanopt.	Thripidae	
						4	Homopt.	Aphididae	
						2		Psyllidae	
						1		exuviae	
						1	Hemipt.	Anthocoridae	
						1		Miridae	
						1	Dipt.	Cecidomyidae	
						1		Phoridae	
						28	Hymenopt.	Agaontidae	
						1	Hymenopt.	Pteromalidae	
						1		Encyrtidae	
						4	Araneida		spiderlings
Suction A33						2	Dipt.	Ceratopogonidae	
						2		Chironomidae	
						1		Agromyzidae	♀ *Phytomyza atricornis*
						2		Hymenopt.	Encyrtidae
Nets-26		light air	18°35′N 120°27′ E	14°23′N 120°31′ E	Passing through north channel, Manila Bay	2	Homopt.	Tettigellidae	(most of the following
						4		Fulgoridae	families of insects were
						37	Dipt.	Chironomidae	caught alive)
						8		Ceratopogonidae	
						2		Cecidomyidae	
						1		Ephydridae	
						1	Hymenopt.	Eulophidae	
						1		Ceraphonidae	
						1		Scelionidae	
						4	Araneida		spiderlings
Suction B34						1	Dipt.	Chironomidae	
						1		Ephydridae	
Nets-27	21	Calm	Subic Bay, Philippines	12°45′N 124°19′ E	270°/64.8 Samar I.	2	Thysanopt.	Thripidae	(most of the following
						1	Coleopt.	Carabidae	families of insects were
						1		Staphylinidae	caught alive)
						1		Nitidulidae	
						2	Homopt.	Aphididae	
						3		Tettigellidae	
						2		Fulgoridae	
						1		Psyllidae	
						3	Hemipt.	Lygaeidae	
						3		Miridae	
						1		Tingidae	
						2	Dipt.	Chironomidae	
						3		Ceratopogonidae	
						4		Cecidomyidae	
						3		Psychodidae	
						1		Phoridae	
						1		Sphaeroceridae	
						14	Hymenopt.	Agaontidae	
						1		Eulophidae	
						1		Ceraphronidae	
						2		Scelionidae	

							11		Formicidae	(3 spp.)
							5	Lepidopt.	Opostegidae	
							2		Oecophoridae	(2 spp.)
							1		Pyralidae	
							1		Noctuidae	
							5	Araneida		spiderlings
							2		exuviae	spiderlings
Nets-28		Calm	12°45′N	124°19′ E	13°30′N	126°25′ E	270°/64.8	2	Thysanopt.	Thripidae	
							Samar I.	3	Coleopt.	Coccinellidae	
								1	Homopt.	Aphididae	
								4		Psyllidae	*Trioza* sp.?
								3		Fulgoridae	
								1	Dipt.	Ceratopogonidae	
								2		Phoridae	
								3		Chironomidae	
								5	Hymenopt.	Agaontidae	
								1		Encyrtidae	
								1		Scelionidae	
								5		Formicidae	
								6	Araneida		spiderlings
On deck								1*	Orthopt.	Mantidae	
Stateroom								1*	Coleopt.	Cleridae	
								1*	Hymenopt.	Formicidae	
Nets-29	22	210°/3	13°30′N	126°25′ E	15°00′N	130°15′ E	270°/202	1	Homopt.	Tettigellidae	
							Samar I.	1		Aphididae	
								1	Hemipt.	Miridae	(thorax, abdomen)
								1	Dipt.	Trypetidae	(wings)
Suction A38		210°/15	15°00′N	130°15′ E	15°43′N	132°12′ E	270°/279 Samar I.	1		Chironomidae	
Nets-32	23	120°/16	16°06′N	133°15′ E	17°26′N	137°27′ E	135°/298	1	Dipt.		Thorax
							Yap I.	1	Hymenopt.	Agaontidae	
Nets-35	24	80°/15	18°25′N	140°36′ E	19°39′N	144°40′ E	90°/248	4	Dipt.		4 legs
							Asuncion I.	1	Lepidopt.	Gelechioidea	(wings and thorax)
Nets-49	30	100°/10	23°46′N	163°24′W	22°45′N	160°13′W	172°/28	1	Homopt.	Fulgoridae	(partly crushed)
							Niihau I.	1	Lepidopt.	Arctiidae?	(crushed)

Legend: A – Large suction trap, B – Small suction trap, * – Alive when caught.

Table 3. Insects taken in high speed trap on Antarctic program (Mitchell).

