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ORIENTAL FRUIT FLY INVESTIGATIONS

QUARTERLY REPORT

April 1 - June 30, 1950.

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ECOLOGY AND BIOLOGY - Work Project I-o-I - K. L. Maehler, Project Leader

SUMMARY

Meteorological data in Tables 1 and 2 indicates greatest precipitation occured in April at all stations. May and June were generally drier, and characterized by gradually rising maximum temperatures particularly at higher elevations. Hilo, which has a very low fly population level, had a total precipitation for the three months of 60 inches. Haiku had 30 inches during the same period and has a very high population level (600 flies per trap day). The area which has the highest population level on Hawaii in these trapping studies was the Mauna Loa truck trail (4200-4600 ft.) where total precipitation for three months was 11 inches.

Comparative studies between Dacus dorsalis and Ceratitis capitata indicate that the former species is less tolerant of lower temperatures. At Haleakula (5200 ft.) adults of C. capitata have emerged from puparia while only negative results have been obtained from D. dorsalis puparia. Adults of C. capitata have a lower threshold of activity. Perhaps the most significant differences between these two species is the fact that D. dorsalis mates crepuscularly when temperatures are apt to be low while C. capitata mates diurnally when temperatures are highest.

These facts and the prevalence of C. capitata at higher elevation indicate that it would probably be better adapted to California winter conditions than D. dorsalis.

Lower temperature greatly extends all stages of the fly and retards sexual maturity. As shown in Figure 1 the chance of a female remaining alive to lay viable eggs are mathematically reduced as the cycle is extended. This may account in some measure for the higher populations occuring at lower elevations.

Mating studies in the field show that this fly will mate at temperatures slightly below 63 °F. and no mating has been observed before 6:00 p.m. Mating has been observed at Kula Insectary (3750 ft.) and at Pohakuloa (6500) viable eggs produced indicates that mating took place there. However, the complete cycle in this instance was almost six months.

Field observations have shown that citrus trees are a favorite resting place for this fly and that frequently fruit is heavily stung. Large collections of all kinds of citrus (Table 43) have resulted in an extremely low recovery of puparia. Laboratory findings reveal that the rag of citrus fruit prevents the entry of newly hatched larvae into the pulp where they can survive. Table 26 shows the results of innoculation of 600 eggs in citrus fruit.

There appears to be a correlation between egg density and larval mortality. The innoculation of 1400 eggs in banana (Table 27) shows that larval mortality was lowest in those fruits which had a lower initial innoculation of eggs.

The odors of different fruits as shown in experiments 440, 446 and 448 appear to have varying degrees of attractiveness to both male and female flies as well as the parasites. Both guava and mango fruit odors attracted more flies than many other fruits tested as shown in Table 29.

Collections on Maui and Hawaii of 3,000 lots including about 110,000 fruits have shown there is marked host preference (Table 45, 46 and 47). Infestation indices vary greatly in different hosts depending on maturity, availibility and occurence. Fruit with a high degree of infestation on Maui were sandal wood, rose apple and false Kamani (Table 45). Fruits with low index includes citrus, plum, cactus, avocado, apple and quince.

Surveys made of citrus, loquat, peach, guava, false kamani, mango and avocado, show these fruits to be infested to varying degrees at different elevations. Percent of parasites recovered from different hosts vary markedly. Parasitism was highest in kamani by O. longicaudatus and in guava by O. persulcatus.

At the same elevations loquat was more heavily infested by D. dorsalis while peach was attacked to a greater extent by C. capitata.

Population level and infestation in guava closely parallel each other.

Population trends on Maui in the last three months at lower elevations have steadily increased. At higher elevations a decrease has been observed. On Hawaii a very low population level exists at all population check areas with the exception of the Mauna Loa truck trail. Fly density varies in different areas and no overall population trend is apparent. Index traps show that population levels are much higher on Maui than Hawaii. This may be a result of higher rainfall in the latter area particularly in the vicinity of Hilo. In the Kula District the highest population level occurred at the peak of the loquat season and has dropped in spite of the abundant peach crop.

At lower elevations on these islands the temperature variation throughout the year is insufficient to account for the marked seasonal fluctuation in fly density. Precipitation is much more variable and may have a more pronounced effect on population level in its effect on female rate of oviposition. During periods of high rainfall as was experienced in Hilo in April and May the activity of the female fly may be so reduced that a material drop in egg production could result in a consequent reduction in future replacements for a population which is always being diminished by natural causes.

The factor which has the greatest variation is biotic rather than climatic. Suitable host material has marked fluctuations and appear to be correlated with a lagging fly population level.

If we can assume that environmental resistance is fairly constant then population rise and fall would be dependent on the rate at which a population was replenished. No factor varies as greatly as the abundance or absence of host material. It appears that fly populatioh follows this rise and fall of some of the main hosts with a developmental lag. While at higher elevations temperatures may be limiting it is felt that they are not in a lethal manner but rather in the degree with which they extend the cycle of the fly and consequently reduce the possibility of the fly living to lay eggs. This is particularly significant because of the greatly retarded sexual development.

HAWAII STUDIES - (C. J. DAVIS)

In preliminary mortality studies involving flies trapped at Hilo and flies trapped on the Mauna Loa Truck Trail and held at Pohakuloa (6511'), the trend toward higher mortality was in favor of Hilo flies. Further experiments in progress have shown a reversal in trend but no conclusion can be drawn at this time.

Under sheltered conditions, flies will live up to 422 days at Pohakuloa. However, under outdoor cage conditions where they are exposed to wind and rain, the adult life span is from one to two months.

In sexual maturity studies in the outdoor control cages, males were mature in about 9-12 days at Hilo, about eleven days at Kaumana, 19 days at Pohakuloa, 16 days at Waiki, and 22 days at Keanakolu. The females died before attaining maturity. In the cages with M.R.T., females attained maturity in Hilo in 13 days, and between 39-42 days at Kaumana. The females at other stations died before attaining maturity. This data was based on an average of 2 studies at each station during the quarter.

In oviposition studies, the lowest temperatures at which eggs were laid was between 54 and 55°F. This was at Keanakolu on May 22, 1950.

Eggs hatch at Hilo in 2 days, Kaumana 3 days, Pohakuloa between 4-7 days and at Keanakolu between 3-5 days.

Larval studies indicate that when banana is used as the media, the larval duration at Hilo is 9-12 days Kaumana 15-20 days and Pohakuloa, 18-35 days.

Pupal studies show a range of 11-15 days at Hilo, 14-22 days at Kaumana, 32-36 days at Pohakuloa and 26-30 days at Waiki.

Rainfall was heavy in March, April and May and this factor probably contributed to the decline shown in populations during this period. This decline took place in all localities where trap lines are maintained.

Three hundred ninety one lots of fruit were collected and of the fruit collected, rose apples, Jerusalem cherries and longan had the highest indexes.

The emergence of dorsalis from Jerusalem cherries on the Mauna Loa Truck Trail is recent but it is not a new development. It is a good Med. fly host.

ECOLOGY-BIOLOGY, Work Project 1-o-1, Line Project 1.1 - N. E. Flitters

SUMMARY

The effect of protein hydrolysate when fed as a supplementary diet to D. dorsalis is clearly shown in all of the tests conducted on the preoviposition period, rate of oviposition, fertility and longevity of flies held at room temperature and in fixed temperature cabinets.

A basic diet of macerated papaya, honey and yeast was fed to flies held in the control and experimental groups. The latter group received the addition of protein hydrolysate in solution. Media and protein in solution was fed fresh to the flies daily, at which time the oviposition sections were removed and examined for egg recovery.

It was found that preoviposition at room temperature with flies fed the fortified diet ran from six to fourteen days and those fed the basic diet took from twenty one to seventy one days.

No egg recoveries were made from flies (with and without protein hydrolysate) held in the constant temperature cabinet at 12.5°C. (55.4°F.). Relative humidity in all the constant temperature cabinets was held between 50 and 60 percent.

The preoviposition period for flies with and without hydrolized protein and held in the various cabinets followed a very uniform pattern. It took protein fed flies about four times as long to reach sexual maturity and oviposit in a constant temperature 15.0°C. (59°F.) than a like group held at room temperature and a trifle over three times as long in cabinet 17.5°C. (63.5°F.) as compared to room temperature, slightly more than twice as long in cabinet 20.0°C. (68°F.) and just twice as long in 22.5°C. or 72.5°F., while cabinet 35.0°C. (95°F.) resulted in a period comparable with that of room temperature. However, the findings in the cabinet at 95°F. cannot be interpreted as optimum. This temperature is almost the upper limit at which development can be expected and must be evaluated upon that basis.

The deposition of eggs by the protein fortified diet group was many times greater than the control group. The total eggs recovered from the experimental group (24 flies) held at room temperature was 21,538 while the control group produced a total of but 655 eggs. Individual totals were much higher for the experimental group in all cases. The highest individual daily total was 136 eggs for this group, with an individual total of but 28 for the control group held at room temperature. The highest individual total of eggs produced by any female was 3,062;

this was from the experimental group. The highest individual total from the control group was only 283 eggs. Both totals were obtained from individuals held at room temperature. The flies held in the constant temperature cabinets reflected the findings of those held at room temperature, the one exception being that the individual and total egg depositions were proportionally lower.

The results obtained from the experiment to date clearly indicate that the addition of protein hydrolysate to the diet of D. dorsalis greatly reduces the preoviposition period, stimulates egg deposition, and does not appear to impair fertility or affect longevity to any extent.

Line Project - 1-o-1-1.1

The influence of protein hydrolysate upon preoviposition, rate of oviposition, fertility and longevity of D. dorsalis at room temperature and in fixed temperature cabinets.

Further data from the experiment presently being undertaken to determine the influence of protein hydrolysate upon the preoviposition, rate of oviposition, fertility and longevity of D. dorsalis in fixed temperature cabinets and room temperature has progressed to the point where most of the data are complete, with the exception of longevity. It would appear that the addition of protein hydrolysate in the diet of D. dorsalis greatly accelerates the rate at which the female fly reaches sexual maturity and commences to oviposit.

In past experiments conducted on the life history of D. dorsalis it was found that the preoviposition period was quite extended, twenty-six days was the minimum time recorded for any female held at room temperature when fed a diet of macerated papaya, honey and yeast.

The preoviposition period for flies fed the same basic diet (with the exception of the yeast which in this test was Brewer's dried yeast flakes against a powdered yeast supplied by the Hawaiian Sugar Planters Association, used in the previous test), but fortified with protein hydrolysate, the resultant preoviposition period was much shorter ranging from six to fourteen days. These findings were also reflected in the fixed temperature cabinet studies being conducted at temperatures from 12.5°C. to 35°C. (or 54.5°F to 95°F.).

No recovery of eggs has been made from the flies held in the constant temperature cabinet at 12.5°C. Apparently temperature has a marked effect upon the attainment of sexual maturity regardless of the dietary needs of the fly. In every instance where we have fed flies the standard media and the fortified protein we find a decided reduction in the preoviposition period, and a marked increase in egg deposition from all flies fed the additional hydrolized protein. However, the influence of temperature upon the fecundity of Dacus dorsalis both with and without a highly fortified protein diet is shown in Table No. 1. Flies held at room temperature, fluctuating between 70°-80°F. and exposed to the regular diurnal fluctuations of light, more closely paralleled the results obtained from the flies held in the fixed temperature cabinet at 20°C. (68°F.) where the only provision for daylight is made by the addition of one blue "daylight" bulb (60 watt) to the wiring series. The only light source in the cabinets is one from incandescent light bulbs which are worked in series with the thermo regulator and are used primarily as the heating source for the cabinet. The cabinets themselves are located in a reefer box where the temperature can be controlled below the developmental range of the fly, and the only visible daylight that could possibly gain admittance would be when the reefer door is opened to admit or egress a person. Perhaps the invisible or penetrating rays of the spectrum could enter through the walls or roof which are thick and heavily insulated but their value might be very questionable in this particular case. I make this point in order to show that to all intent and purpose the diurnal factor is not present in the cabinets. Lights are flashing on and off intermittently both day and night and the "daylight bulbs" (one to each cabinet) work in conjunction with the heating series therefore whatever they contribute in the way of "daylight" rays would be present both day and night.

The individual egg recoveries from flies held at room temperature and the fixed temperature cabinets with and without a high vitamin fortified diet are very interesting. The highest daily total recovered from a female held at room temperature and fed the fortified diet was 136 eggs, while the highest recovery from a female held at the same temperature but minus the protein hydrolysate was only 28 eggs. The total numbers deposited by these two groups were 21,538 eggs for those fed papaya media plus protein hydrolysate, and 655 eggs for the flies fed the papaya media alone. The highest individual total for a fly in the first group (with protein hydrolysate) was 3,062 eggs, while in the latter group the total was but 283 eggs. A complete tabulation of egg deposition compiled from individual flies held at room temperature and fixed temperature cabinets is presented in Table No. 2.

In order to determine which group of flies more accurately represented those encountered in the field a test was conducted with one thousand marked female flies. These flies were segregated upon emergence, starved, placed in the reefer box at a temperature of 36°F. to immobilize them and quickly marked by the expedient of applying quick drying lacquer (red) to the upper surface of their thorax with a hypodermic needle. Immediately after the marking was complete the flies were quickly removed to a site in close proximity to the laboratory and released beneath a mango tree. Evaginated traps baited with slices of banana were suspended in trees immediately surrounding the liberation point. Daily recoveries of marked females were successfully made and the flies so trapped were placed in small isolation cages (3" x 3" x 3"), fed unfortified papaya medium and provided with the customary tangential orange sections for oviposition. Eggs were recovered from flies trapped on the morning of the sixth day. This would indicate that female flies in the field reach sexual maturity and oviposit in a period of six days at this particular season of the year. These findings compare very closely with the results obtained in the laboratory at room temperature with flies fed the standard media plus protein hydrolysate. The one exception was that the flies recovered from the field deposited fertile eggs in six days while those in the laboratory took quite a few days longer. This might be explained by pointing out that the females in the field are subjected to males in a much wider age group than those in the laboratory and consequently have a much greater opportunity of becoming fertilized. It is hoped that a test to determine what age female flies reach sexual maturity in the field can be undertaken in the near future. From the following tables the number of eggs recovered from vitamin fortified flies will be found to be phenomenal, especially when contrasted with those in the low protein group. When we stop to consider that the high protein group more nearly represents what occurs in the field, the data would contain what could be interpreted as one of the factors that could be instrumental in affecting the population trends. It has long been an accepted fact that flies here in Hawaii are much more prevalent at certain periods of the year and explanations and theories for this phenomena are commonplace. It was found by the application of a geometric progressional formula to the known cycle of the fly that the population potential of one gravid female would be in excess of 31 sextrillion flies in a twelve month period. This potential population was based upon results obtained from flies having access to enzymatic yeast hydrolysate because results from these flies would more nearly resemble what we have discovered in the field.

It would, therefore, appear that field flies can avail themselves of some high protein source (the equivalent of that supplied in the laboratory) present in their natural surroundings. This source could be one of the many honey dews, yeast formulations, or any of the animal and vegetative proteins that are known to be present in the field.

However, should this source of protein be unavailable during certain months of the year, flies so deprived of their "elexir" would be materially affected and great reductions in population would follow.

Should changes in temperature particularly the winter "lows" and heavy rains be responsible for this protein absence, then we can perhaps attribute it to being a factor in the inability of D. dorsalis to become established in the cool high elevations.

This theory is presented in the knowledge that it has many shortcomings but its virtue cannot be entirely overlooked when attempting to account for seasonal low population densities.

In previous controlled tests with flies in the laboratory it was found that longevity did not exceed 168 days with a mean of 105 for the twelve flies under experimentation. The records were obtained from flies held at room temperature and fed a medium of macerated papaya, honey and yeast (H.S.P.A.).

In the current experiment we still have live flies in both the high protein and standard media groups after 111 days of operation (Table No. 3). However, we have on record (Mr. C. Davis) the longevity of a female fly in excess of one year, but this must be accepted as the exception and not the rule. Only under certain conditions, rare to the fly, can this age expectancy be anticipated, but it reflects the possibility of resistance that could be built up in future populations if successful mating could be accomplished in those surroundings.

The following tables 1-5 show the data accumulated from the tests so far.

Table 1.--Summary of Preoviposition Period in Days of D. dorsalis with and without Protein Hydrolysate at Various Temperatures. As of 6/30/50

Fly No.	Room Temperature Pro.	Room Temperature N.P.	12.5°C. Pro.	12.5°C. N.P.	15.0°C. Pro.	15.0°C. N.P.	17.5°C. Pro.	17.5°C. N.P.	20.0°C. Pro.	20.0°C. N.P.	22.5°C. Pro.	22.5°C. N.P.	35.0°C. Pro.	35.0°C. N.P.
					D		A		Y		S			
1	8													
2	9	57												
3	11													
4	-													
5	12	21												
6	6													
7	9				70									
8	12				34									
9	10				29									
10	9				61									
11	12	34			30	65								
12	8													
13	8						21							
14	9						29							
15	7	31												
16	9	57												
17	8						34							
18	10													
19	10													
20	9								18	23				
21	-								18					
22	9													
23	14	71							19					
24	10	30							14					
25											16	29		
26											30			
27											12			
28											16	28		
29											12			
30														
31													7	
32													10	
33													7	22
34													26	
35														20
36														

Shortest = #6 Pro. = 6
Longest =#23 N.P. =71
Mean Pro. =16.8
Mean N.P. =37.5

Table 2.—Average Number of Eggs Deposited by Female *D. dorsalis* from initial Day of Oviposition through Longevity. (As of 6/30/50)

	PROTEIN				NO PROTEIN			
Fly No.	Total Eggs	Actual Days of Production	Oviposition Period Days	Oviposition Period Mean	Total Eggs	Actual Days of Production	Oviposition Period Days	Oviposition Period Mean
ROOM TEMPERATURE								
1	767	12	12	64				
2	1,379	35	58	24	18	3	33	1
3	85	8	20	4				
4	-	-	-	-	-	-	-	-
5	1,735	48	78	22	2	1	11	1
6	1,820	48	61	30				
7	774	19	20	39				
8	227	15	29	8				
9	1,351	36	53	25				
10	366	11	17	22				
11	276	9	19	15	283	36	82	3
12	325	8	10	33				
13	1,096	33	43	25				
14	3,062	78	90	34				
15	842	17	24	35	149	19	59	3
16	736	30	36	20	5	1	48	1
17	814	22	26	31				
18	785	19	22	36				
19	420	27	32	13				
20	2,109	39	42	50				
21	-	-	-	-				
22	422	13	14	30				
23	531	22	39	14	144	24	45	3
24	1,616	55	75	22	54	5	19	3
CABINETS								
12.5°C.								
1								
2								
3								
4								
5								
6								
15.0°C.								
7	131	15	45	3				
8	631	40	81	8				
9	813	43	75	11				
10	4	1	4	1				
11	49	6	44	1	25	3	50	1
12	-	-	-	-				
17.5°C.								
13	283	14	31	9				
14	202	9	22	9				
15	-	-	-	-				
16	-	-	-	-				
17	79	5	39	2				
18	-	-	-	-				
20.0°C.								
19	-	-	-	-				
20	767	41	90	9	300	23	100	3
21	668	48	86	8				
22	-	-	-	-				
23	294	13	26	11				
24	1,625	58	80	20				
22.5°C.								
25	987	47	101	10	8	2	15	1
26	784	43	81	10				
27	177	12	18	10				
28	260	16	43	6	19	7	50	1
29	195	8	25	8				
30	-	-	-	-				
35.0°C.								
31	159	9	22	7				
32	15	3	17	1				
33	236	17	23	10	11	1	51	1
34	17	2	5	3				
35	-	-	-	-	82	12	46	2
36	-	-	-	-				

Table 3.—Summary of Longevity of *D. dorsalis* with and without Protein Hydrolysate at Various Temperatures in Days.

	Room Temperature		12.5°C.		D 15.0°C.	A	17.5°C. Y		S 20.0°C.		22.5°C.		35.0°C.	
Fly No.	Pro.	N.P.	Pro.	N.P.	Pro.	N.P.	Pro.	N.P.	Pro.	N.P.	Pro.	N.P.	Pro.	N.P.
1	20	36	91	104										
2	67	90	97	87										
3	31	35	22	17										
4	8	18		102										
5	90	32	47	22										
6	67	27		24										
7	29	63				13								
8	41	36				47								
9	63	21			104									
10	26	10			65	2								
11	31	-			73									
12	18	24			24	56								
13	51	31					52	57						
14	99	29					51	101						
15	31	90					46							
16	45	105					56	65						
17	34	48					73	22						
18	32	28					25	49						
19	42	21							57	89				
20	51	15							108					
21	10	15							104	60				
22	23	41							14	60				
23	53	-							45	39				
24	85	49							104	39				
25												44		
26											111	60		
27											30	59		
28											59	78		
29											37	12		
30											12	59		
31													29	2
22													27	62
33													30	73
34													31	6
35													45	66
36													25	1

Shortest = #36 N.P. = 1
Longest = #26 Pro. = 111*
Mean Pro. = 49.9
Mean N.P. = 45.2

* This figure does not include those flies still living.

Table 4.—Average Eggs per Day for Individual Female D. dorsalis with and without Protein Hydrolysate at Various Temperatures. As of 6/30/50.

Fly No.	Room Temperature Pro.	Room Temperature N.P.	12.5°C. Pro.	12.5°C. N.P.	E 15.0°C. Pro.	G 15.0°C. N.P.	G 17.5°C. Pro.	17.5°C. N.P.	E 20.0°C. Pro.	20.0°C. N.P.	22.5°C. Pro.	22.5°C. N.P.	35.0°C. Pro.	35.0°C. N.P.
1	64													
2	39	6												
3	11													
4	-	-												
5	36	2												
6	38													
7	41				8									
8	15				16									
9	38				18									
10	33				4	8								
11	31	8			8									
12	41													
13	33						20							
14	39						22							
15	50	8												
16	25													
17	37						16							
18	41													
19	16													
20	54								19	13				
21									14					
22	32													
23	24	6							23					
24	29	11							28					
25											21	4		
26											18			
27											15			
28											16	3		
29											24			
30														
31													18	
32													5	
33													14	11
34													9	
35														7
36														

Highest = #1 Pro. = 64
Lowest = #5 N.P. = 2
Mean Pro. = 26
Mean N.P. = 7

Note: Figures are based on days when females produced eggs not total number of days.

Table 5.--Sexual Maturity and Oviposition of *D. dorsalis* with and without Protein Supplement at Various Temperatures. (As of 6/30/50)

Cabinet	Flies Emerged & Segregated	Days in Progress as of 6/30/50	No. Flies in Test		No. Flies in Production		Pre-oviposition Period-Days		Grand Total of Eggs			Highest Individual Total of Eggs			Average per Fly per Day*		Highest Daily Total		Longest Consecutive Laying Period in Days	
			Pro.	N.P.	Pro.	N.P.	Pro.	N.P.	Pro.	Pro./N.P.	N.P.	Pro.	Pro./N.P.	N.P.	Pro.	N.P.	Pro.	N.P.	Pro.	N.P.
Rm. T.	3/6/50	116	24	24	22	7	6-14	21-71	21,538	32.8	655	3,062	10.8	283	27	3	136	28	27	6
12.5°C. 55.4°F.	3/7/50	115	6	6	0	0	-	-	0	0	0	0	0	0	0	0	0	0	0	0
15.0°C. 59.0°F.	3/7/50	115	6	6	5	1	29-70	65	1,628	65.1	25	813	32.5	25	5	1	42	18	15	1
17.5°C. 63.5°F.	3/7/50	115	6	6	3	0	21-34	-	564	564	0	283	283	0	7	0	65	0	3	0
20.0°C. 68.0°F.	3/7/50	115	6	6	4	1	14-18	23	3,354	11.2	300	1,625	5.4	300	12	3	94	22	19	5
22.5°C. 72.5°F.	3/7/50	115	6	6	5	2	12-30	28-29	2,405	89.0	27	987	51.9	19	9	1	74	5	10	3
35.0°C. 95.0°F.	3/7/50	115	6	6	4	2	7-26	20-22	427	4.6	93	236	2.9	82	5	2	41	7	8	3
TOTAL:									29,914	27.2	1,100	7,006	9.9	709						

* Based on oviposition period not actual days of production.

ECOLOGY-BIOLOGY, Work Project 1-c-1, Line Project 3.0 - N. E. Flitters

SUMMARY

Flies exhibit no sexual interest in each other until shortly before sunset. The males appear to attract the females with excited wing movements and rythmic body actions. Copulation usually takes place in the period between sunset and darkness. Copula extends for periods ranging from two hours to twelve thereby making it highly improbable that a male can fertilize more than one female per night. One fertilization is sufficient to enable the female to produce fertile eggs all during her longevity. The frequency of copulation was found to be very low, and apparently females do not accept males before they are six days old. In the tests just completed males under nine days old exhibit no interest in the females whatsoever indicating that males may not reach sexual maturity as quickly as the female. Males will fertilize more than one female but the frequency is very extended.

Line Project 1-o-1-2 - Effect of Climate. (K. L. Maehler)

March, April and May were wet months on the island of Hawaii. Heaviest rainfall occurred at Kaumana where 50. 87 inches were recorded in April. For the same period Mountain View had 48 inches, Hilo 33.45 inches and Keanakolu orchard, 24.34 inches. While the precipitation was not as great at Keanakolu and Waiki, these areas were blanketed by fog considerably and if the scarcity of flies in these two localities is any indication of their dislikes for this weather element, than fog may be a good natural barrier.

The failure of fly populations to "bounce" back may suggest some mortality but other factors such as host availability are important. This is true of Keanakolu-Ookala trail, and Mountain View.

The lowest temperature recorded was 29°F. This was in June at Pohakuloa. During the early part of June, frosts occurred frequently. The highest temperature, 83°F. was recorded at Hilo in June.

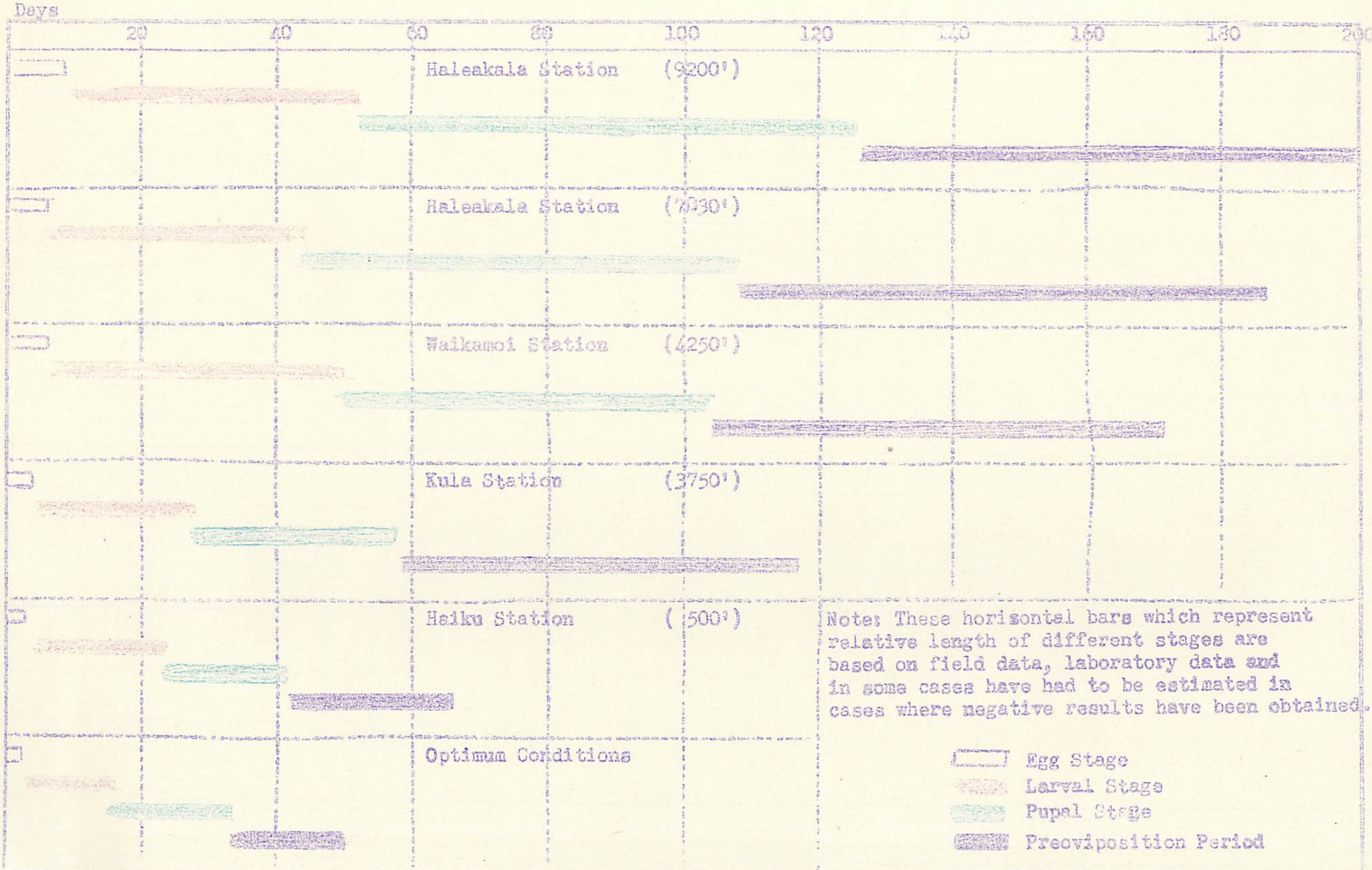
TABLE 1. Meteorological data on Maui Stations

STATION	APRIL	MAY	JUNE	TEMPERATURE
KULA INSECTARY	70	69	70	Absolute Max.
3750'	65.5	66.5	66.5	Max. Mean
	51.7	51.8	53.2	Min. Mean
	44	47	48	Absolute Min.
	7.92	.83	.54	Ppt.
	81.7	88.2	86.4	Aver. Rel. Hum.
HALEAKALA	66	72	78	Absolute Max.
7030'	58.5	61.8	64.1	Max. Mean
	41.1	42.2	43.8	Min. Mean
	36	34	38	Absolute Min.
	12.68	1.37	.43	Ppt.
	75.5	72	61	Aver. Rel. Hum.
HALEAKALA	58	67	76	Absolute Max.
9200'	52.4	55.7	62.8	Max. Mean
	41.5	39.9	44.6	Min. Mean
	38	37	38	Absolute Min.
	8.14	5.31	.40	Ppt.
	62	40	27	Aver. Rel. Hum.
WAIKAMOI	65	63	66	Absolute Max.
4250'	55.2	56.7	60.5	Max. Mean
	50.6	52.5	49.7	Min. Mean
	46	46	47	Absolute Min.
	52.68	30.58	12.71	Ppt.
	95.2	95.2	92.3	Aver. Rel. Hum.
HAIKU	76	78	80	Absolute Max.
500'	72.6	76.2	76	Max. Mean
	63.9	65.0	65.5	Min. Mean
	61	62	62	Absolute Min.
	20.04	5.67	4.85	Ppt.
	81.2	83.5	76.8	Aver. Rel. Hum.
OLINDA, Exp. Station	75	75	75	Absolute Max.
2160'	69.4	71	72.5	Max. Mean
	58.0	59	60	Min. Mean
	53	53	55	Absolute Min.
	20.33	5.21	1.97	Ppt.
				Aver. Rel. Hum.

TABLE 2. Meteorological Data on Hawaii Stations

STATION	APRIL	MAY	JUNE	TEMPERATURE
HILO, INSECTARY	79	81	83	Absolute Max.
75'	74	77	78	Max. Mean
	65	65	66	Min. Mean
	59	62	63	Absolute Min.
	33.45	21.04	6.27	Ppt.
	89%	85%	85%	Aver. Rel. Hum.
KAUMANA	75	83	76	Absolute Max.
2000'	68	72	71	Max. Mean
	55	57	59	Min. Mean
	48	51	55	Absolute Min.
	50.87	23.14	10.94	Ppt.
	96%	92%	95%	Aver. Rel. Hum.
POHAKULOA	75	79	76	Absolute Max.
6511'	67	69	71	Max. Mean
	43	43	36	Min. Mean
	33	36	29	Absolute Min.
	3.42	.05	.00	Ppt.
	84%	79%	83%	Aver. Rel. Hum.
WAIKII	75	72	74	Absolute Max.
4700'	66	67	67	Max. Mean
	46	46	47	Min. Mean
	40	41	44	Absolute Min.
	7.94	1.84	.73	Ppt.
	92%	93%	97%	Aver. Rel. Hum.
KEANAKOLU	68	77	75	Absolute Max.
5200'	61	61	69	Max. Mean
	46	45	48	Min. Mean
	36	41	42	Absolute Min.
	24.34	6.07	1.83	Ppt.
	99%	97%	97%	Aver. Rel. Hum.
KIPUKA KI	82	72	74	Absolute Max.
4250'	76	67	69	Max. Mean
	47	52	52	Min. Mean
	37	48	45	Absolute Min.
	9.34	1.56	.27	Ppt.
	89%	90%	89%	Aver. Rel. Hum.

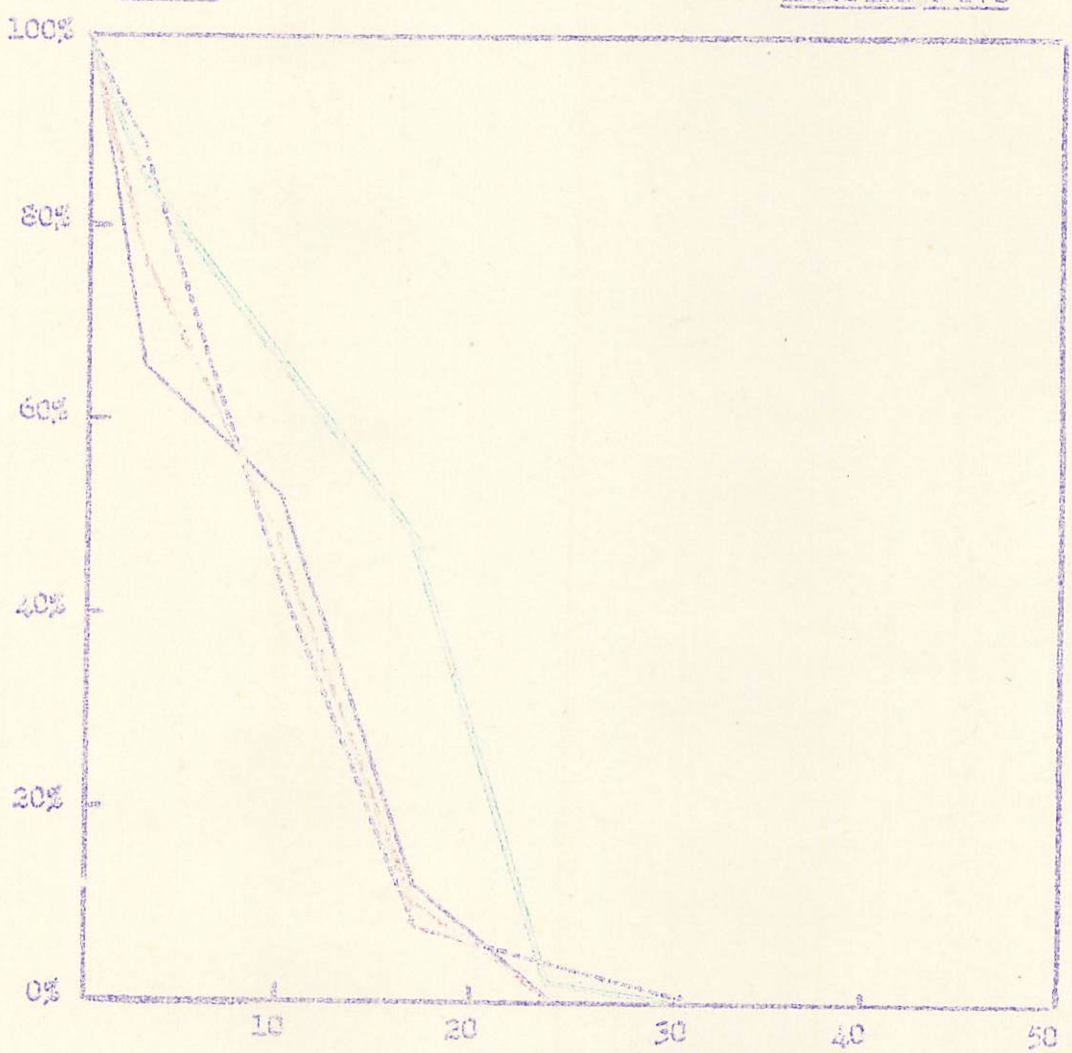
FIG. 1. RELATION BETWEEN TEMPERATURE AND LENGTH OF LIFE CYCLE.



KLMaehler 7/17/50

A STUDY OF TYPES OF CAGE COVERING AND THEIR PROTECTIVE PROPERTIES AND EFFECTS ON FLY MORTALITY

Fig. 2 Experiment 276



Days

Max.	Min.					Max.	Min.
94	30	——	Cloth-covered Cage	Plastic Top Cage	······	84	35
82	30	-.-.-	Plastic Screen Cage	Wire Screen Cage	———	78	29

Note. Fifty *Dacus dorsalis* used in each cage
In this experiment it appears that the cage with the plastic top afforded the flies protection from the rain and allowed greater survival initially. Low temperatures and low relative humidity resulted in the death of all flies in about a month.

STUDY OF CONTAINERS

EXPERIMENT 276

Date 4/14/50

Haleakala 9200'

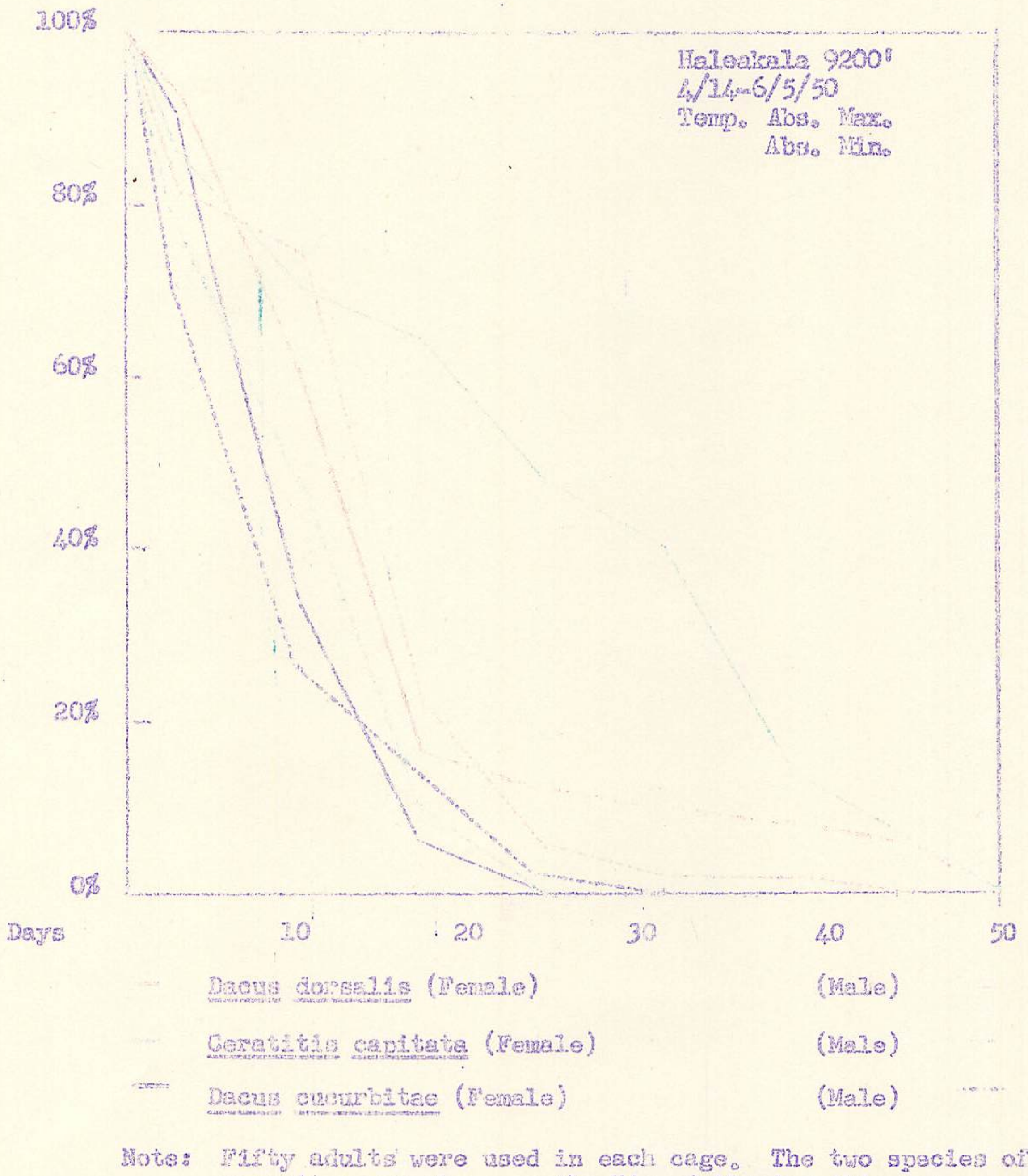
TABLE 3

Lot 1						Lot 2		Temp. Lot 1		Temp. Lot 2	
Date	Days	No	Dead	Percent Alive		No.	Dead	Max	Min	Max	Min
4/14	1	50	0	100 %	100	50	0	78	29	62	30
4/17	3	39	11	78	88	44	6				
4/24	10	24	15	48	44	22	22			82	34
5/1	17	5	19	10	16	8	14				
5/8	24	0	5	0	04	2	6				
5/15	31				0	0	2				
Lot 3						Lot 4		Lot 3		Lot 4	
4/14	1	50	0	100 %	100	50	0			64	30
4/17	3	43	7	86	64	32	18	84	36	94	35
4/24	10	33	10	66	52	26	6	82	35		
5/1	17	24	9	48	12	6	20				
5/8	24	1	23	02	0	0	6				
5/15	31	0	1	0							

A STUDY OF THE COMPARATIVE MORTALITY OF TWO

SPECIES OF PARASITES AND THREE FRUIT FLIES

Fig. 3 Experiment 272

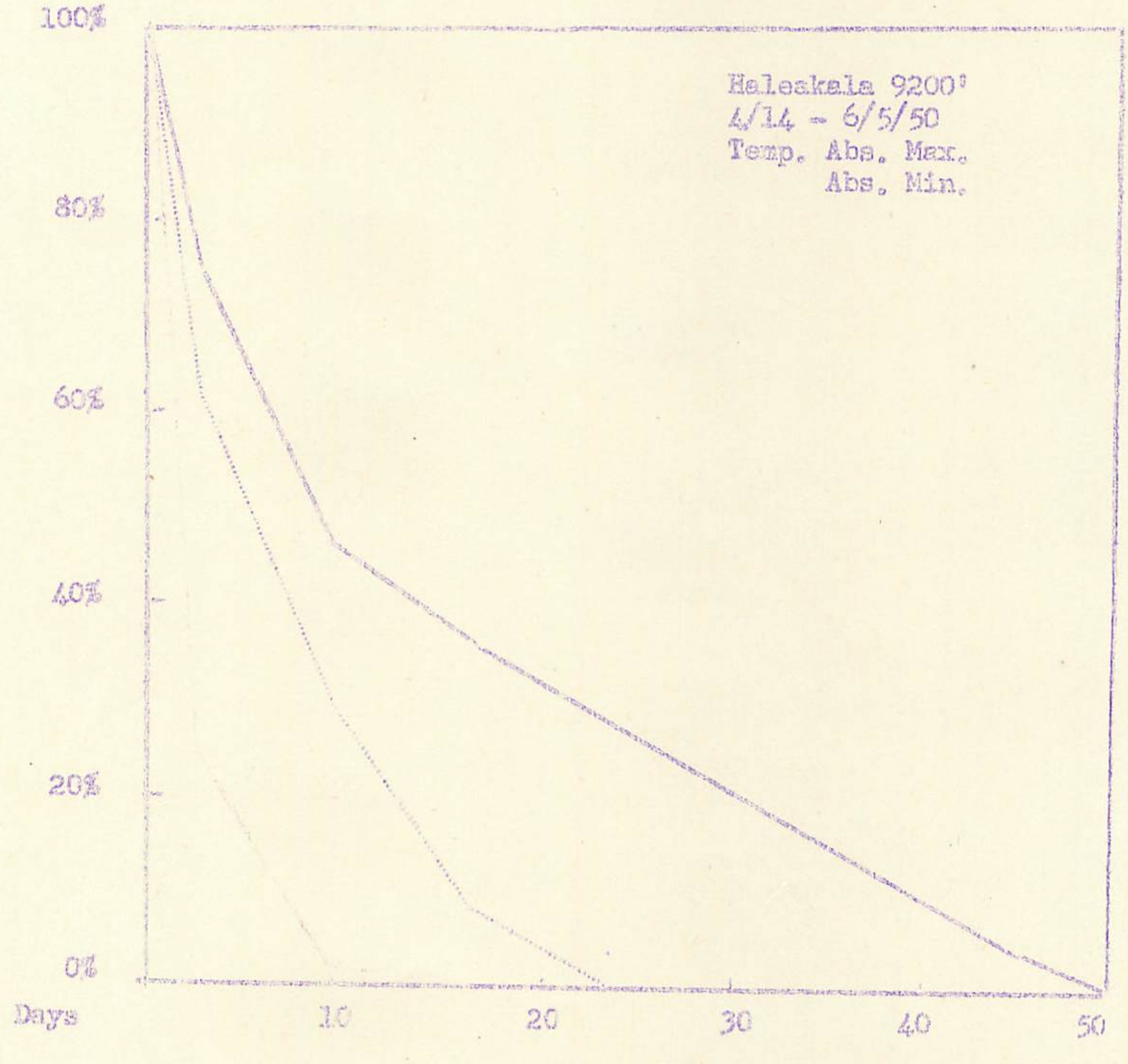


Note: Fifty adults were used in each cage. The two species of parasites are shown on the Fig. following this one.

A STUDY OF THE COMPARATIVE MORTALITY OF TWO

SPECIES OF PARASITES AND THREE FRUIT FLIES

Fig. 4 Experiment 272



Opius longicaudatus (Female)

Opius longicaudatus (Male)

Opius persulcatus (Female)

Note: Fifty adults were used in each cage of O. longicaudatus. O. persulcatus had only 28 adults in the cage. Fruit flies used in this study are shown on preceding figure.

COMPARATIVE MORTALITY

EXPERIMENT 272

Date 4/14/50

Table 4

Haleakala 9200'

DACUS DORSALIS

Date	Days	Female No.	Dead	Percent Alive		Male No.	Dead	Pct.
4/14	1	50	0	100 %	100	50	0	.70
4/17	3	46	4	92	82	41	9	1.27
4/24	10	30	16	60	74	37	4	4.90
5/1	17	8	22	16	22	11	26	4.00
5/8	24	6	2	12	6	3	8	.25
5/15	31	5	1	10	2	1	0	.00.
5/22	38	4	1	8	2	1	0	.86
5/29	45	3	1	6	0	0	1	.20
6/5	52	0	3	0				.00

Lot 3

Female

Lot 4

Male

Date	Days	No.	Dead	Percent Alive		No.	Dead
4/14	1	50	0	100 %	100	50	0
4/17	3	45	5	90	70	35	15
4/24	10	17	28	34	26	13	22
5/1	17	3	14	.06	14	7	6
5/8	24	0	3	0	02	1	6
5/15	31				0	0	1

Lot 5				Lot 6			
4/14	1	50	0	100 %	100	50	0
4/17	3	46	4	92	76	38	12
4/24	10	30	16	60	66	33	5
5/1	17	8	22	16	50	25	8
5/8	24	6	2	12	42	21	4
5/15	31	5	1	10	32	16	5
5/22	38	4	1	8	24	12	4
5/29	45	3	1	6	20	10	2
6/5	52	0	3	0	8	4	6
6/12	59				2	1	3
6/19	66				0	0	1

O. LONGICAUDATUS

	Female				Male		
Lot 7						Lot 8	
Date	Days	No.	Dead	Percent	Alive	No.	Dead
4/14	1	50	0	100 %	100	50	0
4/17	3	38	12	76	62	31	19
4/24	10	23	15	46	28	14	17
5/1	17	8	15	16	08	4	10
5/8	24	2	6	04	0	0	4
5/15	31	2	0	04			
5/22	38	2	0	04			
5/29	45	2	0	04			
6/5	52	0	2	0			

COMPARATIVE MORTALITY

EXPERIMENT 272

Date 4/14/50

Haleakala 9200'

PERSULCATUS

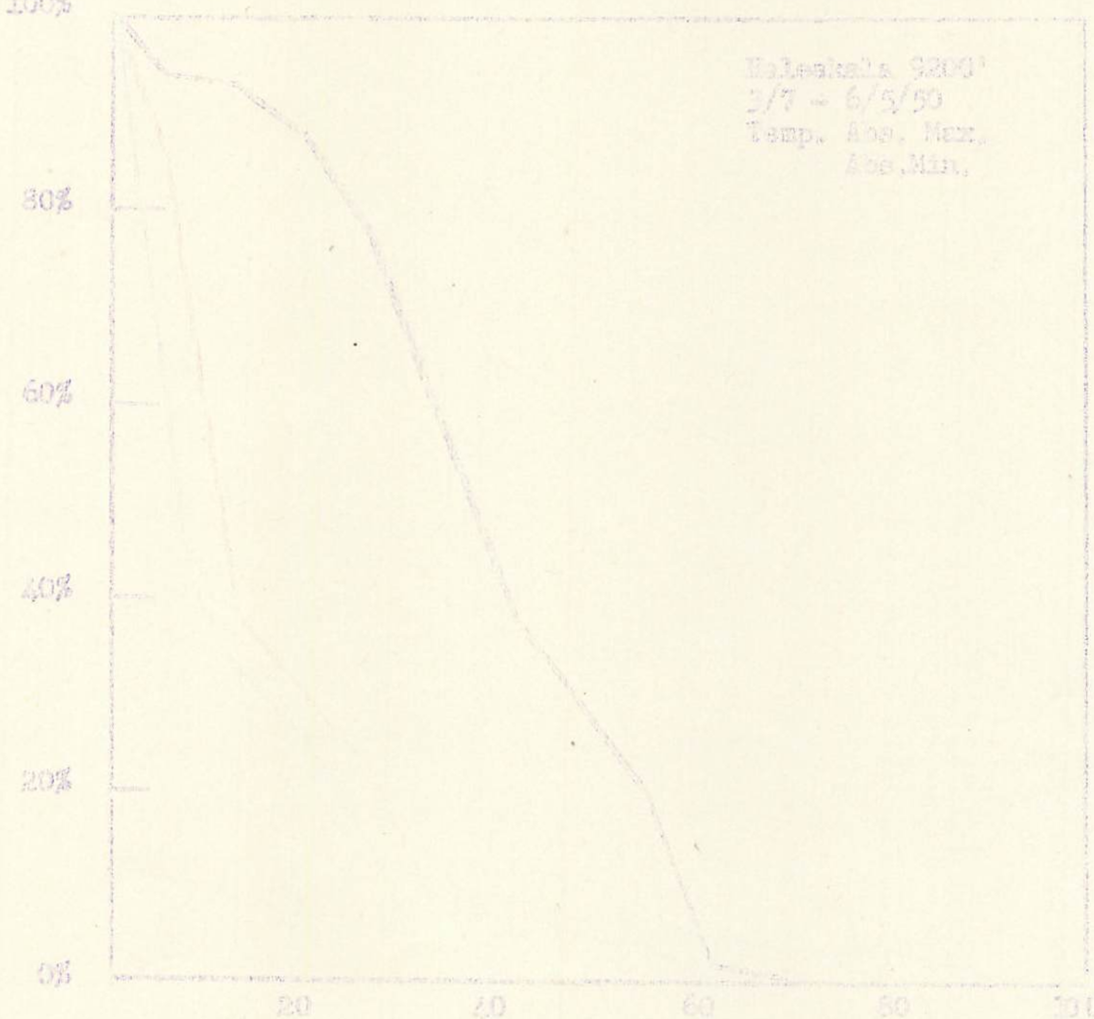
Female
Lot 9

Male
Lot 10

Date	Days	No.	Dead	Percent Alive	No.	Dead
4/14	1	28	0	100		
4/17	3	7	21	25		
4/24	10	1	6	2		
5/1	17	0	1	0		

A COMPARATIVE MORTALITY STUDY

Fig. 5 Experiment [illegible]



Dacus cucurbitae

Dacus dorsalis

Ceratitis capitata

Note: A study of the effect of low temperatures on Dacus dorsalis using two other species of Fruit Flies as controls.

COMPARATIVE MORTALITY

EXPERIMENT 158

Date: 3/7/50

TABLE 5

Haleakala 9200'

DORSALIS
100 Lot 1

Small Cage

MELON FLIES
100 Lot 3

Small Cage

MED. FLIES
100 Lot 2

Small Cage

Date	Days	No.	Dead	Percent Alive		No.	Dead	No.	Dead	Alive Percent
3/7	0	100	0	100 %	100	100	0	100	0	100
3/13	6	76	24	76	96	96	4	42	42	42
3/20	13	38	38	38	93	93	3	33	9	33
3/27	20	30	8	30	88	88	5	25	8	25
3/28	21	27	3	27	88	88	0	17	8	17
4/3	27	21	6	21	77	77	11	12	5	12
4/10	34	7	14	7	40	40	37	9	3	9
4/17	41	7	0	7	37	37	3	8	1	8
4/24	48	5	2	5	30	30	7	6	2	6
5/1	55	4	1	4	20	20	10	6	0	6
5/8	62	0	4	0	1	1	19	5	1	5
5/15	69				0	0	1	3	2	3
5/22	76							3	0	3
5/29	83							3	0	3
6/5	90							0	3	0

COMPARATIVE MORTALITY

EXPERIMENT 336

Date 3/22/50

TABLE 6

Halekala 9200'

DORSALIS

Date	Days	Lot - 1 Female No.	Dead	Percent	Alive	Lot - 2 Male No.	Dead
5/22	1	50	0	100 %	100	50	0
5/29	7	44	6	88	70	35	15
6/5	14	0	44	0	8	4	31
6/12	21				0	0	4

MED.

Date	Days	Female Lot 3 No.	Dead	Percent	Alive	Male Lot 4 No.	Dead
5/22	1	50	0	100 %	100	50	0
5/29	7	39	11	78	78	39	11
6/5	14	9	30	18	0	0	39
6/12	21	6	3	12			
6/19	28	0	6	0			

LONG.

Date 5/22/50

Experiment 336

Date	Days	Lot 5 No.	Dead	Percent	Alive	Lot 6 No.	Dead
5/22	1	50	0	100	100	50	0
5/29	7	25	25	50	38	19	31
6/5	14	0	25	0	0	0	19

Note: MED: *Ceratitis capitata*
LONG: *Opius longicaudatus*

Mortality

In the graph on mortality shown in the last quarterly report the trend toward low mortality was reflected by Mauna Loa Trail flies. This suggested that flies trapped at the higher elevations were better conditioned than those at the lower elevations when both lots were held at Pohakuloa. However, further experiments have shown a complete reversal and the present status of experiments 691, 693, 757, 759, 761 and 763 are shown as follows:

Experiments 691 Lots 1 and 2 (flies from Hilo, 75' and M. L. T. T., 4250') held at Pohakuloa.

Exp. 691 (Lot 1)

Date coll. 5/11/50 Date	Days	From Hilo Males
5/11	1	100
5/15	4	89
5/22	11	88
5/29	18	69
6/5	25	68
6/12	32	66
6/19	39	64
6/26	46	55
7/3	53	49

Exp. 691 (Lot 2)

Date coll. 5/11/50 Date	Days	From M.L.T.T. Males
5/11	1	100
5/15	4	63
5/22	11	60
5/29	18	51
6/5	25	48
6/12	32	47
6/19	39	45
6/26	46	41
7/3	53	35

Experiments 693 Lots 1 and 2 (flies from Hilo, 75' and M. L. T. T., 4250') held at Waikii (4700')

Exp. 693 (Lot 1)

Date coll. 5/11/50 Date	Days	From Hilo Males
5/11	1	25
5/15	4	22
5/22	11	18
5/29	18	16
6/5	25	14
6/12	32	12
6/19	39	12
6/26	46	8
7/3	53	6

Exp. 693 (Lot 2)

Date coll. 5/11/50 Date	Days	From M.L.T.T. Males
5/11	1	25
5/15	4	22
5/22	11	17
5/29	18	15
6/5	25	10
6/12	32	10
6/19	39	10
6/26	46	7
7/3	53	3

Experiments 757 and 759 (flies from M. L. T. T., 4250') held at Fire Cache #2 (M. L. T. T., 4800') and Pohakuloa 6511') respectively.

Exp. 757 (Control)
(Held at Fire Cache #2, M. L. T. T.)

Date coll. 5/22/50 Date	Days	From M. L. T. T. Males
5/22	1	100
5/29	7	90
6/5	14	84
6/12	21	67
6/19	28	55
6/26	35	49
7/3	42	40

Exp. 759
(Held at Pohakuloa)

Date coll. 5/22/50 Date	Days	From M. L. T. T. Males
5/22	1	100
5/29	7	73
6/5	14	62
6/12	21	59
6/19	28	55
6/26	35	43
7/3	42	26

Experiments 761 and 763 (flies from Hilo, 75') held at Hilo and Pohakuloa.

Exp. 761 (Hilo Control)

Date coll. 5/23/50 Date	Days	From Hilo Males
5/23/50	1	100
5/29	6	57
6/5	13	43
6/13	21	40
6/20	28	36
6/26	34	33
7/3	41	29

Exp. 763 (Held at Pohakuloa)

Date coll. 5/23/50 Date	Days	From Hilo Males
5/23	1	100
5/29	6	48
6/5	13	40
6/12	20	38
6/19	27	37
6/26	34	24
7/3	41	19

Experiments 757, 759, 761 and 763 involve control cages at each station. Further replications of these experiments are desired before conclusions can be drawn.

