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Agricultural Research Administration
Bureau of Entomology and Plant Quarantine
Division of Fruit Insect Investigations

University of California

Hawaii Agricultural Experiment Station

Territorial Board of Agriculture and Forestry

Pineapple Research Institute

Hawaiian Sugar Planters' Association
Experiment Station.

ORIENTAL FRUIT FLY INVESTIGATIONS

QUARTERLY REPORT

July 1 -- September 30, 1951

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WORK PROJECT I-0-4. Area Control. Irving Keiser.

The summation and evaluation of area control studies on the island of Lanai were included in the April-June, 1951 quarterly report. In that presentation, the history of all activities relating to pretreatment surveys, area control operations and post-treatment studies were reviewed in considerable detail, and fluctuations of adult fly populations and changes in fruit infestation indices in guava were presented. It was concluded that the area control operations as performed on Lanai were very successful in drastically reducing adult fly populations and fruit infestations, and that the procedures employed may well serve as a guide for large scale control operations on the mainland, should they become necessary because of the accidental introduction of the fly into the continental United States.

It was also noted that the Mediterranean fruit fly became the dominant fruit fly infesting guava immediately following termination of area control operations, and that it was superseded by D. dorsalis approximately four months later in most instances. In the guava area treated with aldrin, the same succession of the two species occurred even though reinfestation was delayed several months due to the lack of a guava crop following termination of area control operations.

During the report quarter, population studies were continued in some of the more interesting areas on Lanai, and guava collections were made until activities were terminated on October 12. As will be discussed later, these additional data were needed to bring the area control studies to a successful conclusion. They indicated that adult fly populations and larval infestations in the guava fruit had increased all over the island. The succession of the fruit fly species was also observed in greater detail in most of the study environments.

Table 1 lists the adult D. dorsalis populations in Lanai City since the beginning of work there in October, 1949. In addition to the tabulated data, counts were also taken for the weeks ending October 5 and 12, 1951. The latter resulted in indices of 2.0 and 1.9 females per trap day, respectively. It will be noted in table 1 that the fly populations were similar during October and early November in 1949 and 1950. The effectiveness of the area control operations is readily apparent when the December 1949 and 1950 populations are compared, and by comparing the populations for January and February in 1950 and 1951. The comparatively low populations which prevailed during the summer of 1950 were attributed to the lack of guava during that particular period. In 1951 after the treatments were concluded, there was sufficient guava for high D. dorsalis populations.

The fact that oriental fruit fly populations remained very low comparatively for several months during the post-treatment period does not indicate that the area control operations retained their effectiveness that long. The Mediterranean fruit fly's ability to infest the guava indicated rather definitely that residues lethal to fruit flies were no longer present. The reasons why the oriental fruit fly failed to develop are not apparent but it may have been related to the succession of parasites of the oriental fly in the treated areas. Additional studies would have been required to get the full story regarding the importance of the parasite succession.

Table 1. Weekly trap collections of adult *D. dorsalis*. Lanai, T. H., 1949-51. Fermenting-sugar lure.

Month	Number of female <i>D. dorsalis</i> per trap day			
	Week ending	1949-50	Week ending	1950-1951
October	-	-	6	7.3
	-	-	13	9.9
	21	14.1	20	15.8
November	28	18.6	27	7.8
	4	12.4	3	5.4
	11	11.5	10	15.0
	18	24.9	17	10.5
December	25	29.4	24	2.5
	2	43.1	1	1.1
	9	43.4	8	2.0
	16	23.2	15	.4
	23	23.4	22	.2
January	30	33.5	29	2.7
	6	42.9	5	.7
	13	-	12	2.0
	20	-	19	.3
February	27	29.1	26	.3
	3	29.9	2	.5
	10	33.9	9	.3
	17	34.9	16	.03
March	24	22.5	23	.008
	3	17.6	2	.2
	10	10.2	9	.04
	17	10.6	16	.1
	24	8.5	23	.1
April	31	6.8	30	.5
	7	4.1	6	.4
	14	6.4	13	.3
	21	4.4	20	.2
May	28	7.1	27	.6
	5	5.8	4	.5
	12	2.9	11	.7
	19	3.9	18	.6
June	26	2.6	25	.9
	2	2.0	1	.4
	9	3.1	8	1.2
	16	1.4	15	.7
July	23	1.3	22	.8
	30	1.3	29	.7
	7	.7	6	.9
	14	.7	13	.7
August	21	.8	20	.7
	28	.4	27	.9
	4	.8	3	.7
	11	.5	10	.6
September	18	.5	17	.4
	25	1.0	24	.4
	1	1.3	31	.4
	8	1.1	7	.6
	15	1.0	14	.7
	22	.8	21	1.1
	29	.7	28	1.3

