Project Number: 82-G2
Seasonal Monitoring of Peach Twig Borer and San Jose Scale Pheromone Traps



Almond Board of California
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Objectives. Seasonal monitoring of peach twig borer (Anarsia lineatella) and San Jose scale (Quadraspidiotus perniciosus) was conducted with pheromone traps for additional validation of phenology models for these 2 species. San Jose scale crawlers were also monitored with sticky tapes around tree limbs.

Concurrent with model validation efforts, chemicals were applied for these species during the season in order to determine optimum timing for chemical controls. The timings were selected on the basis of accumulated heat units, or day-degrees, following first collections of male moths (PTB) or scale in pheromone traps.

Summary. Continued validation of the peach twig borer phenology model in 1982 confirmed results observed in 1981. Optimum control for PTB larvae using May sprays was obtained at 400-500 D° after first moth flights in April. These results, in conjunction with similar observations from Cooperative Extension farm advisors and commercial PCA's in 1981-82, indicate that the PTB model has been and can be used successfully in timing chemical applications for this pest.

Use of double-sided sticky tapes on tree limbs greatly improved monitoring San Jose scale crawler populations throughout the year. An added benefit of this technique was collections of walking male scale, which may eventually eliminate the need to use pheromone traps for male scale monitoring. The SJS phenology model also worked quite well, with scale crawlers emerging as predicted at 400 D° after first male collections. Preliminary tests, (using the model) to optimize spring (1st generation) crawler treatments indicated that sprays should be applied 600-700 D° after first male emergence, or 200-300 D° after crawler emergence. These tests will be repeated in 1983-84 for confirmation.

Bioassays of almond press cake and crude or refined almond oil were conducted to try to improve egg trap performance. Results indicated that the dry press cake is the most attractive single compound to use, while combinations of cake plus crude oil increase egg collections over either material alone. Use of almond oil in the traps can lead to contamination problems.

Peach Twig Borer. Pheromone traps were placed into a 3rd leaf almond orchard in early April. The first male moth was trapped on April 22, followed by a steady increase in collections to May 7 (Fig. 1). Following this date, PTB collections declined sharply for one week, apparently due to temperatures being below the threshold (ca. 60°F) for male activity and flight. PTB flight again increased to a second peak on May 28, and then declined naturally to the end of the first flight in early June. The first PTB twig strikes were observed in young almonds on May 17, ca. 399 D° after the first moths were trapped.

Following the first moth collections on April 22, diazinon 50w at 2.0 lbs. a.i. in 400 gal. water per acre was applied to almonds at 300 D° (5/12), 400 D° (5/17), 500 D° (5/23) and 600 D° (5/26), based on the PTB developmental thresholds of 50° and 88°F. Evaluation of timing efficacy was based on twig strikes, counted on June 9. Results of these treatments showed no differences between the 300, 400, and 500 D° applications (Fig. 1). The 600 D° treatment was much poorer, and was obviously applied too late in the flight to prevent early hatching larvae from entering twigs. The good control observed at 400 and 500 D° confirmed results from a similar test in 1981, and this timing is believed to be optimum for control of first generation PTB larvae. The relatively high level of control at 300 D° in 1982, compared to poor control at the same timing in 1981, is thought to perhaps be due to longer residual activity of the chemical in 1982.

Seasonal flight activity of PTB in 1982 was similar to that observed in previous years, with four full generations occuring between April 22 and December 3 (Fig. 2). Work is being initiated on alternate techniques for timing sprays and

for recommended timing for trap placement in the spring. Preliminary observations are encouraging but will require additional validation.

San Jose Scale. Collections of San Jose scale crawlers on sticky tapes were continuous at a low level throughout the winter of 1981-82 (Fig. 3). Pheromone traps were emplaced in mid-February, and first males were trapped on March 9, 1982. Male collections peaked in late March, then declined and ceased in early May. Crawler emergence began to increase rapidly in late April as a result of female mating in March.

First generation crawlers peaked on May 13, then declined rapidly through late May and June. Second generation crawlers began appearing in early July (Fig. 4).

Chemical treatments for San Jose scale were also timed at selected day-degrees intervals after first males were collected in traps, using SJS developmental thresholds of 51° and 90°F. Evaluation of treatment efficacies using sticky tape-crawler recapture methods were not satisfactory, so smooth skinned stonefruits were used for treatment evaluations. Diazinon 50w was applied to nectarines and plums at 2.0 lbs. a.i. per acre in 400 gal. water. Treatment evaluations and efficacy were based on percent infested fruit per treatment using 500 randomly selected mature fruit from each treatment.