LONGEVITY STUDIES

KULA STATION (3750)

EXP. 264
April
Orange Flies

TABLE 7

Date	Days	Cage 2 (MRT) Alive Male	Cage 2 (MRT) Alive Female	Cage 2 (MRT) Dead Male	Cage 2 (MRT) Dead Female	Cage 3 Alive Male	Cage 3 Alive Female	Cage 3 Dead Male	Cage 3 Dead Female
4/5	1	56	65	0	0	68	76	0	0
4/10	5	45	44	11	21	48	65	10	11
4/17	12	36	39	9	5	45	60	13	5
4/24	19	33	36	3	3	36	52	9	8
4/25	20	31	36	2	0	36	52	0	0
5/2	27	27	30	4	6	23	36	13	16
5/5	30	22	28	5	2	20	33	3	3
5/9	34	20	27	2	1	18	30	2	3
5/15	40	20	26	0	1	17	27	1	3
5/22	47	20	25	0	1	17	25	0	2
5/29	54	19	25	1	0	13	21	4	4
6/5	61	18	23	1	2	12	20	1	1
6/12	68	17	23	1	0	12	18	0	2
6/19	75	16	23	1	0	12	18	0	0
7/3	89	15	22	1	1	12	18	0	0

LONGEVITY STUDIES

KULA STATION

EXP. 320
May
Green Marked Flies

TABLE 8

Date	Days	Cage 2 (MRT) Alive Male	Cage 2 (MRT) Alive Female	Cage 2 (MRT) Dead Male	Cage 2 (MRT) Dead Female	Cage 3 Alive Male	Cage 3 Alive Female	Cage 3 Dead Male	Cage 3 Dead Female
5/11	1	105	109	0	0	104	101	0	0
5/15	4	97	105	8	4	100	92	4	9
5/22	11	82	96	15	9	81	78	19	14
5/29	18	66	85	16	11	51	68	30	10
6/5	25	49	75	17	10	32	50	19	18
6/12	32	34	64	15	11	13	42	19	8
6/19	39	31	55	3	9	11	38	2	4
6/26	46	25	42	6	13	8	33	3	5
7/3	53	19	41	6	1	8	33	0	0
7/11	61	17	38	2	3	7	33	1	0

LONGEVITY STUDIES

KULA STATION

EXP. 376
June
Yellow Marked Flies

		Cage 2 (MRT)				Cage 3			
		Alive		Dead		Alive		Dead	
Date	Days	Male	Female	Male	Female	Male	Female	Male	Female
6/5	1	106	96	0	0	115	98	0	0
6/12	7	71	60	35	36	89	84	26	14
6/19	14	54	54	17	6	63	68	26	16
6/26	21	36	47	18	7	35	44	28	24
7/3	28	31	40	5	7	30	35	5	9
7/10	35	29	37	2	3	27	32	3	3

LONGEVITY STUDIES

HAIKU

EXP. 290
April
Orange Marked Flies

TABLE 10

		Cage 10				Cage 24 (MRT)			
		Alive		Dead		Alive		Dead	
Date	Days	Male	Female	Male	Female	Male	Female	Male	Female
4/26	1	85	97	0	0	75	71	0	0
5/1	6	58	67	27	30	49	22	26	49
5/3	8	52	61	6	6	42	17	7	5
5/8	13	46	59	6	2	41	17	1	0
5/15	20	42	50	4	9	41	16	0	1
5/22	27	38	39	4	11	39	15	2	1
5/29	34	29	32	9	7	35	12	4	3
6/1	37	26	26	3	6	30	5	5	7
6/5	41	25	23	1	3	30	5	0	0
6/12	48	13	12	12	11	15	0	15	5
6/19	55	0	0	13	12	0		15	

LONGEVITY STUDIES

HAIKU

EXP. 322
May
Green Marked Flies

TABLE 11

		Cage 10				Cage 24 (M.R.T.)			
		Alive		Dead		Alive		Dead	
Date	Days	Male	Female	Male	Female	Male	Female	Male	Female
5/11	1	89	100	0	0	105	123	0	0
5/15	4	79	93	10	7	101	115	4	8
5/22	11	74	87	5	6	92	110	9	5
5/29	18	62	74	12	13	69	94	23	16
6/1	21	45	48	17	26	33	48	36	46
6/5	25	35	39	10	9	30	44	3	4
6/12	32	19	21	16	18	17	26	13	18
6/19	39	2	3	17	18	4	8	13	18

LONGEVITY STUDIES

HAIKU

EXP. 378
June
Yellow Marked Flies

TABLE 12

		Cage 10				Cage 24 (MRT)			
		Alive		Dead		Alive		Dead	
Date	Days	Male	Female	Male	Female	Male	Female	Male	Female
6/5	1	117	107	0	0	106	95	0	0
6/12	7	73	64	44	43	79	69	27	26
6/19	14	28	21	45	43	52	42	27	27

LONGEVITY STUDIES

WAIKAMOI

EXP. 268
April
Orange Marked Flies

TABLE 13

		Cage 8 (MRT)				Cage 9			
		Alive		Dead		Alive		Dead	
Date	Days	Male	Female	Male	Female	Male	Female	Male	Female
4/13	1	58	65	0	0	115	119	0	0
4/17	4	44	54	14	11	95	101	20	18
4/24	11	35	41	9	13	56	64	39	37
5/1	18	26	30	9	11	38	42	18	22
5/4	21	0	0	0	0	0	0	0	3

LONGEVITY STUDIES

WAIKAMOI

EXP. 326
May
Green Marked Flies

TABLE 14

		Cage 8 (MRT)				Cage 9			
		Alive		Dead		Alive		Dead	
Date	Days	Male	Female	Male	Female	Male	Female	Male	Female
5/15	1	113	119	0	0	118	106	0	0
5/22	7	55	62	58	57	63	48	55	58
5/29	14	41	50	14	12	42	32	21	16
6/5	21	39	48	2	2	39	30	3	2
6/12	28	38	47	1	1	37	28	1	2
6/19	35	38	47	0	0	36	26	1	2
6/26	42					36	25	0	1
7/10	56					35	25	1	0

LONGEVITY STUDIES

WAIKAMOI

EXP. 382
June
Yellow Marked Flies

TABLE 15

		Cage 8 (MRT)				Cage 9			
		Alive		Dead		Alive		Dead	
Date	Days	Male	Female	Male	Female	Male	Female	Male	Female
6/12	1	90	93	0	0	87	103	0	0
6/19	7	76	84	14	9	77	97	10	6
6/26	14	64	73	12	11	57	69	20	28
7/3	21	53	63	11	10	54	66	3	3
7/10	28	48	57	5	6	51	63	3	3

LONGEVITY STUDIES

HALEAKALA (7030')

EXP. 266
April
Orange Marked Flies

TABLE 16

		Cage 4				Cage 22 (MRT)			
		Alive		Dead		Alive		Dead	
Date	Days	Male	Female	Male	Female	Male	Female	Male	Female
4/6	1	78	102	0	0	97	91	0	0
4/10	4	58	78	20	24	67	62	30	29
4/17	11	43	66	15	12	46	34	21	28
4/24	18	27	48	16	18	29	20	17	14
5/1	25	12	42	15	6	24	12	5	8
5/8	32	8	33	4	9	23	9	1	3
5/15	39	3	28	5	5	0	0	2	2
5/22	46	3	25	0	3				
5/29	53	2	25	1	0				
6/5	60	2	25	0	0				
6/12	67	2	25	0	0				
6/19	74	2	24	0	1				

LONGEVITY STUDIES

HALEAKALA (7030')

EXP. 324
May
Green Marked Flies

TABLE 17

		Cage 4				Cage 22 (MRT)			
		Alive		Dead		Alive		Dead	
Date	Days	Male	Female	Male	Female	Male	Female	Male	Female
5/15	1	113	112	0	0	106	109	0	0
5/22	7	91	78	22	34	72	79	34	30
5/29	14	68	55	23	23	40	50	32	29
6/5	21	47	42	21	13	34	46	6	4
6/12	28	39	34	8	8	30	39	7	4
6/19	35	33	29	6	5	19	30	11	9
6/26	42	31	26	2	3	18	29	1	1
7/3	49	30	23	1	3	17	27	1	2
7/10	56					14	24	3	3

LONGEVITY STUDIES

HALEAKALA (7030')

EXP. 380
June
Yellow Marked Flies

TABLE 18

		Cage 4				Cage 22 (MRT)			
		Alive		Dead		Alive		Dead	
Date	Days	Male	Female	Male	Female	Male	Female	Male	Female
6/5	1	111	103	0	0	108	104	0	0
6/12	7	87	89	24	14	89	84	19	20
6/19	14	47	68	40	21	56	48	33	36
6/26	21	34	55	13	13	42	44	14	4
7/3	28	26	48	8	7	31	30	11	14
7/10	35	18	34	8	14	26	26	5	4

Longevity

The last female Dacus dorsalis of a longevity experiment started on March 11, 1949 died between May 6 and 7th 1950 at Pohakuloa (6500'), Island of Hawaii. Total longevity was 422 days. The experiment started with 25 males and 25 females and was carried on under sheltered conditions. Twenty per cent of the females were alive at this station after the first year. At Kaumana (2000') and Hilo (75') the last fly lived 8 1/2 to 8 1/3 months respectively. No fruit was provided for oviposition at any of the stations.

Flies retained in standard insect cages in an open building at Pohakuloa have consistently demonstrated greater longevity than flies held at other stations. This is probably due to the fact that they are in suspended animation a good deal of the time. Preliminary experiments have shown that they will live without food or water at this station up to seven days where as at Hilo they die within three days.

Results of Longevity Studies in outdoor cages at each station are shown graphically in the following order:

Experiment	No.	231 Kaumana	red flies,	Feb.	release	
"	"	233 Pohakuloa	"	"	"	
"	"	235 Waikii	"	"	"	
"	"	237 Keanakolu	"	"	"	
"	"	239 Hilo	"	"	"	
"	"	341 Kaumana	White flies,	March	release	
"	"	343 Keanakolu	"	"	"	
"	"	347 Pohakuloa	"	"	"	
"	"	349 Waikii	"	"	"	
"	"	359 Hilo	"	"	"	

As mentioned in the last quarterly report certain changes in the * diet of longevity flies were made and these became effective in the April release of orange marked flies. Since the April, May and June releases are active at most of the stations, the longevity trends are presented as follows:

* M.R.I. added to even number cages

Longevity Orange Marked Flies, April Release
Experiment 587

Hilo, 75' Cage 11 Date	Days	Lot 1 emerged 4-15-50 Flies Alive M	F		Hilo, 75' Cage 12 Date	Days	Lot 2 (MRT) emerged 4-15-50 Flies Alive M	F
4/15	1	100	100	Mean Max 76	4/15	1	100	100
4/21	6	92	98	Mean Min 66				
4/21	6	92	98		4/26	11	81	85
5/1	16	53	45		5/1	16	60	69
5/9	24	39	29		5/9	24	40	60
5/16	31	32	21		5/16	31	37	58
5/23	38	30	21		5/23	38	34	56
5/29	44	28	20		5/29	44	32	53
6/5	51	27	20		6/5	51	18	43
6/13	59	26	20		6/13	59	16	41
6/19	64	26	20		6/19	65	16	39
6/26	71	26	20		6/26	72	15	37
7/3	78	25	20		7/3	79	13	35

Experiment 589

Kaumana, 2000' Cage 13 Date	Days	Lot 1 emerged 4-15-50 Flies Alive M	F		Kaumana, 2000' Cage 14 Date	Days	Lot 2 (MRT) emerged 4-15-50 Flies Alive M	F
4/15	1	100	100	Mean Max 70	4/15	1	100	100
4/21	6	98	96	Mean Min 57	4/24	9	95	95
5/1	16	60	65		5/1	16	88	91
5/8	23	41	59		5/8	23	61	73
5/15	30	21	34		5/15	30	35	46
5/22	37	19	32		5/22	37	33	44
5/29	44	19	31		5/29	44	33	42
6/5	51	16	29		6/5	51	32	41
6/12	58	16	29		6/12	58	31	39
6/19	65	16	29		6/19	65	30	39
6/26	72	16	28		6/26	72	29	37
7/3	79	16	28		7/3	79	28	36

Longevity Orange Marked Flies, April Release
Experiment 585

Pohakuloa, 6511' Lot 1, Cage 15, Emerged 4/14/50

Date	Days	Flies Alive M	Flies Alive F	
4/14	1	100	100	Mean Max 69
4/21	7	91	89	Mean Min 41
5/1	17	35	57	
5/8	24	21	31	
5/15	31	14	19	
5/22	38	10	12	
5/29	45	8	10	
6/5	52	8	9	
6/12	59	7	9	
6/19	66	7	8	
6/26	73	6	8	
7/3	80	6	8	

Pohakuloa, 6511' Lot 2 (MRT), Cage 16, Emerged 4/14/50

Date	Days	Flies Alive M	Flies Alive F
4/14	1	100	100
4/24	10	85	93
5/1	17	45	70
5/8	24	25	48
5/15	31	20	39
5/22	38	17	33
5/29	45	13	26
6/5	52	9	22
6/12	59	8	19
6/19	66	7	16
6/26	73	6	15
7/3	80	6	15

Experiment 561

Waikii, 4700', Cage 17, emerged 4/12/50

Date	Days	Flies Alive M	Flies Alive F	
4/12	1	100	100	Mean Max 66
4/21	9	57	71	Mean Min 47
5/1	19	41	51	
5/8	26	22	31	
5/15	33	15	21	
5/22	40	13	17	
5/29	47	11	12	
6/5	54	7	11	
6/12	61	7	11	
6/19	68	7	11	
6/26	75	7	11	
7/3	82	7	11	

Waikii, 4700' Lot 2 (MRT), Cage 18, emerged 4/12/50

Date	Days	Flies Alive M	Flies Alive F
4/12	1	100	100
4/24	12	55	59
5/1	19	42	50
5/8	26	23	28
5/15	33	21	25
5/22	40	16	23
5/29	47	3	14
6/5	54	0	10
6/12	61	0	8
6/19	68	0	8
6/26	75	0	6
7/3	82	0	5

Experiment 591

Keanakolu, 5200' Lot 1
Cage 19 emerged 4-15-50

Date	Days	Flies Alive M	Flies Alive F	
4/15	1	99	97	Mean Max 63
4/25	10	81	77	Mean Min 47
5/2	17	51	42	
5/9	24	41	27	
5/16	31	30	22	
5/23	38	27	15	
5/29	44	25	14	
6/5	51	24	14	
6/13	59	23	14	
6/19	64	23	14	
6/27	72	23	14	
7/4	79	23	14	

Keanakolu, 5200' Lot 2 (MRT)
Cage 20 emerged 4-15-50

Date	Days	Flies Alive M	Flies Alive F
4/15	1	97	98
4/25	10	69	78
5/2	17	39	53
5/9	24	31	43
5/16	31	27	37
5/23	38	26	37
5/29	44	25	36
6/5	51	25	36
6/13	59	23	35
6/19	65	22	35
6/27	72	22	35
7/4	79	22	34

Longevity Green Marked Flies, May Release
Experiment 695

Hilo, 75' Cage 11 Date	Days	Lot 1 emerged 5-4-50 Flies Alive M	F		Hilo, 75' Cage 12 Date	Days	Lot 2 (MRT) emerged 5-4-50 Flies Alive M	F
5/4	1	50	50	Mean Max 78	5/4	1	50	50
5/17	13	35	36	Mean Min 66	5/17	13	42	43
5/23	19	25	29		5/23	19	38	42
5/29	25	13	23		5/29	25	36	41
6/5	32	10	19		6/5	32	22	33
6/13	40	9	19		6/13	40	20	29
6/19	46	9	19		6/19	46	13	25
6/26	53	9	18		6/26	53	11	23
7/3	60	9	17		7/3	60	8	22

Experiment 703

Kaumana, 2000' Cage 13 Date	Days	Lot 1 emerged 5-15-50 Flies Alive M	F		Kaumana, 2000' Cage 14 Date	Days	Lot 2 (MRT) emerged 5-15-50 Flies Alive M	F
5/15	1	50	50	Mean Max 71	5/15	1	50	50
5/22	8	50	48	Mean Min 59	5/22	8	47	48
5/29	15	46	39		5/29	15	43	47
6/5	22	40	32		6/5	22	36	37
6/12	29	32	23		6/12	29	31	34
6/19	36	28	17		6/19	36	26	25
6/26	43	25	14		6/26	43	24	21
7/3	50	25	14		7/3	50	23	19

Experiment 701

Pohakuloa, 6511' Cage 15 Date	Days	Lot 1 emerged 5/12/50 Flies Alive M	F		Pohakuloa, 6511' Cage 16 Date	Days	Lot 2 (MRT) emerged 5/12/50 Flies Alive M	F
5/12	1	50	50	Mean Max 71	5/12	1	50	50
5/15	3	48	48	Mean Min 40	5/15	3	46	48
5/22	10	31	37		5/22	10	42	40
5/29	17	20	29		5/29	17	33	32
6/5	24	14	21		6/5	24	25	26
6/12	31	11	18		6/12	31	27	19
6/19	38	9	15		6/19	38	21	16
6/26	45	6	13		6/26	45	20	15
7/3	52	5	12		7/3	52	18	14

Longevity Green Marked Flies, May Release
Experiment 699

Waikii, 4700' Cage 17 Date	Days	Lot 1 emerged 5-7-50 Flies M	Alive F		Waikii, 4700' Cage 18 Date	Days	Lot 2 (MRT) emerged 5-7-50 Flies M	Alive F
5/7	1	50	50	Mean Max 67	5/7	1	50	50
5/15	8	46	38	Mean Min 46	5/15	8	44	45
5/22	15	42	31		5/22	15	37	38
5/29	22	33	25		5/29	22	24	25
6/5	29	30	19		6/5	29	19	18
6/12	36	22	16		6/12	36	17	15
6/19	43	20	14		6/19	43	13	13
6/26	50	15	12		6/26	50	12	12
7/3	57	14	11		7/3	57	12	10

Experiment 697

Keanakolu, 5200' Cage 19 Date	Days	Lot 1 emerged 5-4-50 Flies M	Alive F		Keanakolu, 5200' Cage 20 Date	Days	Lot 2 (MRT) emerged 5-4-50 Flies M	Alive F
5/4	1	50	50	Mean Max 65	5/4	1	50	50
5/16	12	39	42	Mean Min 47	5/16	12	39	43
5/23	19	35	31		5/23	19	31	41
5/29	25	30	28		5/29	25	27	34
6/5	32	23	23		6/5	32	16	26
6/13	40	19	19		6/13	40	10	24
6/19	46	16	17		6/19	46	8	23
6/27	54	11	14		6/27	54	6	22
7/4	61	11	12		7/4	61	4	20

Longevity Yellow Marked Flies, June Released
Experiment 825

Hilo 75' Cage 11		Lot 1 emerged 6-6-50			Hilo, 75' Cage 12		Lot 2 (MRT) emerged 6-6-50	
Date	Days	Flies Alive M	F		Date	Days	Flies Alive M	F
6/6	1	100	100	Mean Max <u>78</u>	6/6	1	100	100
6/13	7	91	90	Mean Min <u>66</u>	6/13	7	95	97
6/19	13	66	69		6/19	13	75	76
6/26	20	46	57		6/26	20	62	66
7/3	27	32	44		7/3	27	49	53

Experiment 817

Kaumana, 2000' Cage 13		Lot 1 emerged 5-29-50			Kaumana, 2000' Cage 14		Lot 2 (MRT) emerged 5-29-50	
Date	Days	Flies Alive M	F		Date	Days	Flies Alive M	F
5/29	1	100	100	Mean Max <u>71</u>	5/29	1	100	100
6/5	7	97	93	Mean Min <u>59</u>	6/5	7	81	85
6/12	14	75	78		6/12	14	72	79
6/19	21	46	50		6/19	21	64	69
6/26	28	36	37		6/26	28	52	64
7/3	35	34	37		7/3	35	46	59

Experiment 819

Pohakuloa, 6511' Cage 15		Lot 1 emerged 5-29-50			Pohakuloa, 6511' Cage 16		Lot 2 (MRT) emerged. 5-29-50	
Date	Days	Flies Alive M	F		Date	Days	Flies Alive M	F
5/29	1	100	100	Mean Max <u>71</u>	5/29	1	100	100
6/5	7	73	84	Mean Min <u>36</u>	6/5	7	77	74
6/12	14	41	50		6/12	14	54	47
6/19	21	26	38		6/19	21	35	32
6/26	28	18	29		6/26	28	24	21
7/3	35	15	25		7/3	35	22	19

Longevity Yellow Marked Flies, June Released

Experiment 821

Waikii, 4700' Lot 1
Cage 17 emerged 5-29-50

Date	Days	Flies Alive M	Flies Alive F	
5/29	1	100	100	Mean Max 67
6/5	7	88	87	Mean Min 47
6/12	14	63	68	
6/19	21	46	60	
6/26	28	28	44	
7/3	35	27	38	

Waikii, 4700' Lot 2 (MRT)
Cage 18 emerged 5-29-50

Date	Days	Flies Alive M	Flies Alive F
5/29	1	100	100
6/5	7	91	90
6/12	14	68	75
6/19	21	34	48
6/26	28	25	40
7/3	35	22	38

Experiment 823

Keanakolu, 5200' Lot 1
Cage 19 emerged 6-2-50

Date	Days	Flies Alive M	Flies Alive F	
6/2	1	100	100	Mean Max 69
6/5	3	88	90	Mean Min 48
6/13	11	51	63	
6/19	17	25	43	
6/27	25	12	34	
7/4	32	5	11	

Keanakolu, 5200' Lot 2 (MRT)
Cage 20 emerged 6-2-50

Date	Days	Flies Alive M	Flies Alive F
6/2	1	100	100
6/5	3	90	96
6/13	11	68	81
6/19	17	46	62
6/27	25	37	51
7/4	32	20	27

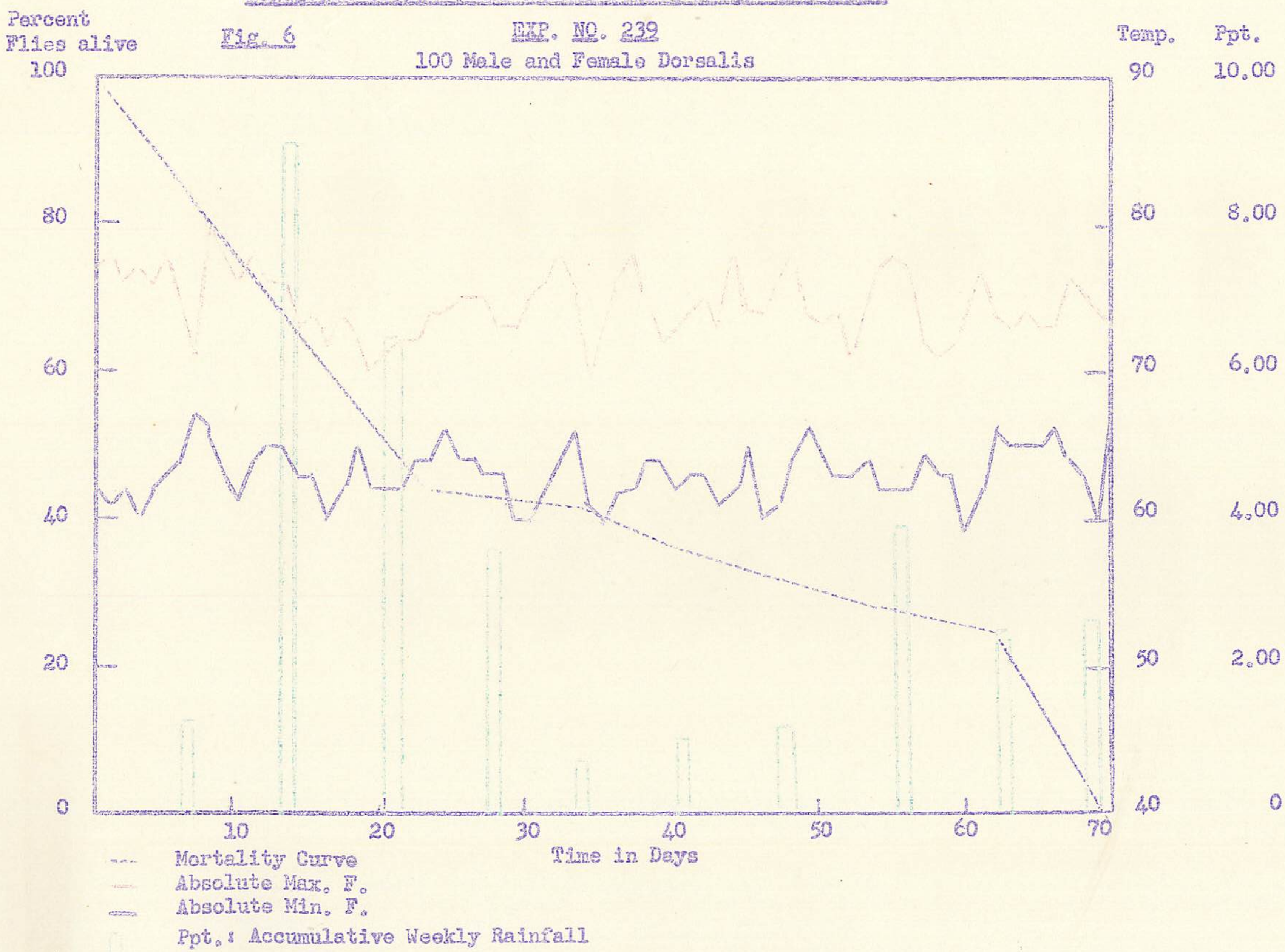
HILO (75')

LONGEVITY STUDIES, RED MARKED FLIES, FEBRUARY RELEASE

Fig. 6

EXP. NO. 239

100 Male and Female Dorsalis



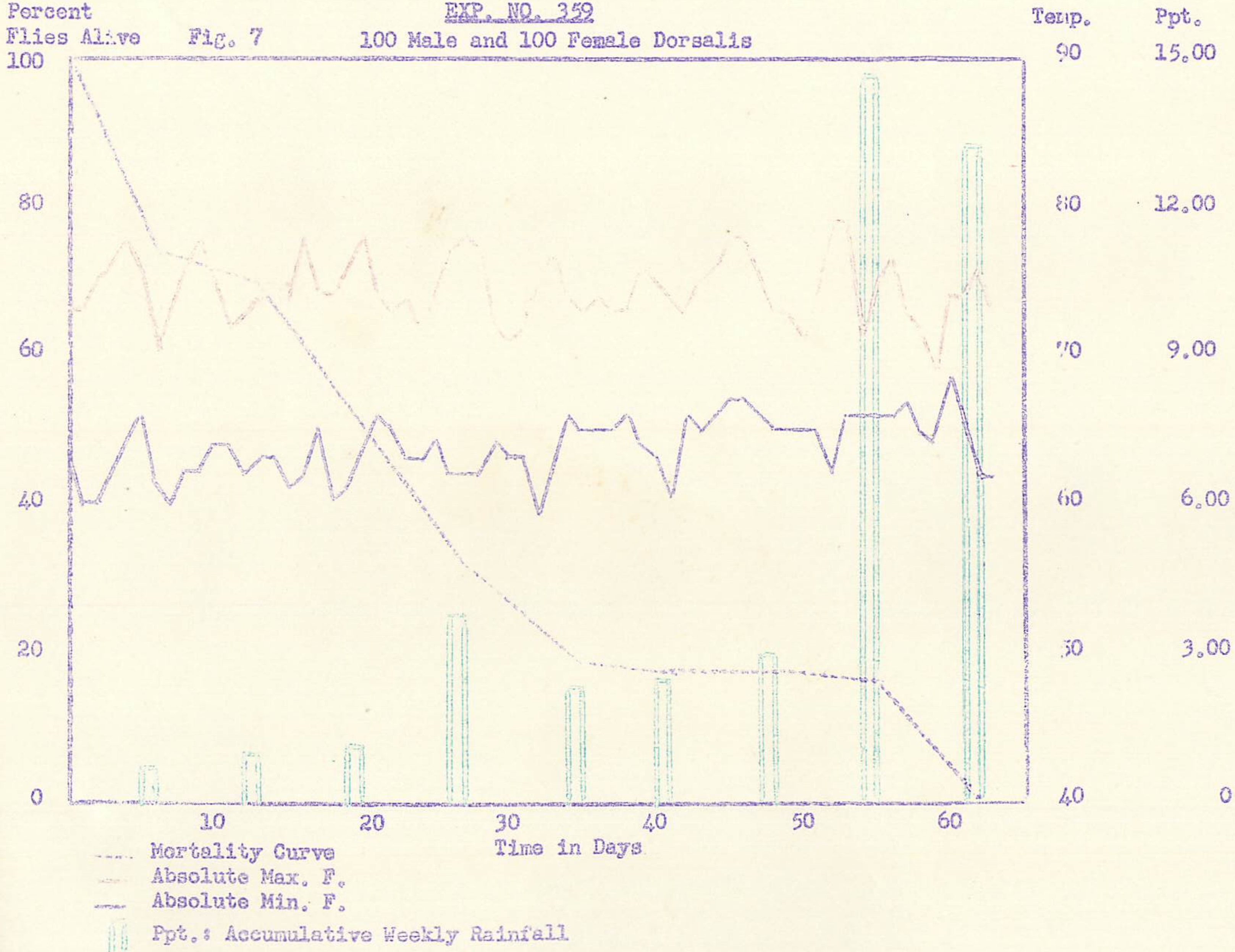
HILO (75')

LONGEVITY STUDIES, WHITE MARKED FLIES, MARCH RELEASE

EXP. NO. 359

Fig. 7

100 Male and 100 Female Dorsalis

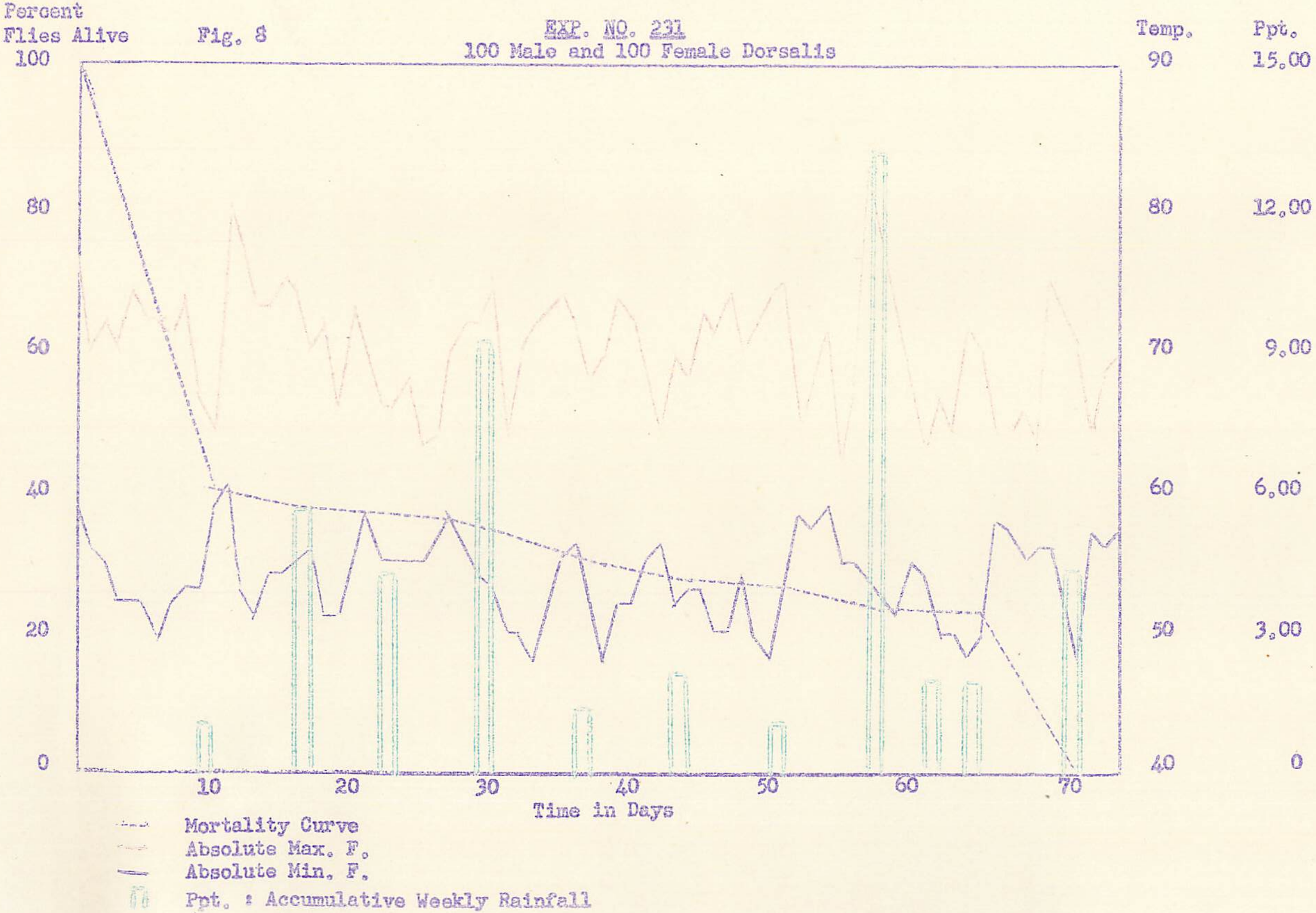


KAUMANA (2000')

LONGEVITY STUDIES, RED MARKED FLIES, FEBRUARY RELEASE

Fig. 8

EXP. NO. 231
100 Male and 100 Female Dorsalis



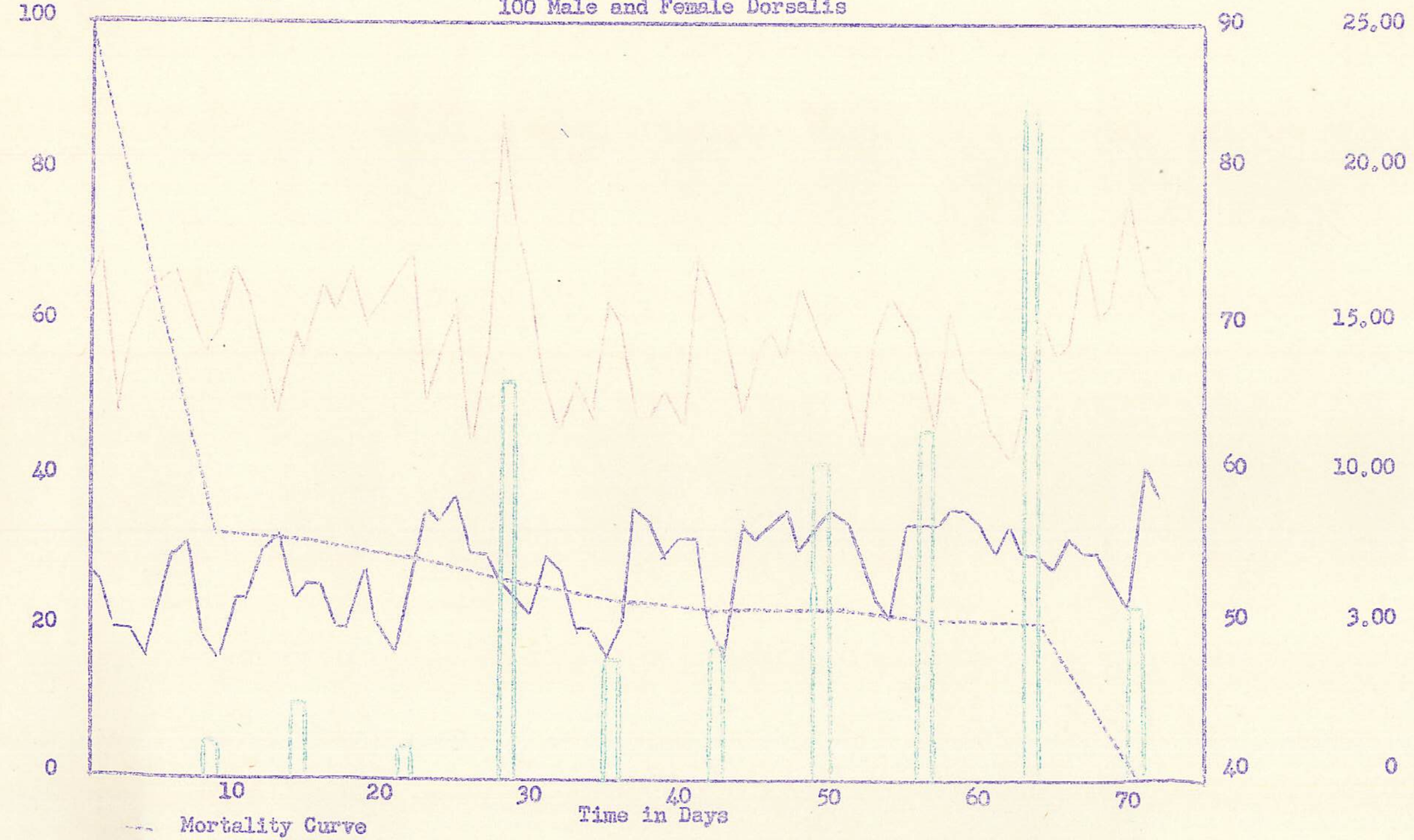
KAUMANA (2000')

LONGEVITY STUDIES. WHITE MARKED FLIES. MARCH RELEASE

Fig. 9

EXP. NO. 341

100 Male and Female Dorsalis



Mortality Curve
Absolute Max. F.
Absolute Min. F.
Ppt. : Accumulative Weekly Rainfall

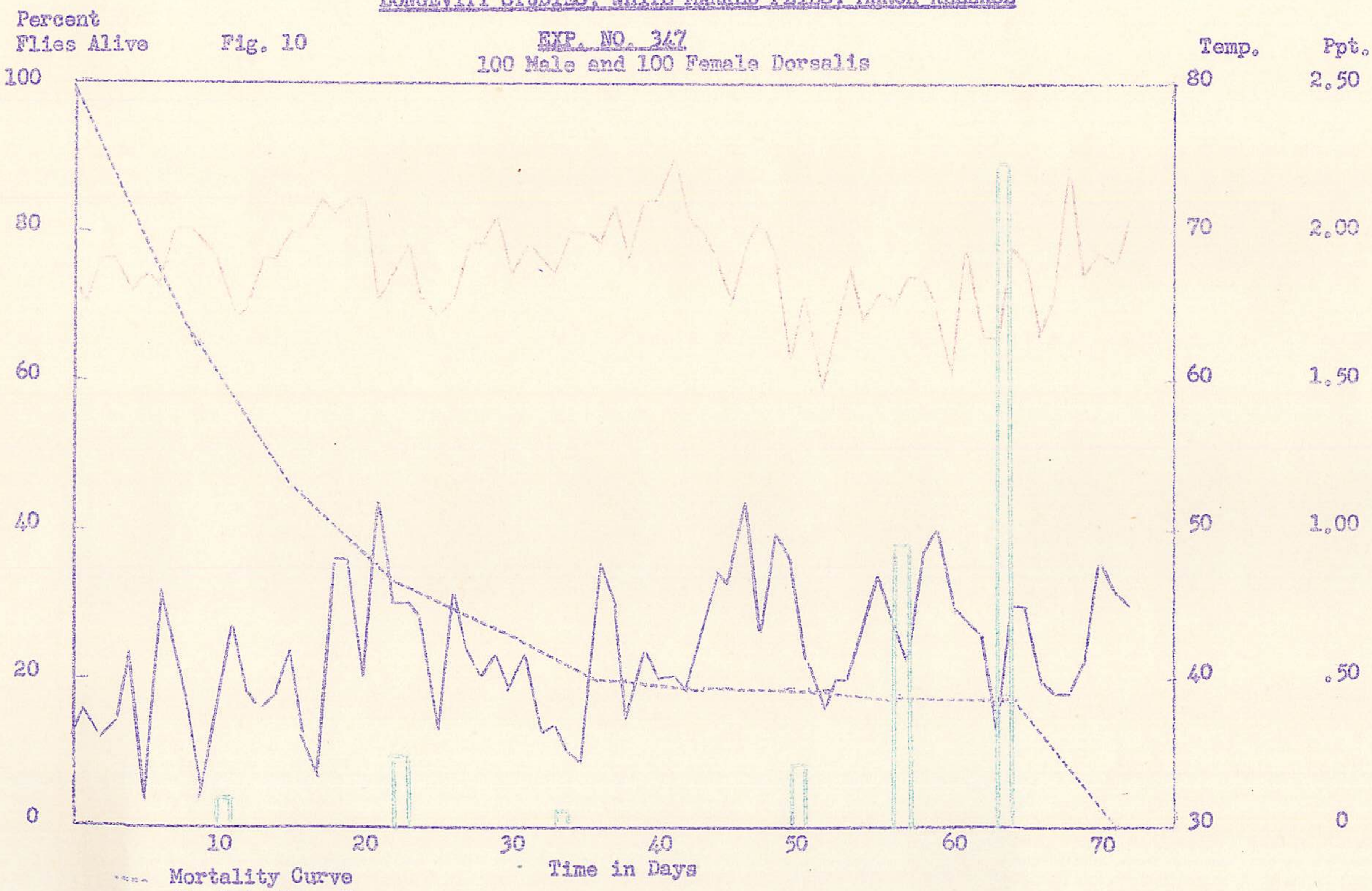
POHAKULOA (6511')

LONGEVITY STUDIES, WHITE MARKED FLIES, MARCH RELEASE

Fig. 10

EXP. NO. 347

100 Male and 100 Female Dorsalis

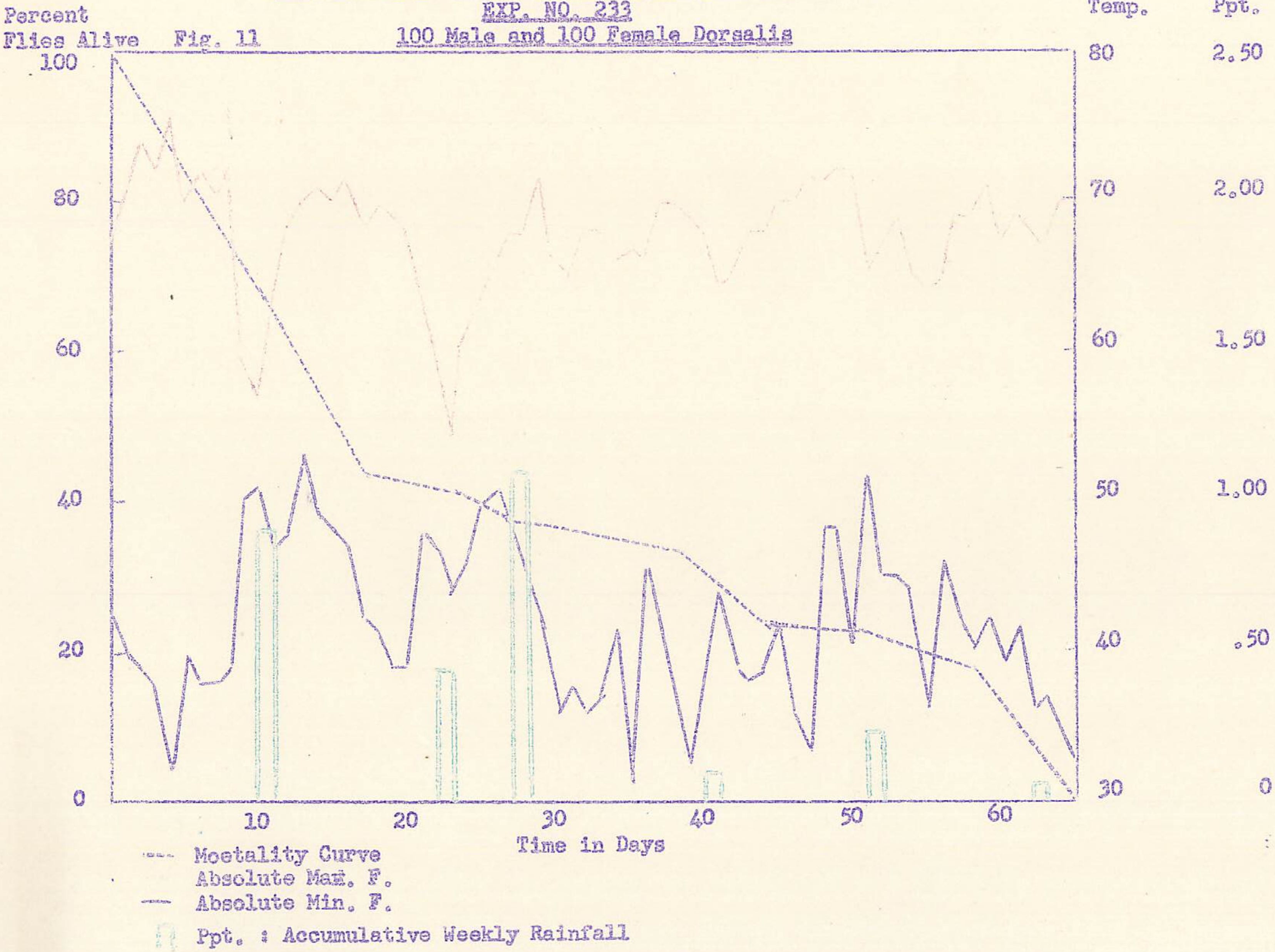


---- Mortality Curve
Absolute Max. F.
Absolute Min. F.
Ppt.: Accumulative Weekly Rainfall

POHAKULOA (6511')

LONGEVITY STUDIES, RED MARKED FLIES, FEBRUARY RELEASE
EXP. NO. 233
100 Male and 100 Female Dorsalis

Fig. 11



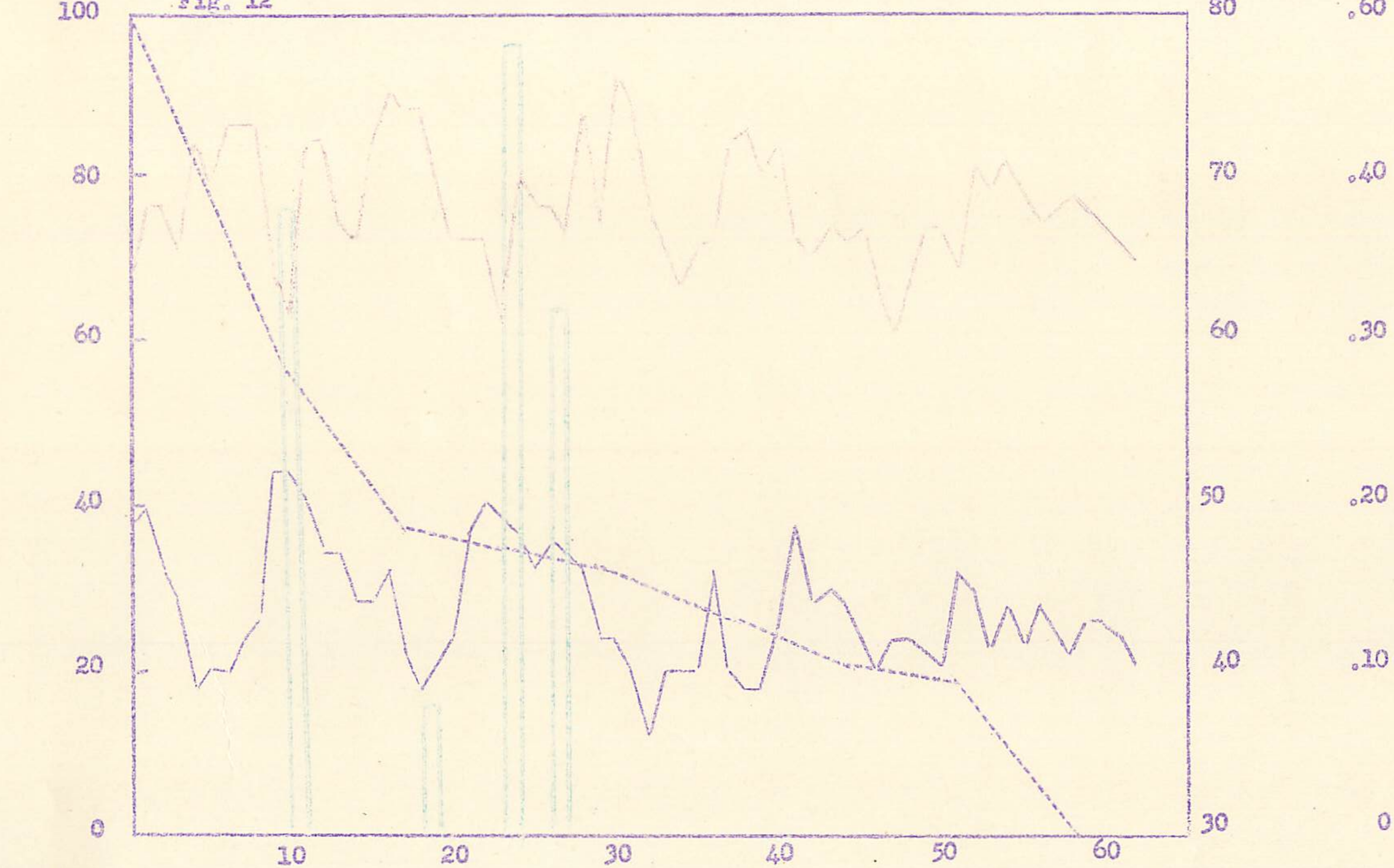
WAIKII (4700')

LONGEVITY STUDIES, RED MARKED FLIES, FEBRUARY RELEASE

EXP. NO. 235

100 Male and 100 Female Dorsalis

Fig. 12



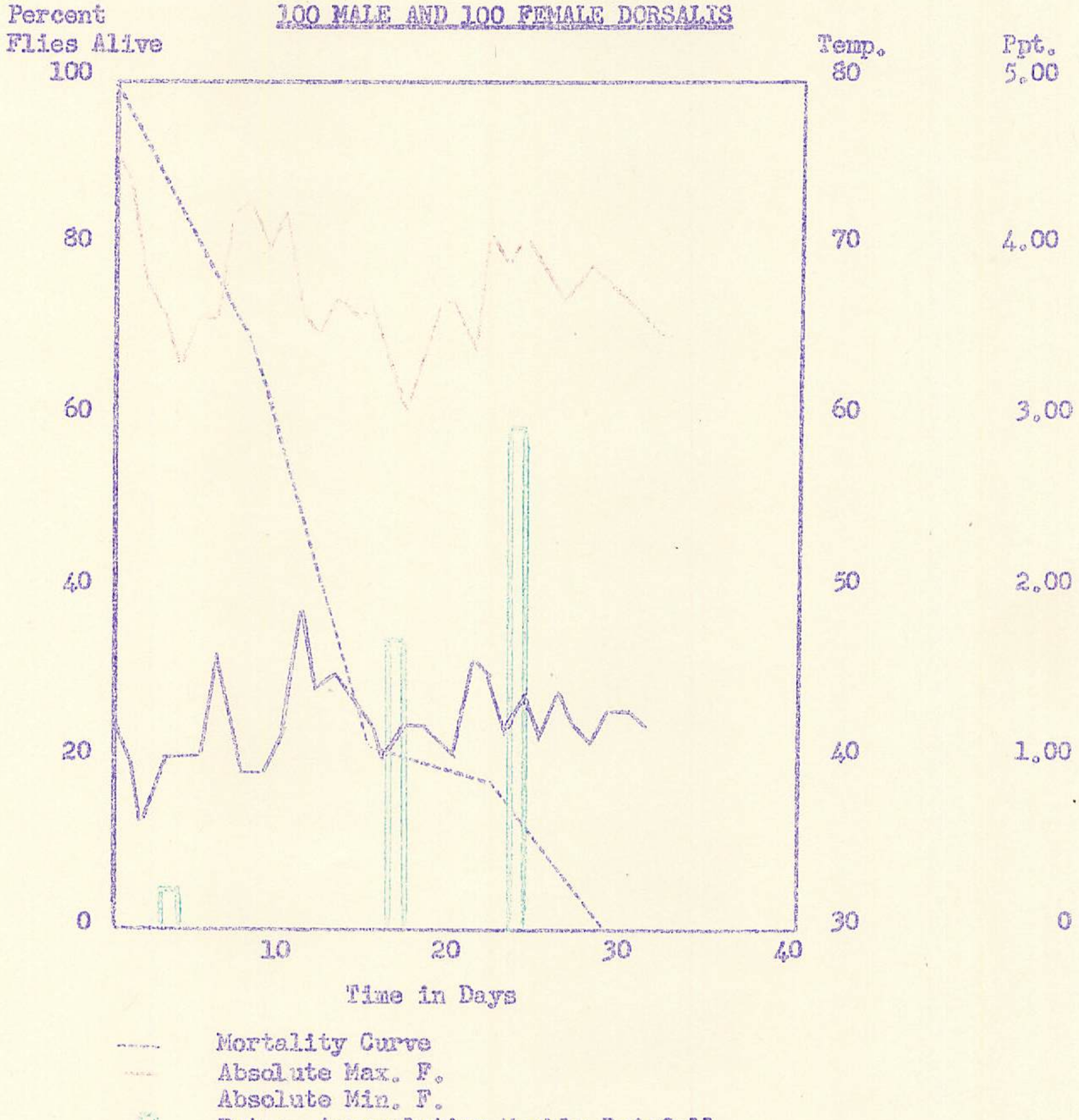
--- Mortality Curve
Absolute Max. F.
Absolute Min. F.
Ppt. : Accumulative Weekly Rainfall

WAIKII (4700')

LONGEVITY STUDIES, WHITE MARKED FLIES, MARCH RELEASE

Fig. 14 EXP. NO. 349

100 MALE AND 100 FEMALE DORSALIS

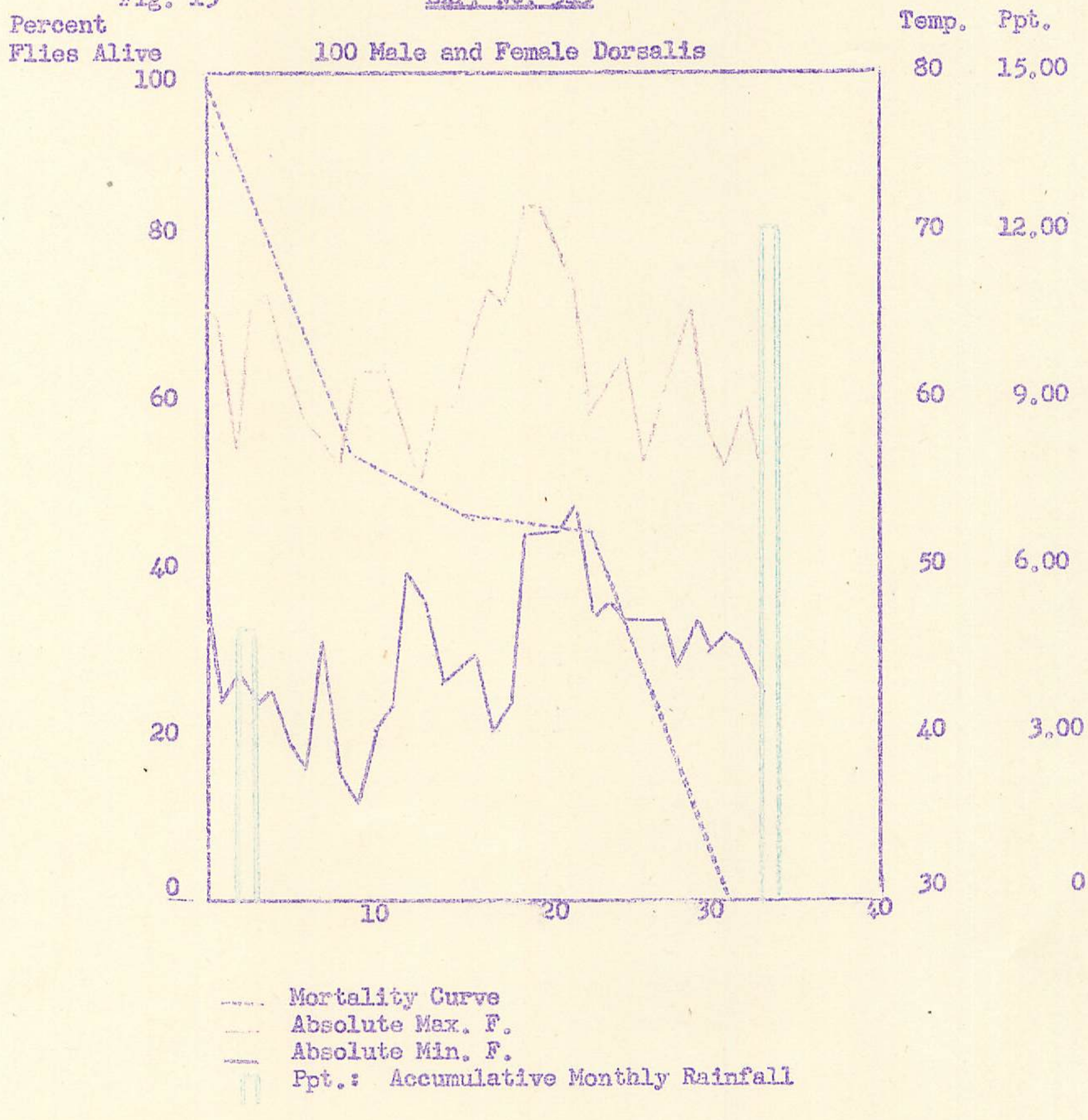


KEANAKOLU (5200')

LONGEVITY STUDIES, WHITE MARKED FLIES, MARCH RELEASE

Fig. 15 EXP. NO. 343

100 Male and Female Dorsalis



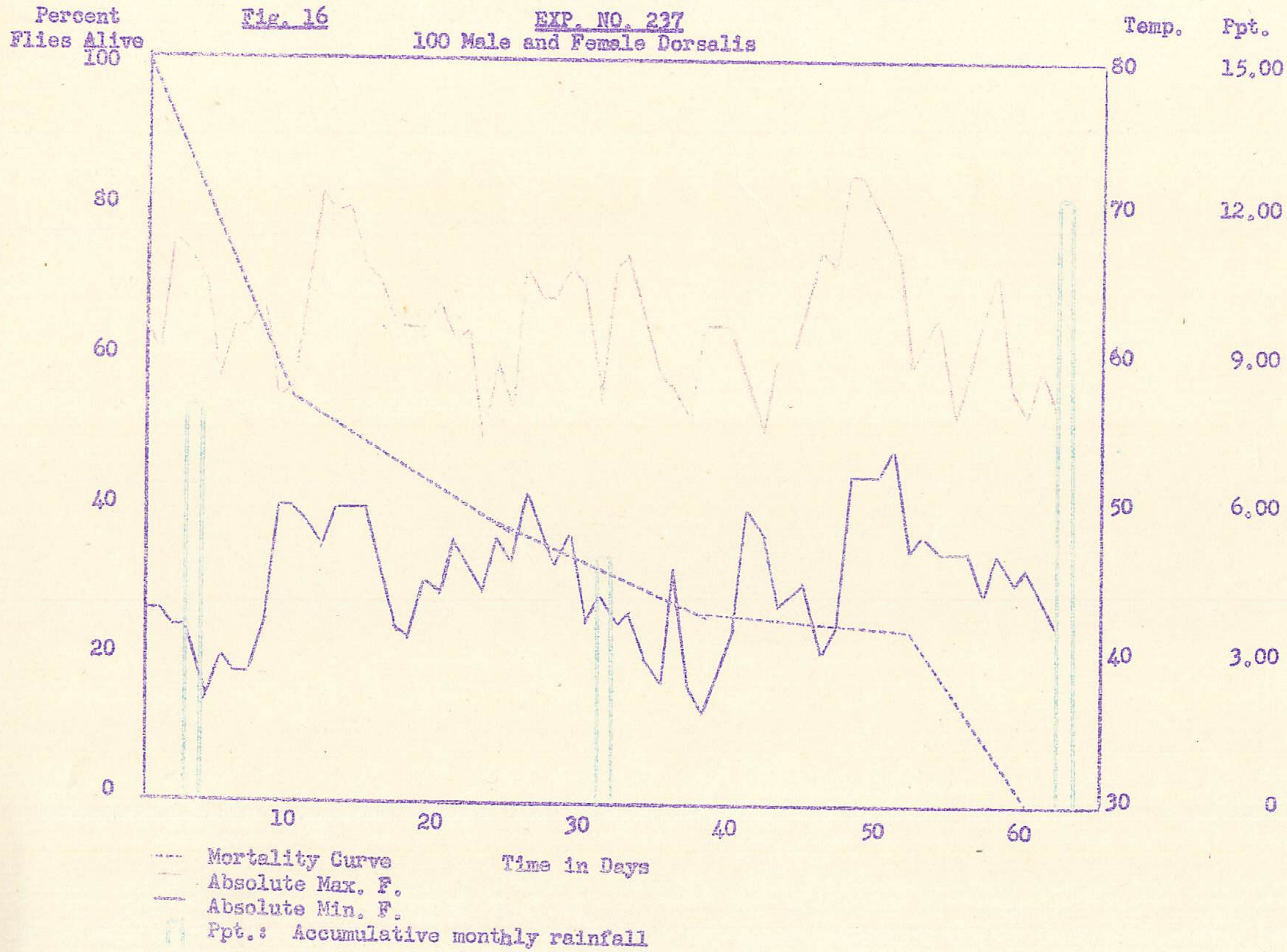
KEANAKOLU (5200')

LONGEVITY STUDIES, RED MARKED FLIES, FEBRUARY RELEASE

Fig. 16

EXP. NO. 237

100 Male and Female Dorsalis



Sexual Maturity

Flies for sexual maturity experiments in the out door cages at all field stations are usually one to two days old when taken to these cages. Beginning with the April release a change in nutrition was made. Two lots of flies were taken to each station, the first lot being fed honey, apple and water and the second lot being fed on the above diet plus M.R.T. The results to date are shown on the following tables:

Exp. 605 Lot 1
Hilo, 75'
Cage 11 emerged 4-20-50

Date	Days	M	F	
4/20	1	100	100	Mean Max <u>75</u>
5/2	12	1(Mat) (Mat)	0	Mean Min <u>64</u>
5/9	19		0	
5/18	28		0	
5/23	33		0	

Exp. 605 Lot 2 (MRT)
Hilo, 75'
Cage 12 emerged 4-20-50

Date	Days	M	F
4/20	1	100	100
5/9	19	1 (Mat) (Mat)	0
5/18	28		0
5/23	33		Eggs Found

Exp. 607 Lot 1
Kaumana, 2000'
Cage 13 emerged 4-20-50

Date	Days	M	F	
4/20	1	100	100	Mean Max <u>70</u>
5/1	11	0	0	Mean Min <u>64</u>
5/8	18	0	0	
5/15	25	5 (Mat)	0	
5/22	32	0	0	

Exp. 607 Lot 2 (MRT)
Kaumana 2000'
Cage 14 emerged 4-20-50

Date	Days	M	F
4/20	1	100	100
5/1	11	0	0
5/8	18	0	0
5/15	25	4 (Mat)	0
5/29	39		
6/1	42		Eggs Found

Exp. 603 Lot 1
Pohakuloa, 6511'
Cage 15 emerged 4-18-50

Date	Days	M	F	
4/18	1	100	100	Mean Max <u>70</u>
5/1	13	0	0	Mean Min <u>56</u>
5/8	20	0	0	
5/15	27	0	0	
5/22	34	0	0	

Exp. 603 Lot 2 (MRT)
Pohakuloa, 6511'
Cage 16 emerged 4-18-50

Date	Days	M	F
4/18	1	100	100
5/1	13	0	0
5/8	20	0	0
5/15	27	0	0
5/22	34	0	0
5/29	41		0
6/5	48		0
6/12	55		0

Sexual Maturity

Exp. 593 Lot 1
Waikii, 4700'
Cage 17 emerged 4/15/50

Date	Days	M	F	
4/15	1	100	100	Mean Max 67
5/1	16	0	0	Mean Min 46
5/8	23	0	0	
5/15	30	0	0	

Exp. 593 Lot 2 (MRT)
Waikii, 4700'
Cage 18 emerged 4-15-50

Date	Days	M	F
4/15	1	100	100
5/1	16	0	0
5/8	23	1	0
5/15	30	0	0
5/22	37	0	0
5/29	44	0	0
6/5	51		0
6/12	58		0

Exp. 595 Lot 1
Keanakolu, 5200'
Cage 19 emerged 4-15-50

Date	Days	M	F	
4/15	1	100	100	Mean Max 61
5/2	17	0	0	Mean Min 46
5/9	24	0	0	
5/16	31	0	0	
5/23	38	2(Mat)	0 (Mat)	

Exp. 595 Lot 2 (MRT)
Keanakolu, 5200'
Cage 20 emerged 4-15-50

Date	Days	M	F
4/15	1	100	100
5/2	17	0	0
5/9	24	0	0
5/16	31	0	0
5/23	38	0	0

Exp. 845
Hilo, 75'
Cage 11 emerged 6-6-50

Date	Days	M	F	
6/6	1	50	50	Mean Max 78
6/15	9	-	-	Mean Min 66
6/21	15	3 Mat	-	
6/30	24	-	-	
7/5	29	-	-	

Exp. 793 (MRT)
Hilo, 75'
Cage 12 emerged 5-27-50

Date	Days	M	F
5/27	1	50	50
6/9	13	4 Mat	Eggs Immature
6/16			Eggs fertile

Exp. 855 Lot 1
Pohakuloa, 6511'
Cage 15 emerged 6-7-50

Date	Days	M	F	
6/7	1	50	50	Mean Max 71
6/19	12	-	-	Mean Min 36
6/26	19	1 Mat	-	

Exp. 855 Lot 2 (MRT)
Pohakuloa, 6511'
Cage 16 emerged 6-7-50

Date	Days	M	F
6/7	1	50	50
6/19	12	-	-
6/26	19	2 Mat	-

Sexual Maturity

Exp. 857 Lot 1
Waikii, 4700'
Cage 17 emerged 6-7-50

Date	Days	M	F	
6/7	1	50	50	Mean Max 67
6/19	12	-	-	Mean Min 47
6/23	16	1 Mat-		

Exp. 857 Lot 2 (MRT)
Waikii, 4700'
Cage 18 emerged 6-7-50

Date	Days	M	F
6/7	1	50	50
6/19	12	-	-

Exp. 797 Lot 1
Keanakolu, 5200'
Cage 19 emerged 5-28-50

Date	Days	M	F	
5/28	1	50	50	Mean Max 69
6/13	16	-	-	Mean Min 47
6/19	22	3 Mat-		

Exp. 797 Lot 2 (MRT)
Keanakolu, 5200'
Cage 20 emerged 5-28-50

Date	Days	M	F
5/28	1	50	50
6/13	16	-	-
6/29	23	2 Mat-	

Exp. 795
Kaumana, 2000'
Cage 13 emerged 5-29-50

Date	Days	M	F	
5/29	1	50	50	Mean Max 73
6/5	7	-	-	Mean Min 58
6/12	14	None Alive		

Exp. 877 Lot 1
Kaumana, 2000'
Cage 13 emerged 6-12-50

Date	Days	M	F	
6/12	1	50	50	Mean Max 70
6/19	7	-	-	Mean Min 59
6/23	11	1 Mat -		

Exp. 877 Lot 2 (MRT)
Kaumana, 2000'
Cage 14 emerged 6-12-50

Date	Days	M	F
6/12	1	50	50
6/19	7	-	-
6/23	11	2 Mat-	

Maturity was determined by dissection of the males and recovery of eggs in bananas. Bananas are placed in the cages on Mondays and removed on Fridays.