Date	Wind direction, velocity (knots)	Plane speed (knots)	Latitude	Longitude	Altitude (meters)	No. Specimen	Order	Family
30.VIII.61			Take off from Quonset Point, R. I.		0–620	1	Dipt.	Muscoid fly
30.VIII.61			40°50′N 39°50′N	72°55′W 74°25′W	3,100	1	Lepidopt.	leg
30.VIII.61			Landing approach Andrews Field, Wash., D. C.		465–0	1	Lepidopt.	leg
8.IX.61			38°05′N 38°25′N	121°55′W 121°40′W	930– 2,170	1	Hymenopt.	Agaontidae
25.X.61	330°/20	185	43°30′S 42°30′S	172°10′E 172°00′E	3,860	1	Hemipt.	Lygaeidae?
25.X.61	220°/13	190	29°15′S 27°25′S	177°15′E 177°55′E	3,810– 5,270	1	Coleopt.	Curculionidae
25.X.61	115°/12	185	04°55′N 14°10′N	168°05′W 160°40′W	4,960	1	Hemipt.	Lygaeidae?
29.XI.61	80°/20	200	66°00′S 59°37′S	171°00′ E 170°20′ E	4,000	1	Hemipt.	Lygaeidae: *Nysius huttoni*?
11.XII.61	110°/25	220	Take off Christchurch, N. Z.		0–620	2*	Thysanopt.	Thripidae
11.XII.61	110°/25	185	44°40′S	171°30′E	2,144– 2,480	1	Thysanopt.	Thripidae
15.XII.61			Take off Hickam AFB		0–620	1	Dipt.	Ceratopogonidae: (*Forcipomyia ingrami* Carter ♂)
24.I.62			Harewood Vicinity, Christchurch, N. Z.		930– 2,697	1	Homopt.	Aphididae
28.I.62			Take off Christchurch, N. Z.		0–620	1*	Hymenopt.	Eulophidae
28.I.62	120°/40	170	44°00′S 44°30′S	172°00′E 171°45′E	3,215– 3,100	1*	Coleopt.	
2.II.62			Take off pattern, Chch., 43°23′S	172°11′E	620– 2,170	1*	Hymenopt.	Braconidae
2.II.62	80°/10		43°55′S 44°23′S	172°11′E 171°49′E	2,325– 3,255	1*	Psocopt.	Mesopsocidae
19.II.62	140°/15	195	19°55′S Touchdown Fiji	177°00′E	3,286–0	1	Dipt.	Ephydridae
20.II.62	100°/8	177	Take off pattern, Fiji 18°50′S	177°15′E	2,697– 4,650	1 1	Coleopt. Lepidopt.	elytron leg
20.II.62	140°/12	185	24°40′S 29°00′S	176°30′E 175°45′E	4,650	1	Dipt.	Ceratopogonidae

Table 4. Insects taken in high speed trap between Hawaii and Midway Atoll (Yamamoto).

1962	Wing direction velocity (knots)	Plane Speed (knots)	Latitude (North)	Longitude (West)	Altitude (meters)	No. Specimen	Order	Family
30.IV	240°/20	220	26°54′ 27°40′	173°47′ 175°57′	1,860	1	Dipt.	Acalyptrate leg
5.V	45°/7		touchdown Oahu		0–2,480	1	Dipt.	Nematocera leg
26.VI	45°/16		10 minutes takeoff from Oahu		1,550	1	Dipt.	Calyptrate abdominal segments
26.VI	180°/10	250	24°02′ 25°10′	165°40′ 168°40′	3,100	1	Coleopt.	Ciidae ? thorax and abdomen
27.VI	30°/30	255	22°50′ 22°10′	162°00′ 160°20′	5,270	1	Dipt.	Acalyptrate thorax, leg
26.VI	95°/14	250	22°00′ 22°10′	159°00′ 160°38′	1,000	1	Dipt.	Acalyptrate tarsal segments
27.VI	300°/30	260	25°15′ 24°00′	169°00′ 166°45′	5,270	1	Dipt.	Wing fragment
27.VI	180°/30	245	26°40′ 26°10′	173°20′ 171°10′	5,270	1	Anoplura	Hoplopluridae *Hoplopura pacifica* ♀
31.VII	110°/20	240	25°00′ 25°20′	168°45′ 166°15′	5,270	1	Homopt.	exuviae of 1st instar nymph

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