Rising populations of the oriental fruit fly occurred during the end of September and the beginning of October, in 1951, and by that time the Mediterranean fruit fly had become much less abundant. The increases in numbers of the oriental fruit fly completed a long cycle of population fluctuations of interest in the Lanai experiment. Initially, populations of *D. dorsalis* were high from October, 1949, to February, 1950, because of the presence of ripe guava. They were low from March through September, 1950, either because of the absence of guava or the time lag in normal population build-up. They started to rise again during October, 1950. When area control measures were applied the flies were drastically reduced and populations remained at a very low level through February, 1951. There was no indication of increase until October of the current year.

In previous reports, it has been noted that an inverse correlation existed between the percentage of female flies, and population increases in Lanai City. That is areas such as Lanai City, Kaunalapau village and Maunalei, which seem to attract flies, showed the highest percentages of male flies during periods when populations of both males and females were comparatively high presumably as a result of a general influx from the guava breeding areas. Prior to such periods, the percentages of females were always higher, indicating that the males live for a comparatively shorter period of time. Table 2 presents the weekly percentages for Lanai City and that portion of the guava acreage originally treated with parathion. Only the data for July through September, 1951, is presented, in order to eliminate discrepancies that may have resulted from the presence of methyl eugenol traps prior to that period.

It is readily evident from table 2 that the percentages of females in the guava areas were similar and significantly above 50% during July and the first two weeks in August. During the week ending August 17, however, the percentage of female flies in Lanai City was 47.0 as compared with 64.4 for the week previous. The females constituted less than 50% of the total in Lanai City through October 12, when studies were terminated. During the same period, they were above 50% in the guava areas. The following explanation is offered: populations in Lanai City and other similar attractant areas were mostly the result of flies which migrated in from the guava breeding areas. Evidently a significantly higher percentage of males than females left the breeding areas.

Table 2. Weekly variations in male-female ratios of adult *D. dorsalis* in different ecological environments. Lanai, T. H., 1951.

Area	Per cent of female <i>D. dorsalis</i>															
	July				August					September				October		
	6	13	20	27	3	10	17	24	31	7	14	21	28	5	12	
Lanai City	63.5	59.6	57.5	60.1	56.8	64.4	74.0	42.6	37.9	31.3	37.5	36.9	39.1	38.5	45.5	
Gulches with guava	69.7	68.6	66.5	70.6	68.5	69.4	66.8	68.2	61.3	63.5	57.2	63.8	63.0	54.1	-	

During the quarter, laboratory-reared flies were marked with various colors and released on different areas of Lanai. Previous studies with male flies collected in the field had indicated comparatively extensive fly movements on this island. These studies were repeated to determine whether the female fly moves about as extensively as the male. It was necessary to use laboratory flies in order to have sufficient females. The results achieved were similar to those of last year, but in addition, they provided the first records of large-scale movement of female flies. Both males and females were recovered in approximately equal numbers. Those released along the northeast shoreline were recovered in the Burma Road guava areas and in Kaunapau village (a distance of approximately 13 miles). The flies released in Lanai City were not found in other environments. However, those released in the Burma Road guava areas were recovered in Lanai City, Maunalei Gulch, and at Kaunapau village. As discussed in previous reports, flies appear to leave the guava areas to a greater extent than they do areas such as Lanai City. Hence the build-up of flies in the city is possible without breeding in this area.

In previous studies on Oahu, marked females had been released and later recovered in the same area. The conclusion drawn was that the female tends to remain in the area where released, and does not move about to any great extent. This earlier conclusion is probably incorrect. Many marked female flies were recovered in traps located in the areas where they were released on Lanai. However, marked female flies were also found in other traps many miles away.