It will be noted that the control cages failed to produce mature females whereas mature females were found in the M.R.T. experiments at the lower stations.

Preliminary studies on sexual maturity under sheltered conditions have indicated that females attain maturity between 30 to 70 days on a honey diet.

However, under outdoor cage conditions most of the flies die before attaining maturity on the same diet.

The females which attained maturity were those that were confined to small standard cages, 10 x 10 x 10", within the large cages.

MATING

The crepuscular mating habits of Dacus dorsalis could well be a limiting factor insofar as the reproductive possibilities of the fly are concerned; for in many areas, particularly at higher elevations, at twilight there is a sharp drop in temperature. The following observations have been made regarding the mating habits of this fly:

On April 14th, 250 newly emerged females were placed in cages, care being taken that no males were present. In the middle of June dissection showed that these females were fully mature, their abdomens having considerable numbers of good sized eggs.

On June 26th about 50 of these mature, virgin females were taken to the Haleakala Station (7030') in a holding cage and about 50 male field flies introduced into the cage at 7:00 p.m. at a temperature of 55 degrees. Little activity was evident and no mating was observed when the flies were checked at 8:30. The temperature was 48 degrees.

On June 27th a cage of 50 more females were placed outside the Kula Insectory and 50 field male flies placed in the cage. Another cage of field male and female were placed along side the first. These cages were checked every evening between 6:00 and 7:00 at which time the temperature is usually about 63-66 degrees. Negative results were noted until July 8th when two pair were observed mating in the field cage. The temperature was 61.5. On July 10 at 6:30 p.m., temp. 63 degrees, another pair of field flies were observed mating. On this particular evening there was no sun and it had been raining all day. On July 12, at 7:00 p.m., temperature 63 degrees one pair was observed mating. This field cage had been checked at 6:00 with negative results. On July 13, 7:15 p.m., temperature 63 one pair in each cage were observed mating. This was the first time the cage containing the virgin females which were at that time 89 days old had been checked and flies were found mating.

On July 14, 50 mature virgin females were taken in a holding cage to Halekala (9200') the following was noted: 6:00 p.m., temperature 61 degrees, sunny, flies active; 6:40 p.m., temperature 54 degrees, flies inactive, fog closing in; 6:50 p.m., temperature 52 degrees, fog closed in, no longer sunny, flies inactive. No mating observed. The flies were then taken to 7030' and at 7:30 the temperature was 58 degrees, and the flies were inactive. At 9:30 the flies were checked again but no mating was observed. The temperature was then 50 degrees.

In contrast to this rather unfriendly atmosphere which seems to prevail between the sexes of Dacus dorsalis a brief check on the libido of Ceratitis capitata shows that they will mate anytime between 8:00 a.m. and 8:00 p.m. On July 9 at 1:30 in the afternoon a cage of mixed dorsalis and capitata were checked to find 23 pairs of C. capitata mating. Another cage examined had 13 pairs mating.

SUMMARY

It is definitely proven that D. dorsalis will mate at temperatures slightly below 63 degrees. To date we have negative results where the temperature is below 60 degrees at twilight. It appears that C. capitata would be able to reproduce in areas which would preclude mating of Dorsalis because the one species mates in the daytime and the other at twilight.

Oviposition

Lots 1-28 last quarter
Experiments 465-717 this quarter
Experiments 719 to 917 incomplete and will be reported next quarter

The following experiments on oviposition involved exposing a banana to gravid females that were held at each station in a standard insect cage. The usual number of females was about 50 and the fruit was exposed for four days at the higher stations and from one to 4 hours at Hilo.

In the course of these experiments, two interesting observations were made concerning female activity and oviposition at temperatures below 60° F. At 3 p.m., May 1, 1950, a half ripe banana was placed in a standard insect cage at Pohakuloa (6511'). The cage contained about 50 gravid females and the temperature at the time was 62° F. (Certified thermometer placed along side cage). Two females promptly assumed the angle for oviposition and appeared to be ovipositing. An hour later (58° F.) one female withdrew. The other female withdrew at 6:15 p.m. and the temperature at that time was 51° F. The banana was immediately examined for eggs but none were found. While the attempt to obtain information on minimum temperatures for oviposition failed, female activity at the above temperatures is noteworthy.

On May 22, 1950, between 5:55 and 6:50 p.m. the following observations on oviposition and female activity were made at Keanakolu, 5200' elevation, on the north east slope of Mauna Kea.

5:55 p.m.	5 females ovipositing	55° F. Temp. 100% Humidity
6:25 p.m.	2 females ovipositing	55° F. Temp. 100% Humidity
6:45 p.m.	1 female ovipositing	54° F. Temp. 100% Humidity
6:50 p.m.	1 female withdrew	54° F. Temp. 100% Humidity

*

The banana was removed at 7 p.m. and twenty eggs were found.

Observations under these conditions have totaled three of which only one resulted in the discovery of eggs. Further observations on ovipositions at low temperatures are planned.

There follows a summary of oviposition studies that were undertaken between experiments 465 to 717.

* Placed in cage about 5:45 p.m.

OVIPOSITION

	Kaumana 2000' Exp. 465	Pohakuloa 6511' Exp. 467	Waikii 4700'	Keanakolu 5200'
1st exposed:	3/20/50	3/20/50		
Last exposed:	3/27/50	3/27/50		
Punct. or eggs obs.	Yes	No		
Larvae Pupated:	Between 4/17/50 & 4/21/50	Negative		
Adults emerged:	Between 5/12/50 & 5/15/50			
Pupal period:	24-28 days			
Total cycle:	45-50 days			
Mean Max. temp:	69° F.	66° F.		
Mean Min. temp.:	55° F.	44° F.		

	Kaumana Exp. 495	Pohakuloa Exp. 497	Waikii Exp. 499	Keanakolu
1st exposed:	3/27/50	3/27/50	3/28/50	
Last exposed:	4/3/50	4/3/50	4/4/50	
Punct. or eggs obs.	No	No	Yes	
Larvae pupated:	Negative	Negative	Negative	
Mean Max. temp.:	69° F.	69° F.	66° F.	
Mean Min. temp.:	51° F.	38° F.	46° F.	

	Kaumana Exp. 535	Pohakuloa Exp. 537	Waikii Exp. 539	Keanakolu Exp. 541
1st exposed:	4/3/50	4/3/50	4/3/50	4/4/50
Last exposed:	4/10/50	4/10/50	4/10/50	4/11/50
Punct. or eggs obs.	Yes	Yes	Yes	Yes
Larvae pupated:	4/28/50	Negative	Between 4/28 & 5/1	Negative
Adults emerged:	Negative		Negative	
Pupal period:	18-25 days		18-28 days	
Mean Max. temp.:	68° F.	67° F.	66° F.	61° F.
Mean Min. temp.:	55° F.	43° F.	46° F.	46° F.

	Kaumana Exp. 553	Pohakuloa Exp. 555	Waikii Exp. 557	Keanakolu Exp. 559
1st exposed:	4/10/50	4/10/50	4/10/50	4/11/50
Last exposed:	4/14/50	4/14/50	4/14/50	4/18/50
Punct. or eggs obs.	Yes	No	Yes	No
Larvae pupated:	Between 4/21 & 4/24	Negative	Between 5/1 & 5/8	Negative
Adults emerged:	Between 5/12 & 5/15		Between 6/9 & 6/12	
Pupal period:	18-24 days		32-36 days	
Total cycle:	31-35 days		56-60 days	
Mean Max. temp.:	70° F.	69° F.	66° F.	62° F.
Mean Min. temp.:	56° F.	45° F.	47° F.	50° F.

	Exp. 579	Exp. 581	Exp. 583	Exp. 601
1st exposed:	4/14/50	4/14/50	4/14/50	4/18/50
Last exposed:	4/21/50	4/21/50	4/21/50	4/25/50
Punct. or eggs obs.	Yes	No	Yes	Yes
Larvae pupated:	Negative	Negative	Negative	Negative
Mean Max. temp.:	67° F.	56° F.	64° F.	60° F.
Mean Min. temp.:	56° F.	44° F.	47° F.	47° F.

	Exp. 623	Exp. 609	Exp. 611	Exp. 613	Exp. 627
1st exposed:	4/24/50	4/21/50	4/21/50	4/21/50	4/25/50
Last exposed:	4/25/50	4/28/50	4/28/50	4/28/50	5/2/50
Punct. or eggs obs.	Yes	Yes	No	Yes	Yes
Adults emerged:	5/19/50	Negative	Negative	Negative	Negative
Pupal period:	14 days				
Total cycle:	25-26 days				
Mean Max. temp.:	76° F.	70° F.	65° F.	67° F.	61° F.
Mean Min. temp.:	65° F.	56° F.	45° F.	46° F.	45° F.

	Exp. 643	Exp. 645	Exp. 647	Exp. 649	Exp. 651
1st exposed:	5/1/50	5/1/50	5/1/50	5/1/50	5/2/50
Last exposed:	5/2/50	5/5/50	5/5/50	5/5/50	5/9/50
Punct. or eggs obs.	Yes	No	No	Yes	Yes
Larvae pupated:	5/12/50	Negative	Negative	Negative	Negative
Adults emerged:	5/27/50				
Pupal period:	15 days				
Total cycle:	25-26 days				
Mean Max. temp.:	77° F.	71° F.	66° F.	67° F.	61° F.
Mean Min. temp.:	65° F.	55° F.	41° F.	46° F.	45° F.

	Exp. 673	Exp. 675	Exp. 677	Exp. 679	Exp. 681
1st exposed:	5/7/50	5/8/50	5/8/50	5/8/50	5/9/50
Last exposed:	5/8/50	5/12/50	5/12/50	5/12/50	5/16/50
Punct. or eggs. obs.	Yes	Yes	No	Yes	No
Larvae pupated:	5/19/50	5/27/50	Negative	Between 5/29 & 5/30	Negative
Adults emerged:	6/2/50	Between 6/16 & 6/19		Between 7/1 & 7/7	
Pupal period:	14 days	20-23 days		31-37 days	
Total cycle:	25-26 days	35-40 days		51-58 days	
Mean Max. temp.:	77° F.	70° F.	70° F.	67° F.	
Mean Min. temp.:	65° F.	58° F.	44° F.	47° F.	

	Exp. 713	Exp. 717
1st exposed:	5/17/50	5/15/50
Last exposed:	5/17/50	5/19/50
Punct. or eggs obs.	Yes	Yes
Larvae pupated:	5/26/50	Negative
Adults emerged:	6/7/50	
Pupal period?	12 days	
Total cycle:	21 days	
Mean Max. temp.:	79° F.	70° F.
Mean Min. temp.:	65° F.	43° F.

Hatching Studies

Lots 1-54 last quarter.
Experiments 507-663 this quarter.
Experiments 883-885 which are incomplete will be included in next quarterly report.

An average of seventeen eggs was transferred to individual bananas for each station and the technique employed was as described in the last quarterly report.

One variation was used in experiment number 533 at Keanakolu in which the flap of banana that was removed in order to deposit the eggs was replaced and sealed with parafin. Results of hatching studies are as follows:

	Exp. 507 Hilo	Exp. 533 Keanakolu
Eggs laid	Bet. 3/29 & 3/30	4/3/50
Eggs transferred	3/30/50 (20)	4/3/50 (30)
Eggs hatched	Bet. 3/31 & 4/4	Bet. 4/4 & 4/11
% hatched	70%	40%
Incubation period	2-3 days	4-7 days
Larvae pupated	4/11/50	5/9/50
Adults emerged	4/28/50	Bet. 6/5 & 6/13
Total Cycle	30 days	63 to 71 days
Mean Max.	71	63
Mean Min.	62	46

	Exp. 563 Hilo	Exp. 565 Kaumana	Exp. 567 Pohakuloa	Exp. 569 Waikii
Eggs laid	4/13	4/13	4/13	4/13
Eggs transferred	4/13 (10)	4/13 (10)	4/13 (10)	4/13 (10)
Eggs hatched	4/15-16	4/14-4/17	Negative	4/17-4/21
% hatched	40%	80%	0	50%
Incubation period	2-3 days	3-4 days		4-7 days
Larvae pupated	4/28-4/30	4/19-4/24		Negative
Adults emerged	5/15	Negative		
Total Cycle	32 days			
Mean Max.	76	68	65	64
Mean Min.	66	56	44	48

LARVAL STUDY IN APPLE

Kula Insectary

Experiment 346

5/19-7/6/50

TABLE 19

Location	Pupal Chamber	Outside Insect
Temp.	65-80	50-90
Innoculated	5/19	5/19
Eggs	25	25
Larvae	5/20 to 6/9	5/20 to 6/11
Duration	22 to	22 to 26
Pupae	6/12 to	6/12 to 6/16
Duration	16 days	22 days
First Adult	6/28	7/4 dorsalis
Last Adult	7/6	7/6
Emergence Span	8 Days	2 days
	E L P	E L P
Duration	2-3 22 16	2-3 22-26 22
Complete Cycle	41 days	46 to 51 days

Note. Eggs used from innoculation were field eggs taken from mango. Egg hatch at Kula is from 2-3 days.

Temperature indicated for outside is a result of sun rays, striking fruit.

DURATION OF LARVAL PERIOD IN BANANA
TABLE 20

Station	KULA	HAIKU	HALEAKALA	HALEAKALA	WAIKAMOI
Elevation	3750'	500'	7030'	9200'	4200'
Experiment	392	394	396	398	400
Lot	1	1	1	1	1
Abs. Max.	70	80	78	76	66
Max. Mean	67.7	76.6	64.8	60.1	60.4
Min. Mean	52.3	65.8	45.1	43.5	51.8
Abs. Min	48	62	38	38	47
Date	6/2	6/2	6/2	6/2	6/2
Stage	egg	egg	egg	egg	egg
Date	6/3	6/3	6/3	6/3	6/3
Stage	Larvae	Larvae	Larvae	Larvae	Larvae
Date	6/26	6/27	7/11	7/17	7/17
Stage	Pupae	Pupae	Pupae	Pupae	Pupae
Duration Larval Stage	23 days	24 days	38 days	44 days	44 days
Date	7/13	7/10	to date neg	to date neg	to date neg
Stage	Adult	Adult			
Pupal Period	17	13	-	-	55 est.
Complete Cycle	41	38	100 est.	110 est.	95 est.

NOTE: Field eggs used and 25 eggs placed in each banana.

Apples used in five replicas of the above were negative.

Est: Estimated, negative to this date

LARVAL STUDIES

Approximately twenty first instar larvae are transferred to bananas and the subsequent development recorded at each station. Results are as follows:

Station	Date 1st inst. trans.	No. of larvae	Date pupated	Larval period	Mean max	Mean min.	Exp. no.
Hilo	2/24	13	3/7	11 days	74	63	331
Pohakuloa	2/24	12	3/24-3/27	31 "	68	41	333
Kaumana	3/3	9	3/7-3/20	15-18 days	71	52	373
Pohakuloa	3/3	9	3/27-3/31	25-29 "	68	41	375
Hilo	3/8	20	3/18	10 days	75	63	389
Kaumana	3/9	20	3/24-3/27	15-18 days	71	53	391
Pohakuloa	3/9	20	3/27-3/31	18-22 "	68	41	393
Waikii	3/13	15	3/31-4/3	21 days	67	44	419
Keanakolu	3/13	30	4/3-4/11	23-29 days	63	45	421
Hilo	3/13	15	3/25	12 days	74	63	423
Kaumana	3/13	15	3/31-4/3	18-21 days	71	53	425
Pohakuloa	3/13	20	4/7-4/18	25-28 "	69	41	427
Waikii	3/17	10	4/7-4/10	21-24 "	68	43	445
Hilo	3/17	10	3/26	9 days	75	63	447
Kaumana	3/17	10	Negative		70	53	449
Pohakuloa	3/17	10	Negative		68	43	451
Hilo	3/24	20	4/5	11 days	74	62	487
Kaumana	3/24	20	4/10-4/14	17-21 days	69	54	489
Pohakuloa	3/24	20	Negative		68	42	491
Hilo	3/31	20	4/12	12 days	74	64	519
Kaumana	3/31	20	4/21	21 "	68	54	521
Pohakuloa	3/31	20	Negative		67	43	523
Waikii	3/31	20	4/28	28 days	66	46	525
Keanakolu	4/4	30	4/25-5/1	21-27 days	61	46	543
Hilo	4/7	20	4/18	11 days	75	65	545
Kaumana	4/7	20	4/28	21 "	68	55	547
Pohakuloa	4/7	20	5/8-5/12	31-35 days	67	43	549
Waikii	4/7	20	Negative		66	46	551
Hilo	4/14	10	4/24	10 days	75	65	571
Kaumana	4/14	10	4/29	15 "	67	56	573
Pohakuloa	4/14	10	5/15	31 "	69	43	575
Waikii	4/14	10	Negative		64	47	577
Hilo	4/18	20	4/28	10 days	74	65	597
Keanakolu	4/18	20	5/10-5/15	22-27 days	60	45	599

Hatching Studies - Cont.

	Exp. 657 Hilo	Exp 659 Kaumana	Exp. 661 Pohakuloa	Exp. 663 Waikii
Eggs laid	5/5	5/5	5/5	5/5
Eggs transferred	5/5 (20)	5/5 (20)	5/5 (20)	5/5 (20)
Eggs hatched	5/7-5/8	Negative	Negative	5/8-5/10
% hatched	90%	0	0	10%
Incubation period	2-3 days			4-5 days
Larvae pupated	5/17			6/2
Adults emerged	6/1			7/7-7/10
Total Cycle	27 days			63-66 days
Mean Max.	77	74	69	66
Mean Min.	65	56	42	46

Station	Date 1st inst. trans.	No. of larvae	Date pupated	Larval period	Mean max.	Mean min.	Exp. no.
Hilo	4/21	20	4/30	9 days	74	66	615
Kaumana	4/21	20	5/5-5/8	14-17 days	69	56	617
Pohakuloa	4/21	20	5/19-5/22	28-31 days	67	43	619
Waikii	4/21	20	5/12-5/15	21-24 days	66	46	621
Hilo	4/28	20	5/8-5/10	10-12 days	76	65	635
Kaumana	4/28	20	5/12-5/15	14-17 "	71	56	637
Pohakuloa	4/28	20	5/22-5/26	24-28 "	69	43	639
Waikii	4/28	20	5/15-5/19	17-21 "	66	46	641
Hilo	5/5	20	5/16	11 days	78	66	665
Kaumana	5/5	16	5/15-5/19	10-14 days	73	57	667
Pohakuloa	5/5	12	6/2	27 days	70	43	669
Waikii	5/5	16	5/20-5/22	15-17 days	66	47	671
Hilo	5/12	18	5/24	12 days	76	65	683
Kaumana	5/12	18	5/27-5/28	15-16 days	69	59	685
Pohakuloa	5/12	18	6/2	21 days	70	43	687
Waikii	5/12	18	5/29	17 "	66	47	689
Hilo	5/19	20	5/29-5/31	10-12 days	77	64	739
Kaumana	5/19	20	6/5-6/9	17-21 "	70	58	741
Pohakuloa	5/19	20	Negative		71	38	743
Waikii	5/19	20	6/9	21 days	67	47	745
Hilo	5/26	10	6/2-6/7	8-12 days	79	65	785
Kaumana	5/26	10	Negative		70	58	787
Pohakuloa	5/26	10	6/12	17 days	71	38	789
Waikii	5/26	10	6/9-6/12	14-17 days	66	47	791
Hilo	6/2	17	6/12	10 days	77	65	827
Kaumana	6/2	18	6/24-6/26	22-24 days	71	59	829
Pohakuloa	6/2	17	6/23	21 days	71	36	831
Waikii	6/2	18	6/23	21 days	66	47	833
Hilo	6/9	12	6/19	10 days	78	66	847
Kaumana	6/9	14	6/26-6/30	17-21 days	71	59	849
Pohakuloa	6/9	14	6/29-6/30	20-21 "	71	36	851
Waikii	6/9	16	6/30	21 days	68	47	853

	Exp. 625	Exp. 629	Exp. 631
Date pupated	4/24 to 4/25 (35)	4/27 to 4/28 (30)	4/27 to 4/28 (30)
Date to station	4/25	4/28	4/28
Date emerged	5/9 to 5/10	Negative	Negative
% emerged	67% 11% parasites		
Pupal duration	14 to 15 days		
Mean max. temp.	76	71	68
Mean min. temp.	65	56	43

	Exp. 621
Date pupated	4/27 to 4/28 (30)
Date to station	4/28
Date emerged	100% mortality
Mean max. temp.	76
Mean min. temp.	65

	Exp. 653	Exp. 655
Date pupated	5/4	5/4
Date to station	5/5 (50)	5/5 (50)
Date emerged	5/18	6/5 to 6/9
% emergence	46% 4% parasites	6%
Pupal duration	14 days	32 to 36 days
Mean max. temp.	77	69
Mean min. temp.	66	41

PUPAL STUDIES

Lots 1-20 last quarter
Experiments 473-815 this quarter

Day old pupae are taken to each station and held in standard rearing cages until emergence. The pupal emergence at each locality has not varied greatly over that furnished in the last quarterly report. In presenting the following table on pupal duration for the various stations, it will be noted that emergences took place at Pohakuloa on June 5 and June 26.

Duration of Pupal Period

	Exp. 473 Hilo	Exp. 475 Kaumana	Exp. 477 Pohakuloa
Date Pupated	3/22 to 3/23 (25)	3/22 to 3/23 (25)	3/22 to 3/23 (25)
Date to station	3/24	3/24	3/24
Date emerged	Negative	Negative	Negative
Mean max. temp.	74	68	67
Mean min. temp.	63	54	42
	Exp. 513	Exp. 515	Exp. 517
Date pupated	3/30 to 3/31 (35)	3/30 to 3/31 (35)	3/30 to 3/31 (35)
Date to station	3/31	3/31	3/31
Date emerged	4/14	4/21 to 4/24	5/12
% emerged	34%	40%	3% melon flies
Pupal duration	14 to 15 days	21 to 24 days	42 to 43 days
Mean max. temp.	74	65	68
Mean min. temp.	64	55	43
	Exp. 527	Exp. 529	Exp. 531
Date pupated	4/2 to 4/3 (50)	4/2 to 4/3 (50)	4/2 to 4/3 (50)
Date to station	4/3	4/3	4/3
Date emerged	4/14	4/17 to 4/21	5/8
% emergence	60%	84%	6% melon fly
Pupal duration	11 to 12 days	14 to 18 days	35 to 36 days
Mean max. temp.	75	65	67
Mean min. temp.	65	55	43

	Exp. 705 Hilo	Exp. 707 Kaumana	Exp. 709 Pohakuloa	Exp. 711 Waikii
Date pupated	5/14 (50)	5/14 (50)	5/14 (50)	5/14 (50)
Date to station	5/15	5/15	5/15	5/15
Date emerged	5/29	6/2 to 6/5	Negative	6/9 to 6/12
% emergence	10%	6%		2%
Pupal duration	15 days	19 to 22 days		26 to 29 days
Mean max. temp.	76	70	68	66
Mean min. temp.	64	58	38	47

	Exp. 723 Hilo	Exp. 725 Keanakolu
Date pupated	5/16 (50)	5/16 (50)
Date to station	5/16	5/16
Date emerged	5/29	Negative
% emerged	46% 6% parasites	
Pupal duration	13 days	
Mean max. temp.	76	65
Mean min. temp.	64	45

	Exp. 727 Hilo	Exp. 729 Kaumana	Exp. 731 Pohakuloa	Exp. 733 Waikii
Date pupated	5/18 (100)	5/18 (100)	5/18 (100)	5/18 (100)
Date to station	5/19	5/19	5/19	5/19
Date emerged	6/2	6/9 to 6/12	Negative	Negative
% emerged	15% 4% parasites	50%		
Pupal duration	15 days	22 to 25 days		
Mean max. temp.	77	70	68	66
Mean min. temp.	65	59	38	47

	Exp. 735 Hilo	Exp. 737 Keanakolu
Date pupated	5/19 (50)	5/19 (50)
Date to station	4/23	5/23
Date emerged	6/3	Negative
% emerged	6%	
Pupal duration	15 days	
Mean max. temp.	77	69
Mean min. temp.	65	48

	Exp. 777	Exp. 779	Exp. 781	Exp. 783
Date pupated	5/26 (50)	5/26 (50)	5/26 (50)	5/26 (50)
Date to station	5/26	5/26	5/26	5/26
Date emerged	6/2 to 6/7	6/12 to 6/16	Negative	Negative
% emerged	30%	24%		
Pupal duration	8 to 12 days	17 to 21 days		
Mean max. temp.	79	70	71	67
Mean min. temp.	65	58	36	47

	Exp. 809 Hilo	Exp. 811 Kaumana	Exp. 813 Pohakuloa	Exp. 815 Waikii
Date pupated	5/31 (50)	5/31 (50)	5/31 (50)	5/31 (50)
Date to station	6/2	6/2	6/2	6/2
Date emerged	6/9 to 6/13	6/16 to 6/19	6/26 to 6/30	6/26 to 6/30
% emerged	34%	6%	10%	20%
Pupal duration	9 to 13 days	16 to 19 days	24 to 30 days	26 to 30 days
Mean max. temp.	77	70	71	67
Mean min. temp.	65	59	36	47

PUPAL STUDIES

TABLE 20

Station	KULA	HALEAKALA	KULA	KULA
Elevation	3750'	7030'	3750'	3750'
Experiment	216	220	226	228
Abs. Max.	71	66	Control 80 F.	Control 70 F.
Max. Mean	65.9	59.8		
Min. Mean	50.2	42.3		
Abs. Min.	49.4	37		
Puparia	100	100	100	100
Pupated	3/16 to 3/21	3/16 to 3/21	3/16 to 3/21	3/16 to 3/21
Age	1-6 days	1-6 days	1-6 days	1-6 days
Dorsalis First Adult	4/18	none	4/2	4/13
Last Adult	4/29		4/8	4/18
Emergence Span	11 days		6 days	5 days
Duration	31 days		18-19 days	23-29 days
Med First Adult	4/16	5/8	4/4	4/12
Last Adult	4/18	5/22		4/13
Emergence Span	2 days	14 days	1 day	1 day
Duration	25-30 days	42-45 days	15-19 days	22-29 days
Par First Adult	4/24	none	4/7 O. long	4/23 o. per 4/8 O. long
Last Adult	-		4/12 O. long	4/24
Emergence Span	-		5 days	12 days
Duration	33-38 days		18-28 days	39- O. per 24-40 days O. l
% Emergence	5%	4% all Med	31%	23%
% Parasitism	1 O. long	none	Dor Med Par 48% 13% 35%	Dor Med Long Per 29% 12% 54% 4%

TABLE 21. Pupal Studies

STATION	KULA	HAIKU	HALEAKALA	HALEAKALA	WAIKAMOI
Elevation	3750'	500'	7030'	9200'	4250'
Experiment	292	300	294	296	298
Absolute Max.	70	78	72	76	66
Max. Mean	66.5	776.2	62.9	59.2	58.6
Min. Mean	52.5	65.	43.	42.2	51.1
Abs. Min.	47	62	34	37	46
Puparia	25	25	25	25	25
Pupated	4/30	4/30	4/30	4/30	4/30
Age	1 day	1 day	1 day	1 day	1 day
DORSALIS First Adult	6/4	5/15	Negative	Negative	
Last Adult	6/14				6/26
Emergence Span	10 days	None			
Duration	36-45 days	16 days			51 to 57 days
MED First Adult	None	5/15			
Last Adult					
Emergence Span		None			
Duration		16 days			
PAR. First Adult	6/6	5/18			
Last Adult	6/17	5/31			
Emergence Span	11 days	12 days			
Duration	38-49 days	18-31 days			
% Emergence	40%	36%			4%
% Parasitism	O. long. 80%	O. long. 55%			

TABLE 22. Pupal Studies

STATION	KULA	HALEAKALA	HALEAKALA	HAIKU	WAIKAMOI
Elevation	3750'	7030'	9200'	500'	4250'
Experiment	356	358	360	362	364
Abs. Max.	70	72	76	80	66
Max. Mean	66.5	62.9	59.2	76.1	58.6
Min. Mean	52.5	43	42.2	65.2	51.1
Abs. Min.	47	34	37	62	46
Puparia	104	84	93	45	70
Pupated	5/26	5/26	5/26	5/26	5/26
Age	3 days	3 days	3 days	3 days	3 days
DORSALIS First Adult	6/23	Negative	Negative	6/14*	None
Last Adult	6/28			-	-
Emergence Span	5 days			-	-
Duration	28-33 days			19 days	
MED. First Adult	6/22			6/14*	7/10
Last Adult	6/25			-	-
Emergence Span	3 days			-	-
Duration	27-30 days			19 days	45 days 1/
PAR. First Adult	7/4 O.lon. 7/1 O per.			None	None
Last Adult	-				
Emergence Span	-				
Duration	39 O.lon. 36 O.per.				
% Emergence	57%			88%	68%
% Parasitism	DD M L P 30% 65 3 2				

Note: * Checked on 6/19 and flies found dead. Estimated emergence.
1/ The hygrothermograph record showed below 60 degrees for the average Max. during the week of emergence.

PUPAL STUDIES

TABLE 23

KULA INSECTORY - 3750'

Station	Weather Shelter	Weather Shelter	Pupal Chamber	Pupal Chamber
Condition of Sand	Dry	Moist	Dry	Moist
Experiment 366	Lot 1	Lot 2	Lot 3	Lot 4
Abs. Max.	70	70		
Max. Mean	67.7	66.5	80	80
Min. Mean	52.3	53.2	75	75
Abs. Min	48	48		
Puparia	25	25	25	25
Pupated	5/30	5/30	5/30	5/30
Age	1 day	1 day	1 day	1 day
Dorsalis First Adult	7/1	7/1	6/15	6/11
Last Adult	-	-	-	6/15
Emergence Span	-	-	-	4 days
Duration	32 days	32 days	16 days	12-16 days
Med First Adult	None	None	None	None
Last Adult				
Emergence Span				
Duration				
Par First Adult	7/6 O.per 7/10 O.lon	7/1 O.per 7/3 O.lon	6/16 O.per 6/21 O.lon	6/15 O.per 6/15 O.lon
Last Adult	-	7/6 O.lon	6/23 O.lon	6/16 O.per 6/22 O.lon
Emergence Span	-	3 days	3 days	1 day O.per 7 days O.lon
Duration	38 O.per 42 O.lon	35 O.per 35 O.lon	17 O.per 22 O.lon	16 days 16-24 days
% Emergence	16%	48%	36%	80%
% Parasitism	50%	69%	78%	65%

Note. The puparia as indicated above pupated in the above medias as mature larvae. There is considerable difference between placing puparia in dry sand and in placing mature larvae in dry sand to pupate.

TABLE 24 Pupal Studies

EXPERIMENT NO.	384	408	386	416	422
Station	KULA	KULA	HAIKU	HAIKU	KULA
Elevation	3750'	3750'	500'	500'	3750'
Abs. Max.	70	70	80	80	70
Max. Mean	67.7	67.7	76	76	66.5
Min. Mean	52.3	52.3	65.5	65.5	53.2
Abs. Min.	48	48	62	62	48
Puparia	25	41	25	41	45
Pupated	5/31	6/4	5/31	6/4	6/9
Age	1 day	1 day	1 day	1 day	3 days
DORSALIS First Adult	7/3	6/26	6/19	6/19	7/6
Last Adult		7/7		6/26*	7/7
Emergence Span		11 days		7 days*	1 day
Duration	33 days	22-31 days	19 days	15 days	27-28 days
MED. First Adult	7/1	None	None	None	7/4
Last Adult					7/6
Emergence Span					2 days
Duration	31 days				25-27 days
PAR. First Adult	7/6 O.per. 7/9 O.lon.	7/12 O.per.	6/19 O.per. 6/19 O.lon.	6/26 O.p.	None
Last Adult	7/9 O.per.		6/26 O.per. 6/26 O.lon.		
Emergence Span	3 days		7 days		
Duration	36 days 39 days	38 days	19 days	22 days*	
PAR. First Adult					
Last Adult					
Emergence Span					
Duration					
% Emergence	24%	50%	72%	56%	66%
% Parasitism	66%	D M L P 90 0 0 10	D M L P 47 0 10 42	D M L P 91 0 0 9	D M L P 43 57 0 0

Note: * Probably several days before this date.

Experiments 388, 412, 428 at Haleakala 9200' were negative.
Experiments 410, 426 at Haleakala 7030' were negative.
Experiments 414, 430 at Waikamoi were negative.

Line Project - 1-0-1-3.0

The result of observations made on the copulation of *Dacus dorsalis*.

A preliminary test was undertaken to determine the time copulation took place, the elapsed time of copula, the frequency, and the age group in which participation was most pronounced.

Observations were conducted for eleven consecutive nights beginning in the early evening and continuing until daybreak.

There were 346 virgin females and 138 males under observation. The flies were all laboratory reared and of known age with the exception of thirty males that were trapped on the initial evening of the experiment. These males were lured into evaginated traps by methyl eugenol and placed ten to a cage with a like number of virgin females thirty days old. It was hoped to discover whether the methyl eugenol had any effect on the males from the standpoint of sex stimulation.

The flies appear to have no sexual interest in each other until the waning of the daylight hours. The flies appear to become very excited just before sundown and for a period of about two hours. At that time some of the males segregate themselves into groups, begin a constant flapping of their wings and gyrate about the floor of the cage. Many instances were observed where groups of males would form a circle, with their heads toward the centre, and perform in a manner closely resembling an Indian war dance. It was clearly evident that this show of male artistry interested certain of the females, and the degree to which it affected them was demonstrated by their advance toward the performers. When a female progressed sufficiently close to the male group one of the demonstrators would immediately break ranks and in very rapid succession mount and engage in copulation. Competition amongst the males was not very common, however, on some occasions interference by other amorous males was observed. The frequency of copulation was very low, only 26 pairs were actually observed in copula. The extreme length of time occupied by copulation is really remarkable. The shortest observed period was two hours but the average was between 10 and 12 hours. It is very definite that males do not copulate with more than one female in a single night, but in one of our current tests we have records on males that have already fertilized five different females in a period of a few weeks. Male flies freshly trapped with methyl eugenol did not exhibit any more interest in the females than did the laboratory reared group.

The following table contains the data accumulated from the test. However, it is hoped that a more comprehensive study can be undertaken in which greater combinations of ages, number of sexes, laboratory reared and field flies can be included.

Table 6.--Copulation Record

Date	Cage No.	Cage or Sections	Date Flies Emerged	No. of Flies ♂♂	No. of Flies ♀♀	Time of Copula	Time Broke Copula	No. Pairs	Elapsed Time Hours
	1	1-6(3♂2♀)	3/18						
	2	1 (2♂10♀)	3/18						
	3	1-6(1♂3♀)	3/18						
4/5	4	1-6(3♂2♀)	3/6						
				3	2	6:50PM	6:10AM	1 pair	11-2/3
				3	2	6:50PM	5:40AM	1 pair	11-1/6
4/5	5	1-6(2♂10♀)	3/6						
				2	10	6:50PM	6:00AM	1 pair	11-1/6
4/7	6	1-6(1♂3♀)	3/6						
				1	3	7:15PM	4:30AM	1 pair	
4/8			3/6	1	3	8:00PM	5:00AM	1 pair	
3/29	7	1-6(3♂3♀)	3/6	3	3	7:10PM	6:15AM	1 pair	11
4/5			3/6	3	3	7:00PM	6:15AM	1 pair	
4/6			3/6	3	3	8:00PM	6:15AM	1 pair	
4/7			3/6	3	3	7:00PM	6:15AM	1 pair	11-1/4
4/5			3/6	3	3	8:00PM	6:15AM	1 pair	10-1/4
4/6			3/6	3	3	7:00PM	4:15AM	1 pair	9-1/4
	8	1 (2♂10♀)	3/6						
	9	1-6(1♂3♀)	3/6						
3/29	10	1 (10♂50♀)	3/6-♂						
			3/5-♀	10	50	6:30PM	6:45AM	1 pair	12-1/4
3/30				10	50	7:00PM	6:20AM	1 pair	11-1/2
3/31				10	50	6:45PM	5:40AM	2 pairs	12-1/3
						6:45PM	6:00AM		11-1/4
4/5				10	50	6:50PM	8:50PM	1 pair	2
4/7				10	50	7:00PM	5:00AM	1 pair	10
	11	1-5(2♂2♀)	3/6-♂						
			3/5-♀						
4/5	12	1-5(2♂2♀)	3/6-♂						
			3/5-♀						
3/31	13	1 (10♂50♀)	3/17-♂						
			2/28-♀	10	50	6:45PM	6:00AM	1 pair	11-1/4
				10	50	7:00PM	5:00AM	1 pair	10
4/2				10	50	7:00PM	4:45AM	1 pair	9-1/4
4/5	14	1 (10♂50♀)	2/28-♂						
			Field♂	10	10	6:45PM	6:00AM	1 pair	11-1/4
			3/5-♀	10	10	8:00PM	6:30AM	2 pairs	10-1/2
4/6			3/5	10	10	8:00PM	5:00AM		9
4/7			3/5	10	10	6:45PM	5:15AM	1 pair	10
4/8			3/5	10	10	8:00PM	3:00AM	2 pairs	7
						7:45PM	4:45AM		8

SUMMARY AND EVALUATION OF EXPERIMENT OF THE EFFECT OF CITRUS RIND ON LARVAL DEVELOPMENT

Field observation show that Citrus trees are a favorite resting place for adult fruit flies and that furthermore in many instances the fruit is heavily stung. Collection of almost 2000 fruit of various species of citrus have shown that very few puparia are recovered from citrus fruit. In those instances where puparia are found it was noted that they were recovered from ground fruit which is susually over-ripe and cracked.

This experiment Table 26 was an attempt to find why this apparently ambiguous situation exists. Six hundred eggs were placed in 30 fruit in one of three ways. First, ten banana were used as a control and 20 eggs placed under the flap of skin in each of 10 banana. The flap was then sealed down with paraffin. Second, ten oranges (California Naval) were each innoculated with 20 eggs. In this case the eggs were placed in a small hole made in the rag of the fruit. A cover glass was placed over the hole and sealed in place to prevent desicsation. Third, ten oranges (California Naval) were plugged (half in plug) and 20 eggs placed on the pulp of the orange and the plug replaced and sealed.

The date indicates that the rag of the fruit has a definite prohibitative effect on the entrance of the larvae into the pulp where they can develop. In no case were any puparia recovered from eggs which had been placed above the rag of the fruit. In nine fruit out of ten which had been plugged puparia were recovered. The eggs used in this experiment were randomized and a check run on hatch which indicated that 88 out of a 100 eggs hatched.

If we can assume that about 88% of the eggs hatched in the fruit, then in banana we recovered 46% of the larvae which hatched initially. In the citrus which was plugged we recovered 36% of the larvae which indicates that bananas offer a more conducive media for development. In the banana on 5/30 28% larvae were recovered showing that banana also results in more rapid development of the larvae.

THE EFFECT OF CITRUS RIND ON LARVAL DEVELOPMENT

Experiment No. 328

Kula Insectory
5/9-5/30/50

TABLE 26

Lot	Fruit	Eggs	Date	Puparia	Mature Larvae	Total
1	Banana	20	5/30	3	7	10
2	"	20	"	2	2	4
3	"	20	"	2	5	7
4	"	20	"	3	4	7
5	"	20	"	2	2	4
6	"	20	"	6	1	7
7	"	20	"	4	1	5
8	"	20	"	9	0	9
9	"	20	"	10	1	11
10	"	20	"	17	0	17
Control: Eggs placed beneathe flap in skin in the above 10 lots						
Total		200		58	23	81
11	Orange	20	"			0
12	"	20	"			0
13	"	20	"			0
14	"	20	"			0
15	"	20	"			0
16	"	20	"			0
17	"	20	"			0
18	"	20	"			0
19	"	20	"			0
20	"	20	"			0
Eggs placed above rag of fruit in small hole and covered with cover glass						
Total		200				0
21	Orange	20	"	3	1	4
22	"	20	"	1	7	8
23	"	20	"	0	0	0
					9	15
25	"	20	"		0	2
26	"	20	"		4	6
27	"	20	"	2	8	10
28	"	20	"	9	2	11
29	"	20	"	1	3	4
30	"	20	"	1	3	4
Citrus plugged and eggs placed on pulp and plug replaced.						
Total		200		27	37	64

THE RELATIONSHIP BETWEEN EGG DENSITY IN FRUIT AND LARVAL AND PUPAL MORTALITY

Experiment 446

Kula Insectory
6/20-7/20

TABLE 27

Lot	Fruit	Egg	Weight Before	Weight After	6/26 M. L.	6/26 Pupae	6/27 M. L.	6/27 Pupae	6/28 M. L.	6/28 Pupae	6/29 M. L.	6/29 Pupae
1	Banana	50	156	71	0	0	0	0	0	1	0	15
2	"	100	143	60	0	0	2	0	0	0	0	16
3	"	150	143	70	0	0	0	0	2	0	3	9
4	"	200	156	68	0	0	0	0	0	0	0	10
5	"	250	150	60	0	0	o	0	1	0	0	22
6	"	300	168	85	0	0	4	0	0	0	0	21
7	"	350	130	42	0	0	0	0	0	0	0	30

Lot	6/30 M. L.	6/30 Pupae	7/2 M. L.	7/2 Pupae	7/3 M. L.	7/3 Pupae	7/4 M. L.	7/4 Pupae	7/5 M. L.	7/5 Pupae	7/6 M. L.	7/6 Pupae	7/7 M. L.	7/7 Pupae
1	0	3	1	2	0	0	0	0	0	0	0	0	0	0
2	0	1	1	3	0	3	0	0	0	0	0	0	0	0
3	0	5	0	0	0	5	0	0	0	3	0	0	0	1
4	0	5	1	3	0	11	0	2	0	3	0	0	0	0
5	3	0	0	5	0	24	1	2	0	5	2	3	0	0
6	0	3	0	4	0	5	0	13	0	0	0	0	0	0
7	4	5	3	6	0	17	0	6	0	4	0	0	1***	0

Lot	7/9 M. L.	7/9 Pupae	7/13 M. L.	7/13 Pupae	Total Puparia Recovered	Larval Mortality	Longest Larval Period	Shortest Larval Period
1	0	0	0	0	22	51%	11	7 days
2	0	0	0	0	27	70%	12 days	7 days
3	0	0	0	0	28	80%	17 days	8 days
4	2**	0	0	0	37	80%	19 days	9 days
5	0	0	0	0	68	70%	15 days	8 days
6	0	0	0	0	50	92%	13 days	7 days
7	4**	0	0	1***	81	75%	22 days	9 days

Note, ** Mature but in pulp. M. L. = Mature Larvae
*** Dwarf
Eggs used from field mango, randomized and checked for hatch (90%).
Larval mortality based on 90% hatch.

THE RELATIONSHIP BETWEEN EGG DENSITY IN FRUIT AND LARVAL MORTALITY

Experiment 444

Kula Insectory
6/16-7/5/50

TABLE 28

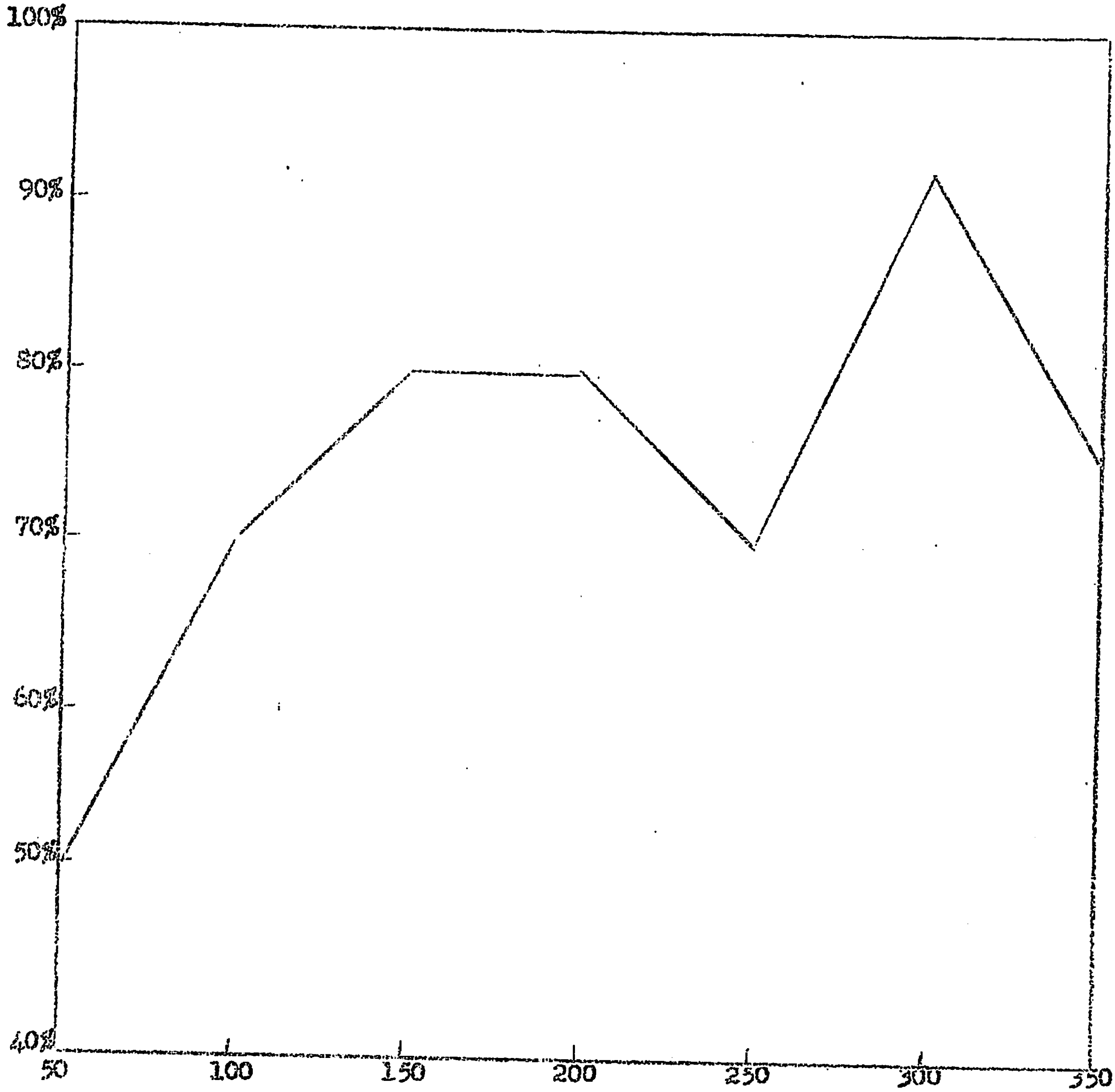
Lot	Fruit	Eggs	6/28 Mat.	6/28 Lar.	6/28 Pupae	7/5 Mat.	7/5 Lar	7/5 Pupae	Total	Larval Mortality
1	Banana	10	1	0	0			8	9	0%
2	"	20	2	0	0			8	10	45%
3	"	30	2	0	2			10	14	63%
4	"	40	4	1	0			20	25	31%
5	"	50	5	0	0			24	29	47%
6	"	60	3	1	0			32	36	41%
7	"	70	6	1	0			27	34	57%
8	"	80	2	0	1			32	35	52%
9	"	90	5	2	1			33	41	50%
10	"	100	17	3	0			23	43	52%

Note. Egg hatch check indicated 90% hatch therefore the larval mortality is based on this figure and egg viability is taken into consideration.

EFFECT OF EGG DENSITY IN FRUIT ON

LARVAL MORTALITY

Larval Mortality Fig. 17 Exp. 446



Number of eggs in banana.

SUMMARY AND EVALUATION OF EXPERIMENTS ON ATTRACTIVENESS OF VARIOUS FRUIT ODORS

Experiments 440, 466, and 468 had as their purpose the matter of determining the varying degrees with which certain fruit attract the fruit fly and incidently its parasites. If ovipositional response is the primary reason for attraction then we might reasonably expect a direct correlation between attractiveness and indices of infestation of the fruit involved. If on the other hand the primary reason is the desire to feed, there would not necessarily be any correlation between the degree with which a certain fruit attracted the fly and its index of infestation. What is quite likely is that the fly is primarily attracted to feed on the fruit exudations and in crawling about, the urge to oviposit is stimulated by cracks or soft spots on the fruit.

To bring out the odor of the fruit it was placed in a blender and reduced to a puree. In this condition the characteristic odor of each fruit was readily detected. It was then poured into McPhail Traps and exposed for one day. This short exposure period was to prevent, insofar as possible, the attraction of the fly to fermenting odors rather than the smell of the fruit itself.

Experiment No. 440 was run in five replications of five traps each at Paia in a mixed orchard. In this test mango and guava showed a much greater attraction than banana, orange or peach. It is also interesting to note that nearly all of the parasites were trapped in the mango traps with the exception of the last replica where guava caught some.

Experiment 466 run in three replications of five traps each was done at Kula. Although mango and guava here again registered high, apricot also showed a high catch. Most of the parasites were again caught in mango.

Experiment 468 run in five replications with five traps showed guava high but strawberry caught the most females. This must be attributed to a feeding response for strawberry is not a good host for this fly. _Opius persulcatus_ was collected mostly from guava although apricot also attracted this parasite.

Generalization on these brief and preliminary tests does not seem merited but it does appear that guava and mango have a strong attraction for _D. dorsalis_. This was also borne out by a population trap at Haiku Territorial Nursery which is suspended from a guava tree. The trap count has greatly increased since ripe guava have appeared on the plant. We do not imply that this guava tree is responsible for a great increase in population around the trap as a result of the development of the fly in the fruit. The fact is that the ripe guava has attracted the fly from the surrounding area and the trap picks up an increased number of flies.