These movement studies should not be interpreted to mean that flies are constantly moving long distances from one place to another. However, it is extremely important to know that comparatively large-scale movement of flies takes place, and that this must be taken into consideration when promulgating quarantine restrictions and area control schedules. It is believed that D. dorsalis could have been eliminated from the island of Lanai if control operations were carried on for a sufficient period of time, and if there were no reinfestation from the island of Maui (and, possibly, from Molokai).

Table 3 lists the infestation data from guava gathered weekly, when available, from the various gulches treated with the different insecticides. The number of parasites emerging has also been tabulated. The indices of infestation have been computed for all data given in previous reports. Originally all of the parasitization was considered to be of D. dorsalis, but recent joint studies carried on by the Biological Control and Area Control projects have indicated that C. capitata is also parasitized by Opius spp. on Lanai.

From an economic standpoint, the total number of pupae recovered is the most important index for evaluating effectiveness of control, or the status of infestation in any particular environment. It is not important whether a larva develops into a D. dorsalis or C. capitata adult or whether it is parasitized by one of the opiines,—the damage is done. As mentioned above, this is purely from an economic standpoint. Continued parasitization may reduce infestations to lower levels on Lanai, but whether or not these will be below levels of economic importance remains to be seen.

Table 3.--Infestation data from weekly collections of ripe guava gathered from the various treatment areas. Lanai, T. H., 1950-51.

A. Parathion

Guava collected		Known period of infestation		Number of pupae reared.	ADULTS REARED (number)								TOTAL
No.	Wgt. grams	Initial	Final		D. dorsalis	C. capitata	Black			Red			
							♀	♂	total	♀	♂	total	
30	1,234	7/25/50	8/28/50	78	26	0	?	?	?	?	?	?	23
35	1,708	8/2/50	9/5/50	16	5	0	?	?	?	?	?	?	3
118	4,090	8/7/50	9/5/50	18	5	0	?	?	?	?	?	?	8
159	6,002	8/14/50	9/11/50	33	12	0	?	?	?	?	?	?	8
369	10,520	8/21/50	9/18/50	140	41	14	?	?	?	?	?	?	26
237	10,790	8/28/50	9/25/50	35	9	0	3	2	5	0	1	1	6
210	9,900	9/5/50	9/25/50	33	17	0	0	1	1	0	1	1	2
96	4,785	9/7/50	9/25/50	16	1	0	4	1	5	0	0	0	5
98	2,636	9/15/50	10/2/50	36	10	2	2	2	4	0	0	0	4
254	7,597	9/22/50	10/16/50	303	74	33	?	?	?	?	?	?	63
279	8,278	9/28/50	10/23/50	425	145	28	?	?	?	?	?	?	99
164	6,436	10/5/50	11/30/50	440	130	8	101	36	137	11	1	12	149
73	2,353	10/12/50	11/13/50	214	57	3	28	23	51	1	1	2	53
115	5,642	10/19/50	11/20/50	389	112	1	124	39	163	7	1	8	171
47	2,126	10/26/50	11/20/50	307	113	11	?	?	?	?	?	?	86
29	1,332	11/1/50	11/27/50	182	58	4	36	12	48	0	3	3	51
17	822	11/8/50	12/4/50	38	9	2	15	4	19	0	0	0	19
42	2,466	11/15/50	12/11/50	100	35	3	15	14	29	0	0	0	29
49	3,232	11/28/50	12/18/50	30	5	15	2	1	3	0	0	0	3
118	8,619	12/7/50	12/11/50	3	0	0	0	0	0	0	0	0	0
124	7,484	12/13/50	-	0	0	0	0	0	0	0	0	0	0
132	5,500	12/20/50	-	0	0	0	0	0	0	0	0	0	0
128	8,108	12/27/50	1/22/51	2	0	1	0	0	0	0	0	0	0
409	23,587	1/3/51	1/15/51	5	0	2	0	0	0	0	0	0	0
161	10,036	1/10/51	-	0	0	0	0	0	0	0	0	0	0
293	20,413	1/17/51	1/29/51	5	0	3	0	0	0	0	0	0	0

See end of table for footnotes.

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Table 3.--cont'd

A. Parathion (cont'd)

Guava collected		Known period of infestation		Number of pupae reared	ADULTS REARED (number)								
No.	Wgt. grams	Initial 1/	Final 2/		Opus species								
					D. dorsalis	C. capitata	Black			Red		TOTAL	
						♀	♂	total	♀	♂	Total		
284	15,480	1/24/51	2/13/51	2	0	1	0	0	0	0	0	0	0
319	19,364	1/30/51	3/12/51	35	7	27	0	0	0	0	0	0	0
482	33,537	2/7/51	3/12/51	18	1	16	0	0	0	0	0	0	0
411	33,183	2/14/51	3/1/51	2	0	1	0	0	0	0	0	0	0
109	10,121	2/28/51	3/12/51	1	0	0	0	0	0	0	0	0	0
175	10,660	3/20/51	4/8/51	71	14	13	1	0	1	0	0	0	1
82	6,408	3/29/51	4/20/51	24	5	8	0	0	0	0	0	0	0
254	14,630	4/4/51	4/20/51	79	0	47	3	1	4	0	0	0	4
130	8,392	4/10/51	5/4/51	54	19	14	4	4	8	0	2	2	10
265	14,063	4/18/51	5/11/51	107	11	27	24	16	40	0	1	1	41
387	22,623	4/24/51	5/24/51	368	10	109	81	95	176	7	8	15	191
519	33,596	5/2/51	6/4/51	645	46	255	123	105	228	9	4	13	241
646	39,322	5/9/51	6/4/51	760	65	206	165	91	256	5	1	6	262
345	19,762	5/15/51	6/22/51	141	16	11	51	26	77	4	1	5	82
478	24,693	5/23/51	6/22/51	349	50	13	66	33	99	7	11	18	117
148	5,676	6/4/51	6/22/51	302	62	18	69	37	106	14	12	26	132
124	5,245	6/14/51	7/2/51	395	95	3	70	33	103	13	10	23	126
37	1,955	7/3/51	7/31/51	38	11	1	9	8	17	0	0	0	17
124	6,719	7/10/51	8/7/51	241	98	12	41	28	69	4	6	10	79
80	3,317	7/19/51	8/7/51	78	23	3	18	9	27	1	2	3	30
177	7,967	7/25/51	8/8/51	158	62	3	26	17	43	1	4	5	48
206	8,193	8/1/51	8/28/51	95	32	0	24	10	34	3	3	6	40
298	12,446	8/10/51	9/11/51	138	28	3	38	17	55	12	4	16	71
146	5,876	8/24/51	9/28/51	76	26	1	26	9	35	2	2	4	39
333	15,876	8/21/51	10/8/51	109	12	3	18	23	41	2	1	3	44

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Table 3.—cont'd B. Aldrin.