SUMMARY

EXP. 440
466
468

TABLE 29

Fruit Lure	No. of Traps	Days	Trap Days	Count	Index
Mango	8	2	16	320	20.0
Guava	13	3	39	528	13.5
Apricot	8	2	16	112	7.0
Peach	8	2	16	80	5.0
Orange	8	2	16	59	4.5
Banana	10	2	20	84	4.3

Index: Flys Per Trap Day

FRUIT LURE

EXP. 440

PAIA
6/13-6/14

Trap No.	Fruit Lure	Dor Male	Dor Female	Med Male	Med Female	Mel Male	Mel Female	Long Male	Long Female	Pers. Male	Pers. Female
Replica I Site: Kamani											
1	Peach	19	19	0	0	1	2	0	0	0	0
2	Banana	9	9	0	0	0	1	0	1	0	0
3	Orange	4	5	0	0	0	0	0	0	0	0
4	Mango	78	114	0	0	1	3	10	7	0	0
5	Guava	65	79	0	1	0	4	2	1	0	0
Replica II Site: Grapefruit											
6	Peach	9	12	0	0	1	0	0	0	0	0
7	Banana	5	7	0	0	0	0	0	0	0	0
8	Orange	12	11	0	0	2	0	0	0	0	0
9	Mango	44	23	2	1	2	2	2	3	0	0
10	Guava	29	57	0	0	1	0	1	0	0	0
Replica III Site: Mango											
11	Peach	15	15	0	0	0	0	0	0	0	0
12	Banana	1	5	0	0	0	0	0	0	0	0
13	Orange	17	16	0	0	0	0	0	0	0	0
14	Mango	26	43	1	0	0	1	0	0	3	0
15	Guava	72	71	0	1	0	0	2	0	0	0
Replica IV Site: Avocado											
16	Peach	14	46	0	0	0	0	0	0	0	0
17	Banana	10	20	0	0	0	0	0	0	0	0
18	Orange	17	29	1	0	1	0	0	0	0	0
19	Mango	67	68	1	2	0	0	4	1	6	2
20	Guava	68	96	0	0	0	1	6	0	0	0

FRUIT LURE | **EXP 440**

PAIA
6/13-6/14

Replica V Site: Avocado

Trap No.	Fruit Lure	Dor Male	Dor Female	Med Male	Med Female	Mel Male	Mel Female	Long Male	Long Female	Pers Male	Pers Female
21	Peach	10	17	0	0	0	0	0	0	0	0
22	Banana	9	36	0	0	0	0	0	0	0	0
23	Orange	9	9	0	0	0	0	0	0	0	0
24	Mango	37	39	2	0	2	0	8	3	5	3
25	Guava	31	71	0	0	0	1	1	2	7	0
TOTAL COUNT	Peach	67	109	0	0	2	2	0	0	0	0
	Banana	34	77	0	0	0	1	1	0	0	0
	Orange	59	70	1	0	3	0	0	0	1	0
	Mango	252	287	6	3	6	5	24	14	14	3
	Guava	265	374		2	1	6	12	3	7	0

Legend:

Dor: *Dacus dorsalis*
Med: *Ceratitis capitata*
Mel: *Dacus cucurbitae*
Lon: *Opius longicaudatus*
Per: *Opius persulcatus*

FRUIT LURE

EXP 466

KULA
6/22-6/23

Replica I Site: Fig

Trap No.	Fruit Lure	Dor Male	Dor Female	Med Male	Med Female	Mel Male	Mel Female	Long Male	Long Female	Pers Male	Pers Female
1	Apricot	17	7	1	2	13	15	0	0	0	0
2	Orange	0	1	0	0	0	0	0	0	0	0
3	Peach	1	0	1	0	3	4	0	0	0	0
4	Mango	22	8	9	6	6	6	0	0	0	0
5	Guava	5	10	1	5	9	15	0	0	0	0
	Replica II Site: Peach										
6	Apricot	32	39	4	1	35	48	0	0	0	0
7	Orange	8	6	8	4	2	9	3	0	0	0
8	Peach	10	5	4	3	6	7	0	0	0	0
9	Mango	25	21	19	16	32	24	7	0	0	0
10	Guava	24	25	4	0	4	11	1	0	0	0
	Replica III Site: Loquat										
11	Apricot	11	8	1	0	17	14	0	0	0	0
12	Orange	5	15	2	2	1	1	0	0	0	0
13	Peach	2	0	0	0	0	0	1	0	0	0
14	Mango	21	20	1	1	14	12	0	0	0	0
15	Guava	19	8	0	0	2	1	2	0	0	0
TOTAL COUNT											
	Apricot	60	54	6	3	65	77	0	0	0	0
	Orange	13	22	10	6	3	10	3	0	0	0
	Peach	13	5	5	3	9	11	1	0	0	0
	Mango	68	49	29	23	52	42	7	0	0	0
	Guava	48	43	5	5	15	27	2	0	0	0

Legend: Dor: Dacus dorsalis
Med: Ceratitis capitata
Mel: Dacus cucurbitae
Long: Opius longicaudatus
Pers: Opius persulcatus

FRUIT LURE

EXP 468

PAIA
6/23

Replica I Site: Kamani

Trap No.	Fruit Lure	Dor Male	Dor Female	Med Male	Med Female	Mel Male	Mel Female	Long Male	Long Female	Pers Male	Pers Female
1	Strawberry	12	13	0	0	0	0	2	0	1	0
2	Banana	33	46	0	0	3	3	0	0	0	0
3	Avocado	3	4	0	0	2	0	0	0	0	0
4	Apricot	25	33	0	0	2	0	8	0	0	0
5	Guava	30	43	0	0	0	0	1	0	0	0
	Replica II Site: Grapefruit										
6	Strawberry	9	17	0	0	0	0	2	0	0	0
7	Banana	13	22	0	0	0	1	0	0	0	0
8	Avocado	7	61	0	0	0	0	0	0	0	0
9	Apricot	18	49	0	0	0	0	4	0	1	0
10	Guava	22	19	0	0	0	0	1	0	0	0
	Replica III Site: Mango										
11	Strawberry	4	189	0	0	0	0	2	0	0	0
12	Banana	1	27	0	0	0	0	0	0	0	0
13	Avocado	3	1	0	0	0	0	0	0	1	0
14	Apricot	2	20	0	0	0	0	3	0	0	0
15	Guava	15	25	0	0	0	0	6	1	2	1
	Replica IV Site: Avocado										
16	Strawberry	0	40	0	0	0	0	0	0	0	0
17	Banana	0	3	0	0	0	0	0	0	0	0
18	Avocado	0	2	0	0	0	0	0	0	0	0
19	Apricot	17	44	0	0	2	1	5	0	6	0
20	Guava	84	72	0	0	0	0	6	0	9	1

FRUIT LURE

EXP 468

PAIA
6/23

Replica V Site: Avocado

Trap No.	Fruit Lure	Dor		Med		Mel		Long.		Pers	
		Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
21	Strawberry	11	21	0	0	0	0	1	1	0	0
22	Banana	3	28	0	0	0	0	0	0	0	0
23	Avocado	23	38	0	0	0	0	1	0	0	0
24	Apricot	12	15	0	0	0	1	10	0	2	0
25	Guava	64	102	2	0	0	1	33	0	5	0
TOTAL COUNT											
	Strawberry	36	280	0	0	0	0	9	0	1	0
	Banana	50	126	0	0	3	4	0	0	0	0
	Avocado	36	106	0	0	2	0	1	0	1	0
	Apricot	52	161	0	0	4	2	30	0	9	0
	Guava	215	261	2	0	0	0	47	1	16	2

Legend:

Dor: *Dacus dorsalis*
Med: *Ceratitis capitata*
Mel: *Dacus cucurbitae*
Long: *Opius longicaudatus*
Pers: *Opius persulcatus*

Project 1-0-1-4 - The susceptibility of California fruit to infestation and development of *D. dorsalis*.

The arrival of varieties of immature fruits from California on April 19th initiated the second phase of host determination and evaluation of fruits exposed to *D. dorsalis* both in cages and in competition with local hosts in the field.

Tests were initially conducted to determine the susceptibility of the host to infestation and development of *D. dorsalis*. The current tests are being run to determine which stages (immature to ripe) of the fruit are susceptible to attack and to what degree the infestation can be expected to develop in the host fruit submitted.

It is recognized that many variables present themselves in a test of this nature. Immature bruised fruits could very possibly be more attractive to the fly than sound fruit, or sound fruit of comparable development submitted to flies that had been deprived of other host material for any length of time might reasonably be expected to become infested. The physical and chemical properties of the fruit no doubt undergo some change when removed from the growing tree, and these changes become more pronounced as the picked fruit advances in age. Therefore, the findings here are submitted with the recommendation that the many variables outlined be taken into account when susceptibility of infestation of the host is being carefully evaluated.

Immature apricots were observed to be infested but no larval development occurred. Females were observed ovipositing in the stem end of the fruit on two occasions, but with the leathery nature of the fruit it is doubtful whether the eggs hatched or that the larvae were able to survive for any length of time if hatch occurred. No recoveries were made and an examination of the fruit after isolation, for a period of three weeks, revealed no galleries or other signs of larval activity. However, the fruit at this time was in a pronounced dry stage, the tissue apparently just shrivelled without too much decay obviating any possibility of successful larval development.

Cherries in their immature stage appear a satisfactory host. Pulp is plentiful and the thin epidermal skin of the fruit offers no resistance to the ovipositor of the fly. Infestation has been recorded in samples of cherries exposed to the flies both in the field and in cages. Apricots, cherries, apples, almonds, Persian walnuts, pears, plums and nectarines are presently being tested.

The procedure being followed is to expose the fruits to the flies for a period of about four days, remove the fruit, suspend it on wire over sand, and when fruits are encountered with an excessively high water content an extra fine screened can is placed directly below them in order to prevent the migratory larvae from drowning. Sifting of the sand for pupal recovery is performed twice weekly and the pupae recovered are placed in a mixture of moist sawdust and sand, held in erlenmeyer flasks and stoppered with cheesecloth. Emergence of flies is checked every day and duly recorded.

To complete a test from introduction of fruit to emergence of the last fly usually takes about thirty days and represents quite a considerable amount of labor. The fruit is arriving in excellent condition and the sample sizes are perfect. Much has been gained from last year's experience and is very profitable to us now.

CAGE INFESTATION OF CALIFORNIA FRUITS BY *D. dorsalis*

Cage No.	In Date	Out Date	Type of Fruit	Quantity	Grams Each	Total Weight	Pupation and Emergence Date	No. Pupae	Date	No. Flies	% Emergence over Pupation
1	4/19/50	4/24/50	Apricots - immature var. Tilton from Winters, Yolo Co.	16		162	5/ 8/50 5/11/50 5/15/50	0 0 0 D			0
2	"	"	Apricots - immature var. Tilton from Winters, Yolo Co.	16		192	5/ 8/50 5/11/50 5/15/50	0 0 0 D			0
3	"	"	Apricots - immature var. Royal from Winters, Yolo Co.	16		214	5/ 8/50 5/11/50 5/15/50	0 0 0 D			0
4	"	"	Apricots - immature var. Royal from Winters, Yolo Co.	16		211	5/ 8/50 5/11/50 5/15/50	0 0 0			0
5	"	"	Almonds - immature var. mixed from Winters, Yolo Co.	16		127	5/ 8/50 5/11/50 5/15/50	4 0 0 D	5/15/50	1 ♀ 2 ♂	75.0
6	"	"	Almonds - immature var. mixed from Winters, Yolo Co.	16		103	5/ 8/50 5/11/50 5/15/50	4 0 0 D	5/12/50	2♀♀ 1 ♂	75.0

D = Host Discarded

Remarks: Immature apricots were observed to be infested but no larval development occurred.

CAGE INFESTATION OF CALIFORNIA FRUITS BY *D. dorsalis*

Cage No.	In Date	Out Date	Type of Fruit	Quan-tity	Grams Each	Total Weight	Pupation and Emergence: Date	No. Pupae	Date	No. Flies	% Emergence over Pupation
1	4/26/50	4/30/50	Cherries - immature var. Chapman			200	5/11/50	322	5/17/50	15♀♀ 23♂♂	
							5/15/50	32			
							5/23/50	0 D	5/16/50	8♀♀ 4♂♂	
									5/18/50	3♀♀ 6♂♂	
									5/19/50	40♂♂ 20♀♀	
									5/20/50	33♂♂ 33♀♀	
									5/22/50	30♂♂ 33♀♀	
									5/23/50	1 ♂	70.3
2	"	"	Cherries - immature var. Royal Ann			200	5/11/50	4	5/23/50	1 ♀	
							5/15/50	13	5/26/50	1 ♀ 3♂♂	
							5/26/50	0 D			29.4
3	"	"	Cherries - immature var. Tartarian			200	5/11/50	107	5/19/50	2♀♀ 3♂♂	
							5/15/50	112			
							5/25/50	0 D	5/20/50	12♀♀ 13♂♂	
									5/22/50	15♀♀ 31♂♂	
									5/23/50	15♂♂ 8♀♀	
									5/25/50	6♂♂ 1 ♀	43.4

CAGE INFESTATION OF CALIFORNIA FRUITS BY *D. dorsalis*

Cage No.	In Date	Out Date	Type of Fruit	Quantity	Grams Each	Total Weight	Pupation and Emergence: Date	No. Pupae	Date	No. Flies	% Emergence over Pupation
4	4/26/50	4/30/50	Cherries - immature var. Bing			200	5/11/50	38	5/22/50	9 ♀♀ 7 ♂♂	
							5/15/50	32			
							5/26/50	0 D	5/23/50	3 ♂♂	
									5/25/50	2 ♂♂	
									5/26/50	3 ♀♀	34.3
5	"	"	Cherries - immature var. Black Oregon			200	5/11/50	24	5/22/50	6 ♀♀ 3 ♂♂	
							5/15/50	58			
							5/25/50	0 D	5/23/50	6 ♀♀ 1 ♂	
									5/25/50	1 ♀ 7 ♂♂	29.3
6	"	"	Cherries - immature var. Lambert			200	5/11/50	66	5/19/50	1 ♀ 3 ♂♂	
							5/15/50	16			
							5/25/50	0 D	5/20/50	3 ♀♀ 6 ♂♂	
									5/22/50	1 ♀ 2 ♂♂	
									5/23/50	1 ♂	
									5/25/50	2 ♂♂	23.3

Remarks: All except Chapman cherries had small pupae.

CAGE INFESTATION OF CALIFORNIA FRUITS BY *D. dorsalis*

Cage No	In Date	Out Date	Type of Fruit	Quantity	Grams Each	Total Weight	Pupation and Emergence: Date	No. Pupae	Date	No. Flies	% Emergence over Pupation
1	5/ 5/50	5/ 9/50	Almonds - immature var. mixed, Yolo Co.	12		150	5/18/50 5/22/50	0 0 D			0
2	"	"	Almonds - immature var. mixed, Winters Yolo Co.	16		150	5/18/50 5/22/50	0 0 D			0
3	"	"	Apricots - immature var. Blenheim Sacramento, Calif.	19		150	5/18/50 5/22/50	0 0 D			0
4	"	"	Apricots - immature var. Blenheim Sacramento, Calif.	20		150	5/18/50 5/22/50	0 0 D			0
5	"	"	Apricots - immature var. Tilton, Winters Yolo Co.	14		150	5/18/50 5/22/50	0 0 D			0
6	"	"	Apricots - immature var. Royal Winters, Yolo Co.	9		150	5/18/50 5/22/50 5/26/50	0 7 0 D	5/31/50 6/ 1/50	1 ♀ 3♀♀	57.1

D = Host Discarded

CAGE INFESTATION OF CALIFORNIA FRUITS BY *D. dorsalis*

Cage No.	In Date	Out Date	Type of Fruit	Quantity	Grams Each	Total Weight	Pupation and Emergence: Date	No. Pupae	Date	No. Flies	% Emergence over Pupation
1	5/12/50	5/16/50	Cherries - ripe var. Chapman			200	5/31/50	114	6/ 1/50	2♂♂	
							6/ 6/50	0 D		2♀♀	
									6/ 2/50	16♂♂	
										12♀♀	
									6/ 3/50	2♂♂	
									6/ 5/50	7♂♂	
									6/ 6/50	0	36.0
2	"	"	Cherries - immature var. Royal Ann			200	5/31/50	442	6/ 1/50	8♂♂	
							6/ 9/50	0 D		3♀♀	
									6/ 2/50	40♂♂	
										29♀♀	
									6/ 3/50	21♂♂	
										25♀♀	
									6/ 5/50	88♀♀	
										80♂♂	
									6/ 6/50	10♀♀	
										11♂♂	
									6/ 7/50	7♀♀	
										12♂♂	
									6/ 8/50	15♀♀	
										8♂♂	
									6/ 9/50	10♂♂	
										6♀♀	84.4

CAGE INFESTATION OF CALIFORNIA FRUITS BY *D. dorsalis*

Cage No.	In Date	Out Date	Type of Fruit	Quantity	Grams Each	Total Weight	Pupation and Emergence: Date	No. Pupae	Date	No. Flies	% Emergence over Pupation
3	5/12/50	5/16/50	Cherries - immature var. Tartarian			200	5/31/50 6/ 9/50	154 0 D	6/ 1/50	3♀♀ 3♂♂	
									6/ 2/50	26♀♀ 22♂♂	
									6/ 3/50	3♀♀ 3♂♂	
									6/ 5/50	22♀♀ 13♂♂	
									6/ 6/50	5♀♀ 3♂♂	
									6/ 7/50	2♀♀ 1 ♂	
									6/ 8/50	1 ♀ 2♂♂	
									6/ 9/50	1 ♂	71.4
4	"	"	Cherries - immature var. Bing			200	5/31/50 6/ 6/50	464 0 D	6/ 1/50	16♀♀ 13♂♂	
									6/ 2/50	126♀♀ 122♂♂	
									6/ 3/50	27♀♀ 33♂♂	
									6/ 5/50	14♀♀ 13♂♂	
									6/ 6/50	5♀♀ 4♂♂	80.4

CAGE INFESTATION OF CALIFORNIA FRUITS BY *D. dorsalis*

Cage No.	In Date	Out Date	Type of Fruit	Quantity	Grams Each	Total Weight	Pupation and Emergence: Date	Pupation and Emergence: No. Pupae	Pupation and Emergence: Date	Pupation and Emergence: No. Flies	% Emergence over Pupation
5	5/12/50	5/16/50	Cherries - immature			200	5/26/50	242	5/31/50	1 ♀	
			var. Black Oregon				5/31/50	29		1 ♂	
							6/ 6/50	6	6/ 1/50	59♀♀	
							6/ 7/50	0 D		69♂♂	
									6/ 2/50	34♀♀	
										46♂♂	
									6/ 5/50	11♂♂	
									6/ 6/50	1 ♂	80.2
6	"	"	Cherries - immature			200	5/26/50	37	6/ 1/50	1 ♀	
			var. Lambert				5/31/50	77		1 ♂	
							6/ 5/50	13	6/ 2/50	0	
							6/ 8/50	0 D	6/ 5/50	3♂♂	
									6/ 6/50	1 ♀	
										2♂♂	
									6/ 7/50	1 ♀	
										1 ♂	
									6/ 8/50	2♀♀	9.4

D = Host Discarded

CAGE INFESTATION OF CALIFORNIA FRUITS BY D. DORSALIS

Cage No.	In Date	Out Date	Type of Fruit	Quantity	Grams Each	Total Weight	Pupation and Emergence: Date	No. Pupae	Date	No. Flies	% Emergence over Pupation
1	5/25/50	5/29/50	Cherries, Bing mature			200	6/8 /50 6/13/50	126 154D	6/13/50	2♀♀ 5♂♂	
									6/14/50	2♀♀ 3♂♂	
									6/15/50	19♀♀ 10♂♂	
									6/16/50	5♀♀ 4♂♂	
									6/19/50	12♀♀ 24♂♂	
									6/20/50	23♀♀ 20♂♂	
									6/21/50	4♀♀ 9♂♂	50.7
2	"	"	Cherries, Lambert mature			200	6/ 8/50 6/13/50 6/15/50	57 129D 186	6/13/50	2♀♀ 2♂♂	
									6/14/50	5♀♀ 2♂♂	
									6/15/50	12♀♀ 10♂♂	
									6/16/50	7♀♀ 4♂♂	
									6/17/50	1 ♂	
									6/19/50	15♂♂ 13♀♀	
									6/20/50	10♀♀ 9♂♂	
									6/21/50	3♀♀ 11♂♂	
									6/22/50	12♀♀ 6♂♂	
									6/23/50	20♀♀ 15♂♂	
									6/26/50	7♀♀ 7♂♂	46.5

CAGE INFESTATION OF CALIFORNIA FRUITS BY D. DORSALIS

							Pupation and Emergence				%
Cage No.	In Date	Out Date	Type of Fruit	Quantity	Grams Each	Total Weight	Date	No. Pupae	Date	No. Flies	Emergence over Pupation
3	5/25/50	5/29/50	Cherries, Royal Ann			200	6/ 8/50	278	6/13/50	1 ♀	
							6/13/50	69D	6/14/50	4♀♀ 8♂♂	
									6/15/50	68♀♀ 61♂♂	
									6/16/50	6♀♀ 6♂♂ 1 ♀	
									6/17/50	10♀♀ 3♂♂	
									6/19/50	21♀♀ 22♂♂	60.8
4	"	"	Cherries, Black Oregon			200	6/ 8/50	69	6/11/50	1 ♂	
							6/13/50	223D	6/13/50	7♀♀ 6♂♂	
									6/14/50	3♀♀ 4♂♂	
									6/15/50	3♀♀ 8♂♂	
									6/16/50	2♂♂	
									6/21/50	12♀♀ 19♂♂	
									6/19/50	9♀♀ 14♂♂	
									6/23/50	4♀♀ 2♂♂	
									6/20/50	10♀♀ 8♂♂	
									6/22/50	11♀♀ 9♂	45.2

CAGE INFESTATION OF CALIFORNIA FRUITS BY D. DORSALIS

Cage No.	In Date	Out Date	Type of Fruit	Quantity	Grams Each	Total Weight	Pupation and Emergence Date	No. Pupae	Date	No. Flies	% Emergence over Pupation
5	5/25/50	5/29/50	Cherries, Tartarian			200	6/ 8/50	253	6/11/50	1 ♂	
							6/13/50	14D	6/13/50	1 ♀	
									6/14/50	3♀♀ 5♂♂	
									6/15/50	51♀♀ 75♂♂	
									6/16/50	3♀♀ 5♂♂	
									6/17/50	2♀♀ 1 ♂	
									6/20/50	1 ♂	55.4

D = Host Discarded

CAGE INFESTATION OF CALIFORNIA FRUITS BY D. DORSALIS

No. Cage	In Date	Out Date	Type of Fruit	Quantity	Grams Each	Total Weight	Pupation and Emergence: Date	No. Pupae	Date	No. Flies	% Emergence over Pupation
1	5/26/50	5/31/50	Apricot var. Wiggins seedling	9		200	6/ 8/50	100	6/13/50	1 ♂	
							6/13/50	99D		1 ♀	
									6/14/50	1 ♂	
									6/15/50	20 ♀♀	
										25 ♂♂	
									6/16/50	5 ♂♂	
										1 ♀	
									6/19/50	27 ♀♀	
										30 ♂♂	
									6/20/50	4 ♂♂	
										4 ♀♀	
									6/21/50	1 ♂	60.3
2	"	"	Apricot var. Wiggins seedling	10		200	6/ 8/50	162	6/14/50	7 ♀♀	
							6/13/50	63D		9 ♂♂	
									6/15/50	18 ♀♀	
										28 ♂♂	
									6/16/50	1 ♂	
									6/17/50	1 ♂	
									6/19/50	11 ♀♀	
										14 ♂♂	
									6/20/50	3 ♀♀	
										6 ♂♂	43.6
3	"	"	Apricot var. Wiggins seedling	10		200	6/8/50	92			
							6/13/50	1D	6/14/50	4 ♀♀	
									6/15/50	11 ♀♀	
										14 ♂♂	
									6/16/50	2 ♀♀	
										2 ♂♂	
									6/17/50	2 ♀♀	
										7 ♂♂	
									6/19/50	1 ♀	
										6 ♂♂	52.7

CAGE INFESTATION OF CALIFORNIA FRUITS BY D. DORSALIS

Cage No.	In Date	Out Date	Type of Fruit	Quantity	Grams Each	Total Weight	Pupation and Emergence Date	No. Pupae	Date	No. Flies	% Emergence over Pupation
4	5/26/50	5/31/50	Apricots var. Wiggins seedling	10		200	6/ 8/50 6/13/50	160 176D	6/13/50	1 ♂	
									6/14/50	4♀♀ 3♂♂	
									6/15/50	29♀♀ 48♂♂	
									6/16/50	7♀♀ 2♂♂	
									6/17/50	4♀♀ 5♂♂	
									6/19/50	40♀♀ 49♂♂	
									6/20/50	15♀♀ 17♂♂	
									6/21/50	3♀♀ 2♂♂	68.2
5	"	"	Apricots var. Wiggins seedling	10		200	6/ 8/50 6/13/50	126 55D	6/13/50	5♀♀ 4♂♂	
									6/14/50	5♀♀ 10♂♂	
									6/15/50	18♀♀ 20♂♂	
									6/16/50	7♀♀ 3♂♂	
									6/17/50	3♀♀ 3♂♂	
									6/19/50	4♀♀ 6♂♂	
									6/20/50	7♀♀ 7♂♂	
									6/21/50	3♀♀ 6♂♂	63.0

CAGE INFESTATION OF CALIFORNIA FRUITS BY D. DORSALIS

Cage No.	In Date	Out Date	Type of Fruit	Quantity	Grams Each	Total Weight	Pupation and Emergence Date	No. Pupae	Date	No. Flies	% Emergence over Pupation
6	5/26/50	5/31/50	Apricot var. Wiggins seedling	10		200	6/ 8/50	227	6/13/50	2♀♀	
							6/13/50	24D	6/14/50	4♀♀ 7♂♂	
									6/15/50	66♂♂ 78♀♀	
									6/16/50	3♀♀ 1 ♂	
									6/17/50	5♀♀ 2♂♂	
									6/19/50	3♀♀ 5♂♂	
									6/20/50	1 ♀ 2♂♂	
									6/21/50	1 ♀ 2♂♂	72.5

D = Host Discarded

CAGE INFESTATION OF CALIFORNIA FRUITS BY D. DORSALIS

Cage No.	In Date	Out Date	Type of Fruit	Quantity	Grams Each	Total Weight	Pupation and Emergence Date	No. Pupae	Date	No. Flies	% Emergence over Pupation
1	5/31/50	6/ 5/50	Apricots, var. Blenheim green and hard	15		150	6/15/50 6/19/50	0 0D			0
2	"	"	Apricots, var. Royal Green and hard	14		150	6/15/50 6/19/50	0 1D	6/26/50	1 ♂	100.0
3	"	"	Almonds, var. non Pareil Green and hard	18		150	6/15/50 6/19/50	0 0D			0
4	"	"	Almonds, var. Drake Green and hard	18		150	6/15/50 6/19/50	0 0D			0
5	"	"	Almonds, var. Peerless Green and hard	13		150	6/15/50 6/19/50	0 0D			0
6	"	"	Almonds, var. IXL	15		150	6/15/50 6/19/50	0 0D			0

D = Host Discarded

FIELD HOST PREFERENCE OF CALIFORNIA FRUITS BY D. dorsalis

Native Host Tree	Date Exposed	Date Isolated	Type of fruit	Quantity	Total Weight	Pupation and Emergence Date	No. Pupae	Date	No. Flies	% Emergence over Pupation
Mango tree (Mangifera indica)	4/20/50	4/24/50	Almond - immature var. mixed	10	75	5/8/50 5/11/50 5/15/50	0 0 0 D			0
Guava tree (Psidium guajava)	"	"	Almond - immature var. mixed	9	66	5/ 8/50 5/11/50 5/15/50	0 0 0 D			0
Lime tree (Citrus aurantiifolia)	"	"	Apricots - immature var. Tilton	18	190	5/ 8/50 5/11/50 5/15/50	0 0 0 D			0
Guava tree (Psidium guajava)	"	"	Apricots - immature var. Tilton	19	190	5/ 8/50 5/11/50 5/15/50	0 0 0 D			0
Mango tree (Mangifera indica)	"	"	Apricots - immature var. Royal	14	190	5/ 8/50 5/11/50 5/15/50	0 0 0 D			0
Mango tree (Mangifera indica)	"	"	Apricots - immature var. Royal	15	190	5/ 8/50 5/11/50 5/15/50	0 0 0 D			0

D = Host Discarded

FIELD HOST PREFERENCE OF CALIFORNIA FRUITS BY *D. dorsalis*

Native Host Tree	Date Exposed	Date Isolated	Type of Fruit	Quantity	Total Weight	Pupation and Emergence: Date	No. Pupae	Date	No. Flies	% Emergence over Pupation
Mango tree (*Mangifera indica*)	4/26/50	5/ 2/50	Cherries - immature var. Chapman		100	5/11/50 5/16/50	0 0	5/18/50	0 D	0
"	"	"	Cherries - immature var. Royal Ann		100	5/11/50 5/16/50	0 0 D			0
"	"	"	Cherries - immature var. Tartarian		100	5/11/50 5/16/50	0 3 D	5/20/50	1 ♂ 1 ♀	66.7
Guava tree (*Psidium guajava*)	"	"	Cherries - immature var. Bing		100	5/11/50 5/16/50	0 0 D			0
"	"	"	Cherries - immature var. Black Oregon		100	5/11/50 5/16/50	0 0 D			0
"	"	"	Cherries - immature var. Lambert		100	5/11/50 5/16/50	0 10 D	5/25/50	4 ♀♀ 1 ♂ 1 *Spalangia* parasite	50.0
"	"	"	Cherries - immature var. Chapman		100	5/11/50 5/16/50	0 0	5/18/50	0 D	0

D = Host Discarded

FIELD HOST PREFERENCE OF CALIFORNIA FRUITS BY D. dorsalis

Native Host Tree	Date Exposed	Date Iso-lated	Type of fruit	Quan-tity	Total Weight	Pupation and Emergence Date	No. Pupae	Date	No. Flies	% Emergence over Pupation
Mango tree (*Mangifera indica*)	5/ 5/50	5/ 9/50	Almonds - immature mixed var. from Winters, Yolo Co.	15	150	5/18/50	0	5/22/50	0 D	0
"	"	"	Apricots - immature var. Royal from Winters, Yolo Co.	10	150	5/18/50	0	5/22/50	0 D	0
"	"	"	Apricots - immature var. Blenheim Sacramento, Calif.	21	150	5/18/50	0	5/22/50	0 D	0
Guava tree (*Psidium guajava*)	"	"	Apricots - immature var. Blenheim Sacramento, Calif.	22	150	5/18/50	0	5/22/50	0 D	0
"	"	"	Apricots - immature var. Tilton from Winters, Yolo Co.	11	150	5/18/50	0	5/22/50	0 D	0
"	"	"	Almonds - immature var. mixed from Winters, Yolo Co.	14	150	5/18/50	0	5/22/50	0 D	0

D = Host Discarded

FIELD HOST PREFERENCE OF CALIFORNIA FRUITS BY D. DORSALIS

Native Host Tree	Date Exposed	Date Isolated	Type of Fruit	Quantity	Total Weight	Pupation and Emergence: Date	No. Pupae	Date	No. Flies	% Emergence over Pupation
Mango tree (*Mangifera indica*)	5/15/50	5/19/50	Cherries, Chapman ripe		150	6/ 1/50 6/ 5/50	3 0D	6/11/50	1 ♀	33.3
"	"	"	Cherries, Royal Ann immature		150	6/ 1/50 6/ 5/50	25 0D	6/ 6/50	1 ♀	
								6/ 7/50	8♀♀ 5♂♂	
								6/ 8/50	1 ♀ 2♂♂	
								6/ 9/50	3♀♀ 1 ♂	
								6/11/50	3♀♀ 1 ♂	100.0
"	"	"	Cherries, Taritarian immature		150	6/ 1/50 6/ 5/50	4 1	6/ 5/50 6/13/50	1 ♀ 1 ♀D	40.0
"	"	"	Cherries, Bing immature		150	6/ 1/50 6/ 5/50	2 0D	6/ 8/50	2♂♂	100.0
"	"	"	Cherries, Black Oregon immature		150	6/ 1/50 6/ 1/50	0 0D			0
"	"	"	Cherries, Lambert immature		150	6/ 1/50 6/ 5/50	0 1D			0

D = Host Discarded

FIELD HOST PREFERENCE OF CALIFORNIA FRUITS BY D. DORSALIS

Native Host Tree	Date Exposed	Date Isloated	Type of Fruit	Quan-tity	Total Weight	Pupation and Emergence: Date	No. Pupae	Date	No. Flies	% Emergence over Pupation
Mango tree (*Mangifera indica*)	5/25/50	5/29/50	Cherries, Bing mature		100	6/ 5/50	8	6/13/50	1 ♂	
						6/ 8/50	17	6/14/50	1 ♂	
						6/13/50	58D	6/15/50	1 ♂	
								6/17/50	4♀♀ 2♂♂	
								6/19/50	8♀♀ 3♂♂	
									3 *longicaudatus*	
								6/20/50	1 *longicaudatus*	
								6/21/50	2♀♀	
									5 *longicaudatus*	
								6/22/50	2♀♀	
									2 *longicaudatus*	
								6/23/50	6 *longicaudatus*	
								6/26/50	1 ♀	
									3 *longicaudatus*	
								6/27/50	1 *persulcatus*	
								6/28/50	1 *longicaudatus*	
										30.1
"	"	"	Cherries, Lambert mature		100	6/ 5/50	6	6/15/50	1 ♂	
						6/ 8/50	36	6/16/50	9♀♀ 7♂♂	
						6/13/50	113D			
								6/17/50	2♀♀ 4♂♂	
									1 *persulcatus*	
								6/19/50	2♀♀	
									13 *persulcatus*	
								6/21/50	13♀♀ 13♂♂	
									4 *persulcatus*	
								6/22/50	1 ♀	
									5 *persulcatus*	
								6/23/50	2 *persulcatus*	
								6/26/50	1 *persulcatus*	
										33.5

FIELD HOST PREFERENCE OF CALIFORNIA FRUITS BY D. DORSALIS

Native Host Tree	Date Exposed	Date Isolated	Type of Fruit	Quantity	Total Weight	Pupation and Emergence: Date	No. Pupae	Date	No. Flies	% Emergence over Pupation
Mango tree (*Mangifera indica*)	5/25/50	5/29/50	Cherries, Royal Ann mature		100	6/ 5/50 6/ 8/50 6/13/50	0 0 1D	6/30/50	1 *longicaudatus*	0
"	"	"	Cherries, Black Oregon mature		100	6/ 5/50 6/ 8/50 6/13/50	0 0 0D			0
"	"	"	Cherries, Tartarian mature		100	6/ 5/50 6/ 8/50 6/13/50	29 15 14D	6/13/50 6/15/50 6/16/50 6/19/50 6/21/50 6/22/50 6/26/50	1 ♂ 1 ♂ 5♀♀ 5♂♂ 1 ♀ 1 ♂ 1 ♀ 2♂♂	29.3

D = Host Discarded

FIELD HOST PREFERENCE OF CALIFORNIA FRUITS BY D. DORSALIS

Native Host Tree	Date Exposed	Date Isolated	Type of Fruit	Quan-tity	Total Weight	Pupation and Emergence: Date	No. Pupae	Date	No. Flies	% Emergence over Pupation
Mango tree (*Mangifera indica*)	5/26/50	5/30/50	Apricot, var. Wiggins seedling. Early shipping stage	10	200	6/ 8/50 6/13/50	144 93D	6/15/50	3♀♀ (Melon fly 1 ♂ (	
								6/16/50	3♀♀	
								6/17/50	11♀♀ 3♂♂ 1 *longicaudatus*	
								6/19/50	2♀♀ 2♂♂ 7 *longicaudatus* 2 *persulcatus* 23♀♀ 22♂♂	
								6/20/50	2 parasites	
								6/22/50	2♀♀	27.8
"	"	"	" "	11	200	6/ 8/50 6/13/50	16 4D	6/17/50	7♀♀ 1 ♂ 4♀♀ 2♂♂	70.0
Red Guava (*Psidium cattleianum*)	"	"	" "	8	200	6/ 8/50 6/13/50	0 0D			0

FIELD HOST PREFERENCE OF CALIFORNIA FRUITS BY D. DORSALIS

Native Host Tree	Date Exposed	Date Isolated	Type of Fruit	Quantity	Total Weight	Pupation and Emergence: Date	No. Pupae	Date	No. Flies	% Emergence over Pupation
Red Guava (*Psidium cattleianum*)	5/26/50	5/30/50	Apricot, var. Wiggins seedling. Early shipping stage.	10	200	6/ 8/50	2	6/21/50	2♀♀	
						6/13/50	7D		2♂♂	
								6/22/50	2♂♂	66.7
								6/30/50	1 *persulcatus*	
Guava (*Psidium guajava*)	"	"	" "	11	200	6/ 8/50	134	6/15/50	1 melon fly	
						6/13/50	144D	6/16/50	4♀♀	
									5♂♂	
								6/17/50	11♀♀	
									8♂♂	
								6/19/50	37♀♀	
									46♂♂	
									14 *persulcatus*	
								6/20/50	2 *longicaudatus*	
									12 *persulcatus*	
								6/21/50	16 *persulcatus*	
									3 *longicaudatus*	
								6/22/50	1 *longicaudatus*	
								6/26/50	4 *longicaudatus*	
								6/27/50	1 *longicaudatus*	
										39.9

FIELD HOST PREFERENCE OF CALIFORNIA FRUITS BY D. DORSALIS

Native Host Tree	Date Exposed	Date Isolated	Type of Fruit	Quantity	Total Weight	Pupation and Emergence: Date	No. Pupae	Date	No. Flies	% Emergence over Pupation
Pomegranate (*Punica granatum*)	5/26/50	5/30/50	Apricot, var. Wiggins seedling. Early shipping stage.	10	200	6/ 8/50	28	6/14/50	2 melon fly	
						6/13/50	45D	6/15/50	3 melon fly	
								6/16/50	2♀♀ 1 ♂	
								6/17/50	7♀♀ 4♂♂	
								6/19/50	19♀♀ 27♂♂	
								6/21/50	1 ♂	
								6/23/50	2 *persulcatus*	83.6

D = Host Discarded

FIELD HOST PREFERENCE OF CALIFORNIA FRUITS BY D. DORSALIS

Native Host Tree	Date Exposed	Date Isolated	Type of Fruit	Quantity	Total Weight	Pupation and Emergence Date	No. Pupae	Date	No. Flies	% Emergence over Pupation
Mango tree (*Mangifera indica*)	5/31/50	6/ 5/50	Apricots, var. Blenheim Green and hard	15	150	6/15/50 6/19/50	0 OD			0
"	"	"	Apricots, var. Royal Green and hard	15	150	6/15/50 6/19/50	0 OD			0
"	"	"	Almonds, var. non Pareil	118	150	6/15/50 6/19/50	0 OD			0
"	"	"	Almonds, var. Drake	17	150	6/15/50 6/15/50	0 OD			0
"	"	"	Almonds, var. Peerless	13	150	6/15/50 6/19/50	0 OD			0
"	"	"	Almonds, var. IXL	15	150	6/15/50 6/19/50	0 OD			0

D = Host Discarded

SUMMARY OF INFESTATION INDICES

The following histograms and table are based on the collections of 40,516 fruit included in 753 different lots. From these collections were recovered a total of 155,495 puparia. This includes about half of the lots collected thus far on Maui but many host species are represented by so few collections that we are limiting this particular study to the seven hosts where we have sufficient data to be at least suggestive.

Of the seven hosts listed, five are good hosts and two are poor ones. Each host has been assigned an index based on average number of puparia recovered per 1000 grams of fruit. Using the percentage of emergence of the species concerned we calculate the number of adults which will be recovered from 1000 grams of fruit. Peaches, loquat and citrus are further divided into infestation indices at different elevations. It will be observed that there is frequently more difference between one host at different elevations than between different species of hosts. And in the case of Citrus (lemon, lime, orange, tangerine, grapefruit) which we have lumped into one group you will find more difference between one host at different stages of maturity than in two different citrus species. Briefly, the bulk of infested citrus is ground fruit which is either over ripe or cracked. The reason for this low infestation appears to be the larvacidal effect of the rind which we cover under miscellaneous studies in this report.

In order of their degree of infestation they are False Kamani, peach, loquat, mango, guava, avocado and citrus. The latter two are poor hosts. We refer to winter avocado or the thick skin varieties.

To determine the role of importance each of these host species plays as a prop under the <u>dorsalis</u> population we would have to go one step further and determine the relative abundance of each species and the amount of fruit produced. While we have no exact quantative data it is quite apparent that guava far exceeds all other species in number and in total fruit production.

This generalized statement has exceptions in localized areas where other hosts may play a dominant role. In the Kula District of Maui, above 3000' there are very few guava and they certainly do not play as important a part as loquat and peaches. However, even in these areas, it appears that population build up at lower levels cause pressure and an upsurge under favorable conditions. This appears to be the case on the Ookala-Keanakolu Trail on Hawaii where trap catches are usually highest at higher elevations when guava is plentiful at the base of the trail.

Another factor to consider is the relative length of the fruiting season of particular hosts. A host which has a sharp peak and then goes out of production, leaves the population dangling and if some other host does not offer a sequence of ovipostional material, mortality factors quickly reduce the population which is not being continually replenished.

The <u>Dorsalis Population</u> might be likened to a mighty river fed by one large tributary (guava) and several lesser ones (mango, kamani, loquat, peach) with many tiny streamlets of the lesser hosts. Divert or cut off the main tributory of the river and you reduce it to an innocuous stream. There is a possibility that the large tributory to the <u>dorsalis</u> population can also be cut off. With the risk of being repetitious the writer would like to point out that a Tortricid moth occuring on Guam (<u>Spilonata holotephras Meyrick</u>) appears to prevent the development and fruiting of this host. (1)

(1) "The Oriental Fruit Fly on Guam" Journal of Economic Entomology, Dec. 1948, V. 41, Number 6, pp. 991-992

NUTRITION EXP. 332

TABLE 30

FLIES ALIVE MALE

CAGE	FOOD	5/18	5/23	5/24	5/25	5/26	5/30	5/31	6/1	6/2	6/5	6/6
1	Methyl Eugenol	25	19	18	17	17	16	15	15	15	14	14
2	Citronella	25	20	16	9	5	0					
3	H2 O	25	13	5	3	2	0					
4	Honey	25	23	21	18	18	18	17	17	17	16	16
5	Honey M. E.	25	24	21	17	17	16	16	14	13	13	13

FLIES ALIVE FEMALE

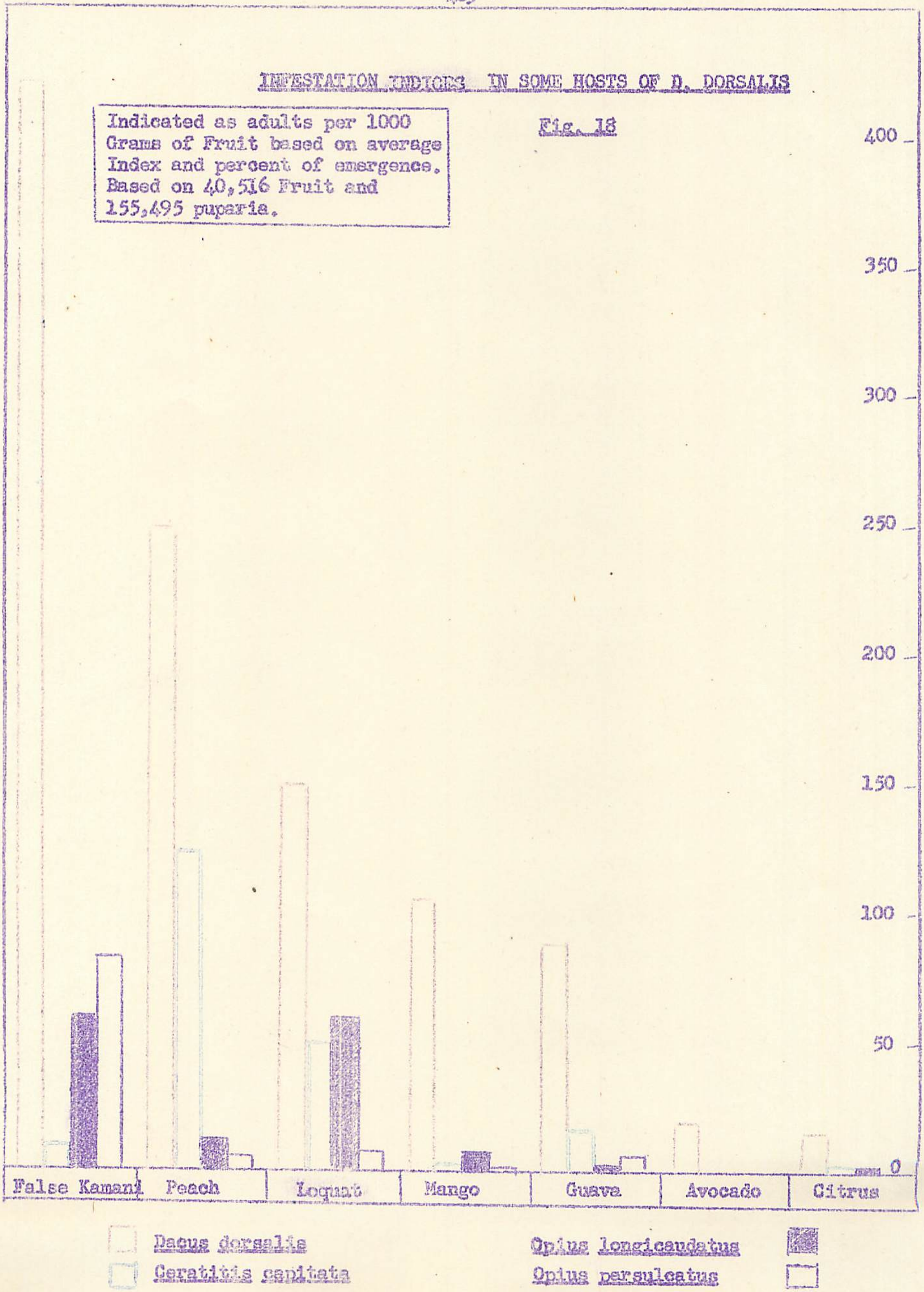
CAGE	FOOD	5/18	5/23	5/24	5/25	5/26	5/30	5/31	6/1	6/2	6/5	6/6
6	Methyl Eugenol	25	20	13	11	7	0					
7	Citronella	25	17	12	6	4	0					
8	H2 O	25	14	12	6	3	0					
9	Honey	25	24	22	22	22	22	22	22	22	21	21
10	Honey M. E.	25	11	5	3	3	2	9	2	2	2	2

CAGE	FOOD	6/7	6/8	6/9	6/12	6/14	6/15	6/19	6/21
1	Methyl E.	14	14	14	11	11	11	11	10
4	Honey	15	15	15	13	12	10	7	7
5	Honey M. E.	13	13	9	6	6	3	2	1
9	Honey	20	20	18	14	11	10	6	6
10	Honey M. E.	1	1	1	1	1	0	1	0

INDCES OF INFESTATION

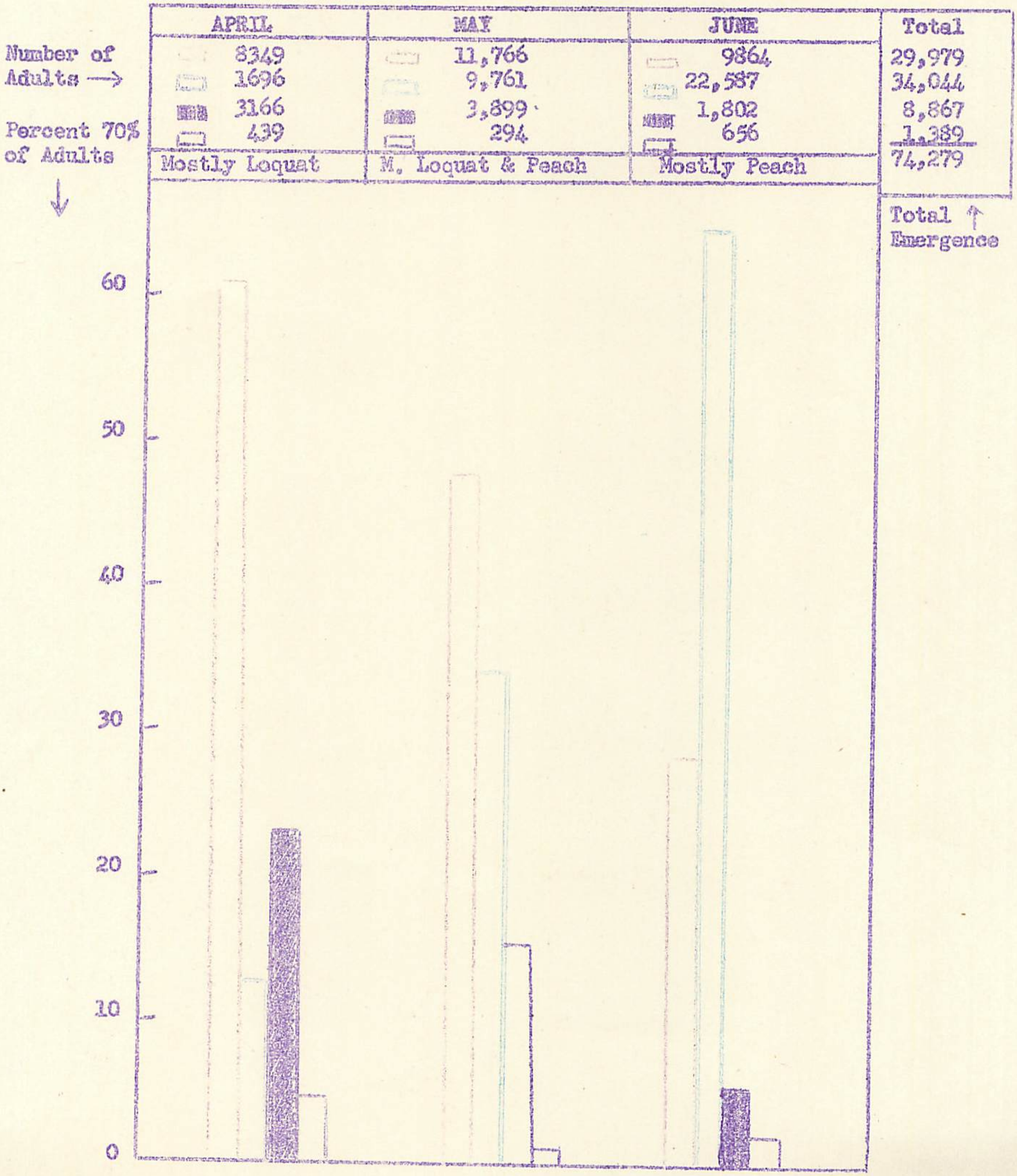
TABLE 31

FRUIT	NO. of LOTS	NO. of FRUIT	PUPARIA	INDEX	ELEVATION	ADULTS PER 1000 GRAMS			
KAMANI	8	614	4,898	448	0-500	367	7.6	61	85
PEACH	61	1129	18,018	793	1000-1500	47	705	31	1
				515	1500-2000	72	402	36	5
				417	2000-2500	154	259	4	0
				413	2500-3000	252	136	12	8
				108	3000-3500	44	21	43	0
LOQUAT	288	33,053	109,192	370	3500-4000	66	222	81	0
				323	3000-3500	148	103	65	6
				285	2501-3000	154	51	60	9
				188	1520-2000	132	7	45	4
				84	0-1000	40	0	34	8
MANGO	23	297	5,341	48	2500-4000	48			
				152	0-1000	114	1.2	5.8	1.2
GUAVA	79	3,153	14,278	170	0-3000	79	17	1	.3
AVOCADO	60	371	1,126	20	0-3500	20	0	0	0
CITRUS	234	1,964	1,516	31	3000 -4000	7	22	2	0
				22	1000 -3000	9	6	6	.3
				17	0 -1000	15	1	.6	.08
TOTAL	753	40,581	155,495						


INFESTATION INDICES IN SOME HOSTS OF D. DORSALIS
Indicated as adults per 1000 Grams of Fruit based on average Index and percent of emergence. Based on 40,516 Fruit and 155,495 puparia.
Fig. 18
400
350
300
250
200
150
100
50
0
False Kamani
Peach
Loquat
Mango
Guava
Avocado
Citrus
Dacus dorsalis
Ceratitis capitata
Opius longicaudatus
Opius persulcatus

TREND IN ADULT EMERGENCE FROM DIFFERENT HOSTS

Fig. 19



Dacus dorsalis

Ceratitis capitata

Opius longicaudatus

Opius persulcatus

SUMMARY OF LOQUAT SURVEY ON MAUI

The information we now have compiled as a result of the loquat survey on Maui which resulted in the collection of 33,053 loquat in various localities and elevations has been presented pictorially in the two following histograms. A total of 109,192 puparia were recovered from this fruit and the infestation indices tabulated indicate that loquat is an excellent host for Dacus dorsalis.

The index figure is computed by figuring the total puparia recovered per 1000 grams of fruit. The data presented indicates that the higher the elevation (up to 4000') the higher the index. This is rather surprising for we might expect the loquat to be most heavily infested in areas where the population of the fly is highest. Apparently there is little correlation between degree of infestation and fly population. Even low populations result in high degree of infestation of this fruit. However, it should be pointed out that the index above 3500' is supported by 60% C. capitata.

We may account for the fact that loquat are less heavily infested at lower elevations because of the greater choice of oviposition material presented to the female in these areas.

The fact that infestation indices are higher at higher elevations results in some rather startling figures. Although most observers feel that the parasites are most abundant at lower elevations, we recover more O. longicaudatus per 1000 grams of fruit above 3500 feet than we do below 1000 feet. In Fig. A which is based on percentage of emergence of adults we observe that the percent of parasitism is highest below 1000 feet. However, in Fig. B which takes into consideration indices of infestation the number of parasites per 1000 grams of fruit gradually increase until they are highest above 3500'.

In our collections taken above 3500 feet we did not recover any O. persulcatus and the total number of this species at the other elevations appears to be about the same although based on percentages it is higher below 1000 feet. In any event it appears to be the least important of the two species in loquat at this time.

We did not recover any Ceratitis capitata in our collection below 1000' although we know from collections of other fruit that an occasional specimen is picked up, particularly during the winter months. It will be noted, however, that up to 3500' Dacus dorsalis is the predominating species.

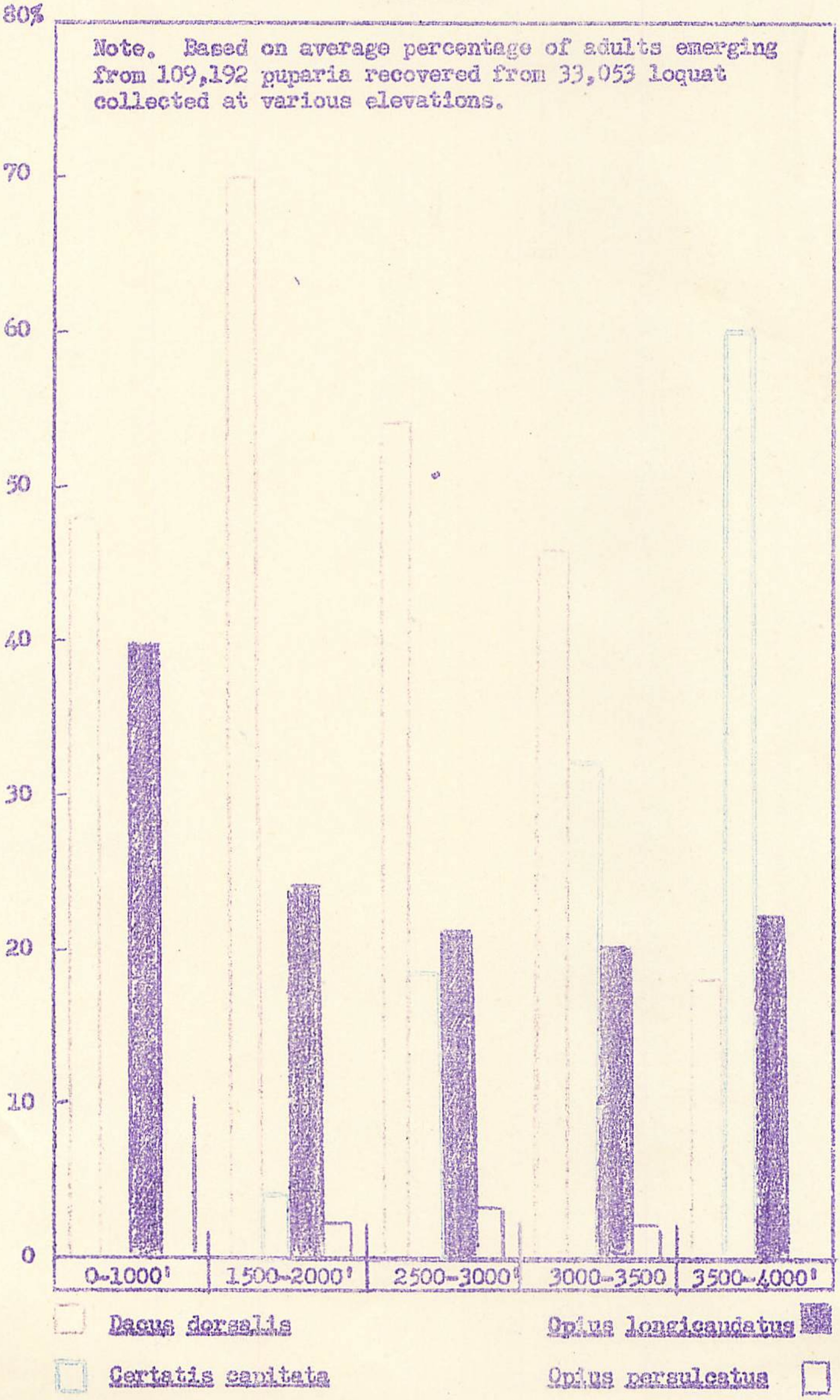
Total emergence figures indicate that as the percentage of C. capitata goes up the percent of both parasites go down. It appears from our data that most of the parasites may be attributable to Dacus dorsalis. If this be the case and the percentage of O. longicadatus is added to the percentage of D. dorsalis it will show that above 3500' 40% of the infestation of loquat is caused by Dacus dorsalis. Between 3000' and 3500', on the same basis, 66% of the infestation is attributable to dorsalis.

Dacus dorsalis appears to be the most dominant species up to 3500 feet. Above this elevation it results in 18% (40% if you attribute all parasites to dorsalis) infestation of loquat.

The writer would like to emphasize, and strongly, that the data here presented is based on loquat. We have good reason to believe that a similar study made on peaches will give entirely different results. Comparing these two studies will point out that there are strong host preferences for each of these flies. It will also show some striking differences in parasite reactions to different hosts.