Guava collected		Known period of infestation		Number of pupae reared	ADULTS REARED (number)								
No.	Wgt. grams	Initial 1/	Final 2/		D. dorsalis	C. capitata	Opus species						TOTAL
							Black			Red			
						♀	♂	total	♀	♂	total		
235	7,909	8/14/50	9/28/50	138	1	64	?	?	?	?	?	?	32
159	4,750	8/21/50	9/18/50	149	1	67	?	?	?	?	?	?	32
253	11,740	8/28/50	9/25/50	558	38	115	?	?	?	?	?	?	168
713	26,970	9/5/50	10/16/50	1,552	156	270	120	90	210	15	19	34	244
372	14,980	9/15/50	10/16/50	455	100	56	93	53	146	12	5	17	163
187	10,638	9/22/50	10/23/50	329	52	78	?	?	?	?	?	?	69
143	7,796	9/28/50	10/30/50	189	48	70	?	?	?	?	?	?	86
8	539	10/5/50	10/30/50	30	9	5	8	3	11	0	0	0	11
44	2,126	11/8/50	12/11/50	984	332	49	112	69	181	4	7	11	192
107	5,840	11/20/50	12/26/50	533	279	45	46	32	78	1	0	1	79
322	21,717	11/29/50	12/26/50	3,279	1,824	205	189	105	294	2	0	2	296
170	14,884	12/7/50	1/8/51	177	117	18	2	0	2	0	0	0	2
112	6,464	12/14/50	12/18/50	1	0	0	0	0	0	0	0	0	0
72	4,252	12/20/50	-	0	-	-	-	-	-	-	-	-	-
105	5,216	12/27/50	1/29/51	46	26	9	0	0	0	0	0	0	0
18	907	1/3/51	-	0	-	-	-	-	-	-	-	-	-
91	4,366	1/17/51	-	0	-	-	-	-	-	-	-	-	-
10	368	5/2/51	-	0	-	-	-	-	-	-	-	-	-
32	1,247	5/9/51	5/24/51	84	0	12	32	23	55	0	2	2	57
35	1,843	5/15/51	6/4/51	25	0	0	13	4	17	0	0	0	17
27	1,162	5/23/51	6/12/51	21	4	3	5	3	8	1	0	1	9
41	2,013	6/4/51	6/22/51	30	2	4	1	1	2	6	4	10	12
50	1,928	6/14/51	7/2/51	170	39	57	24	16	40	1	0	1	41
67	2,665	6/22/51	7/23/51	73	3	15	11	11	22	1	0	1	23
202	9,809	6/27/51	7/23/51	353	11	133	77	39	116	1	0	1	117
363	17,519	7/3/51	7/31/51	513	57	238	28	25	53	2	1	3	56
409	20,723	7/10/51	8/13/51	1,046	181	456	52	45	97	6	6	12	109
524	23,501	7/19/51	8/13/51	1,118	100	383	75	56	131	24	11	35	166
548	25,061	7/25/51	8/18/51	928	68	456	92	60	152	18	8	26	178
439	20,866	8/1/51	8/28/51	462	30	201	77	50	127	9	12	21	148
614	28,803	8/10/51	9/11/51	1,109	210	411	154	88	242	7	4	11	253
141	7,003	8/24/51	9/18/51	689	74	453	50	21	71	0	0	0	71
38	1,928	9/21/51	10/8/51	291	35	45	65	55	120	0	1	1	121

See end of table for footnotes.

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Table 3.—Cont'd.

C. DDT Emulsion plus sugar

Guava collected		Known period of infestation		Number of pupae reared	ADULTS REARED (number)								
No.	Wgt. grams	Initial 1/	Final 2/		Opus species								
					D. dorsalis			C. capitata			Black		Red
				♀	♂	total	♀	♂	total				
19	810	8/7/50	-	0	-	-	-	-	-	-	-	-	-
22	1,010	8/14/50	-	0	-	-	-	-	-	-	-	-	-
19	700	8/21/50	-	0	-	-	-	-	-	-	-	-	-
10	360	8/28/50	9/11/50	2	1	0	0	0	0	1	0	1	1
91	4,780	9/5/50	10/2/50	91	12	41	3	3	6	0	1	1	4
49	2,280	9/15/50	9/25/50	19	2	5	0	1	1	0	0	0	1
292	13,267	9/22/50	10/16/50	148	44	11	?	?	?	?	?	?	25
285	18,373	9/28/50	10/23/50	202	43	32	?	?	?	?	?	?	43
231	12,871	10/5/50	10/30/50	195	43	13	50	17	67	2	1	3	70
122	7,286	10/12/50	10/30/50	259	52	18	44	25	69	3	2	5	74
79	4,393	10/19/50	11/6/50	232	42	7	57	33	90	2	4	6	96
84	4,196	10/26/50	11/27/50	119	22	0	23	3	26	0	0	0	26
26	1,106	11/1/50	12/4/50	214	52	0	51	17	68	4	1	5	73
10	425	11/8/50	12/4/50	52	19	0	15	5	20	1	0	1	21
7	198	11/15/50	12/4/50	32	7	7	0	0	0	0	0	0	0
13	851	11/28/50	12/8/50	26	1	21	0	1	1	0	0	0	1
49	3,970	12/7/50	1/3/51	32	21	3	2	1	3	0	0	0	3
77	6,180	12/14/50	-	0	-	-	-	-	-	-	-	-	-
73	5,811	12/20/50	-	1	-	1	-	-	-	-	-	-	-
190	15,762	12/27/50	1/22/51	136	7	95	0	1	1	0	0	0	1
414	31,664	1/3/51	1/29/51	155	3	76	0	0	0	0	0	0	0
284	24,949	1/10/51	1/29/51	90	3	64	0	0	0	0	0	0	0
230	17,155	1/17/51	2/5/51	3	0	3	0	0	0	0	0	0	0
92	8,221	1/24/51	1/29/51	5	0	5	0	0	0	0	0	0	0
218	18,626	1/30/51	2/29/51	44	0	34	0	0	0	0	0	0	0
89	7,257	2/7/51	3/12/51	53	1	37	0	0	0	0	0	0	0

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Table 3.—cont'd

C.—DDT emulsion plus sugar (cont'd)

Guava collected		Known period of infestation		Number of pupae reared.	ADULTS REARED (number)								
No.	Wgt. grams	Initial 1/	Final 2/		D. dorsalis	C. capitata	Opus species						
							Black			Red			TOTAL
						♀	♂	total	♀	♂	total		
41	3,119	2/14/51	3/12/51	87	1	74	1	0	1	0	0	1	1
34	2,552	2/28/51	3/22/51	130	0	80	0	0	0	0	0	0	0
28	964	3/20/51	4/8/51	79	0	64	0	0	0	0	0	0	0
16	794	3/29/51	4/8/51	12	0	11	0	0	0	0	0	0	0
78	4,762	4/4/51	4/27/51	61	0	34	0	2	2	0	0	0	2
45	3,005	4/18/51	5/11/51	65	3	39	2	2	4	0	0	0	4
59	1,729	4/24/51	5/11/51	78	0	30	16	3	19	3	2	5	24
111	6,407	5/2/51	6/4/51	633	30	351	95	52	147	0	2	2	149
64	4,196	5/9/51	6/4/51	248	21	39	58	50	108	0	0	0	108
111	5,358	5/15/51	6/12/51	168	18	56	30	16	46	4	2	6	52
103	4,905	5/23/51	6/22/51	123	29	5	20	15	35	7	7	14	49
16	964	6/4/51	6/22/51	55	20	1	9	5	14	4	3	7	21
12	567	6/14/51	7/2/51	112	32	0	52	17	69	6	3	9	78
18	397	6/27/51	7/23/51	50	10	1	15	7	22	1	1	2	24
102	4,054	7/10/51	8/7/51	121	36	5	21	18	39	8	8	16	55
149	5,216	7/19/51	8/13/51	151	42	14	18	19	37	5	7	12	49
361	11,453	7/25/51	8/18/51	224	53	14	44	38	82	18	8	26	108
305	12,720	8/1/51	8/28/51	129	27	8	20	19	39	12	3	15	54
338	12,701	8/10/51	9/11/51	222	81	10	34	26	60	12	6	18	78
276	10,519	8/24/51	9/28/51	279	94	10	75	55	130	5	2	7	137
134	6,889	9/21/51	10/8/51	313	66	0	54	70	124	0	3	3	127

See end of table for footnotes.

Cont'd.

Table 3.—cont'd

D. DDT suspension.

Guava collected		Known period of infestation		Number of pupae reared	ADULTS REARED (number)								
No.	Wgt. grams	Initial ^{1/}	Final ^{2/}		D. dorsalis	C. capitata	Cotus species						TOTAL
							Black			Red			
						♀	♂	total	♀	♂	total		
123	5,510	9/5/50	9/25/50	20	0	0	0	0	0	0	0	0	0
123	5,103	9/22/50	10/16/50	194	31	71	6	3	9	1	1	2	11
231	6,237	9/28/50	10/23/50	363	92	88	?	?	?	?	?	?	40
152	4,310	10/5/50	10/30/50	145	52	14	12	1	13	1	3	4	17
39	3,430	12/27/50	1/15/51	4	2	1	0	0	0	0	0	0	0
302	24,891	1/3/51	1/29/51	384	4	243	6	0	6	0	0	0	6
154	13,296	1/10/51	2/5/51	103	0	76	1	2	3	0	0	0	3
107	12,337	1/17/51	2/5/51	22	0	19	0	0	0	0	0	0	0
76	6,180	1/24/51	2/19/51	6	0	1	0	0	0	0	0	0	0
86	6,662	1/30/51	2/19/51	5	0	4	0	0	0	1	0	1	1
39	3,402	2/7/51	2/19/51	5	0	2	0	0	0	0	0	0	0
55	3,742	2/14/51	3/1/51	13	0	9	0	0	0	0	0	0	0
13	1,559	2/28/51	3/22/51	13	0	5	1	0	1	0	2	2	3
35	1,247	3/20/51	4/8/51	42	0	30	0	0	0	1	0	1	1
35	2,211	3/29/51	4/20/51	34	0	20	0	0	0	0	0	0	0
78	4,338	4/4/51	4/27/51	35	5	26	0	0	0	0	0	0	0
24	1,559	4/10/51	5/4/51	7	1	0	2	3	5	0	0	0	5
46	2,495	4/18/51	5/11/51	20	1	12	0	0	0	0	1	1	1
86	5,727	4/24/51	5/18/51	243	9	192	9	10	19	0	2	2	21
127	6,691	5/2/51	5/24/51	341	38	122	47	34	81	20	7	27	108
87	4,961	5/9/51	6/4/51	147	6	41	35	17	52	7	2	9	61
75	4,791	5/15/51	6/12/51	71	19	1	22	8	30	1	0	1	31
62	3,658	5/23/51	6/22/51	130	24	7	27	19	46	1	1	2	48
47	1,503	7/19/51	8/13/51	39	14	1	10	8	18	0	0	0	18
45	1,701	7/25/51	8/18/51	26	10	2	9	1	10	1	2	3	13
159	7,031	8/1/51	8/28/51	222	38	16	40	24	64	12	3	15	79
143	7,400	8/10/51	9/11/51	265	60	29	80	43	123	12	2	14	137
46	1,843	8/24/51	9/28/51	30	4	0	9	4	13	2	1	3	16