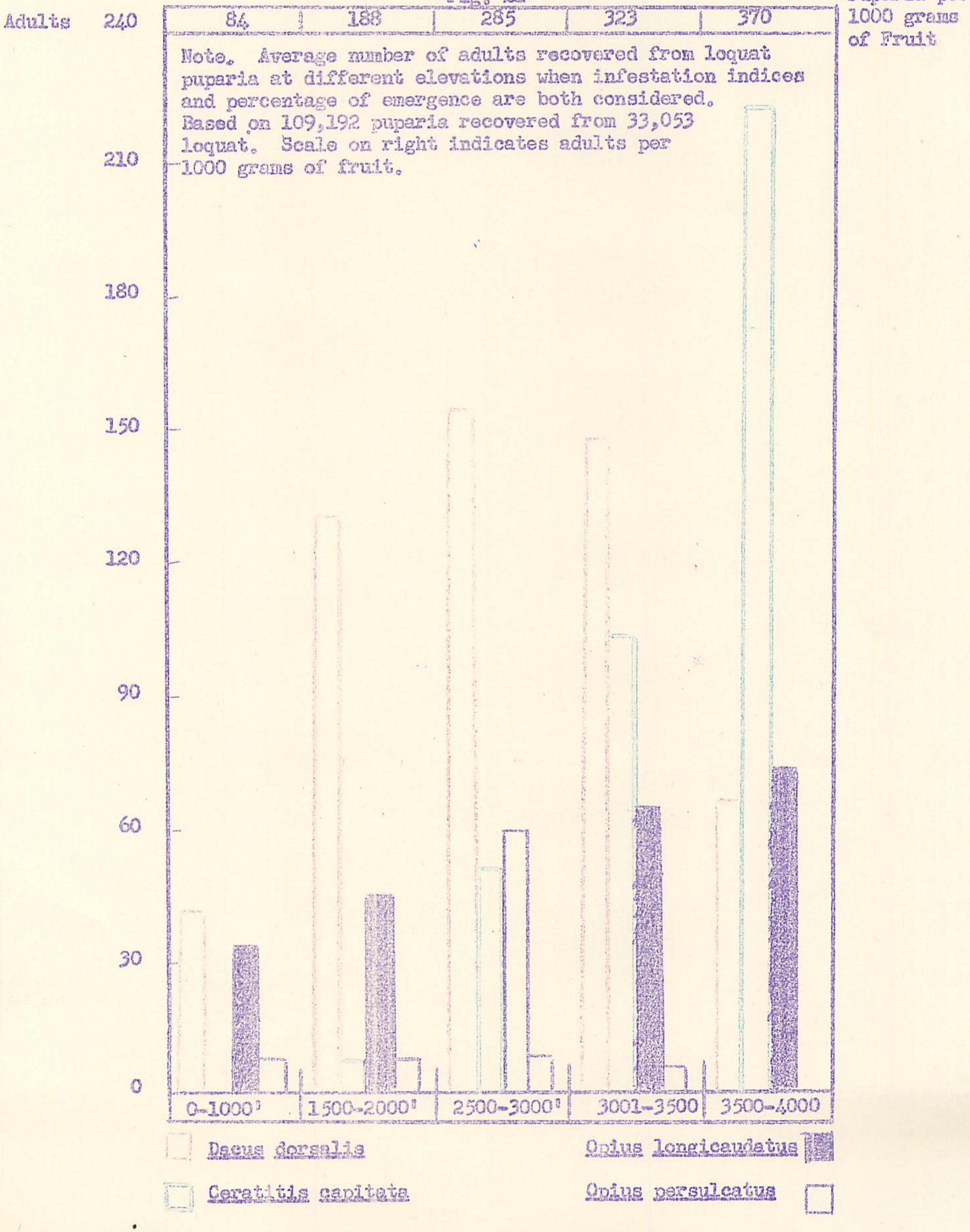
COMPETITION AND PARASITISM AT DIFFERENT ELEVATIONS

Fig. 20



COMPETITION AND PARASITISM AT DIFFERENT ELEVATIONS

Fig. 21



COMPETITION AND PARASITISM AT DIFFERENT ELEVATIONS

BASED ON LOQUAT SURVEY

TABLE 32

	Percentage					Adults per 1000 grams			
ELEV	DOR	MED	LON	PER	INDEX	DOR	MED	LON	PER
0-1000'	48	0	40	10	84	40	0	34	8
1500-2000	70	4	24	2	188	132	7	45	4
2500-3000	54	18	21	3	285	154	51	60	9
3000-3500	46	32	20	2	323	148	103	65	6
3500-4000	18	60	22	0	370	66	222	81	0

Legend:

DOR : *Dacus dorsalis*
MED : *Ceratitis capitata*
LON : *Opius longicaudatus*
PER : *Opius persulcatus*

INDEX: Total puparia recovered per 1000 grams of fruit.

Note: Percentages and infestation indices based on 109, 192 puparia recovered from 33,053 loquat collected at various elevations.

COMPETITION AND PARASITISM AT DIFFERENT ELEVATIONS

BASED ON LOQUAT SURVEY

TABLE 33

				Percentage of Emergence			
LOT	ELEV	PUPARIA	INDEX	DOR	MED	LON	PER
104	2600	122	960	59	40	0	0
179	1990	0	0				
223	750	25	58	64	0	35	0
306	2640	9	12	100			
308	2640	48	13	80	20		
318	1800	55	31	94		6	
319	1800	42	27	92		8	
320	1800	66	31	100			
385	2650	0	0				
388	750	127	201	46		35	18
414	1700	141	63	52		48	
420	750	28	31	66		22	
421	750	23	28	25		75	
431	1700	30	68	57		43	
440	2640	46	7	86	14		
457	2650	0	0				
469	750	61	102	60		13	27
470	75	74	102	19		56	25
496	1700	196	251	22		74	3
523	2600	219	286	47		51	1
524	2600	256	361	37	6	46	10
525	2600	277	332	48	2	45	4

				Percentage of Emergence			
LOT	ELEV	PUPARIA	INDEX	DOR	MED	LON	PER
526	2600	339	470	51	1	35	14
527	2600	223	297	33	5	54	8
528	2600	260	340	60	10	27	2
529	2600	276	361	45	2	36	15
530	2600	488	299	93		3	3
531	2600	463	330	40	4	53	2
532	2600	403	299	34	3	54	9
533	2600	495	235	55	19	26	
535	2600	134	255	20	6	65	3
536	2600	254	140	72	1	27	
537	2600	139	130	50	12	35	2
538	2600	485	255	56	16	26	1
539	2600	203	188	74	17	4	
540	2600	443	218	40	21	34	4
541	2600	405	361	30	6	58	6
542	2600	368	302	54	33	6	4
543	2600	530	393	53	14	24	8
544	2600	182	138	42	7	41	9
545	2600	287	189	57	8	25	9
546	2600	237	156	74	10	13	3
547	2600	85	78	57	15	10	17
548	2600	352	318	32	6	56	4
549	2600	409	262	35	40	23	2
550	2600	259	247	61	11	23	4

LOT	ELEV	PUPARIA	INDEX	Percentage of Emergence DOR	MED	LON	PER
551	2600	378	307	40	22	33	3
552	2600	494	383	48	12	33	4
553	2600	163	128	69	17	13	0
554	2600	377	292	49	7	43	0
555	2600	332	266	43	19	33	3
556	2600	308	197	40	13	47	0
557	2600	477	378	33	5	52	9
558	2600	303	277	39	5	57	1
559	2600	440	379	40	4	45	7
560	3000	64	35	8	60	32	0
561	3000	51	37	38	52	10	0
593	2600	176	335	28	50	20	1
594	2600	63	74	51	31	8	8
595	2600	20	31	44	0	56	0
596	2600	85	98	45	16	39	0
597	2600	25	23	60	0	40	0
598	2600	66	69	23	20	5	16
599	2600	370	330	14	1	77	7
600	2600	46	69	59	35	3	3
601	2600	111	101	27	68	3	0
602	2600	86	62	10	82	0	7
603	2600	168	169	18	77	2	2
604	2600	210	172	64	15	12	8
605	2600	23	36	57	19	9	14

				Percentage of Emergence			
LOT	ELEV	PUPARIA	INDEX	DOR	MED	LON	PER
606	2600	130	209	37	28	35	0
607	2600	48	34	70	5	25	0
608	2600	45	40	79	12	8	0
609	2600	113	95	59	30	11	0
610	2600	105	125	47	3	55	0
611	2600	0	0				
612	2600	256	323	8	3	88	1
613	2600	41	72	78	14	7	
614	2600	168	117	46	35	19	0
615	2600	151	248	34	52	14	0
616	2600	334	407	35	5	48	11
617	2600	149	134	60	8	33	0
618	2600	329	362	16	3	76	4
619	2600	38	28	32	64	3	
622	2600	43	62	33	36	28	3
636	1916	463	219	76	2	19	4
637	1916	251	150	55	3	22	2
638	1916	142	95	69	6	24	0
639	1996	105	130	85	13	1	1
640	1996	159	229	88	7	3	2
641	1996	107	126	73	21	3	3
642	1996	112	202	86	10	4	0
643	1996	158	186	86	8	6	0
644	1996	162	187	87	4	9	0
645	1996	153	152	41	9	50	0

				Percentage of Emergence			
LOT	ELEV	PUPARIA	INDEX	DOR	MED	LON	PER
646	1996	114	161	40	1	60	0
647	1996	70	133	56	0	44	20
648	1996	137	210	56	2	42	0
649	1996	143	226	64	0	36	0
650	1996	118	185	49	8	42	0
651	1996	64	76	42	0	58	0
652	1996	155	176	71	3	22	3
653	1996	161	271	63	11	26	0
654	1996	169	239	59	2	38	0
655	1996	146	122	60	1	36	1
656	1996	224	232	81	1	15	2
657	1996	125	124	79	5	16	0
658	1996	137	129	70	1	19	10
659	1996	167	175	66	3	26	4
666	2600	302	134	35	9	54	1
667	2600	195	100	64	5	31	0
668	2600	218	133	54	18	25	3
669	2600	249	148	52	14	33	0
670	2600	219	219	49	12	38	0
671	2600	216	123	46	23	27	3
672	2600	134	81	60	70	26	8
673	2600	301	170	65	19	13	2
674	2600	200	115	48	10	36	6
675	2600	317	169	45	29	23	2

				Percentage of Emergence			
LOT	ELEV	PUPARIA	INDEX	DOR	MED	LON	PER
676	2600	172	115	53	30	14	2
677	2600	217	136	57	14	25	3
678	2600	380	216	74	9	14	2
679	3100	648	318	32	48	19	0
680	"	319	192	58	3	18	0
688	1990	199	141	77	6	12	4
689	1990	109	109	81	10	8	0
690	1990	208	288	85	1	13	0
691	1990	699	685	88	8	2	2
692	1990	206	213	72	1	22	5
693	1990	231	196	93	3	5	0
694	1990	120	116	76	4	17	3
695	1990	208	188	81	2	16	2
696	1990	148	133	89	2	8	0
697	1990	185	169	84	2	14	0
698	1990	201	249	83	0	14	2
699	1990	214	196	77	3	16	3
700	1990	233	208	88	5	7	0
701	1990	130	120	90	1	7	1
702	1990	212	174	64	3	32	0
703	1990	136	135	74	13	13	0
704	1990	240	241	79	5	15	1
705	1990	208	149	63	3	29	5
706	1990	176	149	61	4	35	0

LOT	ELEV	PUPARIA	INDEX	Percentage of Emergence DOR	MED	LON	PER
707	1990	193	278	59	3	38	0
708	1990	187	287	60	1	38	2
709	1990	209	284	33	2	64	0
710	1990	169	265	79	2	40	0
711	1990	215	172	58	2	37	2
712	1990	211	167	66	6	26	1
713	1990	161	145	69	1	29	1
714	1990	159	130	96	4	0	0
715	1990	226	270	87	10	3	0
716	1990	163	213	78	10	8	1
717	1990	225	260				
718	1990	225	226	55	6	34	4
719	1990	243	440				
720	1840	365	193	33	0	64	3
721	1840	289	201	40	1	41	8
722	1840	262	217	57	1	38	5
723	1840	323	207	47	0	41	11
724	1840	349	232	54	1	39	7
725	1840	350	277	80	1	15	4
726	1840	333	217	92	1	3	4
727	1840	311	221	66	5	20	8
728	1990	190	371	84	1	15	0
729	1990	344	346	91	5	4	0
730	1990	120	101	70	19	11	0

				Percentage of Emergence			
LOT	ELEV	PUPARIA	INDEX	DOR	MED	LON	PER
731	1990	170	179	74	15	11	0
732	1990	131	118	72	12	17	0
733	1990	178	170	90	8	2	0
734	1990	170	144	77	3	20	0
735	1990	187	193	83	8	9	0
736	1990	281	320	92	5	3	0
737	1990	205	241	82	3	15	0
738	1990	145	138	87	8	25	0
739	1990	117	114	72	1	19	0
740	1990	47	44	40	2	57	0
741	1990	45	43	58	0	42	0
742	1990	205	209	85	4	9	1
764	3110	706	383	70	0	30	0
765	3110	243	142	56	20	20	4
767	2850	694	609	55	40	4	0
768	2850	868	652	85	15		
769	2850	711	481	76	21	3	0
770	2850	969	478	88	10	2	
771	2850	987	557	44	44	12	0
772	2850	1256	598	74	16	4	6
773	2850	1501	543	46	7	1	2
774	2850	704	51	37	22	38	2
775	2850	1627	731	61	37	1	0
776	2850	721	547	60	27	13	0

				Percentage of Emergence			
LOT	ELEV	PUPARIA	INDEX	DOR	MED	LON	PER
777	2950	888	460	71	20	7	2
778	2950	1258	562	53	41	4	2
779	2950	1167	415	55	37	4	4
780	2950	1821	584	73	25	2	0
781	2950	1643	616	80	18	1	4
782	2950	1318	474	57	37	1	1
783	2950	660	314	56	32	8	2
784	2950	626	266	82	6	10	2
785	2950	1578	687	64	35	0	0
786	2950	331	224	28	64	5	2
787	2900	2049	807	65	24	7	3
788	2900	1974	829	70	26	3	1
789	2900	1620	663	61	35	3	1
790	2900	1200	506	82	10	2	4
791	2900	886	644	47	44	7	1
792	2900	899	789	65	31	3	6
793	2900	1182	595	67	28	3	2
794	2900	979	479	63	29	4	3
795	3120	480	297	63	4	32	1
796	3120	547	301	29	0	70	0
797	3120	506	262	35	2	62	
798	3120	818	360	41	3	53	3
799	3120	732	274	82	1	15	2
800	3120	1190	528	65		32	2

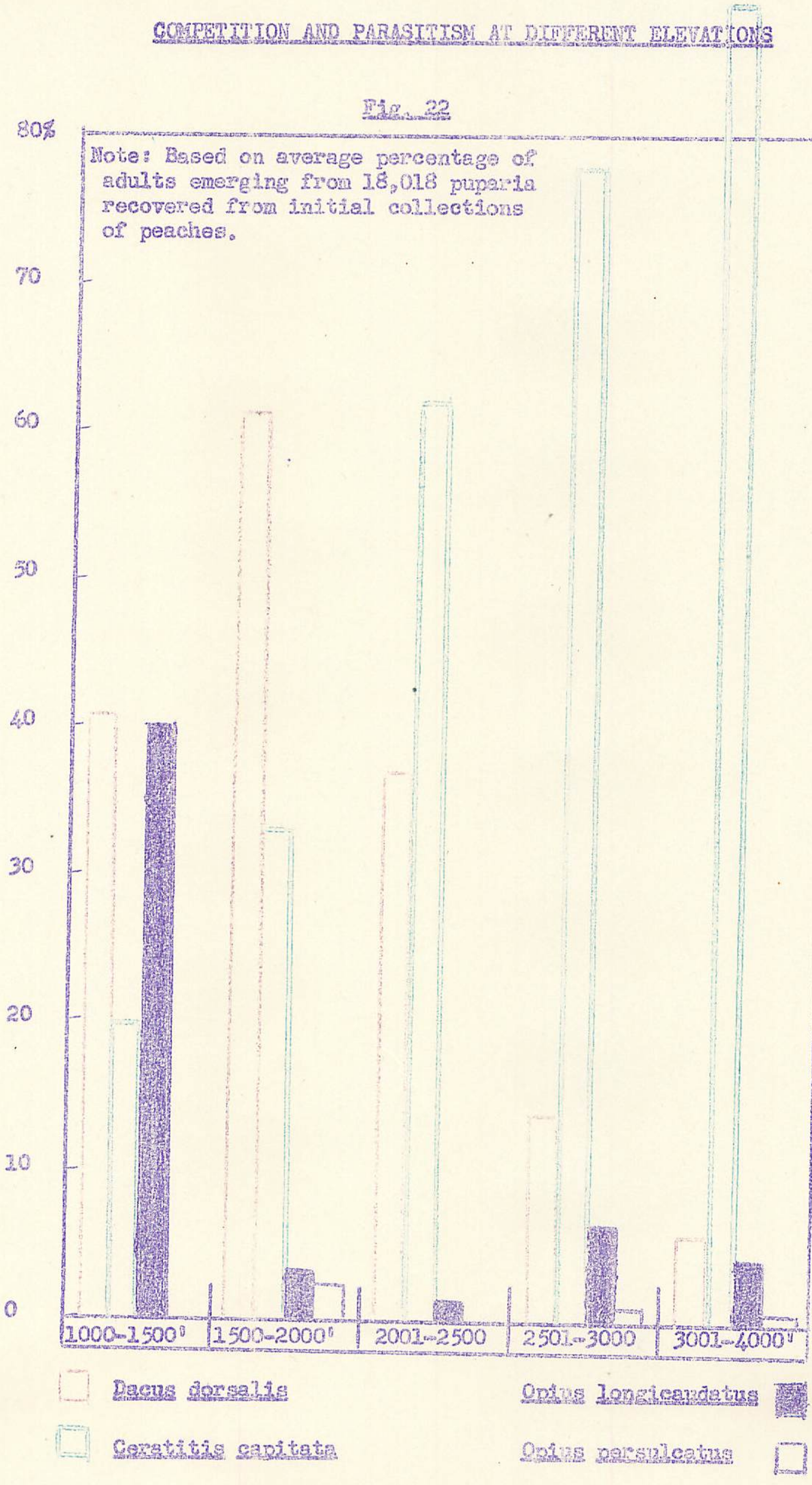
LOT	ELEV	PUPARIA	INDEX	Percentage of Emergence DOR	MED	LON	PER
801	3120	884	483	71	3	25	1
802	2860	609	429	68		32	
803	2860	179	248	47	12	41	
804	2860	659	261	67	22	9	3
805	3050	703	335	46	41	12	2
806	3050	782	370	47	41	11	3
807	3050	718	308	48	37	13	1
808	3050	744	338	48	35	15	1
809	3050	606	299	54	20	25	1
810	3050	904	368	35	54	10	
811	3050	919	456	66	31	3	
813	3150	793	358	72	23	4	1
814	3200	366	146	34	59	6	
815	3300	134	63	70	18	9	3
816	3300	35	11	97	1	2	
817	3300	236	99	52	44	3	0
818	3300	109	97	78	19	2	
819	3800	138	100		100		
820	3800	41	37		100		
847	3320	619	336	100			
848	3320	744	387	98	2		
849	3260	423	252	36	59	4	
850	3260	509	264	46	44	10	
851	3360	754	400	43	22	28	7

				Percentage of Emergence			
LOT	ELEV	PUPARIA	INDEX	DOR	MED	LON	PER
852	3360	878	538	41	23	32	3
853	3360	770	538	34	21	44	2
854	3360	707	402	40	39	20	
855	3360	554	336	53	17	28	1
862	3360	482	333	59	19	19	
863	3360	490	368	44	33	21	2
864	3360	413	300	34	43	22	4
865	3360	247	198	33	40	23	3
866	3360	399	288	37	41	21	4
867	3360	352	267	20	30	45	5
868	3360	346	277	30	34	31	5
869	3360	338	268	26	29	39	5
870	3360	739	622	56	41	1	1
871	3360	207	157	47	16	37	3
872	3360	329	270	44	31	19	6
873	3360	324	279	24	38	32	6
874	3360	408	339	33	43	18	6
875	3360	443	362	29	44	19	7
876	3360	392	333	32	46	16	6
877	3360	391	228	23	38	36	3
878	3360	359	302	45	39	13	3
879	3360	374	342	36	43	19	1
880	3360	464	284	29	56	10	2
881	3360	430	265	52	34	13	1

				Percentage of Emergence			
LOT	ELEV	PUPARIA	INDEX	DOR	MED	LON	PER
882	3360	471	261	40	28	31	0
883	3360	412	350	55	33	11	1
884	3360	458	351	23	49	26	2
885	3360	362	302	37	20	14	4
886	3360	299	254	42	37	15	5
887	3360	401	452	47	31	18	3
888	3360	507	376	36	59	4	1
889	3360	543	340	47	37	15	1
890	3360	354	287	34	35	22	9
891	3360	330	277	27	40	21	11
892	3360	437	324	30	43	24	2
893	3240	527	283	20	62	17	0
894	3240	554	305	39	44	16	0
895	3240	256	138	41	41	18	0
896	3240	378	200	46	46	8	0
897	3240	381	205	46	44	10	0
898	3240	406	233	37	50	13	0
899	3240	428	274	47	49	4	0
900	3240	477	290	57	29	10	4
901	3240	270	219	64	21	14	1
902	3240	285	171	60	28	10	0
903	3240	337	196	65	28	7	0
904	3240	262	149	58	28	13	0
905	3240	348	209	53	34	13	0
906	3240	425	272	39	34	27	0

COMPETITION AND PARASITISM AT DIFFERENT ELEVATIONS

Fig. 22



COMPETITION AND PARASITISM AT DIFFERENT ELEVATIONS

TABLE 34
BASED ON PEACH SURVEY

	Percentage					Adult per 1000 grams			
ELEVATION	DOR	MED	LON	PER	INDEX	DOR	MED	LON	PER
1000-1500	41	20	40	0	108	44	21	43	0
1500-2000	61	33	3	2	413	252	136	12	8
2000-2500	37	62	1	0	417	154	259	4	0
2500-3000	14	78	7	1	515	72	402	36	5
3000-3500	6	89	4	1	793	47	705	31	1

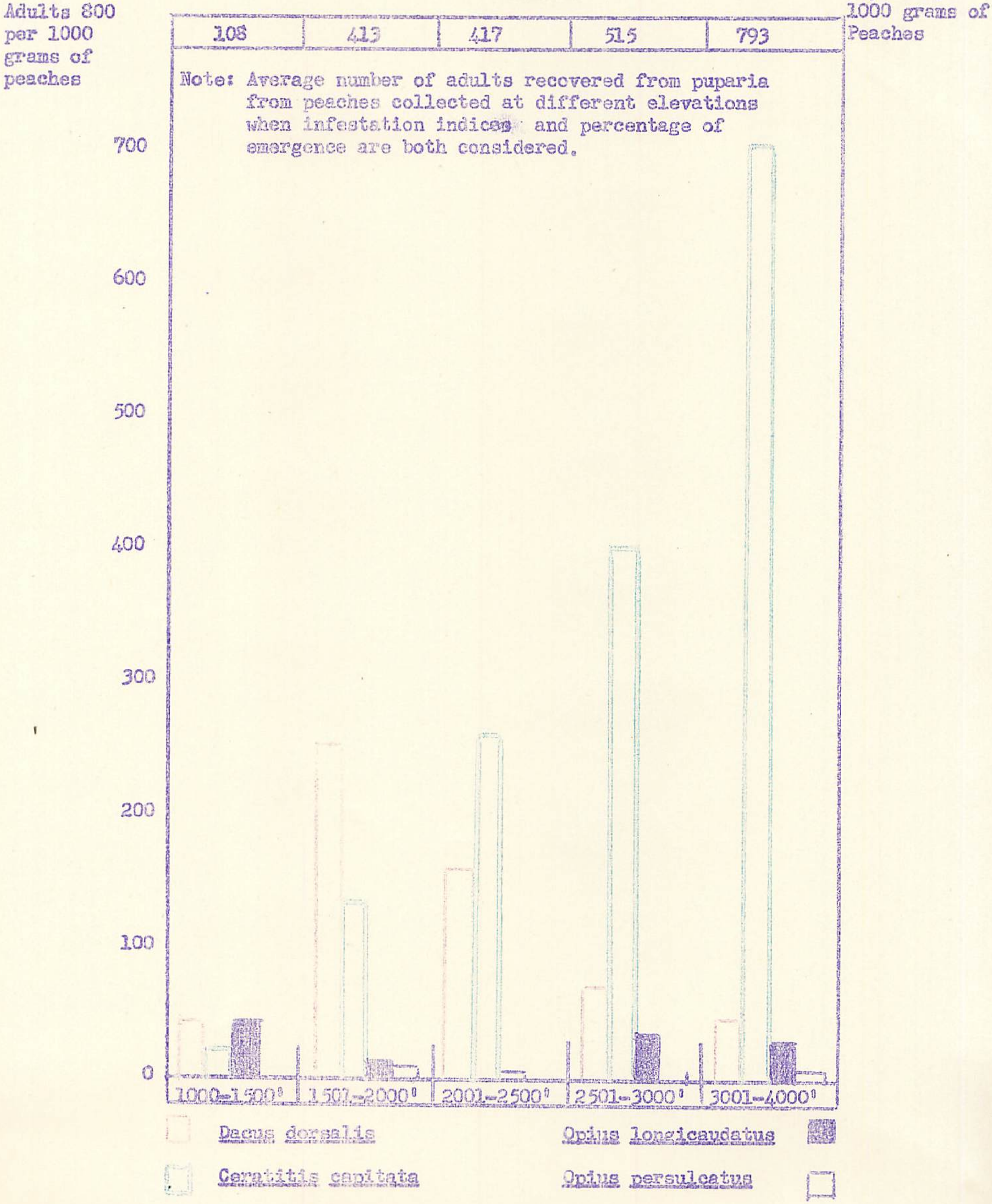
Legend:

DOR : *Dacus dorsalis*
MED : *Ceratitis capitata*
LON : *Opius longicaudatus*
PER : *Opius persulcatus*

INDEX : Total puparia recovered per 1000 grams of fruit

COMPETITION AND PARASITISM AT DIFFERENT ELEVATIONS

Fig. 23



SUMMARY OF PEACH COLLECTIONS TO DATE

The information we now have as a result of our peach collections is incomplete because many of the trees above 3000' still have green fruit on them. However the data we have compiled is very suggestive and it is desirable to incorporate it in this report so that it may be compared with the results on the loquat survey which is now practically complete.

The index figure based on 1000 grams of fruit is higher than the indices of infestation recorded for loquat. The percentage of Ceratitis capitata infesting peaches is much higher than was indicated for loquat at the same elevations. The percent of parasitism is much lower, particularly at elevations above 1500'.

Between the elevations of 2000 and 2500 feet the percentage between the two species of fruit flies runs 60-40% in favor of C. capitata. At similar elevations in loquat the percentages were reversed and D. dorsalis ran about 60% to C. capitata's 20%.

Peaches appear to be much more preferred as a host, insofar as C. capitata is concerned, than loquat. And conversely D. dorsalis prefers loquat to peaches as a host.

The parasites recovered from peaches may be largely attributed to D. dorsalis. Actually at elevations between 2500 and 4000' D. dorsalis seems to be parasitized about the same in both loquat and peaches. The fact that C. capitata is parasitized to such a negligible extent may be due to the fact the very young larvae migrate immediately from the periphrey of the fruit where the eggs are laid to the center of the fruit near the pit. While it is true that O. persulcatus has recently been shown to parasitize eggs or eggs about to hatch still the possibility of parasitism is certainly reduced by the behavior of these larvae.

Another point which should be mentioned regarding peaches is the observed fact that they are stung at a very green stage. Peaches, size of almonds, frequently are covered with exudations of pitch where ovipositional punctures have been made.

The Mediterranean Fruit Fly (C. capitata) and not the Oriental Fruit Fly, Dacus dorsalis) is responsible for the greatest damage done to peaches. It may be said of this particular survey, that peaches are very heavily infested and in most cases a total loss. A ripe peach on the ground without larvae is a very infrequent occurence. As one farmer summed up the situation, "Nobody will even come and steal my peaches!"

PEACH SURVEY

TABLE 36

LOT	ELEV	PUPA	INDEX	1001-1500 D	M	L	P	1500-2000 D	M	L	P	2000-2500 D	M	L	P	2500-3000 D	M	L	P	3000-3500 D	M	L	P
841	1400	40	108	41	20	40	0																
934	2700	865	554													11	55	34	.1				
935	"	659	434													12	59	29	0				
936	"	617	397													10	53	36	.8				
937	2960	1312	804													34	60	5	.4				
939	2000	349	411									80	15	4	2								
940	2900	760	663													5	86	8	.1				
945	3460	2	4gr																				
946	2900	225	407													3	96	.5	0				
947	2900	489	548													19	70	10	1				
948	"	84	215																				
949	3100	303	765																	10	87	3	
950	"	627	751																	14	72	14	
951	2900	354	558													19	70	11					
952	3100	725	853																	1	98	1	
953	"	227	458																	4	89	7	
954	"	182	429																		97	3	
955	2875	289	378													1	95	2	2				
956	2850	186	295													13	87						
957	2750	365	477													8	78	14					
958	3100	585	1163																	14	85	.5	.5
959	"	497	1134																	1	97	2	.5
960	2900	1124	834													21	76	3	.9				
961	2850	378	1067													35	58	6	1				
962	2750	94	309													6	94	0	0				

PEACH SURVEY

TABLE 36

LOT	ELEV	PUPA	INDEX	1001-1500 D	M	L	P	1500-2000 D	M	L	P	2000-2500 D	M	L	P	2500-3000 D	M	L	P	3000-3500 D	M	L
963	2875	490	587													15	82	3				
964	2900	789	732													26	66	7	1			
965	2850	139	351													17	83					
966	2750	117	259														100					
967	2900	444	615													12	86	2				
968	2875	346	407													3	97	.8				
969	"	444	471													4	96	.3				
971	2700	13	22*													31	69					
972	2900	207	472													15	78	2	5			
973	2700	153	240													16	84					
978	1700	6	19gr*																			
979	"	159	521					50	42	2	6											
980	"	228	322					54	40	2	4											
981	"	303	535					66	27	5	2											
982	"	310	434					51	45	4	0											
983	"	399	462					63	35	.5	2											
984	"	353	371					81	15	4	.5											
985	"	349	418					45	47	5	3											
986	"	6	11*																			
987	"	408	400					60	36	2	2											
988	"	230	262					80	14	3	3											
989	2200	10	18									100										
990	"	35	60										93	7								
991	"	5	14											100								
992	"	11	23									32	78									

PEACH SURVEY

TABLE 36

LOT	ELEV	PUPA	INDEX	1001-1500 D	M	L	P	1500-2000 D	M	L	P	2000-2500 D	M	L	P	2500-3000 D	M	L	P	3000-3500 D	M	L	P
993	2200	11	21										100										
994	"	0	0																				
995	2250	14	25										100										
996	"	17	25									88	12										
997	"	0	0																				
998	2600	9	21														100						
999	"	27	83														100						
1000	"	53	144													7	93						
1001	*	35	95													19	81						
1011	*	364	485													37	54	2	7				
1012	3000	202	277													36	27	27	10				

Note: * Green Fruit

SUMMARY - Peach Survey

Fruit	Total Lots	Tree Fruit	Ground Fruit	Pupae	Index
Collected - -	52	48	4	T-4132	76
Infested - -	46 (95.8%)	42(87.5%)	4 (100%)	G- 157	90

TOTAL PEACH FRUIT COLLECTED	1,256
WEIGHT OF FRUIT	60,185 grams
PUPARIA RECOVERED	4,289
AVERAGE INDEX	71
LOTS OF FRUIT	52

COMPARISON WITH CITRUS

TOTAL FRUIT COLLECTED	3,904
WEIGHT OF FRUIT	474,143 grams
PUPARIA RECOVERED	2,601
AVERAGE INDEX	5
LOTS OF FRUIT	378

FRUIT FLY INFESTATION OF PEACH ON HAWAII

BASED ON PUPAL RECOVERY

TABLE 37

KEY:

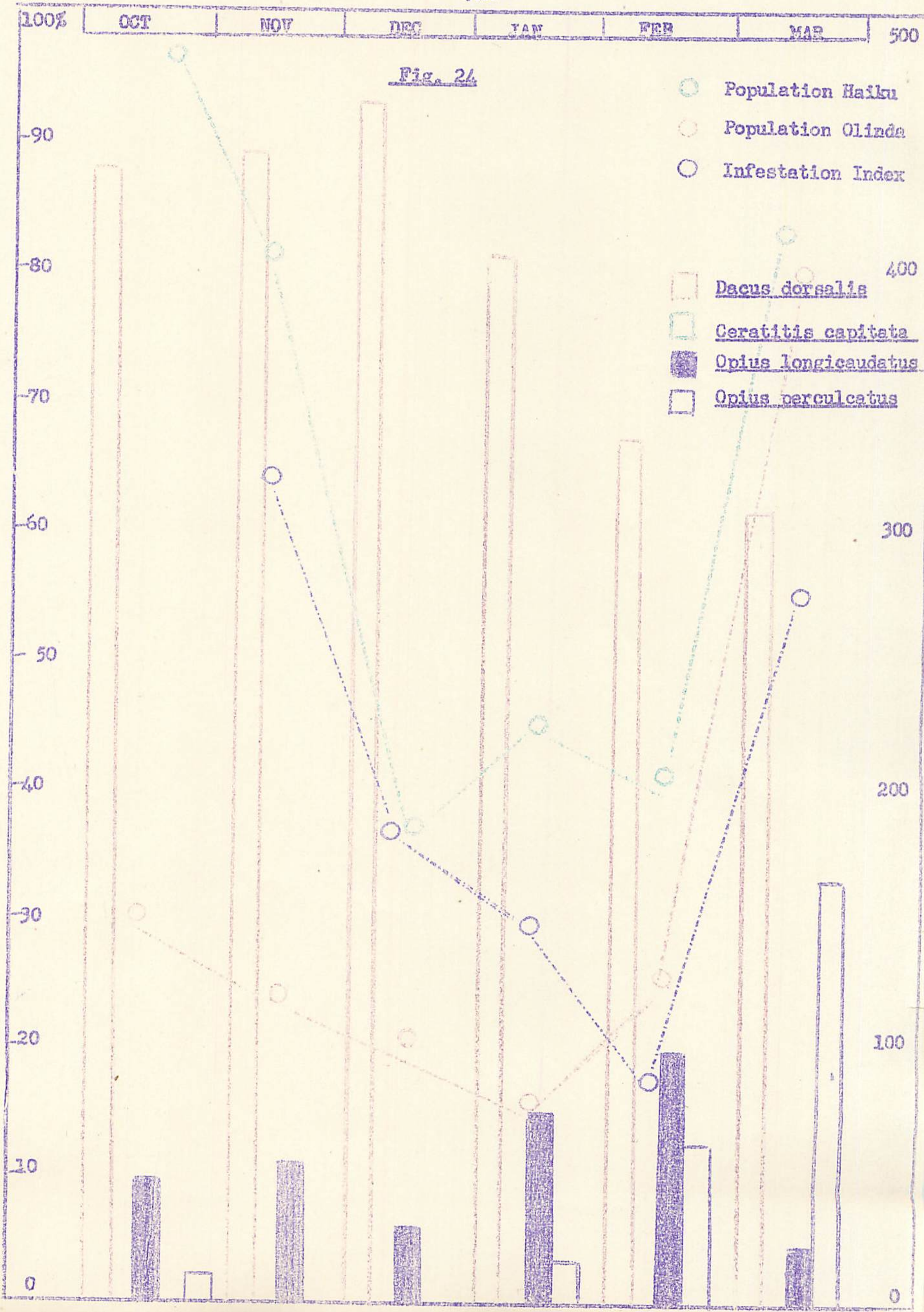
INDEX: Puparia recovered per 1000 grams of fruit
S: Stage of fruit, G: Green
R: Ripe
W: Weight in grams
N: Number of fruit
gr: Ground fruit, usually over ripe

EMERGENCE:
DOR: *Dacus dorsalis*
MED: *Ceratitis capitata*
LON: *Opius longicaudatus*
PER: *Opius persulcatus*

									Emergence				
LOT	DATE	LOCALITY	ELEV	FRUIT	S	W	N	PUPAE	DOR	MED	LON	PER	INDEX
783	4/20	Kona	1900	Peach	R	772	34	0					
800	4/26	Kaumana	1500	"	gr R	272	12	72	29		10	2	264
806	4/27	Hilo	75	"	R	841	11	78	48		2	8	92
807	4/27	Kaumana	1500	"	R	227	12	52	25		2	9	229
816	4/27	Hilo	75	"	gr R	438	10	35	21				79
817	4/27	Hilo	1000	"	gr R	501	21	38	30		7	1	76
819	4/27	Hilo	75	"	R	410	12	16	16				39
821	4/27	Kaumana	1500	"	R	381	12	67	45			2	176
847	4/27	Kona	1900	"	R	409	14	0					
848	4/27	"	1900	"	R	953	23	105	32		2	9	110
849	4/27	"	1900	"	R	772	17	87	49		7	9	113
850	4/27	"	1900	"	R	1317	44		46		15	3	127
851	4/27	"	1900	"	R	999	35	64	34		3	1	64
852	4/27	"	1900	"	R	817	15	75	44		2		92
853	4/27	"	1900	"	R	545	11	83	33		6	5	152

LOT	DATE	LOCALITY	ELEV.	FRUIT	S	W	N	PUPAE	DOR	Emergence MED	LON	PER	INDEX
854	4/27	Kona	1900	Peach	R	908	15	30	20				33
855	"	"	"	"	R	726	14	29	4		2	1	40
856	"	"	"	"	R	454	18	0					
857	"	"	"	"	R	409	17	0					
858	"	"	"	"	R	409	17	6	6				15
859	"	"	"	"	R	363	17	0					
860	"	"	"	"	R	863	14	19	17				22
861	"	"	"	"	R	636	11	19	4		2		30
905	5/4	"	"	"	R	636	30	35	26		1		55
906	"	"	"	"	R	726	32	46	24	5	4		63
907	"	"	1500	"	R	1816	30	111	56		19		61
908	"	"	"	"	R	1771	30	68	25		17	2	38
909	"	"	"	"	R	1816	30	106	42		12	16	58
910	"	"	"	"	R	1544	30	85	26		14	12	55
911	"	"	"	"	R	2270	30	200	112		15	21	88
912	"	"	"	"	R	1544	30	91	58		8	12	59
913	"	"	"	"	R	1407	30	0					
914	"	"	"	"	R	1452	30	58	23		3	7	40
915	"	"	"	"	R	1498	30	94	42		19	10	63
916	"	"	"	"	R	1816	30	138	85		2	14	76
917	"	"	"	"	R	1861	30	146	59		15	19	78
918	"	"	"	"	R	1816	30	109	40		18	18	60
919	"	"	"	"	R	1498	30	55	27		11	3	37
920	"	"	"	"	R	1589	30	197	83		15	11	124
921	"	"	"	"	R	1771	30	38	25		4	1	21
922	"	"	"	"	R	1816	30	174	95		19	2	96
923	"	"	"	"	R	1680	30	111	66		10	11	66

LOT	DATE	LOCALITY	ELEV.	FRUIT	S	W	N	PUPAE	DOR	MED	Emergence LON	PER	INDEX
924	5/4	Kona	1500	Peach	R	1794	30	157	114		17	2	88
925	"	"	"	"	R	1725	30	116	52		27	9	67
926	"	"	"	"	R	1453	30	152	87		12	5	105
927	"	"	"	"	R	1634	30	71	41		8	2	43
928	"	"	"	"	R	1771	30	97	41		5	4	55
929	"	"	"	"	R	1861	30	204	96		8	22	110
930	"	"	"	"	R	1725	30	201	88		17	10	117
931	"	"	"	"	R	1680	30	215	140		19	20	128
932	"	"	"	"	R	1271	22	160	67		12	10	126
1005	5/16	Umikoa	3500	" gr	R	522	16	12	4	5			23


100%
OCT
NOV
DEC
JAN
FEB
MAR
500
Fig. 24
Population Haiku
Population Olinda
Infestation Index
90
80
400
Dacus dorsalis
Ceratitis capitata
Opius longicaudatus
Opius perculcatus
70
60
300
50
40
200
30
20
100
10
0
0

INFESTATION OF GUAVA AT DIFFERENT ELEVATION

TABLE 38

LOT	DATE	ELEV.	PUPARIA	INDEX	Percent of Emergence			
					DOR	MED	LON	PER
31	10/3	400	494	477	94	0	6	0
34	10/14	1500	0					
40	10/25	200	83	47	83	0	9	9
58	10/26	2700	8	7	75		25	
59	"	"	34	55	100			
106	11/14	1700	439	344	100			
110	"	700	373	224	93		7	
111	"	"	115	44	91		9	
112	"	"	82	31	66		33	
150	"	2700	0					
191	11/21	300	235	107	84		16	
192	"	"	37	30	89		11	
193	"	"	56	37	100			
203	12/7	2100	137	254	100	0	0	0
314	12/29	3200	127	108	90		10	
315	12/22	"	52	37	84		16	
316	"	"	68	39	100			
317	"	"	20	13				
368	12/29	1483	606	185	73	1	26	0
369	"	"	219	60				
386	1/1	500	172	90	100			
405	1/5	580	29	29	80		20	
433	1/17	1700	43	34	69		31	
434	1/17	"	184	62	87		7	7
443	1/18	2050	28	8	100			

					Percent of Emergence			
LOT	DATE	ELEV.	PUPARIA	INDEX	DOR	MED	LON	PER
444	1/18	1050	22	8				
445	"	"	11	3	100			
446	"	"	62	20	100			
447	"	"	205	59	100			
448	1/18	1050	163	38	88			12
474	1/25	1050	191	75	68		29	3
475	"	"	169	67	55		35	10
476	"	"	278	108	92		5	3
477	"	"	169	52	86		14	
478	"	"	179	59	84	6	6	3
479	"	"	213	88	85		15	
480	"	"	212	86	55		19	25
481	"	"	158	80	61		39	
482	"	"	198	80	92		8	
483	"	"	263	103	72		26	2
484	"	"	212	116	70		30	
485	"	"	138	41	68		32	
486	"	"	190	58	95		5	
487	"	"	218	79	70		9	21
488	"	"	210	42	93		7	
489	"	"	127	35	92		8	
490	"	"	58	17	86	7	7	
491	"	"	142	50	60		33	7
492	"	"	93	22	66		28	6
493	"	"	182	46	77		17	6
494	"	"	49	18	100			
495	1/26	1700	50	82	100			

LOT	DATE	ELEV.	PUPARIA	INDEX	Percent of Emergence DOR	MED	LON	PER
498	1/26	1700	403	389	68		27	5
511	2/2	500	277	112	75		17	8
512	"	"	253	102	54		27	19
513	2/9	1050	89	25	94			6
514	"	"	138	37	100			
515	"	"	168	53	69		23	8
516	"	2160	199	60	46		56	
517	"	"	186	55	53		47	
518	2/9	2160	67	19	54		46	
519	"	1000	83	81	45		18	37
520	"	650	19	15	66		16	16
589	2/21	1450	67	20	70		30	
590	"	"	87	31	58		25	17
591	"	"	213	50	66		18	16
625	2/24	750	428	187	100			
626	"	"	627	335	81		16	3
627	"	"	364	20	66		4	30
662	2/28	20	724	631	89		11	
681	3/1	1450	147	212	70		11	19
682	"	"	690	580	53			47

TABLE 39

SUMMARY OF GUAVA DATA

		Percentages of Each Sp.				Number per 1000 Grams			
Month	Index	DOR	MED	LON	PER	DOR	MED	LON	PER
OCT	146	87.7	0	9.9	2.2	128	0	1.4	3.1
NOV	119	89.1	0	11	0	106	0	13	0
DEC	99	93	0	6	0	92	0	8	0
JAN	74	81	.4	14.9	3.3	59.9	2.9	11	2.4
FEB	122	67	0	20	12.7	81.7	0	24.4	14
MAR	396	61.5	0	5.5	33	243.5	0	21.7	130.6

SUMMARY OF FALSE KAMANI COLLECTIONS, (Terminalia catappa)

Collections of a limited number of False Kamani Fruit (650), show that the fruit of this tree is an excellent host for Dacus dorsalis. Considering that the fruit is composed of a large central nut surrounded by a relatively thin layer of pulp it is surprising the number of puparia which are recovered from the screening of this fruit. Frequently pupation takes place within the pulp itself and it is necessary to examine the fruit to assure a complete count of all puparia.

Ordinarily we would expect a fruit of this type to afford the parasites a good opportunity to reach the fruit fly larvae. These collections, however, do not indicate that Dacus dorsalis is highly parasitized by either parasite in Kamani on Maui.

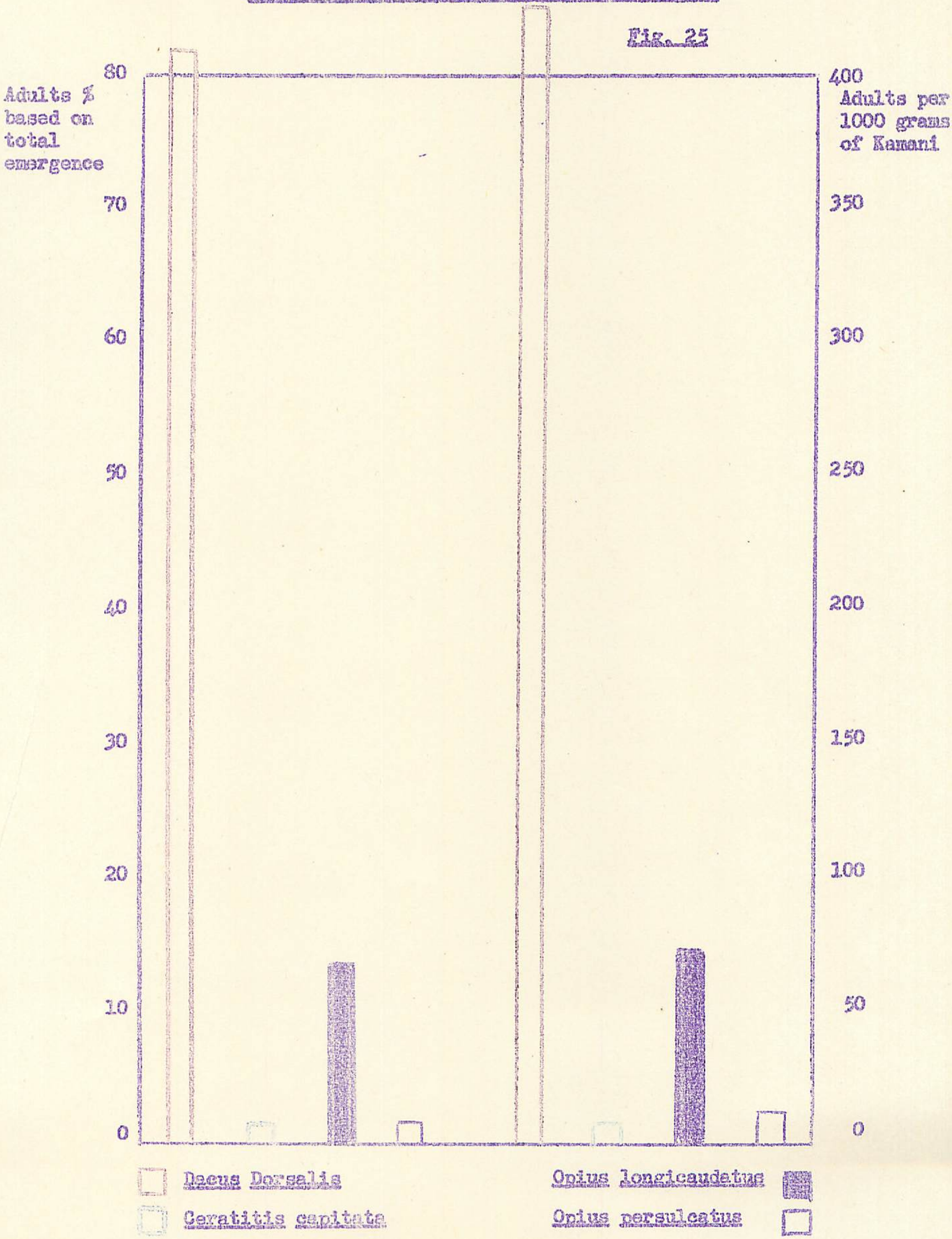
Mature fruit was collected from September to February in 1949 and surveys made recently indicate that ripe fruit was beginning to fall in June along the Hana coast and in Ioa Valley appears to be reaching maturity during the first of July. These trees bear prolifically for a period of about four months.

Flies emerging from puparia recovered from Kamani are usually considerably smaller than the average run of flies. These dwarfed flies are probably the result of inadequate food in the larval stage.

Kamani, because of its extended fruiting period, the large number of fruit which are borne, and the relatively high indices of infestation must be conceded to be one of the more important hosts of this fly in these islands.

DACUS DORSALIS INFESTATION IN FALSE KAMANI

Fig. 25



INFESTATION IN FALSE KAMANI

TABLE 40

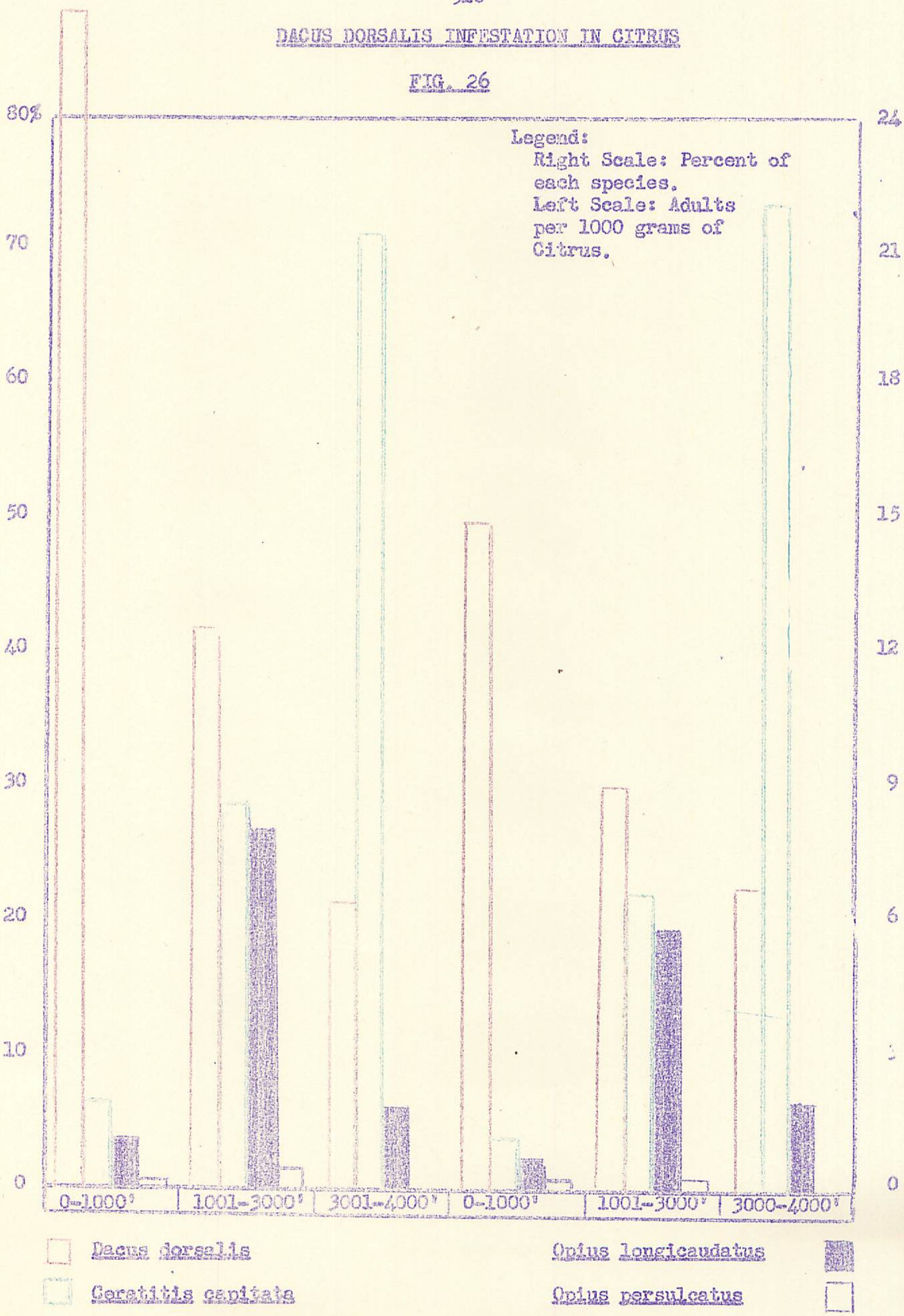
LOT	DATE	ELEV	PUPA	INDEX	D	M	L	P	FRUIT
26	9/30		482	549	96	0	1	3	16
109	11/4		1335	322	77	0	23	0	244
195	11/15		100	238	92	1	7	0	161
390	1/4		408	206	88	10	2	0	104
529	2/20		789	1138	45	2	37	16	24
188	11/14		357	171	100	0	0	0	136
521	2/9		691	625	77	0	23	0	41
592	2/24		789	1138	53	0	10	0	24
	Total		4338	548					614

SUMMARY

	D	M	L	P
Percent	82.3	.1	13.4	2.4
Adults per 1000 grams	451	54	734	131

DACUS DORSALIS INFESTATION IN CITRUS

FIG. 26



CITRUS SURVEY SUMMARY

TABLE 41

	0-1000	1000-3000'	3001-4000'
Index	17	22	31
Total Lots	52	64	101
Infested	17	12	23
Negative	35	52	23
% Infested	67%	18%	23%
	DOR MED LONG PER	DOR MED LON PER	DOR MED LON PER
	89% 7% 4% .5%	42% 29% 27% 1.4%	22% 72% 6% 0%
	15 1 .6 .08	9 6 6 .3	7 22 2

NOTE: Index based on number of puparia recovered per 1000 grams from infested lots. Lower line indicates number of adult recovered per 1000 grams of fruit calculated by figuring percentage of emergence of each species and index of infestation average at each elevation.

CITRUS SURVEY

Note: Figures given are percentages under each species.
Index: Based on puparia recovered per 1000 grams of Citrus

LEGEND:
D: *Dacus dorsalis*
M: *Ceratitis capitata*
L: *Opius longicaudatus*
P: *Opius persulcatus*

TABLE 42

LOT	ELEV	PUPA	IND	0 to 1000'				1000' to 2500'				3000 to 3600'			
				D	M	L	P	D	M	L	P	D	M	L	P
2	2850	0	0									0	0	0	0
7	"	0	0									0	0	0	0
14	"	1	3									0	0	0	0
21	"	2	5									0	0	0	0
22	"	0	0									0	0	0	0
28	650	2	1	0	0	0	0								
50	2800	4	2									0	0	0	0
55	3650	0	0									0	0	0	0
60	"	0	0									0	0	0	0
64	"	0	0									0	0	0	0
65	"	0	0									0	0	0	0
66	"	0	0									0	0	0	0
67	3500	0	0									0	0	0	0
74	3650	1	2									0	0	0	0
75	"	0	0									0	0	0	0
76	"	0	0									0	0	0	0
102	1700	0	0					0	0	0	0				
114	700	117	66g	96	0	4	0								
118	"	0	0	0	0	0	0								
135	2600	0	0					0	0	0	0				
142	2850	0	0									0	0	0	0
143	"	0	0									0	0	0	0
144	"	0	0									0	0	0	0
145	"	0	0									0	0	0	0
159	3500	0	0									0	0	0	0
162	"	0	0									0	0	0	0

LOT	ELEV	PUPA	IND	0 to 1000'				1000 to 2500'				3000 to 3600'			
				D	M	L	P	D	M	L	P	D	M	L	P
165	2900	0	0									0	0	0	0
169	1700	9	4					0	0	0	0				
187	800	16	17g	100	0	0	0								
198	800	7	11g	0	0	0	0								
202	2100	0	0					0	0	0	0				
207	3650	0	0									0	0	0	0
210	"	0	0									0	0	0	0
212	"	0	0									0	0	0	0
213	"	0	0									0	0	0	0
215	1050	4	3					100	0	0	0				
216	1050	0	0					0	0	0	0				
217	"	0	0					0	0	0	0				
218	1700	21	12					0	0	0	0				
219	"	1	1					0	0	0	0				
231	2850	0	0					0	0	0	0				
232	"	0	0					0	0	0	0				
233	"	0	0					0	0	0	0				
234	"	0	0					0	0	0	0				
235	"	0	0					0	0	0	0				
236	"	6	17					0	100	0	0				
237	2850	2	3					0	100	0	0				
239	3600	0	0									0	0	0	0
241	"	0	0									0	0	0	0
243	"	0	0									0	0	0	0
245	"	0	0									0	0	0	0
248	"	0	0									0	0	0	0
249	"	0	0									0	0	0	0

LOT	ELEV	PUPA	IND	0 to 1000'				1000 to 2500'				3000 to 3600'			
				D	M	L	P	D	M	L	P	D	M	L	P
250	3000	0	0									0	0	0	0
251	"	0	0									0	0	0	0
252	"	0	0									0	0	0	0
253	"	0	0									0	0	0	0
254	"	0	0									0	0	0	0
255	"	0	0									0	0	0	0
256	"	0	0												
257	"	0	0												
258	"	0	0												
259	"	0	0												
260	"	0	0												
261	"	0	0												
262	"	0	0												
263	"	0	0												
264	2500	0	0												
265	"							0	0	0	0				
266	3600	0	0												
267	"	0	0												
268	"	0	0												
269	"	0	0												
270	"	0	0												
271	600	0	0	0	0	0	0								
272	"	9	10	0	100	0	0								
273	"	0	0	0	0	0	0								
274	"	0	0	0	0	0	0								
275	"	0	0	0	0	0	0								
276	"	0	0	0	0	0	0								

LOT	ELEV	PUPA	IND	o to 1000'				1000 to 2500'				3000 to 3600'			
				D	M	L	P	D	M	L	P	D	M	L	P
277	600	0	0	0	0	0	0								
278	"	0	0	0	0	0	0								
279	"	0	0	0	0	0	0								
280	"	0	0	0	0	0	0								
281	"	0	0	0	0	0	0								
282	100	11	18	100	0	0	0								
283	400	0	0	0	0	0	0								
285	600	0	0	0	0	0	0								
286	600	14	14	100	0	0	0								
287	"	3	2	0	0	0	0								
288	"	0	0	0	0	0	0								
289	"	0	0	0	0	0	0								
290	"	0	0	0	0	0	0								
293	"	0	0	0	0	0	0								
301	2640	31	49					16	66	82					
303	"	0	0					0	0	0	0				
305	2680	0	0					0	0	0	0				
307	2640	1	2					0	0	0	0				
312	3020	0	0									0	0	0	0
313	"	15	118									17	83	0	0
325	2650	0	0												
327	"	0	0					0	0	0	0				
329	"	0	0					0	0	0	0				
331	"	0	0					0	0	0	0				
342	3600	0	0									0	0	0	0
343	"	0	0									0	0	0	0
344	"	0	0									0	0	0	0

LOT	ELEV	PUPA	IND	0 to 1000'				1000 to 2500'				3000 to 3600'			
				D	M	L	P	D	M	L	P	D	M	L	P
351	750	0	0	0	0	0	0								
354	"	0	0	0	0	0	0								
355	"	1	1	0	0	0	0								
359	"	0	0	0	0	0	0								
360	"	0	0	0	0	0	0								
362	"	0	0	0	0	0	0								
366	1700	134	40gr					66	0	20	14				
375	3600	0	0									0	0	0	0
376	"	59	104gr									0	100	0	0
377	"	0	0									0	0	0	0
378	3600	18	13									0	100	0	0
383	2650	0	0					0	0	0	0				
385	1050	4	4					0	0	0	0				
396	"	1	3					0	0	0	0				
397	"	9	10gr					100	0	0	0				
398	"	0	0					0	0	0	0				
399	"	0	0					0	0	0	0				
400	"	0	0							100					
401	"	6	5					0	0	0	0				
402	"	0	0					0	0	0	0				
403	"	0	0					0	0	0	0				
404	"	0	0					0	0	0	0				
425	750	0	0	0	0	0	0								
426	"	0	0	0	0	0	0								
427	"	0	0	0	0	0	0								
428	"	0	0	0	0	0	0								
452	2650	0	0					0	0	0	0				

LOT	ELEV.	PUPA	IND	0 to 1000'				1000 to 2500'				3000 to 3600'			
				D	M	L	P	D	M	L	P	D	M	L	P
453	2650	41	103					0	12	88	0				
454	"	0	0					0	0	0	0				
455	"	0	0					0	0	0	0				
456	"	0	0					0	0	0	0				
458	3600	0	0									0	0	0	0
459	"	0	0									0	0	0	0
460	"	0	0									0	0	0	0
461	"	0	0									0	0	0	0
463	1050	0	0					0	0	0	0				
468	750	6	2gr	100	0	0	0								
497	1700	15	11gr			100									
590	"	2	5					100	0	0	0				
501	"	0	0					0	0	0	0				
502	"	4	2					0	0	0	0				
503	"	0	0					0	0	0	0				
504	"	0	0					0	0	0	0				
562	3600	0	0									0	0	0	0
563	"	0	0									0	0	0	0
564	"	0	0									0	0	0	0
565	"	7	3gr									66	33	0	0
567	"	0	0									0	0	0	0
568	"	36	41									0	100	0	0
569	"	0	0									0	0	0	0
570	"	0	0									0	0	0	0
571	"	1	1									0	0	0	0
572	"	0	0									0	0	0	0
573	"	0	0									0	0	0	0

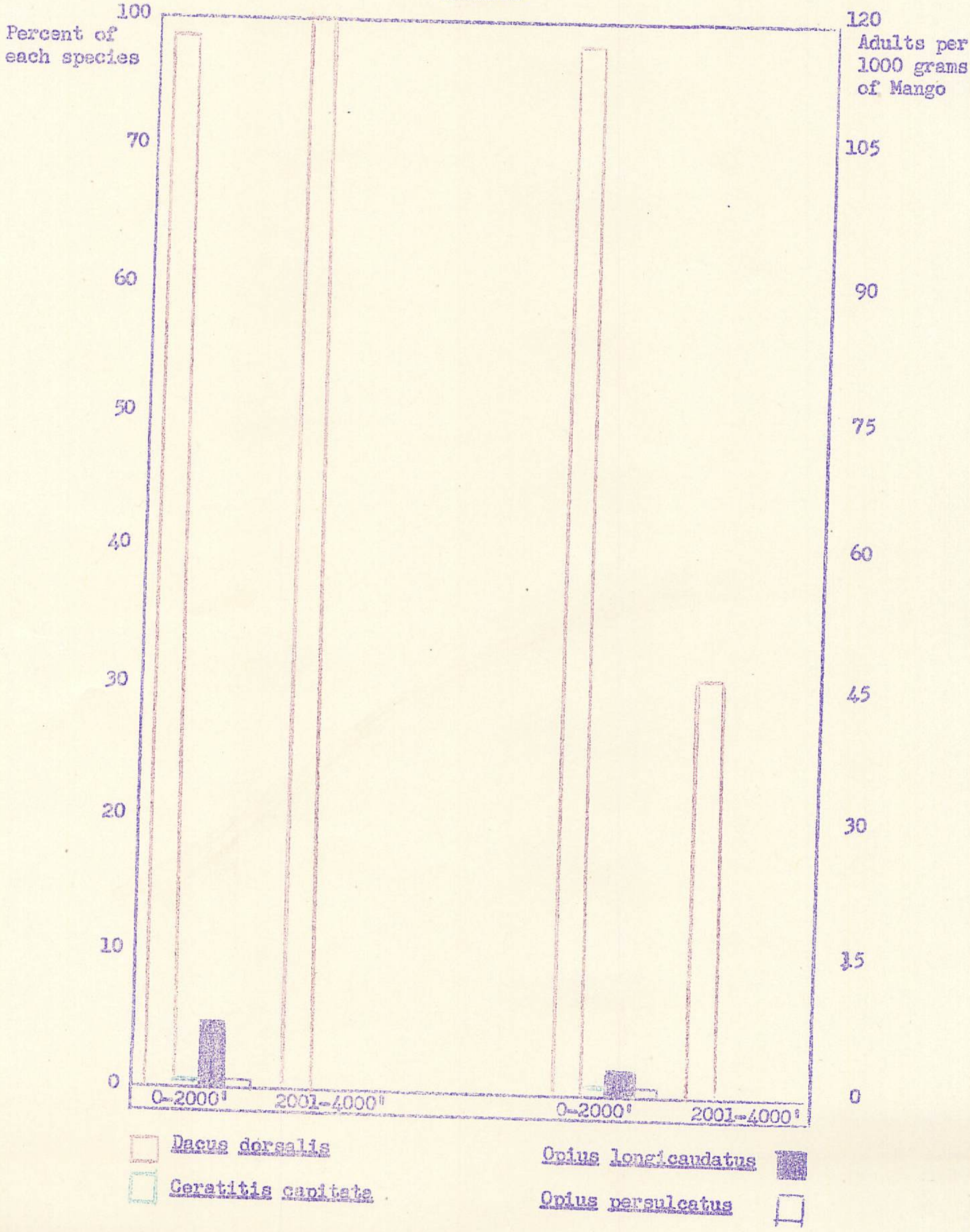
LOT	ELEV	PUPA	IND	0 to 1000'				1000 to 2500'				3000 to 3600'			
				D	M	L	P	D	M	L	P	D	M	L	P
574	"	0	0									0	0	0	0
575	"	64	88									32	68	0	0
576	"	0	0									0	0	0	0
578	"	0	0									0	0	0	0
579	"	5	4										50	50	
580	"	0	0									0	0	0	0
581	"	0	0									0	0	0	0
582	"	0	0									0	0	0	0
583	"	0	0									0	0	0	0
584	"	0	0									0	0	0	0
585	"	0	0									0	0	0	0
586	"	0	0									0	0	0	0
630	750	0	0	0	0	0	0								
683	"	0	0	0	0	0	0								
684	"	5	4	100	0	0	0								
685	"	0	0	0	0	0	0								
686	"	0	0	0	0	0	0								
743	3600	0	0									0	0	0	0
744	"	0	0									0	0	0	0
745	"	0	0									0	0	0	0
746	"	0	0									0	0	0	0
747	"	0	0									0	0	0	0
748	"	4	14									0	0	0	0
749	"	0	0									0	0	0	0
750	"	0	0									0	0	0	0
751	"	0	0									0	0	0	0
752	"	71	37gr									33	33	33	0

LOT	ELEV	PUPA	IND	0 to 1000'				1000 to 2500'				3000 to 3600'			
				D	M	L	P	D	M	L	P	D	M	L	P
753	3600	65	48gr									61	15	23	0
754	"	28	47									8	92	0	0
755	"	0	0									0	0	0	0
756	"	0	0									0	0	0	0
757	"	0	0									0	0	0	0
758	"	0	0									0	0	0	0
759	3110	28	30gr									100	0	0	0
760	"	8	8gr									0	0	0	0
761	"	19	22gr									0	91	9	0
762	"	0	0									0	0	0	0
763	"	7	12gr									100	0	0	0
766	2850	0	0					0	0	0	0				
822	800	0	0	0	0	0	0								
823	"	8	10	100	0	0	0								
824	"	25	26	93	0	7	0								
825	"	0	0	0	0	0	h0								
827	"	0	0	0	0	0	0								
828	800	17	20	100	0	0	0								
829	"	0	0	0	0	0	0								
830	"	0	0	0	0	0	0								
831	"	36	29	100	0	0	0								
832	"	0	0	0	0	0	0								
833	"	2	2	0	0	0	0								
834	"	0	0	0	0	0	0								
835	"	0	0	0	0	0	0								
836	"	0	0	0	0	0	0								
837	"	0	0	0	0	0	0								

LOT	ELEV	PUPA	IND	0 to 1000'				1000 to 2500'				3000 to 3600'			
				D	M	L	P	D	M	L	P	D	M	L	P
838	"	30	30	100	0	0	0								
839	"	0	0	0	0	0	0								
842	1400	12	28					66	33						
843	"	0	0					0	0	0	0				
923	75	0	0	0	0	0	0								
924	"	219	336g	78	0	18	4								
926	"	194	369g	65	3	28	4								
1005	3600	36	43									0	93	7	0
1006	"	9	10									0	100	0	0
1051	3500	0	0									0	0	0	0

DACUS DORSALIS INFESTATION IN MANGO

FIG. 27



MANGO SURVEY SUMMARY

TABLE 43

Elevations	0-2000'				2000 - 4000'			
Index	152				48			
Percentages	DOR	MED	LONG	PER	DOR	MED	LONG	PER
Of Each Species	95%	.1%	4.8%	.1%	100%	0	0	0
Adults per 1000 grams	144	.1	7.2	.1	48			

Legend:

INDEX: Total puparia recovered per 1000 grams of Mango.

DOR: *Dacus dorsalis*
MED: *Ceratitis capitata*
LON: *Opius longicaudatus*
PER: *Opius persulcatus*

Note: Based on 5,341 puparia recovered from 297 mango.

INFESTATION IN MANGO

TABLE 44

Lot	Date	Elev	Pupa	Index	D	M	L	P
27	10/1	400	1114	96	90		10	
30	10/3	400	165	29	97		3	
39	10/11	400	330	199				
44	10/16	2800	34	16	0	0	0	0
45	"	"	34	12	100			
46	"	"	21	28	100			
47	"	"	0	0	0	0	0	0
98	11/3	"	186	205	100			
156	11/7	3800	4	25	0	0	0	0
201	11/18	2100	9	7	0	0	0	0
415	1/6	650	9	7	0	0	0	0
911	2/24	50	278	163	75	0	25	0
916	"	75	406	191	94	1	5	0
917	"		425	222	98		2	
918	"		200	124	100			
919	"		309	169	97		1	3
920	"		272	186	98		2	
921	"		259	141	89		11	
929	"	500	403	196	88	1	11	
930	"		150	96	97		3	
931	"		0	0	0	0	0	0
932	"		73	37	92	3	3	3
938	"		669	280	78	.5	21	.5

INFESTATION OF AVOCADO - WINTER PEAR

LOT	DATE	ELEV	PUPA	INDEX	D	M	L	P
5	9/20	2850	22	14	100	0	0	0
8	"	"	2	1	0	0	0	0
9	"	"	1	2	0	0	0	0
18	"	"	77	27	100	0	0	0
43	10/16	2850	27	18	60	40	0	0
79	11/2	"	30	28	100			
107	11/3	1700	430	100	83	0	17	0
119	11/4	700	0	0	0	0	0	0
126	11/3	650	188	58	100	0	0	0
133	11/4	50	5	1	100	0	0	0
134	11/4	50	36	23	0	0	0	0
136	"	2800	0	0	0	0	0	0
140	11/3	2850	0	0	0	0	0	0
141	"	"	0	0	0	0	0	0
148	"	"	0	0	0	0	0	0
160	11/8	3500	0	0	0	0	0	0
174	11/8	650	0	0	0	0	0	0
175	"	"	0	0	0	0	0	0
230	12/1	2850	2	1	0	0	0	0
235	"	"	0	0	0	0	0	0
294	12/20	650	0	0	0	0	0	0
295	"	"	0	0	0	0	0	0
298	12/21	2640	0	0	0	0	0	0
299	12/21	"	39	34	100	0	0	0
326	12/27	2650	0	0	0	0	0	0
328	"	"	2	1	0	0	0	0
330	"	"	0	0	0	0	0	0

LOT	DATE	ELEV	PUPA	INDEX	D	M	L	P
334	"	750	7	3	100	0	0	0
335	"	"	5	1	0	0	0	0
336	12/27	750	20	8	100	0	0	0
341	12/27	750	0	0	0	0	0	0
349	12/29	"	0	0	0	0	0	0
356	"	"	22	19	100	0	0	0
357	"	"	1	.3	0	0	0	0
361	"	"	3	1	0	0	0	0
363	"	1700	0	0	0	0	0	0
364	"	"	142	96	100	0	0	0
410	1/5	"	0	0	0	0	0	0
411	"	"	0	0	0	0	0	0
412	"	"	11	5	100	0	0	0
419	1/12	750	0	0	0	0	0	0
422	"	"	0	0	0	0	0	0
423	"	"	0	0	0	0	0	0
424	"	"	0	0	0	0	0	0
432	1/17	1700	0	0	0	0	0	0
438	1/18	650	0	0	0	0	0	0
439	1/18	650	0	0	0	0	0	0
449	1/20	2650	0	0	0	0	0	0
450	"	"	0	0	0	0	0	0
451	"	"	0	0	0	0	0	0
471	1/24	750	4	1	0	0	0	0
632	2/24	"	0	0	0	0	0	0
633	"	"	4	1	50	0	50	0
634	"	"	0	0	0	0	0	0
635	"	"	2	1	0	0	0	0
812	3/31	3050	0	0	0	0	0	0

LOT	DATE	ELEV	PUPA	INDEX	D	M	L	P
826	4/6	800	0	0	0	0	0	0
859	4/20	500	0	0	0	0	0	0
927	4/24	75	0	0	0	0	0	0
928	4/24	75	45	55	0	0	0	0

SUMMARY AND EVALUATION OF FRUIT HOSTS

Although it is true that *Dacus dorsalis* has been shown to infest 130 different hosts, probably the most limiting factor in many areas would be suitable ovi-positional material in abundance and in sequence.

In our studies of host relationships, thus far, we have collected on Maui over 1604 Lots totaling 60,793 fruit. On Hawaii our collections amount to about 50,000 fruit. On some hosts our surveys are quite complete and the information we have is quite conclusive. On others the information appears to be very suggestive, but on many hosts we do not have enough data to warrant stating definitely their importance.

It seems desirable at this time to prepare lists indicating host importance, based on the number of puparia recovered from these fruit. These lists will be revised as further data indicates.

As a matter of convenience the lists have been split into three Sections. Section I includes the excellent, good and poor hosts of *Dacus dorsalis* and are listed according to the average total number of puparia recovered per 1000 grams of fruit. Because of the great variability in infestation the indexes are listed under low, high and average. Factors such as maturity of fruit, breaks in the skin, abundance of fruit, area in which it is grown, and weather conditions such as wind, rain and temperature and population level of the flies all enter into the picture. With so many variables it is necessary to take as large a sample as possible and as many collections as practical, to establish any kind of a worthwhile index.

After enough data has been compiled it is possible to determine the general latitude from low to high infestation which may be expected in a certain host. But even then, for a single fruit or a single collection of fruit, you are apt to come up with something at considerable variance with what you expected.

Section II includes listed hosts which we have found to be uninfested in our collections on Maui. This list includes quite a number of border line hosts whose status, at best, is very doubtful. Some of the others in this list have been collected in insufficient number apparently to turn up any larvae.

I do not mean to infer that the records established for these host are not valid, on the contrary I congratulate the persons responsible for finding larvae in hosts where they apparently occur so infrequently.

In Section III are listed a number of species which in our collections have always shown negative results. These species were collected in areas where *D. dorsalis* occured and in stage of maturity which would offer the most chance for being infested.

It should be further stated that Section I is drawn showing the species having the greatest infestation first, and continuing to the poorer hosts at the end of the list. This should not be construed to mean that they are placed in the position of relative importance insofar as supporting the fly population is concerned. The abundance of these species has not been weighed against their index of infestation. To do this on a quantative basis would require a survey in which counts were kept of the different species. Without going to these ends it is possible to roughly evaluate the importance of most species by a general knowledge of the area and the predominance of one species over another. It required no scientific survey to point out that guava, by far, exceed in numbers all the other hosts put together and probably could be said to produce a greater abundance of fruit than all the other species put together in these islands.

SECTION I

HOST PREFERENCE LIST BASED ON PUPAL RECOVERY

TABLE 45

NOTE: Based on 1604 lots totaling 60,793 fruit.

INDEX: PUPAL RECOVERY PER 1000 GRAMS OF FRUIT

	HOST		LOW	HIGH	AVER.
1	Sandal Wood	*Santalum album* L.	536	1244	899
2	Rose Apple	*Eugenia jambos* L.	431	1502	736
3	False Kamani	*Terminalia* catappa L	100	1335	548
4	Gourd	*Benincasa hispida* (Thunb.)			500 (1)
5	Peach	*Prunus persica* L.	18	1163	449*
6	Banana (ripe)	*Musa sp.* L.	38	620	273
7	Cucumber	*Cucumis sativus* L.	175	356	265*
8	Loquot	Eriobotyra japonica (Thunb.)	9	829	250*
9	Pineapple Guava	*Feijoa sellowiana* Berg.	79	198	162*
10	Fig	*Ficus carica* L.	3	353	160*
11	Strawberry Guava	*Psidium cattleianum* Sabine	11	434	148
12	Mountain Apple	*Eugenia malaccensis* L.			103
13	Papaya (ripe)	*Carica papaya* L.	1	312	101
14	Surinam Cherry	*Eugenia uniflora* L.	1	238	101
15	Mango	*Mangifera indica* L.	7	280	100
16	Guava	*Psidium guajava* L.	3	631	98
17	Fern Tree	*Filicium decipens*	63	104	83
18	Custard Apple	*Annona reticulata* L.			78
19	Banana (green)	*Musa sp.* L.			60
20	*Terminalia chebula*		22	105	52
21	Coffee	*Coffea arabica* L.			47
22	Sweet Sop	*Annona squamosa* L.			28
23	Jac Fruit	*Artocarpus heterophylla* Lam.			27

	HOST		LOW	HIGH	AVER.
24	Walnut	Juglans hindsii	18	37	27
25	Apple	Pyrus malus L.	1	95	24*
26	Cactus (red fruit)	Opuntia megacantha	5	40	23
27	Citrus Fruit	Citrus sp.	1	360	23
28	Nikatroemia uva-ursi				23
29	Plum	Prunus cerasifera			22*
30	Cactus (green fruit)	Opuntia megacantha			19
31	Avocado (winter)	Persea americana	1	100	19
32	Ficus	Ficus sp			18
33	Persimmon, Oriental	Diospyros kaki L.	3	48	16*
34	Star Fruit	Averrhoa carambola L.	1	47	14
35	Wi	Spondias dulcis Forst.			13
36	Tomato	Lycopersicon esculenta Mill.			5 (1)
37	Pomegranate	Punica granatum L			6
38	Quince	Cydonia oblonga			2*
39	Breadfruit	Artocarpus communis L.			1

NOTES: * ordinarily mixed population of Dacus dorsalis and C. capitata

(1) Dacus cucurbitae index

SECTION II

TABLE 46

FRUIT LISTED AS HOSTS WHICH HAVE BEEN COLLECTED AND FOUND UNIFESTED

WITH DACUS DORSALIS ON MAUI

1	*Anacardium occidentale* L.	Cashew Nut
2	*Ananas comosus* L.	Pineapple
3	*Artocarpus incisus* (Thunb.)	Breadfruit (1)
4	*Cocos nucifera* L.	Cocoanut (2)
5	*Coffea liberica* (Bull.)	Liberian Coffee
6	*Cordyline terminalis* (L.)	Ti
7	*Diospyros ferrea*	Hawaiian Persimmon
8	Diospyros *discolor* Willd.	Velvet Apple
9	*Fragaria chiloensis* (L.)	Strawberry
10	*Garcinia mangostana* L.	Mangosteen
11	*Garcinia xanthochymus* Hook	Gourka
12	*Gossypium barbadense* L	Cotton
13	*Macadamia ternifolia* F.	Macadamia Nut
14	*Mammea americana* L.	Mamee Apple
15	*Melia azedarach* L.	Pride of India
16	*Momordica charantia* L.	Balsam Apple
17	*Morinda citrifolia* L.	Noni
18	*Morus nigra* L	Black mulberry
19	*Passiflora edulis* Sims	Lilikoi
20	*Passiflora laurifolia* L.	Yellow Water Lemon
21	*Passiflora subpeltata* Ortega	White Passion Flower
22	*Phoenix dactylifera* L.	Date
23	*Prunus amygdalus* L.	Almonds (3)
24	*Scaevola frutescens* (Forst.)	Half Flower
25	*Thevetia peruviana* (Pers.)	Be-Still
26	*Vaccinium* reticulatum Smith	Ohelo

Notes: (1) Only one pupa from several lots. (2) Eggs only. (3) Eggs only.

SECTION III

TABLE 47

FRUIT NOT LISTED AS HOSTS WHICH HAVE BEEN COLLECTED AND SHOWN TO BE UNINFESTED WITH DACUS DORSALIS ON MAUI

1	Acacia farnesiana (L)	Klu
2	Breynia nivosa roseo-picta (Bull.)	Snow Bush
3	Carya pecan	Pecan
4	Clermontia sp.	
5	Cyphomandra betacea (Cav.)	Tree Tomato
6	Duranta repens	Golden Dew Drop
7	Ficus heterophylla	
8	Jatropha curcas L.	Physic Nut
9	Ligustrum sp.	Privet
10	Linociera macrophylla	Maypea
11	Pittosporum sp.	
12	Prosopis juliflora	Kiawe
13	Pyracantha sp.	Firethorn
14	Solanum melongena L.	Egg Plant
15	Solanum sodomaeum	Sodom's Apple
16	Styphelia tameiameiae Cham.	Pukiawe

Note: With the exceptions of Clermontia (collected at Waikamoi) and Styphelia tameiameiae (collected Haleakala 7500') all of these fruits were collected in areas where Dacus dorsalis occurs and in a stage of maturity which appeared most susceptible to the fly.

MAUI FRUIT COLLECTIONS

TABLE 48

NOTE:

Lots 509 - 1007 included in this June Report.

Lots 1008 - which are not complete will be included in the September Report

A "Lot" of fruit may include from a few to several hundred depending upon availability, size, etc.

KEY:

INDEX: Puparia recovered per 1000 grams of fruit
S: Stage of fruit, G: Green, R: Ripe
W: Weight in grams
N: Number of fruit
gr: Ground fruit, usually over ripe

EMERGENCE
DOR: *Dacus dorsalis*
MED: *Ceratitis capitata*
LON: *Opius longicaudatus*
PER: *Opius persulcatus*

										Emergence				
LOT	DATE	LOCALITY	ELEV.	FRUIT		S	W	N	PUPAE	DOR	MED	LON	PER	INDEX
509	2/2	Pauwela	500'	Breadfruit	gr	R	3060	4	1					
510	"	"	"	"	gr	R	3046	4	0					
511	"	"	"	Guava	gr	R	2452	66	277	50		10	7	112
512	"	"	"	"	gr	R	2480	54	253	18		9	5	102
513	2/9	Kaupakalua	1050	"	gr	R	3513	71	89	17			1	25
514	"	"	"	"	gr	R	3699	100	138	6				37
515	"	"	"	"	gr	R	3145	84	168	9		3	1	53
516	"	Olinda	2160	"	gr	R	3274	70	199	12		14		60
517	"	"	"	"	gr	R	3330	85	186	24		21		55
518	"	"	"	"	gr	R	3428	81	67	14		12		19
519	"	Kahakuloa		"	gr	R	1020	26	83	13		5	11	81
520	"	Haiku	650	"	gr	R	1245	24	19	4		1	1	15
521	"	Wailuku	200	Kamani, F.	gr	R	1105	41	691	49		14		625
522	"	Kahakuloa		Wikstroemia uva-ursi		R	170	349	4	4				23
523	2/26	Kula	2600	Loquat		R	764	100	219	38		41	1	286
524	"	"	"	"		R	749	100	256	35	6	44	10	361
525	"	"	"	"		R	834	100	277	42	2	39	4	332

LOT	DATE	LOCALITY	ELEV.	FRUIT	S	W	N	PUPAE	Emergence DOR	MED	LOW	PER	INDEX
526	2/16	Kula	2600	Loquat	R	721	100	339	37	1	24	10	470
527	"	"	"	"	R	749	100	223	34	5	56	8	297
528	"	"	"	"	R	764	100	260	24	4	11	1	340
529	"	"	"	"	R	764	100	276	35	2	28	12	361
530	"	"	"	"	R	1630	150	488	26		1	1	299
531	"	"	"	"	R	1403	150	463	19	2	25	1	330
532	"	"	"	"	R	1347	150	403	36	3	57	10	299
533	"	"	"	"	R	1474	150	495	17	6	8		235
534	"	"	"	"	R	1119	150	392	13	1	18	1	35
535	"	"	"	"	R	525	69	134	14	4	38	2	255
536	"	"	"	"	R	1814	100	254	62	1	23		140
537	2/17	"	"	"	R	1062	100	139	34	8	24	2	130
538	"	"	"	"	R	1899	125	485	68	20	32	1	255
539	"	"	"	"	R	1077	125	203	43	10	5		188
540	"	"	"	"	R	1389	125	443	54	29	46	6	218
541	"	"	"	"	R	1119	150	405	46	9	90	10	361
542	"	"	"	"	G	1217	125	368	108	63	11	7	302
543	"	"	"	"	R	1347	150	530	58	15	26	9	393
544	"	"	"	"	R	1316	125	182	31	5	30	7	138
545	"	"	"	"	R	1516	125	287	61	9	27	10	189
546	"	"	"	"	R	1516	125	237	100	13	18	4	156
547	"	"	"	"	R	1077	125	85	23	6	4	7	78
548	"	"	"	"	R	1105	125	352	15	3	26	2	318
549	"	"	"	"	R	1559	125	409	20	23	13	1	262
550	"	"	"	"	R	1048	125	259	48	9	18	3	247
551	"	"	"	"	R	1231	125	378	36	20	29	3	307
552	"	"	"	"	R	1287	125	499	23	6	16	2	383

LOT	DATE	LOCALITY	ELEV.	FRUIT	S	W	N	PUPAE	Emergence DOR	MED	LON	PER	INDEX
553	2/17	Kula	2600'	Loquat	R	1273	125	163	32	8	6		128
554	"	"	"	"	R	1287	125	377	74	11	65		292
555	"	"	"	"	R	1245	125	332	40	18	31	3	266
556	"	"	"	"	R	1559	125	308	48	15	55		197
557	"	"	"	"	R	1259	125	477	35	6	56	10	378
558	"	"	"	"	R	1091	106	303	36	5	52	1	277
559	"	"	"	"	R	1160	125	440	77	9	89	14	379
560	"	"	3000	"	R	1799	100	64	2	15	8		35
561	"	"	"	"	R	1347	73	51	11	15	3		37
562	2/21	"	3600	Lemon	R	410	12	0					
563	"	"	"	Orange	R	721	6	0					
564	"	"	"	"	R	935	7	0					
565	"	"	"	"	gr R	2268	35	7	2	1			3
566	"	"	"	Grapefruit	R	978	8	2			2		2
567	"	"	"	Orange	gr R	1828	21	0					
568	"	"	"	Tangerine	R	863	26	36		11			41
569	"	"	"	Orange	gr R	1531	25	0					
570	"	"	"	Grapefruit	R	679	6	0					
571	"	"	"	Lemon	G	949	8	1		1			1
572	"	"	"	Orange	R	622	7	0					
573	"	"	"	"	gr R	2353	32	0					
574	"	"	"	"	gr R	1134	20	0					
575	"	"	"	Lemon	R	721	4	64	13	28			88
576	"	"	"	Orange	R	707	6	0					
577	"	"	"	Grapefruit	R	949	3	0					
578	"	"	"	Lime	R	311	8	0					
579	"	"	"	Orange	R	877	8	8		2	2		
580	"	"	"	"	gr R	1020	19	0					

LOT	DATE	LOCALITY	ELEV.	FRUIT		S	W	N	PUPAE	Emergence DOR	MED	LON	PER	INDEX
581	2/21	Kula	3600	Grapefruit	gr	R	1006	27	0					
582	"	"	"	Orange	gr	R	1160	16	0					
583	"	"	"	"	gr	R	538	12	0					
584	"	"	"	Grapefruit		R	764	6	0					
585	"	"	"	Lemon		R	424	11	0					
586	"	"	"	"		R	580	21	0					
587	"	Makawao	1700	Jerusalem cherry		R	57	35	0					
588	"	"	"	Ficus hetero-phylla		R	664	40	0					
589	"	Kaupakalua	1450	Guava	gr	R	3345	50	67	12		5		20
590	"	"	"	"	gr	R	2721	50	87	7		3	2	31
591	"	"	"	"	gr	R	4195	62	213	25		7	6	50
592	2/20	Wailuku	200	Kaumani, F.	gr	R	693	24	789	53		10		1140
593	2/24	Kula	2600	Loquat		HR	525	59	176	21	38	15	1	335
594	"	"	"	"		R	849	36	63	18	11	3	3	74
595	"	"	"	"		OR	636	51	20	4		5		31
596	"	"	"	"		R	863	56	85	14	5	12		98
597	"	"	"	"		R	1062	49	25	3		2		23
598	"	"	"	"		HR	949	55	66	15	5	1	4	69
599	"	"	"	"		OR	1119	97	370	23	2	125	12	330
600	"	"	"	"		HR	664	37	46	22	13	1	1	69
601	"	"	"	"		G	1090	97	111	6	40	2		101
602	"	"	"	"		HR	1375	106	86	3	24		2	62
603	"	"	"	"		G	992	95	168	16	68	2	2	169
604	"	"	"	"		R	1217	111	210	50	12	9	6	172
605	"	"	"	"		R	636	29	23	12	4	2	3	36
606	"	"	"	"		R	622	66	130	17	13	16		209
607	"	"	"	"		R	1389	92	48	14	1	5		34
608	"	"	"	"		R	1105	57	45	19	3	2		40

LOT	DATE	LOCALITY	ELEV.	FRUIT	S	W	N	PUPAE	Emergence				INDEX
									DOR	MED	LON	PAR	
609	2/24	Kula	2600	Loquat	R	1188	47	113	38	19	7		95
610	"	"	"	"	R	820	110	103	16	1	21		125
611	"	"	"	"	HR	820	58	0					
612	"	"	"	"	OR	792	91	256	7	3	78	1	323
613	"	"	"	"	HR	566	63	41	11	2	1		72
614	"	"	"	"	HR	1431	86	168	32	24	13		117
615	"	"	"	"	HR	608	60	151	30	46	12		248
616	"	"	"	"	OR	820	91	334	19	3	26	6	407
617	"	"	"	"	HR	1105	116	149	31	4	17		134
618	"	"	"	"	OR	907	99	329	14	3	68	4	362
619	"	"	"	"	G	1330	135	38	10	20	1		28
620	"	"	"	*Passiflora edulis*	R	467	17	0					
621	"	"	"	Cotton	G	113	6	0					
622	"	"	"	Loquat	R	693	32	43	12	13	10	1	62
623	"	"	"	*Ficus sp.*	R	42	34	0					
624	"	"	"	Walnut	G	99	1	0					
625	"	Paia	750	Guava	R	2282	28	428	11				187
626	"	"	"	"	R	1871	23	627	96		1	19	335
627	"	"	"	"	R	1814	22	364	82		4	38	200
628	"	"	"	Loquat	R	740	64	129	27		17	1	174
629	"	"	"	"	R	630	45	114	11		26	9	180
630	"	"	"	Grapefruit	R	1417	5	0					
631	"	"	"	"	R	1380	6	1					
632	"	"	"	Avocado	G	2055	5	0					
633	"	"	"	"	gr G	2154	5	4	1		1		1
634	"	"	"	"	G	2495	7	0					
635	"	"	"	"	gr R	2296	6	2					1

LOT	DATE	LOCALITY	ELEV.	FRUIT		S	W	N	PUPAE	DOR	Emergence MED	LON	PER	INDEX
636	2/24	Ulupalakua	1916	Loquat		R	2111	188	463	100	2	25	5	219
637	"	"	"	"		R	1672	139	251	69	5	49	3	150
638	"	"	"	"		R	1488	124	142	32	3	11		95
639	2/28	Kanaio	1996	"		HR	806	92	105	78	12	1	1	130
640	"	"	"	"		HR	693	100	159	101	8	3	2	229
641	"	"	"	"		HR	849	100	107	48	14	2	2	126
642	"	"	"	"		HR	552	100	112	65	8	3		202
643	"	"	"	"		HR	849	100	158	113	10	8		186
644	"	"	"	"		OR	863	100	162	98	5	10		187
645	"	"	"	"		OR	1006	100	153	32	7	39		152
646	"	"	"	"		OR	707	100	114	28	1	40		161
647	"	"	"	"		OR	525	100	70	34		27		133
648	"	"	"	"		R	650	100	137	59	2	45		210
649	"	"	"	"		R	636	100	143	36		20		226
650	"	"	"	"		R	636	100	118	39	7	34		185
651	"	"	"	"		R	834	100	64	19		26		76
652	"	"	"	"		R	877	100	155	80	3	25	4	176
653	"	"	"	"		R	594	100	161	71	13	29		271
654	"	"	"	"		R	707	100	169	59	2	38		239
655	"	"	"	"		R	1188	100	146	42	1	25	1	122
656	"	"	"	"		R	964	100	224	105	2	20	3	232
657	"	"	"	"		R	1006	100	125	64	4	13		124
658	"	"	"	"		R	1062	100	137	67	1	18	10	129
659	"	"	"	"		R	949	100	167	63	3	25	4	175
660	"	Lahaina	50'	Santalum album		R	90	109	112	42		43		1240
661	"	"	20	Papaya		R	877	3	0					
662	"	"	"	Guava	gr	R	1146	24	724	33		4		631
663	"	"	50	Santalum album		R	99	122	138	12		48		1390

LOT	DATE	LOCALITY	ELEV.	FRUIT	S	W	N	PUPAE	Emergence DOR	MED	LON	PER	INDEX
664	2/24	Pauwela	550		R	42		0					
665	"	Haiku	650	Cordyline	R	297		0					
666	"	Waikoa	2600	Loquat	OR	2253	125	302	33	9	51	1	134
667	"	"	"	"	OR	1941	125	195	55	4	27		100
668	"	"	"	"	R	1630	100	218	92	30	42	6	133
669	"	"	"	"	R	1672	100	249	54	15	34		148
670	"	"	"	"	R	1742	100	219	49	12	38		125
671	"	"	"	"	R	1756	100	216	46	23	27	3	123
672	3/2	Waiakoa	2600	"	R	1644	100	134	70	8	30	9	81
673	"	"	"	"	R	1770	100	301	101	30	20	4	170
674	"	"	"	"	R	1728	100	200	50	10	37	6	115
675	"	"	"	"	R	1871	100	317	55	35	28	3	169
676	"	"	"	"	R	1488	100	172	62	36	17	2	115
677	"	"	"	"	R	1588	100	217	51	13	23	3	136
678	"	"	"	"	R	1756	100	380	143	18	28	4	216
679	3/1	Kula	"	Loquat	R	2035	130	648	98	143	59		318
680	"	"	"	"	R	1658	77	319	82	34	25		192
681	"	Grove Ranch	1450	Guava	R	693	11	147	55		9	15	212
682	"	"	"	"	R	1188	18	690	10			9	580
683	"	Paia	750	Tangerine	R	693	4	693	0				
684	"	"	"	Orange gr	R	1105	8	684	5	3			4
685	"	"	"	Orange gr	R	834	12	0					
686	"	"	"	Lemon gr	R	1105	6	0					
687	"	"	"	Date gr	R	156	33	0					
688	3/2	Kanaio	1900	Loquat	R	1403	132	199	73	6	11	4	141
689	"	"	"	"	R	992	100	109	31	4	3		109
690	"	"	"	"	R	1105	100	208	127	2	20		188
691	"	"	"	"	R	1020	100	699	45	4	1	1	685

LOT	DATE	LOCALITY	ELEV.	FRUIT	S	W	N	PUPAE	Emergence DOR	MED	LON	PER	INDEX
692	3/2	Kanaio	1900	Loquat	R	964	100	206	76	1	23	5	213
693	"	"	"	"	R	1174	100	231	93	3	5		196
694	"	"	"	"	R	1034	100	120	53	3	12	2	116
695	"	"	"	"	R	1105	100	208	97	2	19	2	188
696	"	"	"	"	R	1105	100	148	76	2	7		133
697	"	"	"	"	R	1091	100	185	83	2	14		169
698	"	"	"	"	R	806	100	201	114		20	3	249
699	"	"	"	"	R	1091	100	214	98	4	21	4	196
700	"	"	1990	"	R	1119	100	233	111	6	9		288
701	"	"	"	"	R	1077	100	130	71	1	6	1	120
702	"	"	"	"	R	1217	100	212	54	3	27		174
703	"	"	"	"	R	1020	100	136	58	10	10		133
704	"	"	"	"	R	992	100	240	133	9	25	2	241
705	"	"	"	"	R	1389	100	208	67	3	31	5	149
706	"	"	"	"	R	1174	100	176	49	3	28		149
707	"	"	"	"	R	693	100	193	67	3	44		278
708	"	"	"	"	R	650	100	187	75	1	47	2	287
709	"	"	"	"	R	209	100	209	45	3	87		284
710	"	"	"	"	R	636	100	169	79	2	40		265
711	"	"	"	"	R	1245	100	215	61	2	39	2	172
712	"	"	"	"	R	1259	100	211	65	6	26	1	167
713	"	"	"	"	R	1105	100	161	55	1	23	1	145
714	"	"	"	"	R	1217	100	159	96	4			130
715	"	"	"	"	R	834	100	226	153	18	5		270
716	"	"	"	"	R	764	100	163	97	13	14	1	213
717	"	"	"	"	R	863	100	225					
718	"	"	"	"	R	992	100	225	53	6	33	4	226

LOT	DATE	LOCALITY	ELEV.	FRUIT	S	W	N	PUPAE	Emergence DOR	MED	LON	PER	INDEX
719	3/2	Kanaio	1990	Loquat	R	552	100	243					440
720	3/3	Maluhia	1814	"	R	1885	100	365	46		90	5	193
721	"	"	"	"	R	1431	100	289	39	1	40	17	201
722	"	"	"	"	R	1202	100	262	85	1	57	7	217
723	"	"	"	"	R	1559	100	323	78		68	18	207
724	"	"	"	"	R	1502	100	349	79	1	57	10	232
725	"	"	"	"	R	1259	100	350	76	1	14	4	277
726	"	"	"	"	R	1531	100	333	67	1	2	3	217
727	"	"	"	"	R	1403	100	311	73	6	22	9	221
728	3/9	Kanaio	1990	"	R	992	100	190	57	1	10		371
729	"	"	"	"	R	992	100	344	156	8	7		346
730	"	"	"	"	R	1188	100	120	33	9	5		101
731	"	"	"	"	R	949	100	170	48	10	7		170
732	"	"	"	"	R	1105	100	131	63	9	15 ok		118
733	"	"	"	"	R	1048	100	178	58	5	3		170
734	"	"	"	"	R	1174	100	170	58	2	15		144
735	"	"	"	"	R	964	100	187	86	8	9		193
736	"	"	"	"	HR	877	100	281	112	6	3		320
737	"	"	"	"	HR	849	100	205	120	4	22		241
738	"	"	"	"	OR	1048	100	145	52	6	19		138
739	"	"	"	"	OR	1020	100	117	41	1	15		114
740	"	"	"	"	OR	1062	100	47	16	1	23		44
741	"	"	"	"	OR	1034	100	45	15		11		43
742	"	"	"	"	OR	978	100	205	93	5	10	1	209
743	3/28	Kula	3600	Lemon	R	1330	12	0					
744	"	"	"	Orange	R	1105	7	0					
745	"	"	"	Lemon	R	368	13	0					

LOT	DATE	LOCALITY	ELEV	FRUIT	S	W	N	PUPAE	DOR	MED	LONG	PER	IND
746	3/28	Kula	3600	Grapefruit	R	608	4	0					
747	"	"	"	Lemon gr	R	255	14	0					
748	"	"	"	Tangerine gr	R	269	10	4	1				14
749	"	"	"	Grapefruit gr	R	608	9	0					
750	"	"	"	Lemon	R	778	8	0					
751	"	"	"	Lemon	R	1048	4	0					
752	"	"	"	Orange gr	R	1899	18	71	2	2	2		37
753	"	"	"	Orange gr	R	1347	12	65	16	4	6		48
754	"	"	"	Tangerine	R	594	16	28	1	13			47
755	"	"	"	Lemon	R	170	8	0					
756	"	"	"	Orange	R	453	3	0					
757	"	"	3110	Orange	R	283	6	0					
758	"	"	"	Lemon	R	438	4	0					
759	"	"	"	gr. Grapefruit	R	907	5	28	3				30
760	"	"	"	Grapefruit gr	R	892	6	8					9
761	"	"	"	Grapefruit gr	R	863	4	19		10	1		22
762	"	"	"	Orange	R	650	9	0					
763	"	"	"	Orange gr	R	580	7	7	2				12
764	"	"	"	Loquat	R	1842	62	706	7		3		383
765	"	"	"	Loquat	R	1700	100	243	17	6	6	1	142
766	"	"	2850	Lime	G	325	10	0					
767	"	"	"	Loquat	R	1259	200	694	26	19	2		609
768	"	"	"	Loquat	R	1330	200	868	33	6			652
769	"	"	"	Loquat	R	1474	200	711	29	8	1		481
770	"	"	"	Loquat	R	202	200	969	192	23	2		478

LOT	DATE	LOCALITY	ELEV	FRUIT	S	W	N	PUPAE	DOR	MED	LON	PER	IND
771	3/28	Kula	2850	Loquat	R	1770	200	987	37	37	8		557
772	"	"	"	Loquat	R	2097	200	1256	187	41	10	4	598
773	"	"	"	Loquat	R	2763	200	1501	375	28	5	1	543
774	"	"	"	Loquat	R	1375	200	704	108	65	109	6	512
775	"	"	"	Loquat	R	2224	200	1627	163	97	4		731
776	"	"	"	Loquat	R	1316	200	721	151	69	32	1	547
777	"	Waiakoa	2960	Loquat	R	1927	200	888	149	43	13	6	460
778	"	"	"	Loquat	R	2238	200	1258	260	203	19	9	562
779	"	"	"	Loquat	R	2806	200	1167	87	59	7	6	415
780	"	"	"	Loquat	R	3117	217	1821	384	131	10	2	584
781	"	"	"	Loquat	R	2650	200	1643	343	75	5	2	616
782	"	"	"	Loquat	R	2779	200	1318	248	174	4	5	474
783	3/30	"	"	Loquat	R	2097	200	660	73	42	11	3	314
784	"	"	"	Loquat	R	2353	200	626	100	7	12	3	266
785	"	"	"	Loquat	G	2296	200	1578	255	138			687
786	"	"	"	Loquat	HR	1474	100	331	11	25	2	1	224
787	"	"	2900	Loquat	R	2537	200	2049	240	89	27	10	809
788	"	"	"	Loquat	R	2381	200	1974	283	105	11	5	829
789	"	"	"	Loquat	R	2440	200	1620	273	155	14	4	663
790	"	"	"	Loquat	R	2367	200	1200	183	23	4	8	506
791	"	"	"	Loquat	R	1375	100	886	69	65	11	1	644
792	"	"	"	Loquat	R	1139	100	899	112	53	6	1	789
793	"	"	"	Loquat	R	1984	165	1182	69	29	3	2	595
794	"	"	"	Loquat	R	2041	175	979	56	26	4	3	479
795	"	"	3120	Loquat	R	1616	55	480	74	5	37	1	297

LOT	DATE	LOCALITY	ELEV	FRUIT	S	W	N	PUPAE	BOR	MED	LON	PER	IND
796	3/30	Waiakoa	3120	Loquat	R	1814	60	547	18		43		301
797	"	"	"	Loquat	R	1927	70	506	16	1	28		260
798	"	"	"	Loquat	OR	2268	100	818	29	2	38	2	360
799	"	"	"	Loquat	OR	2664	100	732	206	2	39	4	274
800	"	"	"	Loquat	OR	2253	100	1190	132		65	5	528
801	"	"	"	Loquat	OR	1828	80	884	81	3	29	1	483
802	"	"	"	Loquat	OR	1417	70	609	82		39		429
803	"	"	2860	Loquat	R	721	55	179	28	7	24		248
804	"	"	"	Loquat	R	2523	200	659	138	45	18	6	261
805	3/31	Keokea	3050	Loquat	OR	2097	200	703	177	159	48	1	335
806	"	"	"	Loquat	OR	2111	200	782	146	129	35	1	370
807	"	"	"	Loquat	OR	2381	200	718	159	123	44	3	308
808	"	"	"	Loquat	OR	2196	200	744	134	98	41	4	338
809	"	"	"	Loquat	OR	2026	200	606	122	45	57	3	299
810	"	"	"	Loquat	OR	2452	100	904	117	178	34		368
811	"	"	"	Loquat	HR	2012	200	919	170	82	7		456
812	3/21	"	"	Avocado	G	1146	4	0					
813	"	"	"	Loquat	OR	2210	121	793	116	38	7	1	358
814	"	"	"	Loquat	R	2495	237	366	48	83	9	0	146
815	"	"	"	Loquat	R	2097	161	134	24	6	3	1	63
816	"	"	"	Loquat	OR	3003	233	35					11
817	"	"	"	Loquat	OR	2381	165	236	51	44	3		99
818	"	"	"	Loquat	OR	1119	54	109	36	9	1		97
819	4/3	Kula	3800	Loquat	R	1375	56	138		78			100
820	"	"	"	Loquat	R	1105	40	41		12			37

LOT	DATE	LOCALITY	ELEV	FRUIT	S	W	N	PUPAE	DOR	MED	LON	PER	IND
821	4/2	Haiku	600	Cordyline sp	R	707	-	0					
822	4/6	Paia	800	Lemon	R	594	5	0					
823	"	"	"	Orange gr	R	764	5	8	4				10
824	"	"	"	Orange gr	R	949	6	25	5	9	1		26
825	"	"	"	Orange	R	834	7	0					
826	"	"	"	Avocado gr	R	1828	4	0					
827	"	"	"	Lemon gr	R	921	7	0					
828	"	"	"	Lemon gr	R	849	9	17	1				20
829	"	"	"	Orange	Hr	672	7	0					
930	"	"	"	Lemon	HR	764	8	0					
831	"	"	"	Orange	R	1231	7	36	10				29
832	"	"	"	Lime gr	R	863	10	0					
833	"	"	"	Orange	R	735	9	2					
834	"	"	"	Lemon	HR	1105	7	0					
835		Makawao	"	Orange	R	949	7	0					
836	"	Paia	"	Grapefruit	HR	1091	5	0					
837	"	"	"	Lemon	HR	679	6	0					
838	"	"	"	Lemon	R	978	4	30	19				30
834	"	Paia	"	Orange gr	R	636	10	0					
835		Makawao	1400	Avocado gr	R	1927	4	12			1		6
836	"	Paia	800	Grapefruit	HR	1091	5	0					0
837	"	"	"	Lemon	HR	679	6	0					0
838	"	"	"	Lemon	R	978	4	30	19	0	0	0	30

LOT	DATE	LOCALITY	ELEV	FRUIT	S	W	N	PUPAE	Emergence DOR	MED	LON	PER	IND
839	4/6	Paia	800'	Orange gr	R	636	10	10					0
840	"	Makawao	1400	Avocado gr	R	1927	4	12			1		6
841	"	"	"	Peach	R	368	9	40	12	6	11		108
842	"	"	"	Lime	R	424	8	12	6	3			28
843	"	"	"	Lemon gr	R	608	7	0					0
844	"	"	"	Papaya	R	1871	1	0					0
845	"	"	1620	Papaya gr	HR	1260	3	0					0
846	"	"	"	Cherimoya	R	1741	4	390	7				210
847	"	Upper Kula	3320	Loquat	R	1842	120	619	104				336
848	"	"	"	Loquat	R	1920	131	744	173	179	3		387
849	4/20	Keokea	3260	Loquat	R	1672	122	423	81	133	10		252
850	"	"	"	Loquat	R	1927	170	509	94	89	21		264
851	"	Upper Kula	3360	Loquat	R	1885	153	754	167	53	108	26	400
852	"	"	"	Loquat	R	1630	135	878	94	54	74	8	538
853	"	"	"	Loquat	R	1756	159	770	86	48	112	6	438
854	"	"	"	Loquat	R	1756	139	707	85	83	41		402
855	"	"	650	Loquat	R	1644	131	554	142	47	75	3	336
856	"	Haiku	"	*Lenzoiera macrophylla*		241	86	0					
857	"	"	500	Mango	G	2424	6	76	42		1		31
858	"	"	"	Mango	R	1403	5	614	152	2	11		437
859	"	"	"	Avocado	HR	2055	4	0					0
860	"	"	650	*Cordiline terminalus*		170		0					0
861	"	"	"	Jerusalem cherry	R	57	33	16	9			2	280
862	4/24	Kula	3360	Loquat	R	1446	100	482	120	38	44		333
863	"	"	"	Loquat	R	1330	100	490	96	73	47	4	368

LOT	DATE	LOCALITY	ELEV	FRUIT	S	W	N	PUPAE	Emergence DOR	MED	LON	PER	IND
864	4/24	Kula, upper	3360	Loquat	R	1375	100	413	72	92	47	1	300
865	"	"	3360	Loquat	R	1245	100	247	50	61	34	4	198
866	"	"	"	Loquat	R	1174	100	399	78	88	45	1	339
867	"	"	"	Loquat	R	1316	100	352	19	29	43	5	267
868	"	"	"	Loquat	R	1245	100	346	56	64	59	9	277
869	"	"	"	Loquat	R	1259	100	338	38	42	57	7	268
870	"	"	"	Loquat	R	1188	100	739	150	110	4	3	622
871	"	"	"	Loquat	R	1316	100	207	35	12	28	2	157
872	"	"	"	Loquat	R	1217	100	329	75	54	32	10	270
873	"	"	"	Loquat	R	1160	100	324	33	52	44	8	279
874	"	"	"	Loquat	R	1202	100	408	48	62	26	9	339
875	"	"	"	Loquat	R	1223	100	443	57	85	37	14	362
876	"	"	"	Loquat	R	1174	100	392	69	100	36	13	333
877	"	"	"	Loquat	R	1714	100	391	39	64	61	3	228
878	"	"	"	Loquat	R	1188	100	359	75	65	21	5	302
879	"	"	"	Loquat	R	1091	100	374	76	91	40	2	342
880	"	"	"	Loquat	R	1630	100	464	57	111	26	4	284
881	"	"	"	Loquat	R	1602	100	430	81	53	20	2	265
882	"	"	"	Loquat	R	1799	100	471	82	58	65		261
883	"	"	"	Loquat	R	1174	100	412	111	68	22	2	350
884	"	"	"	Loquat	R	1302	100	458	49	103	55	4	351
885	"	"	"	Loquat	R	1202	100	362	78	42	30	8	302
886	"	"	"	Loquat	R	1174	100	299	79	69	27	9	254
887	"	"	"	Loquat	R	1347	100	401	92	61	36	7	452
888	"	"	"	Loquat	R	1347	100	507	125	208	14	3	376

LOT	DATE	LOCALITY	ELEV	FRUIT	S	W	N	PUPAE	Emergence DOR	MED	LON	PER	IND
889	4/24	Kula upper	3360	Loquat	R	1330	100	453	109	86	34	2	340
890	"	"	"	Loquat	R	1231	100	354	63	65	41	16	287
891	"	"	"	Loquat	R	1188	100	330	48	69	36	19	277
892	"	"	"	Loquat	R	1347	100	437	69	101	57	5	324
893	"	"	3240	Loquat	OR	1856	100	527	40	122	33	0	283
894	"	"	"	Loquat	OR	1814	100	554	63	72	26	0	305
895	"	"	"	Loquat	OR	1842	100	256	45	45	18	0	138
896	"	"	"	Loquat	OR	1885	100	378	74	74	12	0	200
897	"	"	"	Loquat	OR	1856	100	381	84	81	16	0	205
898	"	"	"	Loquat	OR	1742	100	406	44	60	15	0	233
899	"	"	"	Loquat	OR	1559	100	428	70	73	7	0	274
900	"	"	"	Loquat	OR	1644	100	477	128	66	23	9	290
901	"	"	"	Loquat	OR	1231	100	270	71	23	16	1	219
902	"	"	"	Loquat	OR	1658	100	285	70	35	11		171
903	"	"	"	Loquat	OR	1714	100	337	84	36	10		196
904	"	"	"	Loquat	OR	1756	100	262	66	32	15		149
905	"	"	"	Loquat	OR	1658	100	348	83	52	20		209
906	"	"	"	Loquat	OR	1559	100	425	74	65	51		272
907	"	"	"	Loquat	OR	2706	145	409	82	72	9		151
908	"	"	3100	Loquat	R	594	35	189	51	1	35	5	319
909	"	Hana	50	Eugenia jambos	OR	820	37	530	175		154		646
910	"	"	"	Eugenia jambos	R	749	37	505	209	2	118		674
911	"	"	"	Mango gr	R	1700	18	278	109		35		163
912	"	"	"	Eugenia jambos	HR	424	22	637	120	5	71	6	1502
913	"	Makaoli	75	Fig	R	382	5	4	3				10

LOT	DATE	LOCALITY	ELEV	FRUIT	S.	W	N	PUPAE	Emergence DOR	MED	LON	PER	IND
914	4/24	Hana	50	Eugenia jambos gr	OR	834	43	559	189		163	15	670
915	"	"	"			85	54	0					
916	"	Lahaina	75	Mango gr	OR	2125	24	406	226	1	17		191
917	"	"	"	Mango gr	OR	1913	24	425	219		3		222
918	"	Makaoli	"	Mango gr	R	1602	5	200	64				124
919	"	"	"	Mango gr	R	1828	6	309	56		1	7	169
920	"	"	"	Mango gr	R	1460	7	272	79		1		186
921	"	"	"	Mango gr	R	1828	8	259	64		8		141
922	"	"	"	Papaya	R	1531	5	50	48		1		32
923	"	"	"	Tangerine	HR	156	14	0					
924	"	"	"	Tangerine gr	R	650	9	219	128		30	5	336
925	"	"	"	Avocado gr	R	1431	4	0					
926	"	"	"	Tangerine gr	R	525	6	194	71	2	31	5	369
927	"	"	"	Avocado gr	R	1273	3	0					
928	"	"	"	Avocado	R	806	3	45	26				55
929	4/23	Iao Valley	500	Mango gr	R	2055	18	403	185	1	24		196
930	"	"	"	Mango gr	R	1559	21	150	75		2		96
931	"	Pauwela	"	Mango	R	1630	5	0					
932	"	"	"	Mango	HR	1964	6	73	38	1	1	1	37
933	4/24	Haiku	650	Ti	R	453	-	0					
934	"	Waiakoa	2700	Peach gr	R	1559	36	865	49	251	154	2	554
935	"	"	"	Peach gr	R	1516	40	659	42	209	101		434
936	"	"	"	Peach gr	R	1545	43	617	36	188	126	3	397
937	4/27	"	2960	Peach gr	R	1630	32	1312	160	275	22	2	804
938	"	Iao Valley	500	Mango gr	R	2381	23	669	189	1	51	1	280

LOT	DATE	LOCALITY	ELEV	FRUIT	S	W	N	PUPAE	Emergence DOR	MED	LON	PER	IND
939	5/1	Olinda	2000	Peach	R	849	28	349	180	34	9	5	411
940	5/2	Kula	2900	Peach	OR	1146	27	760	25	435	43	1	663
941	5/3	"	3140	Almond	G	127	7	0					
942	"	"	3640	Loquat	R	1231	115	538	34	219	51	1	437
943	"	"	"	Loquat	OR	1700	115	503	51	123	52		295
944	"	"	"	Loquat	OR	1273	111	244	31	88	32		191
945	"	"	3460	Peach	G	495	11	2					4
946	"	"	2900	Peach	R	552	15	225	6	191	1		407
947	"	"	"	Peach gr	R	892	19	489	55	201	29	3	548
948	"	"	"	Peach	G	382	9	84					
949	"	"	3100	Peach gr	R	396	7	303	13	111	4	0	765
950	"	"	"	Peach gr	R	834	30	627	42	222	42	0	751
951	"	"	2900	Peach gr	R	636	11	354	36	129	20	0	558
952	"	"	3100	Peach	HR	849	30	725	5	395	4	0	853
953	"	"	"	Peach	G	495	30	227	6	121	9	0	458
954	"	"	"	Peach	HR	424	14	182	0	125	4	0	429
955	"	"	2875	Peach gr	R	764	18	289	2	189	4	3	378
956	"	"	2850	Peach	G	629	20	186	20	133	0	0	295
957	"	"	2750	Peach gr	R	764	12	365	15	154	28	0	477
958	"	"	3100	Peach gr	R	636	19	585	25	149	1	1	1163
959	"	"	"	Peach gr	HR	438	16	497	3	352	7	1	1134
960	"	"	2900	Peach gr	R	1347	32	1124	109	391	14	3	834
961	"	"	2850	Peach gr	R	354	7	378	77	129	14	1	1067
962	"	"	2750	Peach	G	304	12	94	4	64	0	0	309
963	"	"	2875	Peach gr	R	834	20	490	27	148	5	0	587

LOT	DATE	LOCALITY	ELEV	FRUIT	S	W	N	PUPAE	Emergence DOR	MED	LON	PER	IND
964	5/3	Kula	2900	Peach gr	R	1077	23	789	85	218	23	2	732
965	"	"	2850	Peach	G	396	15	139	20	101	0	0	351
966	"	"	2750	Peach	HR	451	10	117	0	105	0	0	259
967	"	"	2900	Peach	R	721	20	444	35	247	7	0	615
968	"	"	2875	Peach	R	849	19	346	6	237	2	0	407
969	"	"	"	Peach gr	R	942	23	444	13	293	1	0	471
970	"	"	2900	Fig	G	276	7	0					
971	"	"	2700	Peach	G	575	20	13	4	9	0	0	22
972	"	"	2900	Peach	R	438	9	207	21	111	3	8	472
973	"	"	2700	Peach	G	636	22	153	14	75	0	0	240
974	5/4	Haiku	600	Filicium decipens	R	283	475	18	6	0	1	7	
975	"	"	"	Canistel	R	511	2	0					
976	"	"	"	Casimiroa edulis	R	127	12	0					
977	"	"	"	Litchi	R	141	14	1					
978	"	Makawao	1700	Peach	G	311	10	6	0	4	0	0	19
979	"	"	"	Peach	G	305	12	159	60	50	3	7	521
9809	"	"	"	Peach	HR	707	16	228	88	66	3	7	322
981	"	"	"	Peach	HR	566	16	303	131	53	10	3	535
982	"	"	"	Peach	R	714	20	310	81	72	7	0	434
983	"	"	"	Peach	R	863	21	399	122	67	1	2	462
984	"	"	"	Peach	R	949	20	353	136	25	7	1	371
985	"	"	"	Peach	R	834	21	349	89	94	11	6	418
986	"	"	"	Peach	HR	538	14	6		6	0	0	11
987	"	"	"	Peach	HR	1020	25	408	151	90	5	5	400
988	"	"	"	Peach	G	877	32	230	112	20	4	4	262

LOT	DATE	LOCALITY	ELEV	FRUIT		S	W	N	PUPAE	Emergence DOR	MED	LON	PER	IND
989	5/4	Olinda	2200	Peach		R	552	20	10	7	0	0	0	18
990	"	"	"	Peach	gr	R	580	11	35	0	27	2	0	60
991	"	"	"	Peach		R	354	13	5	0	3	0	0	14
992	"	"	"	Peach		R	460	15	11	2	7	0	0	23
993	"	"	"	Peach		G	467	10	11	0	11	0	0	21
994	"	"	2250	Peach		HR	467	13						0
995	"	"	"	Peach		R	552	11	14		12			25
996	"	"	"	Peach		R	511	10	17	15	2			25
997	"	"	"	Peach		HR	488	11	0					0
998	"	"	2600	Peach		R	417	11	9		8			21
999	"	"	"	Peach		R	325	7	27	0	26	0	0	83
1000	"	"	"	Peach		R	368	11	53	3	38	0	0	144
1001	"	"	"	Peach		HR	368	12	35	6	26	0	0	95
1002	5/8	Waiakoa	3800	Loquat		R	1757	82	36	1	25	0	0	20
1003	"	"	"	Loquat		R	1602	79	356	11	160	0	4	222
1004	"	"	3600	Loquat		R	2509	60	63	29	4	1	0	25
1005	"	"	"	[illegible]	gr	R	820	6	36	0	29	2	0	43
1006	"	"	"	Orange		R	863	8	9	0	4	0	0	10
1007	"	Kula	2800	Banana		R	764	12	241	37	5	26	0	315

Hawaii Fruit Collections

This report covers 391 lots of fruit collected on the island at large from sea level to 5200 feet.