^{1/} Date guava collected from field.^{2/} Date of last sifting which yielded immature forms.

The data in table 3 are broken down to show the succession of species in guava from each of the treatment areas. In each treatment area, the effect of treatment may be readily noted by the sharp reduction of infestation in guava, and by the elimination of all species in this fruit during some weeks. Following termination of area control activities, C. capitata became the dominant species and later it was superseded by D. dorsalis. In the acreage treated with aldrin, however, this succession has not been completed.

A detailed study of the aldrin portion of table 3 is of interest. The first few weekly collections of guava during the 1950-51 season were infested, predominantly with C. capitata. Later this species was superseded by D. dorsalis. Then during area control operations, total fruit fly infestation dropped to zero in most weeks, and C. capitata again returned as the dominant species after control operations had been concluded. There was no available ripe guava during the summer of 1950 due to the 1949-50 drought on Lanai. It appears, on the basis of these studies, that in areas where there is little or no host sequence, as on Lanai, C. capitata is the first species to infest guava, when hosts become available, and that it is eventually superseded by D. dorsalis.

The following summary of population studies on Lanai may be of interest:

The beginning of a general D. dorsalis population increase was noted on Lanai during the last half of September, 1951, and the first half of October. A similar population increase had also been noted in October of 1949 and in October of 1950.

Populations were at low levels during the summer of 1950 because of no ripe guava available for breeding. However, the low dorsalis populations during the summer of 1951, when host fruits were available, were due to the failure of this species to reestablish itself during the weeks immediately following the termination of area control activities.

C. capitata was always the first species to infest guava following control operations even when infestation was delayed several months because of the absence of guava fruit in some areas.

Female, laboratory-reared, marked flies were recovered in fermenting-sugar lure traps as far as approximately 13 miles from the point of their liberation on Lanai. Evidently the female moves about to an extent comparable to that which had previously been demonstrated for the males. The 1951 marked-fly studies with males confirm and strengthen the movement data gathered and reported on in 1950.

Studies on the island of Lanai were commenced in October, 1949, and terminated in October, 1951. They showed that the fly may be concentrated in certain fruit and shelter tree areas, and that they multiply in the guava gulches and then move into these attraction centers. Population fluctuations were demonstrated to be directly correlated with the presence or absence of ripe guava on Lanai, and not significantly with variations of wind, rain or temperature. The area control procedures employed reduced populations to

extremely low levels, providing a basis for the utilization of similar measures on the mainland of the United States, should they be necessary. The results indicated that eradication of the oriental fruit fly on Lanai is entirely possible, if reinfestation from neighboring islands would not occur. The long distance movement of the fly that was demonstrated should serve as a graphic example of the difficulties that might be encountered in attempts to eliminate a seemingly isolated oriental fruit fly infestation.