Of the fruit collected, rose apples, and longan (dragons eye) appear to be most heavily infested. In general, fruit collected where it is warm and dry have a higher *dorsalis* index than fruit collected at higher elevations. Fruit collected at 3500 feet and above yield mostly Med. flies, but *dorsalis* is capable of breeding in fruit up to 4700 feet under natural conditions.

One lot of mock orange fruit collected in Hilo yielded 32 pupae and from these emerged 21 *dorsalis*, 5 Med. flies and 6 *O. longicaudatus*. It is not often that Med. flies are recovered from fruit in Hilo, at least not since *dorsalis* arrived.

Collection of potential native host fruit was made along the Keanakolu trail and other localities but results were negative.

Of 52 lots of peaches collected in the recent survey six lots or 130 peaches were uninfested. Most of the peaches were collected at an elevation of 1900 feet. *Opius longicaudatus* and *Opius perculcatus* parasites are very active in this locality and are apparently exerting some pressure on *dorsalis*.

HAWAII FRUIT COLLECTIONS

NOTE

Lots 637 – 1028 included in this June Report

Lots 1029 – 1261 which are not complete will be included in the September Report

A "Lot" of fruit may include from a few to several hundred depending upon availability, size, etc.

KEY:

INDEX: Puparia recovered per 1000 grams of fruit.

S: Stage of fruit, G: Green, R: Ripe

W: Weight in grams

N: Number of fruit

gr: Ground fruit, usually overripe.

EMERGENCE:

DOR: *Dacus dorsalis*

MED: *Ceratitis capitata*

LON: *Opius longicaudatus*

PER: *Opius persulcatus*

TABLE NO. 49

LOT	DATE	LOCALITY	ELEV.	FRUIT	S	W	N	PUPAE	Emergence DOR	Emergence MED	Emergence PAR	INDEX
637	2/28	Waiahinu	1000	Guava	R	2043	26	171	72	–	18	84
638	3/1	Kona	1500	Avocado	gr R	3087	12	28	16		2	9
639	"	"	"	Guava	R	1180	16	5	3		1	4
640	2/28	Keololekaa	"	Loquat	R	454	20	154	66		45	339
641	3/1	Keahou	10	Noni	R	1544	15	0				
642	2/28	Honaunau	10	Noni	R	1816	17	0				
643	"	Manuka	1500	Lemon	R	2452	8	0				
644	"	"	"	"	R	1044	13	0				
645	"	Keololekaa"		Rang pur lime	R	499	4	0				
646	3/1	Puuwaawaa	1900	Loquat	R	999	84	42	30			42
647	2/28	Kapapala	3500	Akia	R	590	616	0				
648	"	Holualoa	1600	Guava	R	454	11	15	8		5	33
649	3/1	Puuwaawaa	2400	Lemon	R	363	11	1	1			3
650	2/28	Kainaliu	1800	Coffee	R	227	62	0				
651	"	Kahuku,Kau	1500	Kauila	G	136	108	0				
652	3/1	Puuwaawaa	1800	Lama	R	6	11	0				
653	2/28	Honuapu	20	Alahee	G	107	371	0				
654	3/6	Waikii	4700	S. Pseudocap.	R	115	100	86	7	72		747

LOT	DATE	LOCALITY	ELEV	FRUIT	S	W	N	PUPAE	Emergence DOR	MED	PAR	INDEX
655	3/8	Mt. View	2000	Grapefruit	R	1771	8	6	4			3
656	"	" "	"	S. tangelo	R	726	10	13	7			17
657	"	M.L.T.T.	4000	Guava	R	545	26	44	20	14		80
658	"	Bird Park	"	"	R	272	16	16	5	6		58
659	"	M.L.T.T.	4250	"	R	499	27	34	21	10		68
660	"	Bird Park	4000	Ohelo berry	R	162	205	0				
661	"	M.L.T.T.	"	S.Pseudocap.	R	9	10	0				
662	"	M.L.T.T.	4250	" "	R	112	100	1				9
663	"	M.L.T.T.	"	" "	R	7	9	0				
664	"	Bird Park	4000	Akia	R	57	366	0				
665	3/13	Volcano	3800	Tree Ohelo	R	12	28	1				83
666	"	M.L.T.T.	4000	S.pseudocap.	R	20	17	8	7	1		40
667	"	Waikii	4700	" "	R	100	65	72		51		720
668	"	M.L.T.T.	5000	Ohelo	R	4	18	0				
669	"	M.L.T.T.	4250	S.pseudocap.	R	105	100	0				
670	"	M.L.T.T.	4000	" "	R	36	43	0				
671	"	M.L.T.T.	4250	Guava	R	206	10	3		3		15
672	"	Mt. View	2000	Waiawi	R	484	29	59	37		4	121
673	"	M.L.T.T.	4250	S. pseudocap.	R	97	100	0				
674	"	Mt. View	2000	Lemon	R	908	12	0				
675	"	" "	"	S.tangelo gr	R	772	12	9	7			12
676	3/13	Mt. View	2000	Navel orange "	R	1362	8	1	1			1
677	"	" "	2000	Lemon gr	R	772	12	0				
678	"	" "	"	Navel orange	R	1952	12	18	17			9
679	"	" "	"	S. tangelo	R	726	12	10			5	14
680	3/14	Ookala	"	Mehame	R	319	724	0				
681	"	Keanakolu Tr.	2700	"	R	99	139	0				

LOT	DATE	LOCALITY	ELEV.	FRUIT	S	W	N	PUPAE	Emergence DOR	MED	PAR	INDEX
682	3/14	Keanakolu Tr.	5000	Akala	R	181	27	0				
683	"	" "	2100	Antidesma sp.	R	30	164	0				
684	"	" "	5000	" "	R	16	146	0				
685	"	" "	4300	Pokeberry	R	23	114	0				
686	"	" "	5200	"	R	31	144	0				
687	"	" "	4700	"	R	38	128	0				
688	"	Keanakolu	5200	P.mollissimum	R	880	12	0				
689	"	Keanakolu Tr.	4900	" "	R	1261	9	0				
690	"	Keanakolu	5200	" "	R	735	10	0				
691	"	Keanakolu Tr.	4500	" "	R	505	8	0				
692	"	Keanakolu	5200	" "	R	645	12	0				
693	"	Keanakolu Tr.	4600	Akala	R	89	21	0				
694	"	" "	4500	"	R	137	23	0				
695	"	" "	4700	"	R	82	18	0				
696	"	Keanakolu	5200	"	R	281	61	1				4
697	"	Ookala	2000	Guava	R	1998	53	156	109		4	78
698	3/20	M.L.T.T.	5000	Blackberry	R	33	50	0				
699	"	M.L.T.T.	4250	Guava	R	254	12	25	20			98
700	"	M.L.T.T.	4250	S.psuedocap.	R	103	100	64	20	41		622
701	"	M.L.T.T.	"	S.pseudocap.	R	102	100	38	19	8		372
702	"	M.L.T.T.	4000	" "	R	8	10	0				
703	"	M.L.T.T.	4250	" "	R	1	2	0				
704	"	M.L.T.T.	6200	Pukiawe	R	23	102	0				
705	"	Mt. View	2000	Grapefruit gr	R	1498	7	18	13			12
706	"	" "	"	S. tangelo	R	999	12	20	17			20
707	"	" "	"	" " gr	R	908	12	13	5		2	14
708	"	" "	"	Lime Gr	R	1135	12	2	1			2

LOT	DATE	LOCALITY	ELEV.	FRUIT	S	W	N	PUPAE	DOR	MED	PAR	INDEX
709	3/20	Mt. View	2000	Tangerine gr	R	772	12	180	51		35	233
710	"	Waikii	4700	S.pseudocap.	R	85	100	52		46		611
711	3/21	Keanakolu	5200	P.mollissima	R	321	6	0				
712	3/22	Mt. View	2000	Waiawi	R	1104	72	91	64		2	82
713	3/28	Waikii	4700	S.pseudocap.	R	73	100	149		104		2041
714	3/27	Mt. View	2000	Lime gr	R	766	8	0				
715	"	M.L.T.T.	4200	S.pseudocap.	R	102	100	15	1	10		147
716	"	M.L.T.T.	4250	Naio	R	37	109	0				
717	"	Mt. View	2000	S.tangelo gr	R	420	8	18	9		2	43
718	"	M.L.T.T.	4500	Poha gr	R	32	15	0				
719	3/28	Keanakolu	5200	Akala	R	67	31	0				
720	"	Keanakolu	"	P.mollissima	R	608	12	0				
721	"	"	"	" " gr	R	484	9	0				
722	"	"	"	" " gr	R	717	14	0				
723	"	"	"	" "	R	600	11	0				
724	3/29	Ainahou	3000	Guava	R	545	13	0				
725	"	M.L.T.T.	4100	"	R	1300	53	269	180	26		201
726	"	M.L.T.T.	4250	"	R	170	8	40	26			235
727	"	Ainahou	3000	Loquat	R	1319	54	3	2			2
728	3/30	Kohala	300	Noni	R	896	6	0				
729	"	Waimea	500	Akia	R	258	264	1	1			4
730	"	Kawaihae	1000	S.cucumber	R	481	10	0				
731	"	"	10	Mango gr	R	1028	12	65	47	6		63
732	3/31	Hilo	75	Sapota	G	795	9	26	24			33
733	"	"	"	Lisbon lemon	R	640	6	9	8			14
734	"	"	"	T. Grapefruit	R	1748	9	13	13			7
735	"	"	"	Longan	R	1142	227	676	627		2	591

LOT	DATE	LOCALITY	ELEV.	FRUIT	S	W	N	PUPAE	Emergence DOR	Emergence MED	Emergence PAR	INDEX
736	3/31	Hilo	75	Longan	R	776	206	412	326	9	7	530
737	4/2	Kona	1500	Pomegranate	R	688	6	3	1			4
738	4/3	Waikii	4700	S.pseudocap.	R	84	100	44		42		523
739	4/2	Kona	1600	Undetermined	R	94	247	0				
740	"	"	1500	Temple orange	R	950	6	14	11			11
741	"	"	"	D.Grapefruit	R	2860	7	55	30			19
742	"	"	1600	Fieurte avocado	R	3087	10	3	2			1
743	"	"	1500	Mango gr	R	974	12	40	33		2	41
744	"	"	1900	Surinam Cherry	R	350	78	37	33			105
745	4/3	M.L.T.T.	4250	S.pseudocap.	R	94	100	63	20	13		670
746	"	M.L.T.T.	4000	" "	R	8	11	0				
747	"	M.L.T.T.	4250	" "	R	89	100	16	11			123
748	4/3	M.L.T.T.	4000	S.pseudocap.	R	7	6	6	1			857
749	"	M.L.T.T.	4090	Guava	R	121	6	0				
750	"	Volcano	3800	Pyracantha	R	14	45	0				
751	4/4	Hilo	75	Star apple	R	2996	14	4	3			1
752	"	Hilo	"	Longan gr	R	1146	271	431	255		5	376
753	4/5	Hilo	"	Navel orange	R	640	4	0				
754	"	"	"	Lemon	R	923	11	5	4			5
755	"	"	"	Rough skin lemon	R	1393	11	0				
756	"	"	"	Lemon	R	678	8	0				
757	"	"	"	"	R	869	12	0				
758	"	"	"	Rough skin lemon	R	1212	6	0				
759	"	"	"	Navel orange	R	983	6	0				
760	"	"	"	Tangerine	R	235	4	0				
761	"	"	"	Surinam cherry	R	68	15	29	10		8	426

LOT	DATE	LOCALITY	ELEV.	FRUIT	S	W	N	PUPAE	Emergence DOR	Emergence MED	Emergence PAR	INDEX
762	4/4	Keanakolu	5200	P. Mollissima	R	703	12	0				
763	4/5	Hilo	75	Jamaica cherry	R	54	74	0				
764	4/8	Keaukaha	1000	Spiny cucumber	R	320	7	0				
765	4/10	Mt. View	2000	Lemon	R	1240	12	1	1			1
766	"	M.L.T.T.	4250	S.pseudocap.	R	93	100	58	42	2	3	623
767	"	M.L.T.T.	4000	" "	R	4	4	0				
768	"	Waikii	4700	" "	R	70	100	52		43		742
769	4/11	Keanakolu	5200	Akala	R	85	15	0				
770	"	Keanakolu Tr.	3600	Tree ohelo	R	9	19	0				
771	4/13	Hilo	75	Longan gr	R	86	12	5	4			58
772	4/14	Hilo	75	Rough skin	R	1362	9	0				
773	"	"	"	Sapota	R	551	12	21	16		3	38
774	"	"	"	Villa Franca lemon	R	1012	6	0				
775	"	"	"	Mandarin	R	264	6	0				
776	4/17	Waikii	4700	S.pseudocap.	R	84	100	70		70		833
777	"	M.L.T.T.	4000	" "	R	8	7	0				
778	"	M.L.T.T.	"	" "	R	3	3	0				
779	4/18	Keanakolu	5200	P.mollissima	R	730	9	0				
780	"	"	"	" "	R	589	11	0				
781	4/20	Kona	1800	Lemon	R	1319	7	0				
782	"	"	"	Grapefruit	R	1362	6	0				
783	"	"	1900	Peach	R	772	34	0				
784	"	"	1500	Surinam cherry	R	112	41	17	12			151
785	"	Waimea	3500	Akia	R	196	208	0				
786	4/25	Keanakolu	5200	P.mollissima	R	1090	10	0				
787	"	"	"	" "	R	1135	15	0				
788	"	"	"	" "	R	590	8	0				

LOT	DATE	LOCALITY	ELEV	FRUIT	S	W	N	PUPAE	DOR	MED	PAR	INDEX
789	4/25	Keanakolu	5200	P. mollissima	R	817	10	0				
790	"	"	"	" " gr	R	614	5	0				
791	"	Keanakolu Tr.	4900	" "	R	621	5	0				
792	"	" "	4200	Tree ohelo	R	15	47	0				
793	"	" "	3380	Antidesma sp.	R.	14	120	0				
794	"	" "	3100	Tree ohelo	R	17	44	0				
795	4/24	Waikii	4700	S. pseudocap.	R	98	100	112		101		114
796	"	M.L.T.T.	4250	" "	R	100	100	3	1	1		30
797	"	M.L.T.T.	4000	" "	R	100	97	2	1			20
798	4/26	Hilo	75	Rose apple gr	R	227	12	251	40		39	1106
799	"	Kaumana	1500	" " gr	R	136	7	6	4			44
800	"	"	"	Peach gr	R	272	12	72	29		12	264
801	"	Hilo	75	Rough skin lemon	R	1271	7	0				
802	"	Kaumana	1500	" " "	R	636	7	0				
803	"	Hilo	75	Surinam cherry	R	205	40	72	30			351
804	"	Hilo	"	Rough skin lemon	R	863	9	2	1			2
805	"	Kaumana	1500	Surinam cherry	R	56	17	0				
806	4/27	Hilo	75	Peach	R	841	11	78	48		10	92
807	"	Kaumana	1500	"	R	227	12	52	25		11	229
808	"	Hilo	75	Pomegranate	R	499	4	0				
809	"	Hilo	"	Hawaiian orange gr	R	999	9	20	14			20
810	"	"	"	Surinam cherry	R	152	27	11	8			72
811	"	"	"	Lemon	R	545	7	0				
812	"	"	"	Mango gr	R	726	10	134	75		8	184
813	"	"	"	Lemon	R	363	9	0				
814	"	"	"	Rose apple	R	205	8	82	64		1	400
815	"	"	"	Longan gr	R	95	27	0				

LOT	DATE	LOCALITY	ELEV.	FRUIT		S	W	N	PUPAE	DOR	MED	LON	PER	INDEX
816	4/27	Hilo	75	Peach	gr	R	438	10	35	21				79
817	"	"	1000	"	gr	R	501	21	38	30			8	76
818	"	"	75	Star apple		R	1317	11	0					
819	"	"	"	Peach		R	410	12	16	16				39
820	"	Kaumana	1500	Navel orange		R	1180	5	2	2				2
821	"	"	"	Peach		R	381	12	67	45			2	176
822	"	"	"	Rose apple		R	283	12	109	51		15	15	385
823	"	"	"	Guava		R	750	8	43	20		1		57
824	"	Hilo2	75	Orange		R	772	8	0					
825	"	Kaumana	1500	Guava	gr	R	865	9	16	16				18
826	"	"	"	Waiawi		R	150	20	28	24				186
827	"	Kona	1800	Armstrong seedless lime		R	772	4	0					
828	"	Kona	"	Avocado	gr	R	1180	4	75	58				63
829	"	Kona	"	Siamese pomelo		R	2179	11	0					
830	4/26	Volcano	4000	Ohelo berry		R	15	46	0					
831	"	Kapapala	2000	Apple of Sodom		R	817	36	0					
832	"	"	2300	" " "		R	499	41	0					
833	4/27	Kona	1500	Rose apple		R	129	7	54	10	1	28		419
834	4/26	Volcano	4000	Plum		R	726	18	0					
835	"	"	"	"		R	863	26	0					
836	4/27	Kona	1900	Loquat		R	908	145	226	91		38	3	249
837	4/26	Kalapana	50	Guava		R	1362	20	495	285		9		363
838	"	"	"	"		R	1226	17	396	203			7	323
839	"	Naalehu	500	"		R	772	20	276	173		3	2	358
840	"	"	"	"		R	681	24	228	135		1		335
841	4/27	Waiahinu	1000	"		R	726	16	243	75		41	19	335
842	"	Kalapana	50	Guava		R	1180	17	300	204				254
843	"	Pahala	1500	"		R	1362	16	161	91		9	1	118

LOT	DATE	LOCALITY	ELEV.	FRUIT	S	W	N	PUPAE	DOR	MED	LON	PER	INDEX
844	4/27	Kapapala	3000	Guava	R	1044	17	245	126		15	4	235
845	"	"	"	Akia	R	39	66	0					
846	"	"	"	Guava	R	817	19	262	93		8	1	321
847	"	Kona	1000	Peach	R	409	14	0					
848	"	"	1900	"	R	953	23	105	32		2	9	110
849	"	"	"	"	R	772	17	87	49		7	9	113
850	"	"	"	"	R	1317	44	167	46		15	3	127
851	"	"	"	"	R	999	35	64	34		3	1	64
852	"	"	"	"	R	817	15	75	44		2		92
853	"	"	"	"	R	545	11	83	33		6	5	152
854	"	"	"	"	R	908	15	30	20				33
855	"	"	"	"	R	726	14	29	4		2	1	40
856	"	"	"	"	R	454	18	0					
857	"	"	"	"	R	409	17	0					
858	"	"	"	"	R	409	17	6	6				15
859	"	"	"	"	R	363	17	0					
860	"	"	"	"	R	863	14	19	17				22
861	"	"	"	"	R	636	11	19	4		2		30
862	"	"	1500	Mango	R	1634	19	4	3				2
863	"	"	"	"	R	908	12	9	6				10
864	"	"	"	"	R	1226	19	120	60		7		98
865	"	"	"	"	R	1407	17	226	173	11	15	2	161
866	"	Kona	"	"	R	1135	14	35	28		2	1	31
867	"	"	"	"	R	863	11	146	48		60	2	169
868	"	"	"	"	R	454	8	45	44		1		99
869	"	"	"	"	R	1180	15	22	18			1	19
870	"	"	"	"	R	953	12	28	17		4		29
871	"	"	"	"	R	772	10	175	61		31	18	227

LOT	DATE	LOCALITY	ELEV.	FRUIT		S	W	N	PUPAE	Emergence DOR	MED	LON	PER	INDEX
872	4/27	Kona	1500	Mango		R	999	11	0					
873	"	"	"	"		R	863	10	82	56		9		95
874	"	"	"	"		R	1180	12	12	6		6		10
875	"	"	"	"		R	1226	12	3					2
876	5/1	Mt. View	2000	Grapefruit		R	681	5	0					
877	"	" "	"	"	gr	R	442	3	2	2				5
878	"	"	"	Lime	gr	R	747	7	0					
879	"	M.L.T.T.	4000	Guava		R	247	19	0					
880	"	M.L.T.T.	"	S. pseudocap.		R	65	73	0					
881	"	M.L.T.T.	5000	Blackberry		R	35	44	0					
882	"	M.L.T.T.	4250	S.pseudocap.		R	100	90	0					
883	"	Mt. View	2000	Lime		R	469	6	0					
884	"	Waikii	4700	Plum		R	135	28	0					
885	"	"	"	"		R	169	12	26		22			154
886	5/2	Kalapana	10	Guava	gr	R	908	12	216	97		2		238
887	"	Kapoho	300	Rose apple		R	1044	63	1222	488		39		1170
888	"	"	"	" "		R	454	32	260	133		14	1	573
889	"	"	"	" "		R	545	38	743	312		22	1	1363
890	5/1	Volcano	4000	Plum	gr	R	817	30	0					
891	5/1	Volcano	"	"	gr	R	863	30	0					
892	"	"	"	"	gr	R	908	30	0					
893	"	"	"	"	gr	R	999	30	0					
894	"	"	"	"	gr	R	908	30	0					
895	"	"	"	"	gr	R	636	18	0					
896	5/2	Hopuwai	5200	"		R	499	39	0					
897	"	Keanakolu	"	P.mollissima		R	999	17	0					
898	"	"	"	" "		R	545	10	0					
899	"	"	"	" "	gr	R	908	16	0					

LOT	DATE	LOCALITY	ELEV	FRUIT		S	W	N	PUPAE	DOR	Emergence MED	LON	PER	INDEX
900	5/2	Keanakolu	5200	P. mollissima		R	545	10	0					
901	"	"	"	" "		R	636	9	0					
902	"	"	"	" "	gr	R	726	13	0					
903	"	"	"	" "		R	953	12	0					
904	5/5	Hilo	75	Mango	gr	R	1226	13	557	210		43	4	454
905	5/4	Kona	1900	Peach		R	636	30	35	26		1		55
906	"	"	"	"		R	726	32	46	24	5	4		63
907	"	"	1500	"		R	1816	30	111	56		19		61
908	"	"	"	"		R	1771	30	68	25		17	2	38
909	"	"	"	"		R	1816	30	106	42		12	16	58
910	"	"	"	"		R	1544	30	85	26		14	12	55
911	"	"	"	"		R	2270	30	200	112		15	21	88
912	"	"	"	"		R	1544	30	91	58		8	12	59
913	"	"	"	"		R	1407	30	0					
914	"	"	"	"		R	1452	30	58	23		3	7	40
915	"	"	"	"		R	1498	30	94	42		19	10	63
916	5/4	Kona	1500	Peach		R	1816	30	138	85		2	14	76
917	"	"	"	"		R	1861	30	146	59		15	19	78
918	"	"	"	"		R	1816	30	109	40		18	18	60
919	"	"	"	"		R	1498	30	55	27		11	3	37
920	"	"	"	"		R	1589	30	197	83		15	11	124
921	"	"	"	"		R	1771	30	38	25		4	1	21
922	"	"	"	"		R	1816	30	174	95		19	2	96
923	"	"	"	"		R	1680	30	111	66		10	11	66
924	"	"	"	"		R	1794	30	157	114		17	2	88
925	"	"	"	"		R	1725	30	116	52		27	9	67
926	"	"	"	"		R	1453	30	152	87		12	5	105
927	"	"	"	"		R	1634	30	71	41		8	2	43

LOT	DATE	LOCALITY	ELEV.	FRUIT	S	W	N	PUPAE	Emergence DOR	MED	LON	PER	INDEX
928	5/4	Kona	1500	Peach	R	1771	30	97	41		5	4	55
929	"	"	"	"	R	1861	30	204	96		8	22	110
930	"	"	"	"	R	1725	30	201	88		17	10	117
931	"	"	"	"	R	1680	30	215	140		19	20	128
932	"	"	"	"	R	1271	22	160	67		12	10	126
933	5/8	Volcano	4000	Plum gr	R	908	30	0					
934	"	"	"	" gr	R	953	30	0					
935	"	"	"	" gr	R	931	30	0					
936	"	"	"	" gr	R	908	30	0					
937	"	"	"	" gr	R	920	30	0					
938	"	"	"	" gr	R	863	30	0					
939	"	"	"	" gr	R	908	30	0					
940	"	M.L.T.T.	4250	S.pseudocap	R	105	100	0					
941	"	M.L.T.T.	4000	" "	R	8	5	0					
942	"	Waikii	4700	" "	R	113	100	235		225			2080
943	"	"	"	Plum	R	48	3	0					
944	5/10	Hilo	75	Phyllanthus distichus	R	344	80	1		1			3
945	"	"	"	Star apple gr	R	1317	8	19	6		3	1	14
946	5/9	Keanakolu	5200	Plum	R	105	10	0					
947	5/10	Hilo	75	Fan fruit (palm) gr	R	117	93	2	1				17
948	"	Hilo	"	Red Ti	R	134	254	0					
949	"	"	"	" "	R	162	396	0					
950	5/9	Keanakolu Tr.	4450	P.mollissima	R	772	7	0					
951	"	" "	5200	" "	R	636	6	0					
952	"	" "	4900	" "	R	545	6	0					
953	"	" "	5000	" "	R	454	6	0					
954	"	" "	4700	" "	R	636	6	0					

LOT	DATE	LOCALITY	ELEV.	FRUIT	S	W	N	PUPAE	Emergence				INDEX
									DOR	MED	LON	PER	
955	5/9	Keanakolu	5200	P. mollissima	R	253	10	0					
956	"	"	"	" "	R	908	11	0					
957	"	"	"	" "	R	999	12	0					
958	5/10	Hilo	75	Rose apple gr	R	499	20	148	43		20	34	297
959	"	"	"	Dracaena fragrans	R	151	76	0					
960	5/12	Kaumana	1500	Pyracantha	R	12	53	0					
961	"	Hilo	75	Tamarind	R	131	18	0					
962	"	Piihonua	1500	Surinam cherry	R	46	16	0					
963	5/12	Hilo	75	" "	R	20	10	0					
964	"	"	"	Rose apple	R	136	6	6				2	44
965	"	"	"	" " gr	R	320	19	9	43		28	62	434
966	"	"	"	Star apple	R	1200	8	0					
967	"	"	"	" " gr	R	1502	7	2	2				1
968	5/11	M.L.T.T.	4000	Guava	R	64	5	0					
969	"	Kalapana	10	" gr	R	2179	38	526	193		4	4	241
970	"	"	"	"	R	1861	33	331	164		4		178
971	5/12	Waikii	4700	Plum	G	104	19	38		27			365
972	"	"	"	"	G	287	52	57		57			199
973	"	"	"	"	R	162	14	86		82			531
974	"	"	"	"	R	507	27	156		137			308
975	5/11	Pahoa	250	Rose apple	R	772	43	395	145		28	51	512
976	"	"	"	" "	R	454	21	230	87		25	39	507
977	"	Kalapana	20	Guava	R	2180	40	354	216		7	25	162
978	"	"	"	"	R	1090	20	73	40		1		67
979	"	Pahoa	250	Rough skin lemon	R	501	4	0					
980	5/15	Hilo	75	Mango steen gr	R	405	3	42	21				104
981	"	Waikii	4700	S. pseudocap	R	115	100	249		214			2165

LOT	DATE	LOCALITY	ELEV	FRUIT	S	W	N	PUPAE	DOR	Emergence MED	LOW	PER	INDEX
982	5/15	Waikii	4700	Plum	R	202	11	62	3	36			307
983	"	M.L.T.T.	4250	S.pseudocap.	R	88	100	12	9				136
984	"	M.L.T.T.	4000	" "	R	8	9	0					
985	"	Volcano	3800	Plum gr	R	1816	70	0					
986	"	"	"	" gr	R	1680	65	0					
987	"	"	"	" gr	R	1771	70	0					
988	5/15	Volcano	3800	Plum gr	R	1861	70	0					
989	"	"	"	" gr	R	1816	70	0					
990	5/16	Keanakolu	5200	P.mollissima	R	690	10	0					
991	"	"	"	" "	R	760	12	0					
992	"	"	"	" "	R	793	12	0					
993	"	Kukaiau	3500	Guava gr	R	943	20	58	44			1	62
994	"	"	"	"	R	983	20	179	113	2	1	6	182
995	"	"	"	Ulei	R	70	118	0					
996	5/17	Hilo	75	Mango gr	R	1250	13	327	171		3	50	262
997	5/22	M.L.T.T.	4000	S.pseudocap.	R	103	100	0					
998	"	M.L.T.T.	4250	" "	R	108	100	0					
999	"	Volcano	3800	Plum gr	R	908	31	0					
1000	"	"	"	" gr	R	999	35	5	1				5
1001	"	"	"	" gr	R	1725	40	0					
1002	"	"	"	" gr	R	1180	40	0					
1003	5/16	Keanakolu	5200	Yellow plum	R	276	53	0					
1004	"	"	"	Plum	R	282	39	0					
1005	"	Umikoa	3500	Peach gr	R	522	16	12	4	5			23
1006	5/19	Hilo	75	Shell ginger	R	187	49	0					
1007	"	Hilo	"	Rough skin lemon gr	R	1128	5	0					
1008	5/17	Hilo	"	Mango steen gr	R	1259	10	83	24			1	66

LOT	DATE	LOCALITY	ELEV.	FRUIT	S	W	N	PUPAE	Emergence DOR	MED	LON	PER	INDEX
1009	5/19	Hilo	75	Rough skin lemon	R	1352	6	0					
1010	"	"	"	Red Ti	R	103	180	0					
1011	"	"	"	Mango steen gr	R	458	3	11	4				24
1012	"	"	"	Gooseberry	R	513	121	0					
1013	5/19	Hilo	"	D.fragrans	R	123	44	0					
1014	"	"	"	" "	R	188	67	0					
1015	5/17	"	"	" "	R	433	151	0					
1016	"	"	"	Mock orange	R	128	307	32	21	5	6		250
1017	5/19		"	" "	R	66	163	17	5		2	5	258
1018	5/15	Pohakuloa	6511	S.pseudocap.	R	5	4	0					
1019	5/22	Waikii	4700	" "	R	116	100	194		180			1672
1020	5/23	Keanakolu	5200	P.mollissima	R	592	7	0					
1021	"	"	"	" "	R	600	6	0					
1022	"	"	"	" "	R	403	6	0					
1023	"	"	"	" "	R	413	7	0					
1024	"	"	"	Plum	R	273	31	0					
1025	"	"	"	Yellow plum	R	536	70	0					
1026	"	"	"	" "	R	423	65	0					
1027	"	"	"	" "	R	350	58	0					
1028	5/24	Hilo	75	S. pseudocap	R	36	40	0					

SUMMARY OF POPULATION AND AN EVALUATION OF LIMITING FACTORS

What factor is most responsible for limiting the population of Dacus dorsalis? The correct answer might allow us to forecast the areas where this fly might successfully establish itself. The most limiting factor, in the writer's opinion, is the lack of suitable ovipositional material in sequence, this, in spite of the 130 hosts listed for this fly, the bulk of which could be written off as unimportant; unimportant because they do not occur in sufficiently large numbers or do not offer suitable media for the development of large number of flies.

Population studies have shown that there are marked fluctuations and trends in fruit fly populations in different areas, and frequently there is little correlation between the population in one area and that in another. To maintain a high population, which is continuously being reduced by the inroads of many mortality factors, it is necessary to replenish it to the extent that it is being reduced. Many factors operating are difficult to measure; eg., during the last week in April heavy rains were prevalent in most parts of Maui. Eight inches of rain were reported in several areas. Index traps showed a fly catch drop of from 30 to 94%. If this drop was a reflection of fly activity we should have expected the count to return to its previous level in the sunny week that followed. This, however, was not the case and it appears that the rains caused considerable mortality.

The number of eggs which hatch and ultimately result in adults which lay eggs must be infinitesimally small. It would only be essential for a female to replace herself and one male for the population to remain static. In view of the relatively high biotic potential of the fly we must concede that there is considerable environmental resistance and that it is necessary for the population to be constantly renewed.

If this be the case and the environmental resistance is fairly constant then we must assume that the reason the population rises and falls is because of the rate at which it is replenished. No factor varies as greatly as the rise and fall of suitable host material. And it appears that the fly population follows this rise and fall of some of the main hosts with a slight lag to allow for development.

While at higher elevations temperatures may be limiting it is felt that they are not in a lethal manner but rather to the degree with which they extend the cycle of the fly and consequently reduce the possibility of the fly living to lay eggs. It is particularly significant because of the greatly delayed sexual development of the fly in cooler areas.

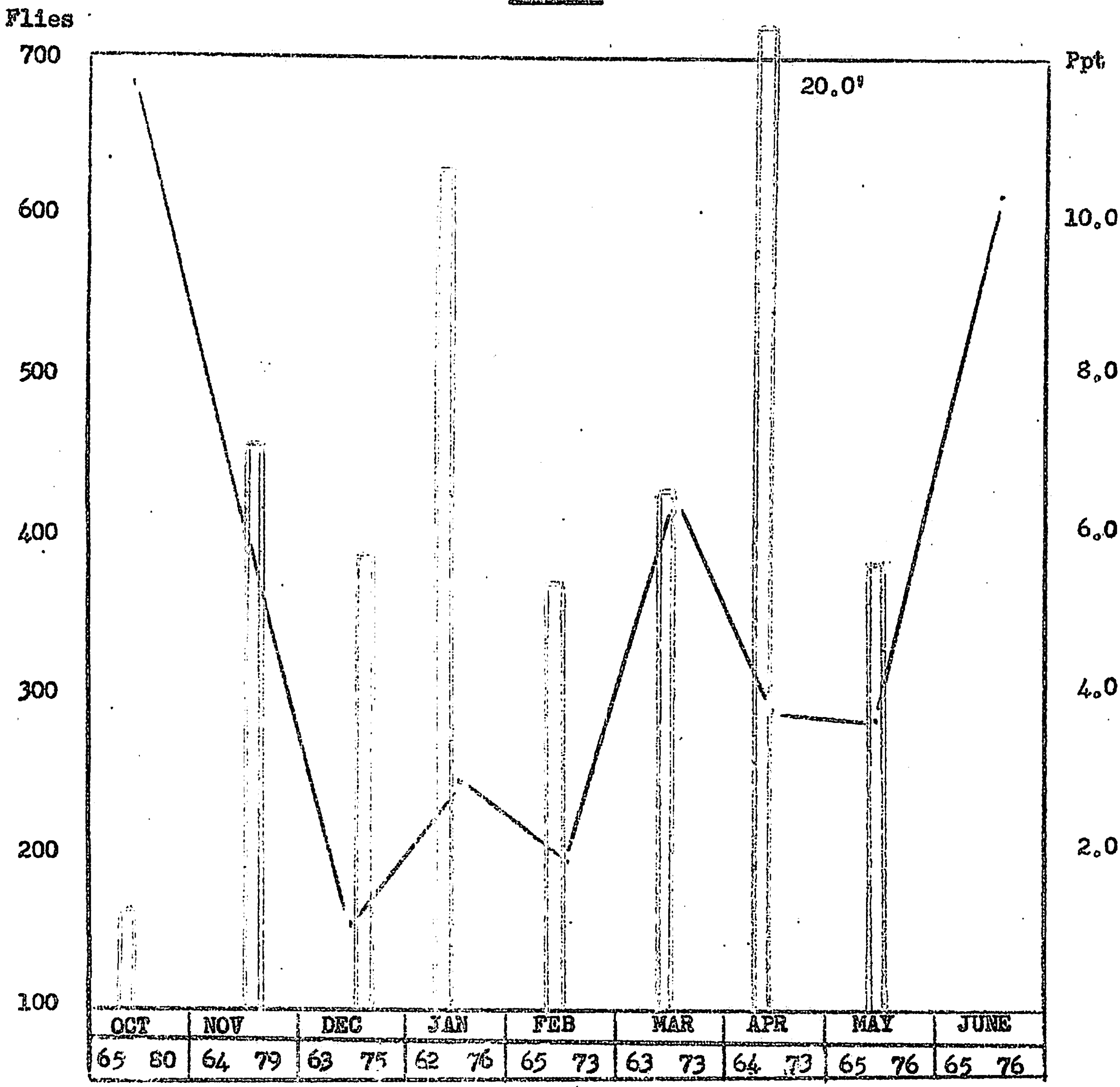
Cooler temperature at twilight may also be limiting in the degree with which they discourage mating. This is discussed under mating studies.

Population trends in the Kula District show to a higher fly incidence in December than in June. This is certainly not correlated with temperature. In Iao Valley the population was low in December and January and increased greatly in May and June. There is no great thermal change here which would effect such a change in population. At Olinda although the temperature has risen since the winter months the fly population is still low and probably will remain so until Fall when the guavas in the gulch ripen.

In these islands at elevations up to 6500' temperature does not appear to be a limiting factor. Heavy rains appear to cause considerable mortality and rainy areas which would preclude oviposition would doubtlessly have reduced populations. However, it is the feeling that the sharp rises and falls of fly population are a reflection of the rate at which the population is being replenished.

POPULATION TRENDS AT HAIKU TERRITORIAL NURSERY (500')

FIG. 28



Legend:

- — · Population Trends. Monthly Average Catch per trap day.
Monthly Ppt.
Figures at bottom of graph represent monthly Min.Mean and Max.Mean Temp.
Graphic information based on 465,033 flies.

POPULATION TRENDS AT HAIKU TERRITORIAL NURSERY (500')

TABLE NO. 50

Month	Max. Mean	Min. Mean	Ppt.	Days	Traps	TD	Fly Count	Index
Oct.	80	65	1.3	21	5	105	71,960	685
Nov.	79	64	7.2	31	5	155	63,458	409
Dec.	75	63	5.8	29	5	145	23,080	159
Jan.	76	62	10.6	35	5	175	42,919	245
Feb.	73	65	5.4	28	5	140	27,879	199
Mar.	73	62	6.6	28	5	140	59,317	423
Apr.	72	63	20.0	28	5	140	40,661	290
May	76	65	5.6	35	5	175	49,793	284
June				28	5	140	85,966	614
Total			62.5	263	5	1,315 Trap Days	465,033	367 Average

TABLE NO. 51

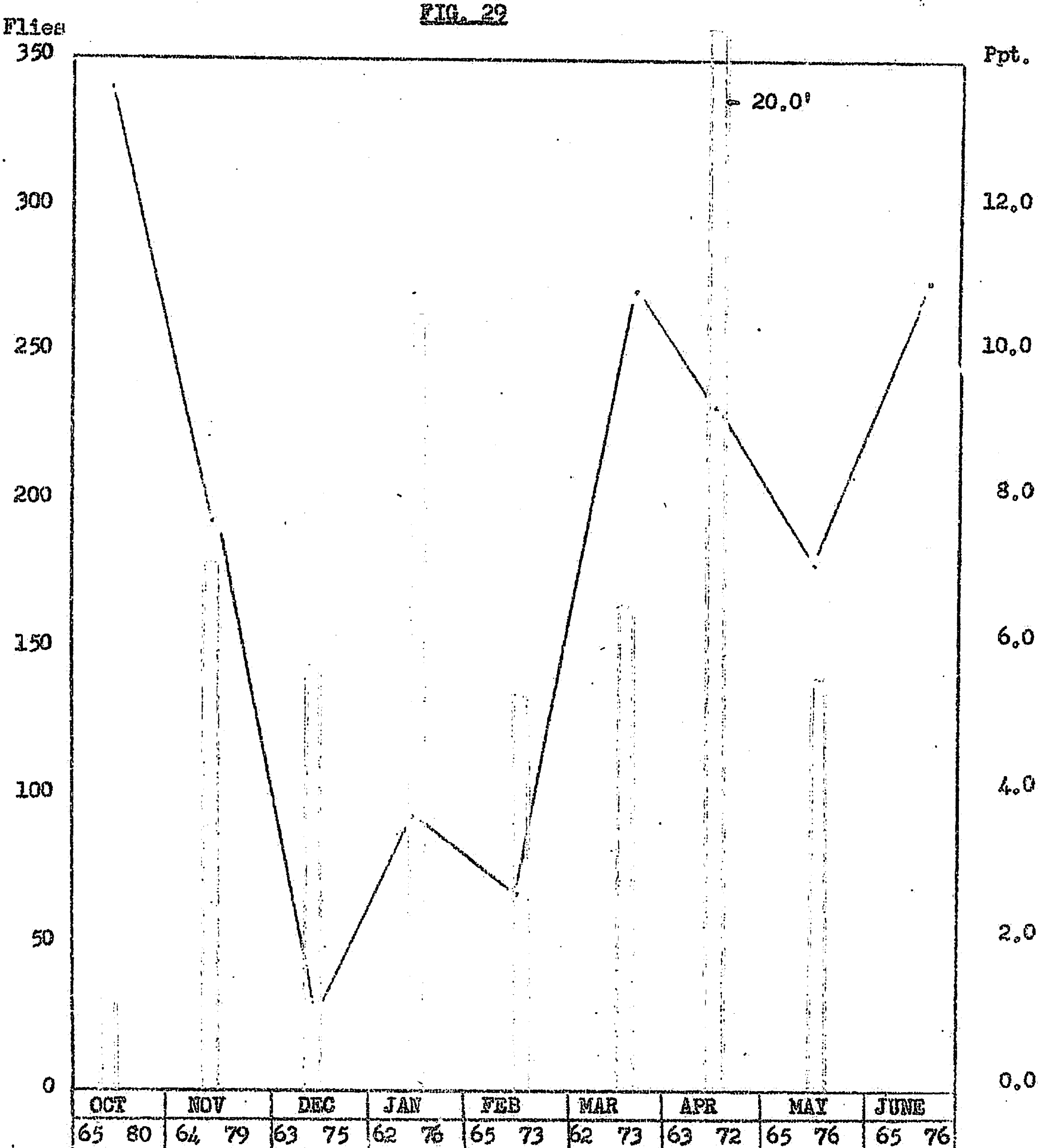
Trap No.	Date of checking and D. dorsalis trapped					Total
	4/3	4/10	4/17	4/24		
67	4156	4150	2945	3071		14,322
70	1637	1624	1312	1850		6,423
78	1156	1924	1385	1131		5,596
56	2124	2609	2545	2585		9,863
89	868	1242	1286	1061		4,457
	5/1	5/8	5/15	5/22	5/29	Total
67	1884	3055	3159	4414	6961	19,473
70	1124	955	1136	1850	4918	9,983
78	761	565	1169	1928	4825	9,248
56	641	694	752	1529	2612	6,228
89	722	486	492	1021	2140	4,861
	6/5	6/12	6/19	6/26		Total
67	5916	6548	5500	6410		24,374
70	5325	6414	4534	3204		19,477
78	5840	6161	6345	4946		23,292
56	2635	3495	1815	2366		10,311
89	2163	3085	1754	1510		8,512

April	290
May	284
June	614

Index (Flies per trap day)

POPULATION TRENDS AT BALDWIN'S MANGO ORCHARD, PAUWELA (400')

FIG. 29



Legend:

Population Trend based on monthly average catch per trap day

Ppt. Monthly

Figures at bottom of graph represent the monthly Min.Mean and Max.

Mean Graphic information based on 221,337 flies

POPULATION TRENDS AT BALDWIN'S MANGO ORCHARD, PAUWELA (400')

TABLE NO. 52

Month	Max. Mean	Min. Mean	Ppt.	Days	Traps	TD	Fly Count	Index
Oct.	80	65	1.3	21	5	105	32,320	340
Nov.	79	64	7.2	31	5	155	22,768	196
Dec.	75	63	5.8	29	5	145	4,261	29
Jan.	76	62	10.6	35	5	175	16,452	94
Feb	73	65	5.4	28	5	140	9,542	68
Mar.	73	62	6.6	28	5	140	38,050	271
Apr.	72	63	20.0	28	5	140	32,505	232
May	76	65	5.6	35	5	161*	28,918	179
June				28	5	133*	36,521	274
Total			62.5	263	5	1,294 Trap Days	221,337	187 Average

POPULATION STUDIES HAIKU BALDWIN'S

TABLE NO. 53

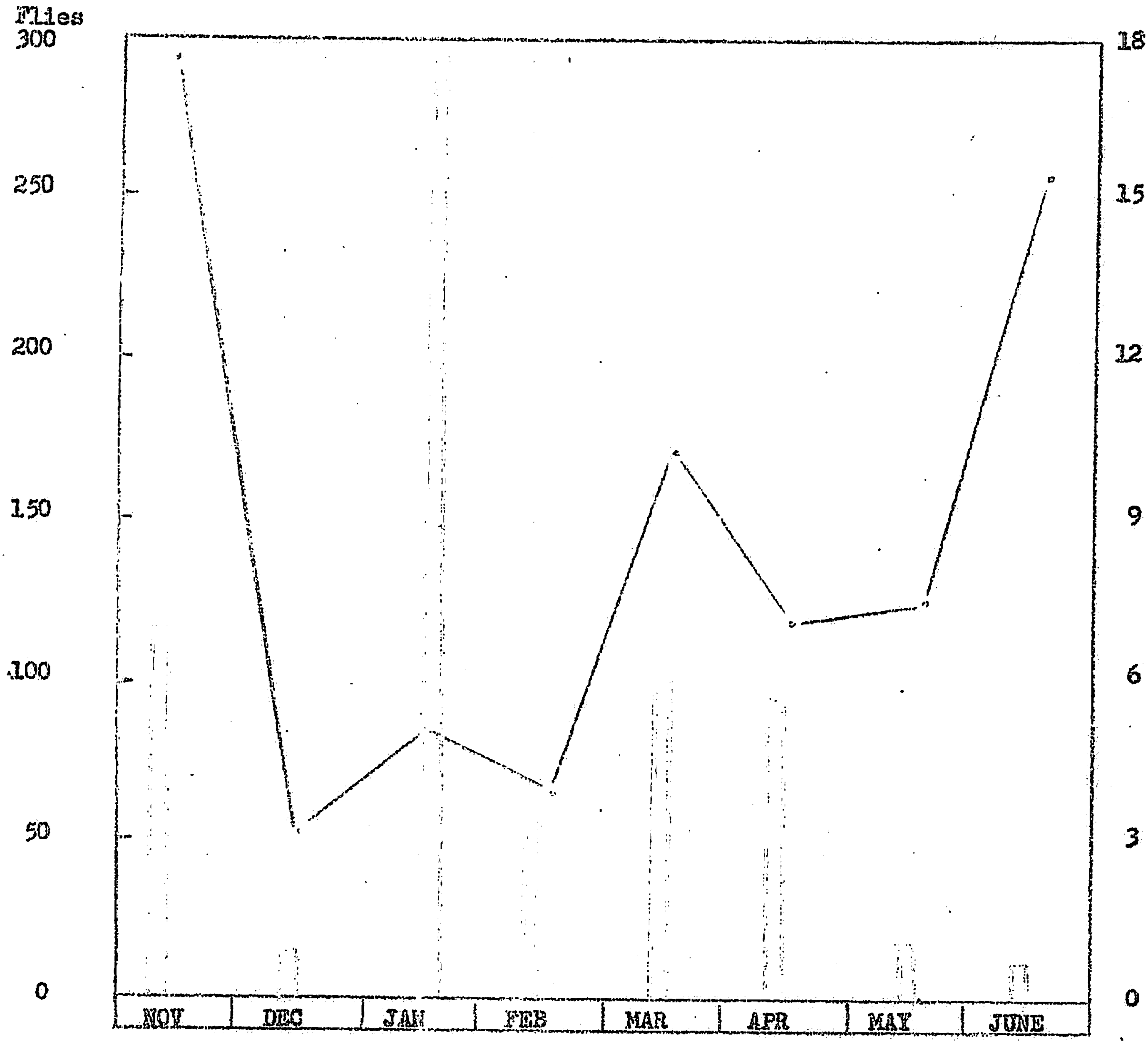
Trap No.	Date of checking and D. dorsalis trapped					Total
	4/3	4/10	4/17	4/24		
20	950	1000	996	872		3818
36	2440	2752	1831	1663		8686
65	1173	1523	1245	1369		5310
107	1227	1609	1813	2195		6844
109	1436	1995	2504	1912		7847
Total	7226	8879	8389	8011		32,505
	5/1	5/8	5/15	5/22	5/29	
20	872	852	730	938	1246	4638
36	1255	1716	1626	1223	3032	8852
65	603	619	834	951	1392	4399
107	740	844				1584
109	1296	1211	1624	1985	3329	9445
Total	4766	5242	4814	5097	8999	28,918
	6/5	6/12	6/19	6/26		
20	1252	948	892	692		3784
36	2204	2363	1800	452		6819
65	1813	472	395	72		2752
107		4881	4496	1696		11,073
109	4786	2395	3516	1414		12,111
Total	10,037	11,059	11,099	4,326		36,521

April 290
May 284
June 614

Index (Flies per trap day)

POPULATION TRENDS IN IAO VALLEY (300'-1000')

FIG. 30



Legend:

—— Population Trend. Monthly Average Catch per trap day.
.... Ppt. Monthly

Mean Graphic information based on 221,337 flies.

POPULATION TRENDS IN IAO VALLEY (300-1000')

TABLE NO. 54

Month	Days	Traps	TD	Fly Count	Index
Nov.	24	5	120	35,681	296
Dec.	30	5	150	7,987	53
Jan.	35	5	175	15,038	85
Feb.	28	5	140	9,149	65
Mar.	28	5	140	23,840	170
Apr.	28	5	140	16,779	119
May	35	5	175	21,971	125
June	28	5	140	36,206	258
Total	236	5	1,180 Trap Days	166,651	147 Average

POPULATION STUDIES IAO VALLEY

TABLE NO. 55

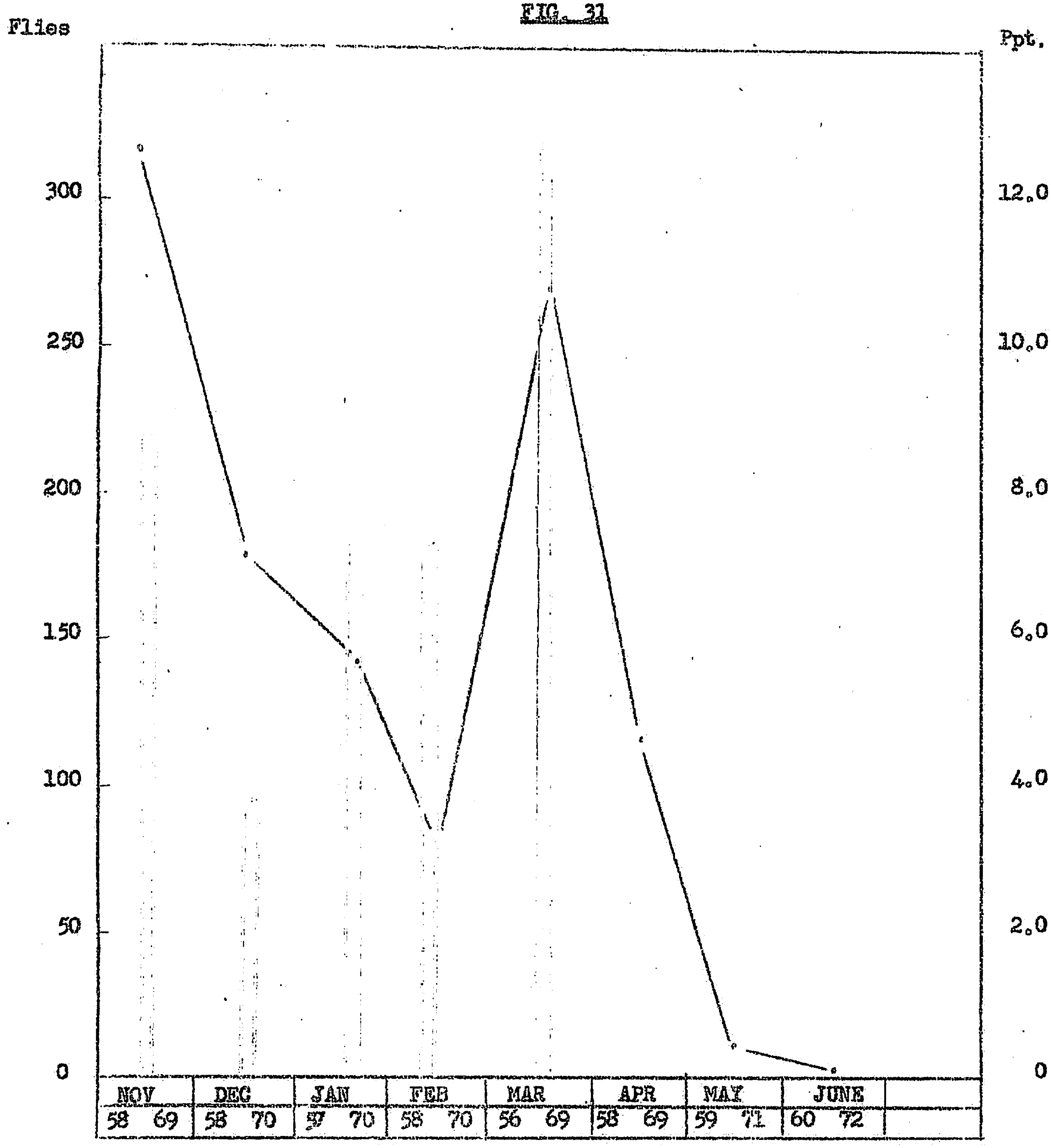
Trap No.	Date of checking and D. dorsalis trapped					Total
	4/3	4/10	4/17	4/24		
125	11	1521	2065	923		4520
130	690	845	604	200		2339
142	2040	1743	1628	692		6103
176	1109	952	1081	36		3178
178	43	43	17	536		639
Total	3893	5104	5395	2387		16,779
	5/1	5/8	5/15	5/22	5/29	
125	1004	1165	1608	2629	3739	10,145
130	304	379	442	492	460	2,077
142	1260	1140	1140	1436	2188	7,164
176	364	352	342	465	1016	2,539
178	12	11	8	0	15	46
Total	2944	3047	3540	5022	7418	21,971
	6/5	6/12	6/19	6/26		
125	5080	3540	2572	3130		14,322
130	844	900	856	1088		3,688
142	2218	3228	2196	3870		11,512
176	1046	1714	1174	2685		6,619
178	4	10	8	43		65
Total	9192	9392	6806	10,816		36,206

April 119
May 125
June 258

Index (Flies per trap day)

POPULATION TRENDS IN A GUAVA GULCH, OLINDA (2160')

FIG. 31



Legend:
— Population Trend based on monthly average per trap day
⋮ Ppt.
Figures at bottom of graph represent the monthly Man.Mean and Max.Mean
Graphic information based on 138,045 flies.

POPULATION TRENDS IN A GUAVA GULCH, OLINDA (2160')

TABLE NO. 56

Month	Max.Mean	Min.Mean	Ppt.	Days	Traps	TD	Fly Count	Index
Nov	69	58	8.78	11	5	55	17,502	318
Dec	70	58	3.79	29	5	145	26,085	179
Jan.	70	57	7.43	35	5	175	25,706	146
Feb.	70	58	7.31	28	5	140	11,753	83
Mar.	69	56	13.07	28	5	140	37,860	270
Apr.	69	58		28	5	140	16,468	117
May	59	71		35	5	175	2,046	11
Jun	60	72		28	5	140	625	4
Total			40.38	222	5	1,110 Trap Days	138,045	139 Average

POPULATION STUDIES MURAKAMI'S GULCH

TABLE NO. 57

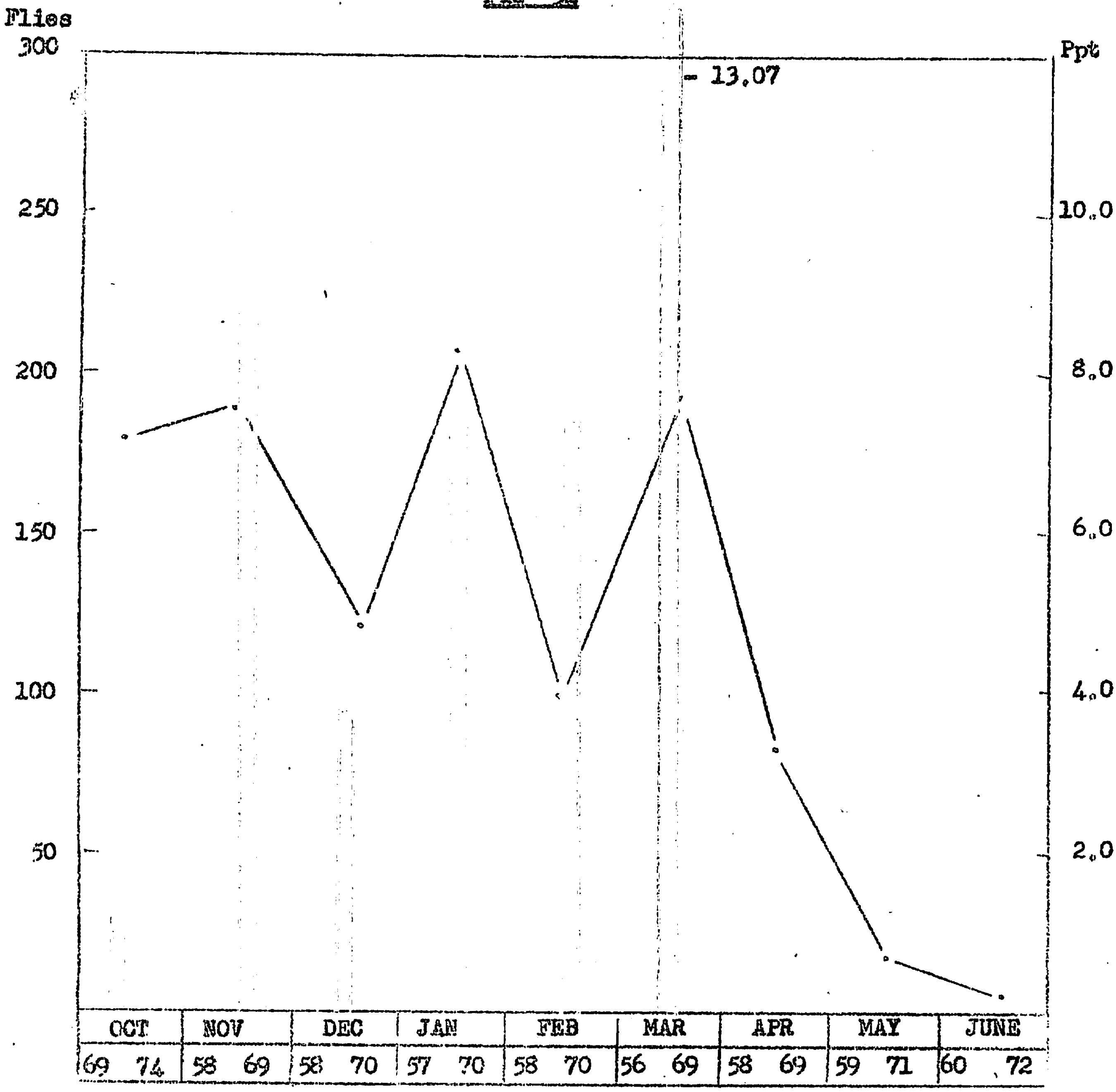
Trap No.		Date of checking and D. dorsalis trapped				Total
	4/3	4/10	4/17	4/24		
73	540	921	1070	57		2588
117	331	973	1394	107		2805
163	1120	1613	1662	148		4543
164	940	1340	919	59		3258
171	931	1309	976	58		3274
Total	3862	6156	6021	429		16,468
	5/1	5/8	5/15	5/22	5/29	
73	34	41	79	60	37	251
117	25	18	17	29	29	118
163	91	140	76	178	244	729
164	47	137	174	144	68	570
171	57	88	80	72	81	378
Total	254	424	426	483	459	2046
	6/5	6/12	6/19	6/22		
73	36	16	18	2		72
117	63	2	4	1		70
163	41	56	29	35		161
164	155	11	31	16		213
171	64	17	18	10		109
Total	359	102	100	64		625

April 117
May 11
June 4

Index (Flies per trap day)

POPULATION TREND AT UNIVERSITY OF HAWAII EXPERIMENT STATION
OLINDA. (2160')

FIG 32



Legend:

Population Trend based on monthly average per trap day

Ppt

Figures at bottom of graph represent the monthly Min.Mean and Max.Mean
Graphic information based on 148,200 flies

POPULATION TRENDS AT UNIVERSITY OF HAWAII EXPERIMENT STATION, OLINDA (2160')

TABLE NO. 59

Month	Max. Mean	Min. Mean	Ppt.	Days	Traps	TD	Fly Count	Index
Oct.	74	69	1.33	11	5	55	9,852	179
Nov	69	58	8.78	31	5	145	27,655	190
Dec.	70	58	3.79	29	5	145	17,651	121
Jan.	70	57	7.43	35	5	175	36,318	207
Feb.	70	58	7.31	28	6	140	14,120	100
Mar	69	56	13.07	28	5	140	27,227	194
Apr.	69	58		28	5	140	11,695	83
May	71	59		35	5	175	3,011	17
Jun				28	5	140	671	5
Total			40.38	253	5	1,255 Trap Days	148,200	121 Average

TABLE NO. 59

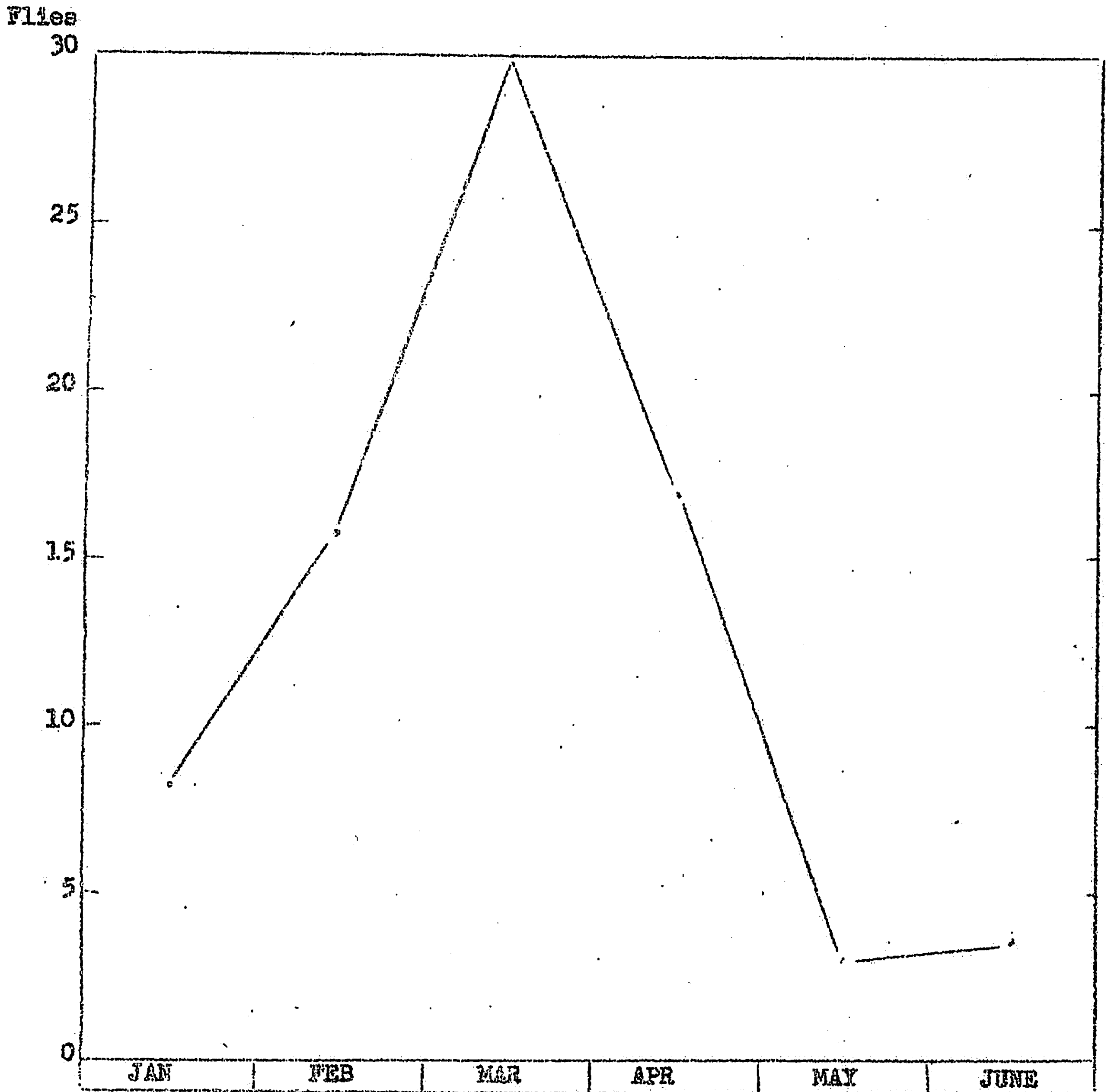
Trap No.	Date of checking and D. dorsalis trapped					Total
	4/3	4/10	4/17	4/24		
14	894	1209	2033	348		4484
16	242	395	819	146		1602
27	17	142	108	35		302
40	450	762	961	173		2346
43	647	995	1211	108		2961
Total	2250	3503	5132	810		11,695
	5/1	5/8	5/15	5/22	5/29	
14	178	320	233	336	71	1138
16	30	47	115	88	64	344
27	20	6	11	7	1	45
40	81	134	268	342	106	931
43	62	102	168	128	93	553
Total	371	609	795	901	335	3011
	6/5	6/12	6/19	6/26		
14	93	31	32	12		168
16	35	39	24	14		112
27	9	3	1	2		15
40	78	86	27	42		233
43	60	27	30	26		143
Total	275	186	114	96		671

April: 83
May: 17
June: 5

Index (Flies per trap day)

POPULATION TREND ON THE OLINDA PRISON ROAD (1200'-4000')

FIG. 33



Legend:

—— Population Trend based on monthly average catch per trap day
Graphic information based on 42,955 flies

POPULATION TRENDS ON THE OLINDA PRISON ROAD (1200' - 4000')

TABLE NO. 60

Month	Days	Traps	TD	Fly Count	Index
Jan	14	20	280	2,296	8.2
Feb	28	20	560	9,404	16.7
Mar	28	20	560	17,395	31.0
Apr	28	20	560	9,561	17.0
May	35	20	700	2,258	3.2
Jun	28	20	560	2,041	3.6
Total	161	20	3,220 Trap Days	42,955	13.3 Average

POPULATION STUDIES OLINDA PRISON ROAD

TABLE NO. 61

Trap No.	Date of checking and D. dorsalis trapped				Total
	4/3	4/10	4/17	4/24	
115	321	357	216	22	916
162	138	251	188	42	619
173	179	201	355	34	769
191	1341	1350	921	294	3906
168	330	588	436	27	1381
113	217	519	619	206	1561
211	28	21	91	3	143
217	45	67	34	24	170
230	16	10	11	1	38
57	7	14	5	0	26
95	1	5	0	0	6
172	0	0	1	0	1
155	4	1	2	0	7
83	4	5	1	0	10
51	1	4	1	0	6
82	0	0	0	0	0
122	1	1	0	0	2
92	0	0	0	0	0
29	0	0	0	0	0
17	0	0	0	0	0
Total	2633	3394	2881	653	9561

April 17.0

Index (Flies per trap day)

TABLE NO. 62

Trap No.	Date of checking and D. dorsalis trapped					Total
	5/1	5/8	5/15	5/22	5/29	
115	27	55	110	138	136	466
162	38	65	66	24	112	305
173	8	4	15	16	32	75
191	197	242	213	77	204	933
168	11	36	83	31	41	202
113	32	29	59	88	47	255
211	0	0	4	1	2	7
217	1	2	3	2	4	12
230	0	0	3	0	0	3
57	0	0	0	0	0	0
95	0	0	0	0	0	0
172	0	0	0	0	0	0
155	0	0	0	0	0	0
83	0	0	0	0	0	0
51	0	0	0	0	0	0
82	0	0	0	0	0	0
122	0	0	0	0	0	0
92	0	0	0	0	0	0
29	0	0	0	0	0	0
17	0	0	0	0	0	0
Total	314	433	556	377	578	2258

May 3.2

Index (Flies per trap day)

TABLE NO. 63

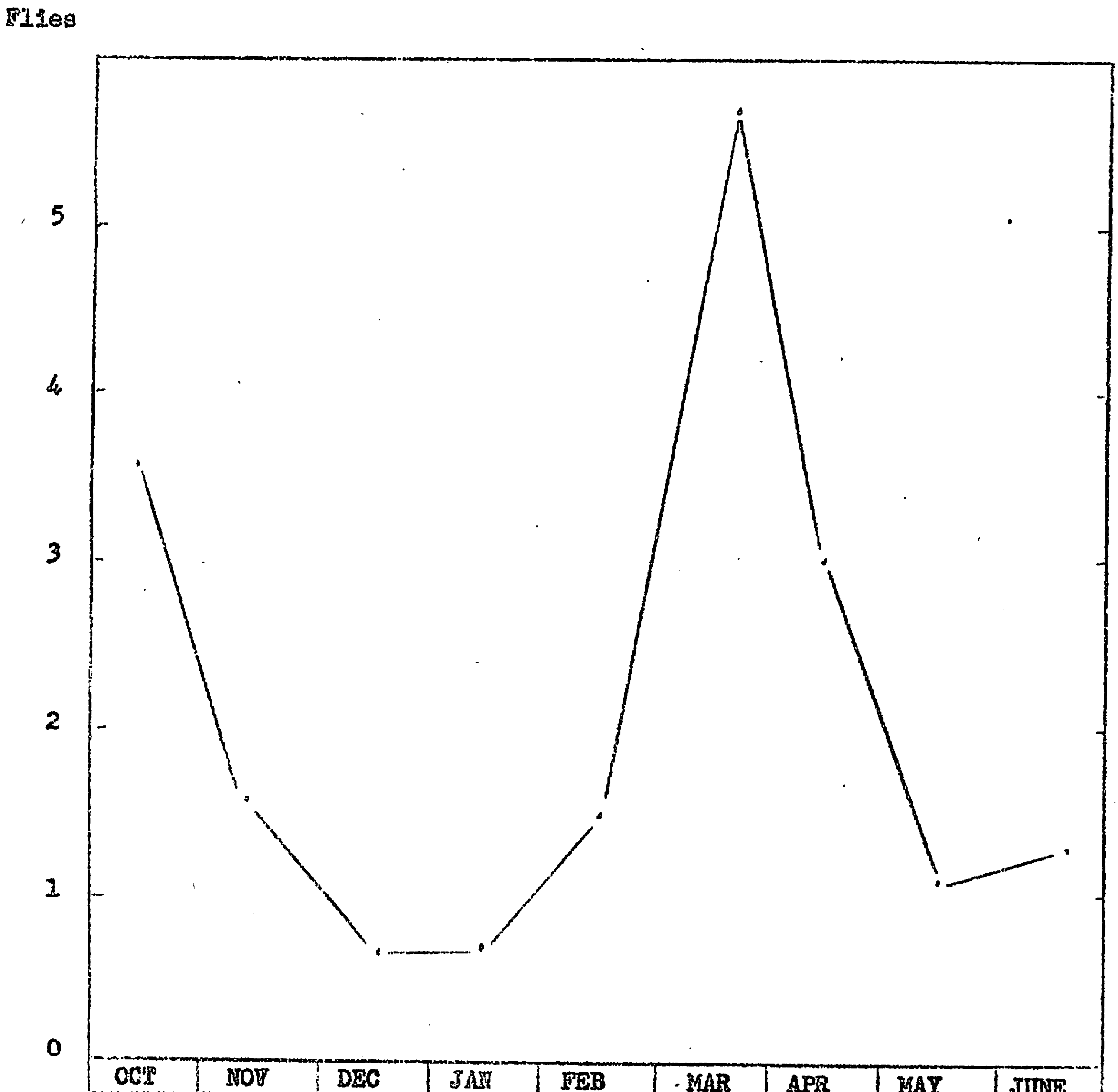
Trap No.	Date of checking and D. dorsalis trapped				Total
	6/5	6/12	6/19	6/26	
115	129	151	203	257	740
162	75	67	37	42	221
173	30	58	104	49	241
191	98	170	164	177	609
168	38		9	7	54
113	71	27	57	9	164
211	3	1	2	1	7
217	4	0	1	0	5
230	0	0	0	0	0
57	0	0	0	0	0
95	0	0	0	0	0
172	0		0	0	0
155	0		0	0	0
83	0	0	0	0	0
51	0	0	0	0	0
82	0	0	0	0	0
122	0	0	0	0	0
92	0	0	0	0	0
29	0	0	0	0	0
17	0	0	0	0	0
Total	448	474	577	542	2041

June: 3.6

Index (Flies per trap day)

POPULATION TRENDS ON THE KULA ROAD (3750' - 2800')

FIG. 34



Legend:

— Population trend based on monthly average count per trap day
Graphic information based on 5,901 flies

POPULATION TRENDS ON THE KULA ROAD (3750' - 2800')

TABLE NO. 64

Month	Days	Traps	TD	Fly Count	Index
Oct.	2	13	26	48	3.6
Nov.	33	13	429	706	1.6
Dec.	28	13	364	259	.7
Jan.	35	13	455	363	.7
Feb.	28	13	365	554	1.5
Mar.	27	12	324	1865	5.7
Apr.	28	13	364	1105	3.0
May	35	13	455	505	1.1
June	28	13	364	496	1.3
Total	277	13	3,146 Trap Days	5,901	2.1 Average

TABLE NO. 65

Trap No.	Date of checking and D. dorsalis trapped				Total
	4/3	4/10	4/17	4/24	
157	0	0	0	0	0
131	0	0	0	0	0
38	10	4	5	2	21
26	46	42	59	14	161
2	25	23	21	3	72
50	9	29	6	7	51
66	1	3	1	1	6
34	2	3	5	0	10
167		4	46	19	69
24	113	147	129	97	486
8	13	11	20	9	53
22	16	26	17	15	74
35	28	32	25	17	102
Total	263	324	334	184	1105

April: 3.0

Index (Flies per trap day)

TABLE NO. 66

Trap No.	Date of checking and D. dorsalis trapped					Total
	5/1	5/8	5/15	5/22	5/29	
157	0	0	0	1	0	1
131	0	0	0	1	0	1
38	0	0	0	0	0	0
26	8	21	15	3	2	49
2	0	5	2	0	0	7
50	2	3	0	3	1	9
66	0	0	0	0	0	0
34	0	0	0	0	0	0
167	7	17	16	15	6	61
24	57	72	68	43	35	275
8	0	5	2	0	0	7
22	17	11	12	7	6	53
35	12	7	3	10	10	42
Total	103	141	118	83	60	505

May: 1.1

Index (Flies per trap day)

TABLE NO. 67

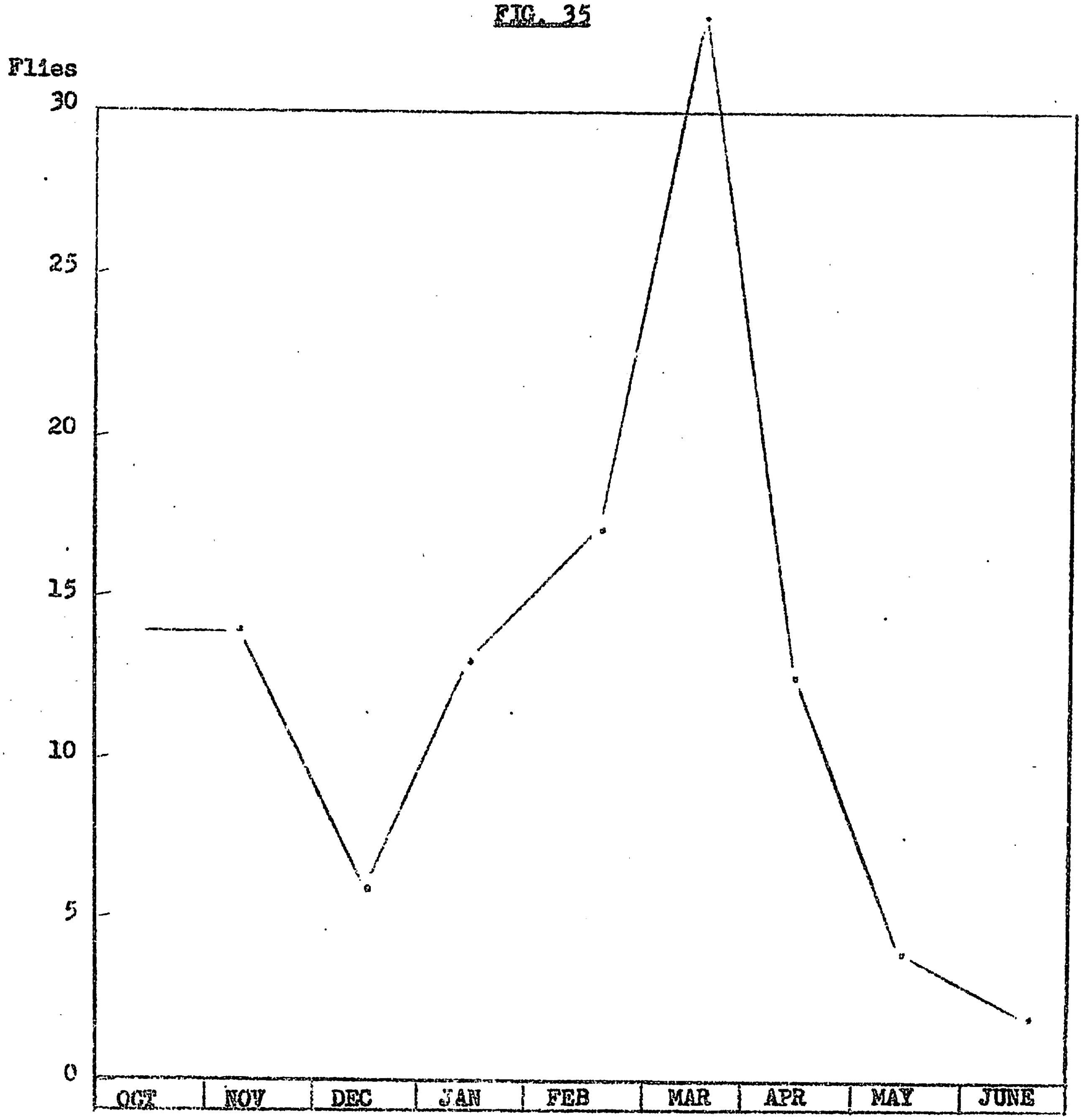
TRAP NO.	Date of checking and D. dorsalis trapped				Total
	6/5	6/12	6/19	6/26	
157	0	0	0	0	0
131	1	1	0	1	3
38	1	1	1	0	3
26	7	9	12	6	34
2	1	3	0		4
50	2	1	0	3	6
66	1	0	0	0	1
34	0	3	0	6	9
167	10	22	11	33	76
24	46	79	71	30	226
8	1	4	7	18	30
22	7	14	27	14	62
35	6	15	10	11	42
Total	83	152	139	122	496

June: 1.3

Index (Flies per trap day)

POPULATION TRENDS AT THE KULA SANITARIUM FARM (2850')

FIG. 35



Legend:

. — Population Trend based on monthly average catch per trap day
Graphic information based on 16,456 flies

POPULATION TRENDS AT THE KULA SANITARIUM FARM (2850')

TABLE NO. 68

Month	Days	Traps	TD	Fly Count	Index
Oct.	19	5	95	1,335	14
Nov.	31	5	155	2,196	14
Dec.	29	5	145	946	6
Jan.	35	5	157*	2,041	13
Feb.	28	5	140	2,471	17
Mar.	28	5	140	4,710	33
Apr.	28	5	140	1,737	12
May	35	5	169*	774	4
June	28	5	140	246	2
Total	261	5	1,281 Trap Days	16,456	12.7 Average

POPULATION STUDIES KULA FARM

TABLE NO. 69

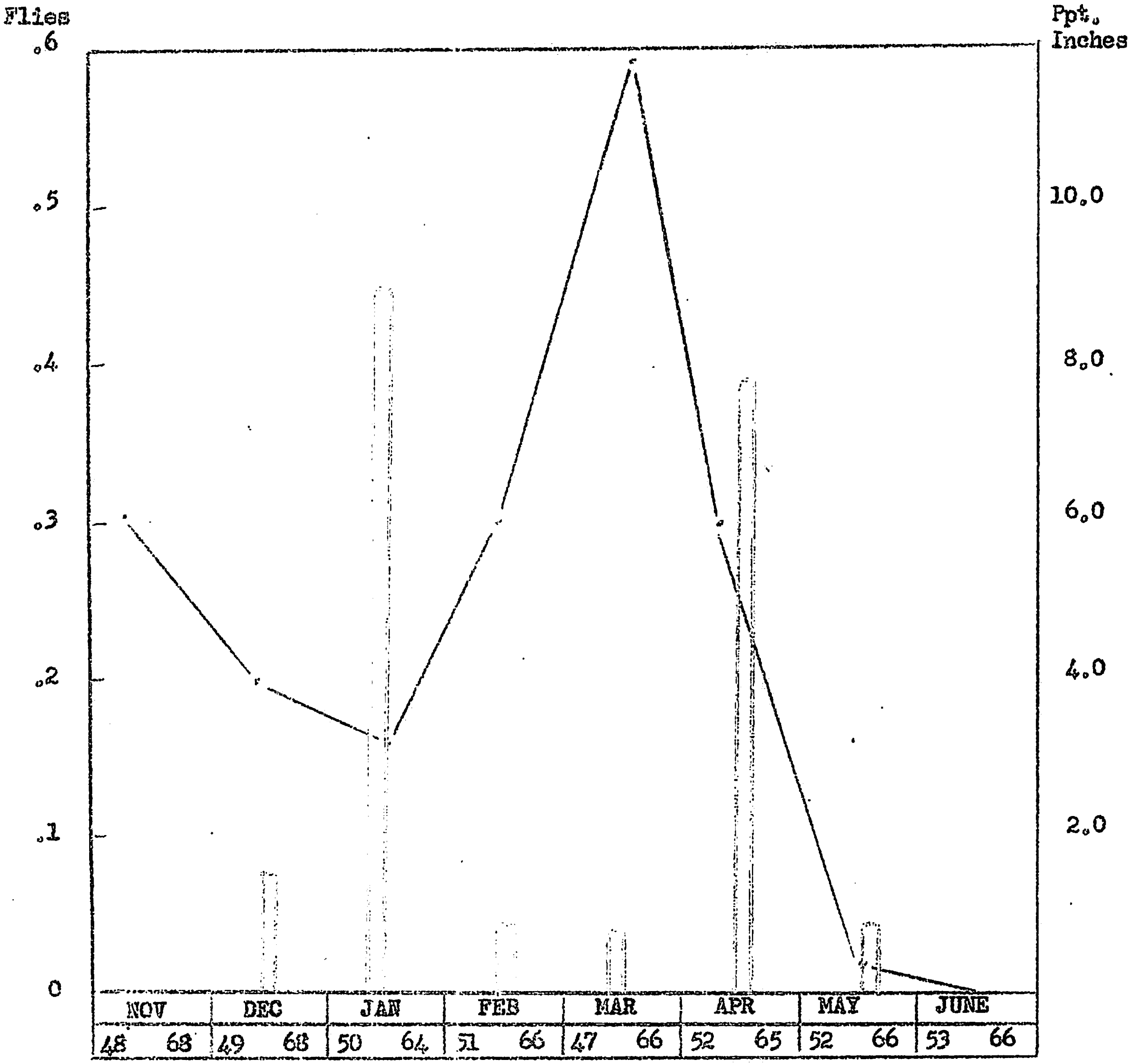
Trap No.	Date of checking and D. dorsalis trapped					Total
	4/3	4/10	4/17	4/24		
1	141	133	136	61		471
3	138	93	96	40		367
4	39	70	69	68		246
5	164	181	127	58		530
6	30	34	35	24		123
Total	512	511	463	251		1737
	5/1	5/8	5/15	5/22	5/29	
1	23	43	69	41	60	236
3	27	20	39	32	56	174
4	40	33	47	52	54	226
5	15	10	33	31	36	125
6		1	3	5	4	13
Total	105	107	191	161	210	774
	6/5	6/12	6/19	6/26		
1	21	83	65	66		235
3	43	88	59	72		262
4	72	118	78	46		314
5	28	54	58	55		195
6	2	6	3	7		18
Total	166	349	263	246		1024

April: 12
May: 4
June: 2

Index (Flies per trap day)

POPULATION TRENDS IN A MIXED ORCHARD, AMBROSE'S, KULA (3800')

FIG. 36



Legend:

Monthly Ppt.
Population Trend. Monthly average catch per trap day
Figures at bottom of graph represent the monthly Min.Mean and Max.Mean
Graphic information based on 246 flies.

POPULATION TRENDS IN A MIXED ORCHARD, AMBROSE'S KILA (3800')

TABLE NO. 70

Month	Max.Mean	Min.Mean	Ppt.	Days	Traps	TD	Fly Count	Index
Nov.	68	48	0	19	5	95	26	.3
Dec.	68	49	1.5	28	5	140	32	.2
Jan.	64	50	9.26	30	5	150	24	.16
Feb.	66	47	.89	30	5	150	44	.3
Mar.	66	47	.81	28	5	140	90	.64
Apr.	65	51	7.92	28	5	140	26	.3
May	66	52		35	5	175	4	.02
June				28	5	140	0	.00
Total			20.38	226	5	1,130 Trap Days	246	.2 Average

TABLE NO. 71

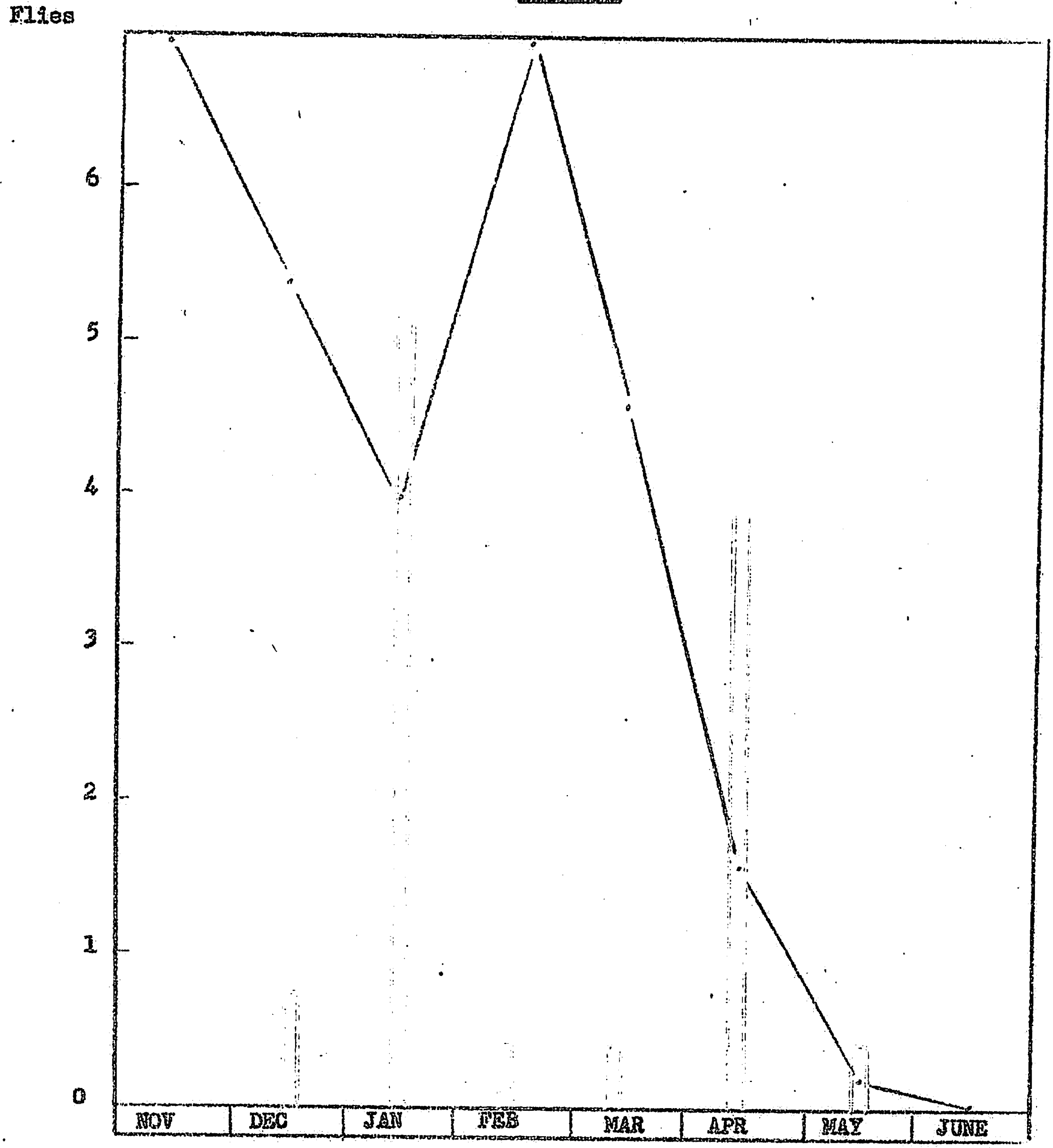
Trap No.	Date of checking and D. dorsalis trapped					Total
	4/3	4/10	4/17	4/24		
150	3	5	2	2		12
126	1	0	2	0		3
152	1	0	0	0		1
111	1	1	0	0		2
102	3	4	0	1		8
Total	9	10	4	3		26
	5/1	5/8	5/15	5/22	5/29	
150	1	0	0	0	0	1
126	0	0	0	0	0	0
152	0	0	0	0	0	0
111	0	0	0	0	0	0
102	1	1	1	0	0	3
Total	2	1	1	0	0	4
	6/5	6/12	6/19	6/26		
150	0	C	0	0		0
126	0	0	0	0		0
152	0	0	0	0		0
111	0	0	0	0		0
102	0	0	0	0		0
Total	0	0	0	0		0

April: .3
May: .02
June: .00

Index (Flies per trap day)

POPULATION TRENDS IN LYON'S CITRUS ORCHARD, KULA (3650')

FIG. 37



Legend:

Population Trends based on monthly average per trap day

Ppt. monthly

Graphic information based on 4,095 flies

POPULATION TRENDS IN LYON'S CITRUS ORCHARD, KULA (3650')

TABLE NO. 72

Month	Max. Mean	Min. Mean	Ppt.	Days	Traps	TD	Fly Count	Index
Nov.	68	48	0	19	5	95	700	7.3
Dec.	68	49	1.5	28	5	140	766	5.4
Jan.	64	50	9.26	30	5	150	605	4.0
Feb.	66	51	.89	30	5	150	1094	7.3
Mar.	66	47	.81	28	5	140	653	4.6
Apr.	65	51	7.92	28	5	140	231	1.6
May	66	52		35	5	175	41	0.2
June				28	5	140	5	0.03
Total			20.38	226	5	1,130 Trap Days	4,095	3.7 Average

TABLE NO. 73

Trap No.	Date of checking and D. dorsalis trapped					Total
	4/3	4/10	4/17	4/24		
101	16	12	7	4		39
134	25	7	7	3		42
147	12	7	5	0		24
148	15	9	6	2		32
149	41	38	12	3		94
Total	109	73	37	12		231
	5/1	5/8	5/15	5/22	5/29	
101	0	1	3	1	0	5
134	2	5	3	1	0	11
147	3	1	0	0	0	4
148	4	2	2	0	1	9
149	2	4	5	1	0	12
Total	11	13	13	3	1	41
	6/5	6/12	6/19	6/26		
101	0	1	0	0		1
134	0	0	0	0		0
147	0	0	0	0		0
148	0	0	0	0		0
149	1	0	0	3		4
Total	1	1	0	3		5

April: 1.6
May: .2
June: .03

Index (Flies per trap day)

POPULATION TRENDS

There was a considerable decline in dorsalis populations on Hawaii between March and June 1950. The weekly high of 16,503 flies on the M. L. T. T. dropped to 398 flies in June.

The picture at other stations was as follows:

Hilo:

The April peak was 856 flies, based on catches from 5 traps over a seven day period. This dropped to 107 during the last week of June. During the months of April and May, 33.45 and 21.04 inches of rainfall were recorded. This was almost a daily occurrence in Hilo. An increase in parasitism was observed and the number reared from dorsalis pupae has increased. There was a scarcity of fruit between January and March.

Mt. View:

The number of flies trapped during this quarter dropped from a weekly high of 463 to a weekly low of 71 flies. This was based on weekly catches from 4 traps. Host availability was poor and 48 inches of rainfall were recorded during April.

Waikii:

Between April and June only 11 flies were caught in the four McPhail traps at this station. In contrast, about 330 flies were trapped last November. The cumulative precipitation for three months at Waikii was 10.51 inches. Weather conditions such as fog, wind, rain and temperature are believed to have been the limiting factors for fly activity during this period. Jerusalem cherries were plentiful and plums began to ripen in May.

Keanakolu:

Weather conditions, particularly fog and rain have apparently driven the fly from Keanakolu orchard, as only 3 flies have been trapped since April 25th. 24.34 inches of rainfall were recorded for April. Fog is the usual thing in the orchard and if a tally on the actual number of sunlight hours were possible, it would reveal a very low number. Passion fruit continued to be abundant and plums began to mature during the latter part of May.

The Keanakolu-Ookala trail population dropped from a bi-weekly total of 9,870 to a total of 377 flies. Scarcity of guavas at the lower end of the trail, and heavy rainfall along the trail have been important factors.

TABLE NO. 74 Dates for Checking and Dacus Dorsalis Trapped - Mauna Loa Truck Trail

Trap No.	Elev.	Miles	4/10 Trap	4/17 Trap	4/24 Trap	5/1 Trap	5/8 Trap	5/15 Trap	5/22 Trap	5/29 Trap	6/5 Trap	6/12 Trap	6/19 Trap	6/26 Trap	7/3 Trap	Total
23	6700'	11.0	4	-	-	-	-	-	-	3	-	-	-	-	1	8
22	6500'	10.5	-	-	-	-	-	-	-	1	-	-	-	-	3	4
21	6200'	10.0	-	-	-	-	-	-	-	3	-	-	-	-	4	7
20	6000'	9.5	-	1	-	-	-	1	-	4	-	-	-	1	4	11
19	5900'	9.0	7	2	-	-	3	1	-	6	3	-	1	-	13	36
18	5800'	8.5	2	0	1	-	1	-	-	1	2	-	-	-	1	8
17	5700'	8.0	22	5	-	-	4	6	-	7	3	-	2	-	31	80
16	5550'	7.5	3	1	-	-	5	15	-	15	7	1	-	7	16	70
15	5260'	7.0	5	-	-	-	1	2	-	3	-	-	-	1	4	16
14	5220'	6.5	3	1	-	-	1	-	-	2	1	-	-	-	1	9
13	5120'	6.0	4	2	-	-	-	2	-	2	-	2	2	-	5	19
12	5020'	5.5	21	4	1	-	3	4	2	1	-	-	-	-	2	38
11	4980'	5.0	9	2	13	-	2	6	-	3	1	-	-	-	16	52
10	4860'	4.5	22	1	3	2	1	5	-	9	-	-	1	1	18	63
9	4760'	4.0	7	6	-	-	1	-	1	-	1	-	-	-	4	20
8	4620'	3.5	9	-	1	1	2	3	2	3	3	1	1	-	17	43
7	4520'	3.0	38	5	4	1	7	22	4	7	50	2	15	7	62	224
6	4420'	2.5	10	11	3	2	-	7	2	10	15	1	-	1	15	77
5	4360'	2.0	21	10	2	3	3	4	1	3	2	1	-	-	14	64
4	4240'	1.5	2485	1335	365	394	224	2638	243	321	472	84	71	85	542	9259
3	4150'	1.0	2565	1227	405	156	170	464	107	384	832	107	82	66	906	7471
2	4090'	.5	907	1420	217	174	147	638	97	147	585	33	29	37	637	5068
1	4000'	.0	4580	3870	657	893	1530	3420	673	2840	1294	267	285	192	3229	23730
	Total		10724	7903	1672	1626	2105	7238	1132	3775	3271	499	489	398	5545	46377

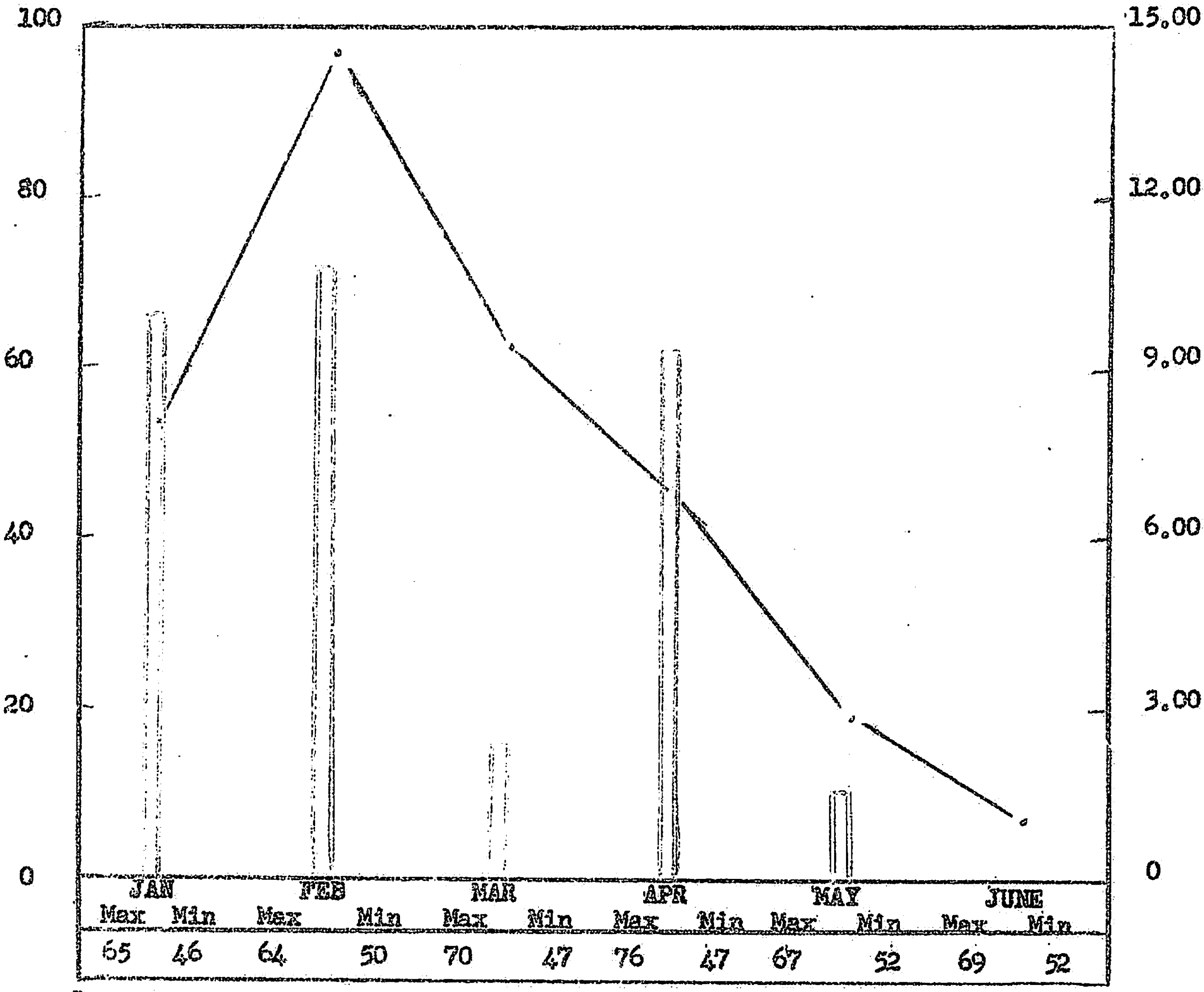
TABLE NO. 75. Dates of Checking and Dacus dorsalis Trapped- Keanakolu-Ookala Trail.

Trap No.	Elev.	Miles	4/11 Trap	4/25 Trap	5/9 Trap	5/23 Trap	6/6 Trap	6/20 Trap	7/4 Trap	Total
15	5200'	0	3	3	-	-	-	-	-	6
16	4900'	.5	-	1	-	-	-	-	-	1
17	4650'	1.0	2	4	-	-	-	-	-	6
18	4450'	1.5	2	-	1	-	-	-	-	3
19	4200'	2.0	-	3	-	-	-	-	-	3
20	3900'	2.5	2	11	3	-	-	-	-	16
21	3600'	3.0	5	-	1	-	1	-	-	7
22	3330'	3.5	4	15	3	-	-	-	-	22
23	3100'	4.0	7	47	2	-	-	-	-	56
24	2800'	4.5	23	31	9	-	3	-	-	66
25	2600'	5.0	65	74	26	7	4	1	-	177
26	2300'	5.5	70	10	8	3	-	1	-	92
27	2040'	6.0	36	165	43	22	42	24	37	369
28	1700'	6.5	415	146	95	78	47	61	54	896
29	1400'	7.5	105	27	160	125	76	96	115	704
30	700'	8.5	425	184	487	146	204	423	875	2744
	Totals		1164	721	838	381	377	606	1081	5168

POPULATION TRENDS ON MAUNA LOA TRUCK TRAIL, 4000' - 6700'

FIG. 38

INDEX: FLIES Graphic information based on 179,668 flies Ppt.



Legend:

——— · Flies caught per trap day, monthly average

Accumulative monthly rainfall.

Note: A good percent of these flies are believed to be drifts from an undetermined locality. When dorsalis is reared from jerusalem cherries in this area, it is mostly between 4000-4250' and seldom above 4250'.

POPULATION TRENDS , MAUNA LOA TRUCK TRAIL, 4000-6700'

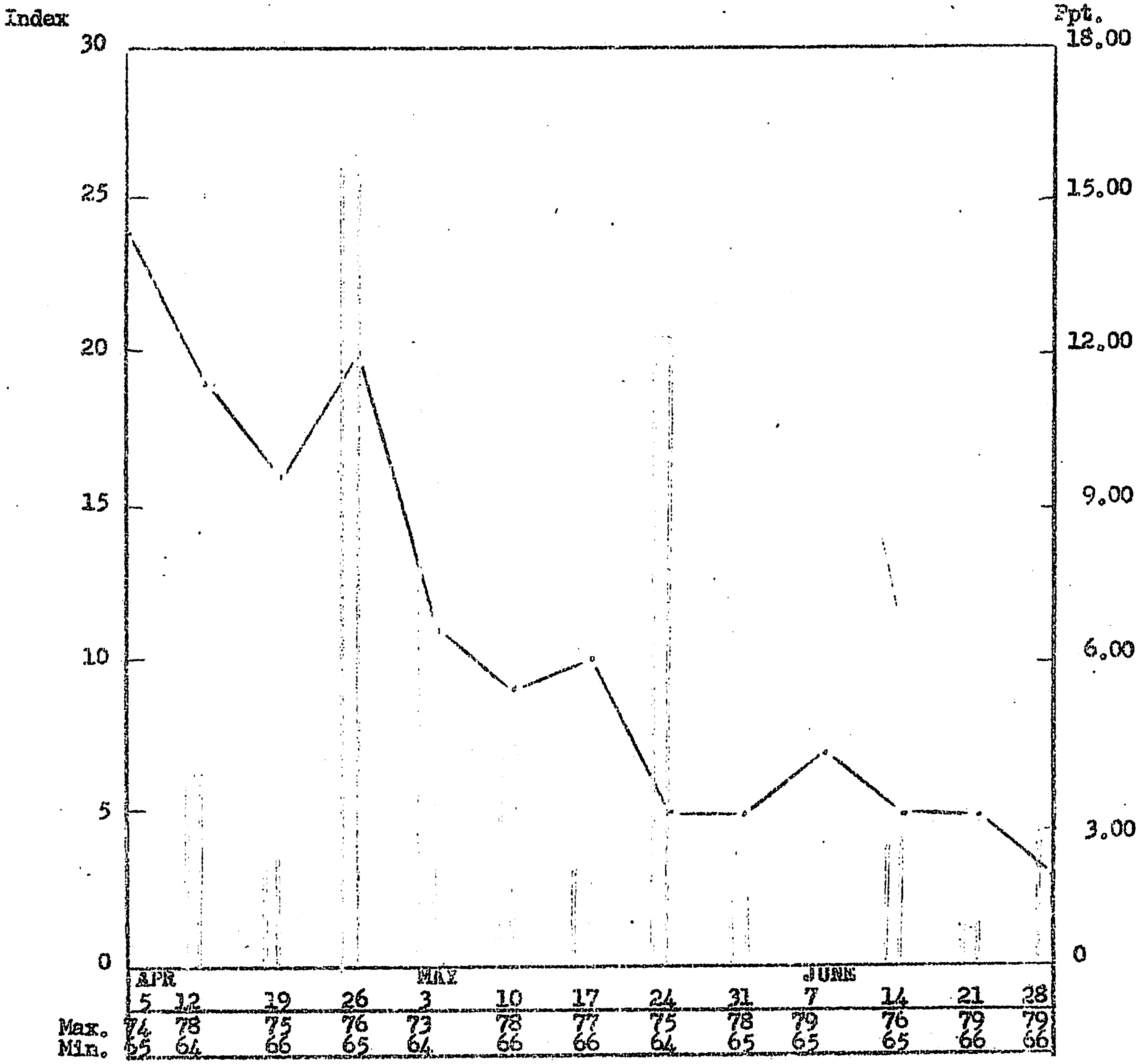
TABLE NO. 76

Month	Max.Mean	Min.Mean	Pct.	Days	Traps	TD	Fly Count	Index
Jan.	65	46	10.00	21	23	483	26,294	54
Feb.	64	50	10.96	28	23	644	62,604	97
Mar.	70	47	2.56	28	23	644	40,652	63
Apr.	76	47	9.34	28	23	644	29,552	45
May	67	52	1.56	35	23	805	15,909	19
June	69	52	.27	28	23	644	4,657	7
Total			34.69	168	23	3864	179,668	Av.48

POPULATION TRENDS AT COSTA'S CITRUS ORCHARD, HILO (75')

Graphic information based on 4,949 flies.

FIG. 39



——, Flies caught per trap day, weekly average

Accumulative weekly rainfall

POPULATION TRENDS, COSTA'S CITRUS ORCHARD, HILO (75')

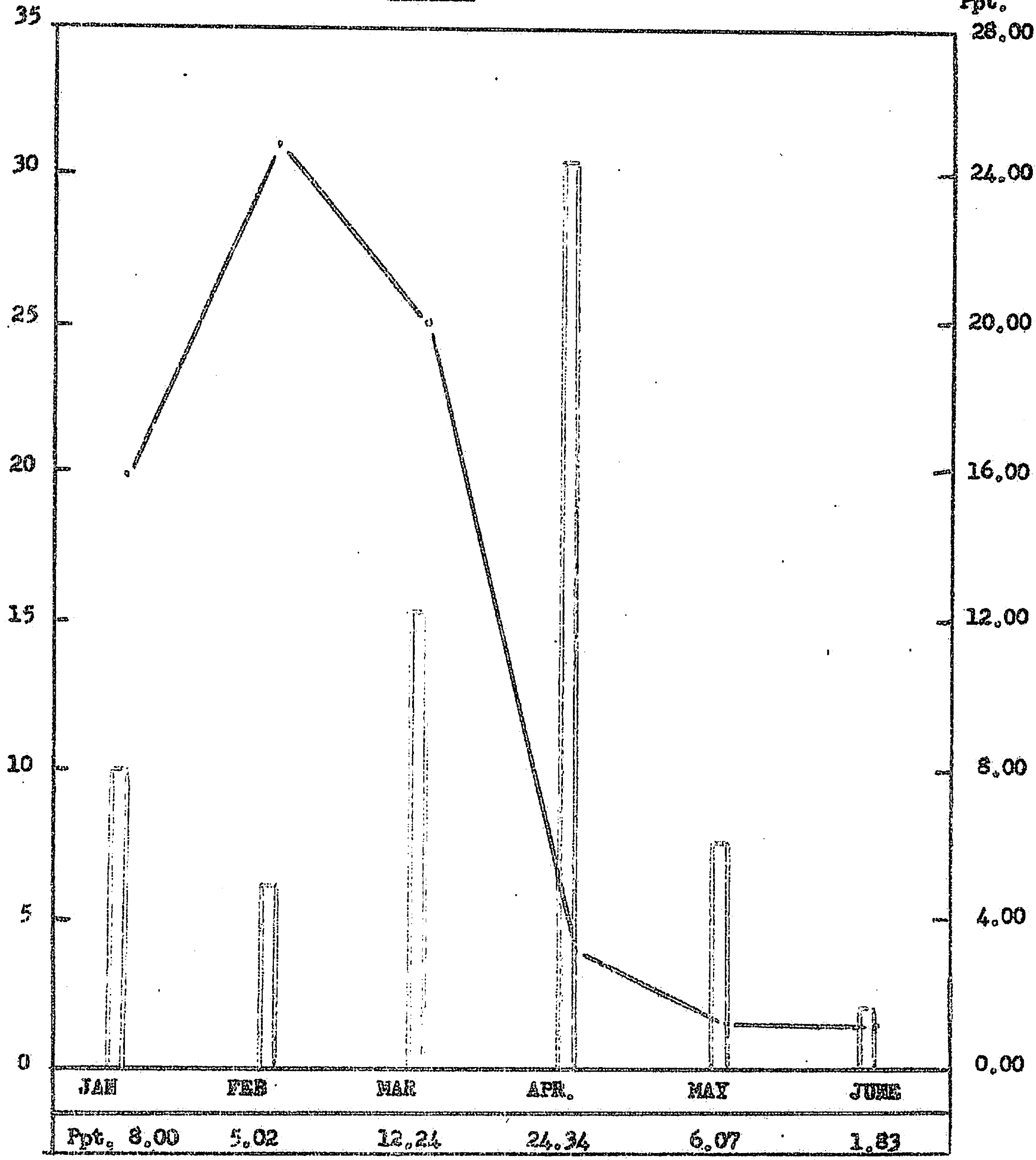
TABLE NO. 77

Month	Max.Mean	Min.Mean	Ppt.	Days	Traps	TD	Fly Count	Index
Apr. 5	74	65	1.43	7	5	35	856	24
" 12	78	64	3.84	7	5	35	655	19
" 19	75	66	2.30	7	5	35	577	16
" 26	76	65	15.98	7	5	35	708	20
May 3	73	64	11.79	7	5	35	382	11
" 10	78	66	4.33	7	5	35	333	9
" 17	77	66	1.91	7	5	35	378	10
" 24	75	64	12.29	7	5	35	202	5
" 31	78	65	1.44	7	5	35	160	5
Jun. 7	79	65	.12	7	5	35	230	7
" 14	76	65	2.57	7	5	35	174	5
" 21	79	66	.78	7	5	35	187	5
" 28	79	66	2.30	7	5	35	107	3
Total			61.58	91	5	455	4949	Ave. 10

POPULATION TRENDS ON KEANAKOLU OOKALA TRAIL 700' TO 5200'

INDEX: FLIES

FIG. 40



LEGEND:

Population Trends, monthly average catch per trap day
Monthly precipitation
Graphic information based on 41,645 flies

POPULATION TRENDS, KEANAKOLU-OOKALA TRAIL 700' TO 5200'

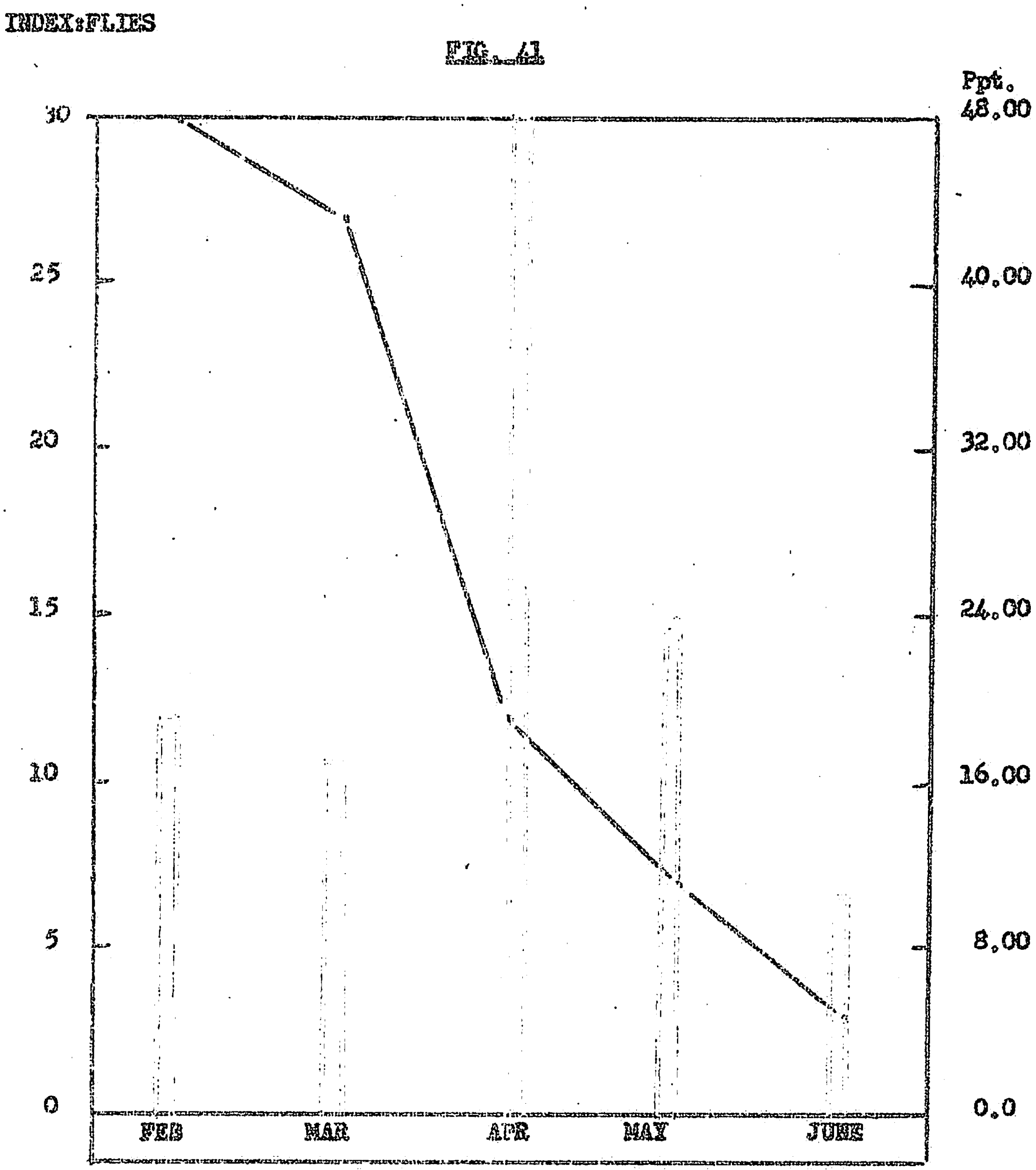
TABLE NO. 78

Month	Fruit	Ppt	Days	Traps	TD	Fly Count	Index
Jan.	Guava	8.00	42	16	*644	12,886	20
Feb.	Guava	5.02	28	16	*434	13,604	31
Mar.	Scarce	12.24	28	16	*434	11,068	25
Apr.	----	24.34	28	16	448	1,885	4
May	----	6.07	28	16	448	1,219	2
June	----	1.83	28	16	448	983	2
Total		57.50	182	16	2856	41,645	Av. 14

* Adjustment made

POPULATION TRENDS AT MARTIN'S ORCHARD, MT. VIEW (1200')

FIG. 41



Legend:

—.—. Population Trends, monthly average catch per trap day

Monthly Ppt.
Graphic information based on 10,763 flies

Note: Scarcity of fruit and heavy precipitation appear to be important factors in the decline shown above.

POPULATION TRENDS, MARTINS ORCHARD, MT. VIEW 2000'

TABLE NO. 79

Month	Ppt.	Days	Traps	TD	Fly Count	Index
Feb.	19.42	35	4	140	4,207	30
Mar.	17.33	28	4	112	3,095	27
Apr.	48.13	28	4	112	1,471	12
May	24.01	35	4	140	991	7
Jun	10.47	28	4	112	355	3
Total	119.36	161	4	644	10,763	Av. 16

Key:

TD: Trap days

Index: Monthly average catch per trap day