Results of these tests (Fig. 3) showed best crawler control at 500°, 600°, or 700 D° after first male scale collections, with the 400 D° timing coming too early in the crawler emergence period to be effective. This is the first series of treatments evaluating SJS control based on D° timing. The tests will be repeated in 1983, with additional treatments included to provide better bracketing of the optimum timing treatment.

The use of sticky tapes to monitor SJS populations is a more reliable method than pheromone traps, but requires greater replication (more sampling sites) than

traps due to the non-uniform distribution of scale crawler populations. The greatest advantage of the tapes is that they are not affected by wind or other adverse weather conditions to the extent that traps are. The tapes also catch walking males along with crawlers, and with improved use technology may be preferred by some growers or PCA's.

Naval Orangeworm. During 1982, several lab studies and one field study on NOW attractants were conducted. These studies attempted to improve the efficacy or attractiveness of the standard NOW egg trap. All bioassays contained a press cake and a blank standard with one exception; the field study had no blanks. All treatments were presented in standard NOW egg traps. Evaluation of the different treatments was based on egg counts.

Crude and refined almond oil were compared against press cake (Tables 2, 3). The oils were applied to a 1.0 x 5.0 cm cotton wick, with amounts of oil varying from 2 mls. to saturation (approx. 7 mls.). In most cases, the crude almond oil was more attractive than the refined oil (Table 3). A disadvantage of working with the straight oils is their tendency to be messy. Cross contamination of other treatments can also be a problem. At no time during these tests, and with the quantities and ratios used, did the oils out-perform the press cake.

Anti-oxidant at 1X, 4X, and 16X rates was added to crude almond oil and then applied to a 1 x 5 cm wick until saturation (Table 1). A second test using 2 mls. oil and anti-oxidant mixture/wick was also run. The results of the two tests were similar. The 1X treatment improved efficacy and in each case was better than straight almond oil. The 4X treatment was no different than straight oil and the 16X treatment seemed to have somewhat of a negative or repellant effect. The standard press cake treatment again was much better than all other treatments. The same problems of messiness and cross contamination persisted.

The most successful test used mixtures of almond press cake and crude almond oil, shown in two separate tests. The difference between the two was in

the method of presenting the oil/press cake mixture. In the first, a 10.1 ratio of press cake to almond oil was used. This was compared to a similar ratio of press cake to refined oil. Straight oil and straight press cake treatments were also included. The oil was thoroughly mixed into the press cake. All six replications of this test showed the press cake/crude oil mixture to be the best treatment (Table 3).

In the second test, only crude almond oil/press cake mixtures were used. The oil was presented in clear poly-vinyl packets containing 1 ml. oil. The packet was suspended in the egg trap (not in contact with the press cake). This test was replicated five times and the treatments were as follows: One gram press cake, 1 ml. crude almond oil in Borregaard dispensers, 1 gram press cake with a Borregaard dispenser suspended over it, and a blank. Significantly more eggs were laid on the egg traps containing the press cake with the Borregaard dispenser (Table 4).

Crude almond oil, whether mixed directly with the press cake, or in close proximity as with the Borregaard dispenser, appears to enhance the attractiveness of the standard press cake NOW egg trap to female NOW.

Table 1. (NOW 82-4)

| Treatments: | Total No. Eggs Collected |
|---|---|
| 1. Crude almond oil (7 mls.) applied to a 1 x 5 cm. cotton wick | 392 |
| 2. " " " " plus 1X rate anti-oxidant applied to a 1 x 5 cm cotton wick | 496 |
| 3. " " " " " 4X " " " " " " " " " " | 387 |
| 4. " " " " " 16X " " " " " " " " " " | 323 |
| 5. 15 grams of almond press cake (standard field load) | 1587 |
| 6. Blank | 60 |

Table 2. (NOW 82-5)

| Treatments: | Total No. Eggs Collected |
|---|---|
| 1. Standard NOW press cake egg trap (15 grams) - not changed | 125 |
| 2. Crude almond oil (4 mls.) - changed weekly | 20 |
| 3. " " " " - not changed | 8 |

Table 3. (NOW 82-7)

| Treatments: | Total No. Eggs Collected |
|---|---|
| 1. 1.5 grams crude almond oil applied to a 1 x 2.5 cm cotton wick | 32 |
| 2. " " refined " " " " " " " " " | 10 |
| 3. 1.5 grams crude almond oil mixed thoroughly with 15 grams of press cake | 473 |
| 4. " " refined " " " " " " " " " " | 253 |
| 5. 15 grams of almond press cake (standard field load) | 313 |
| 6. Blank | 11 |

Table 4. (NOW 82-8)

| Treatments: | Total No. Eggs Collected |
|---|---|
| 1. 1 gram almond press cake | 548 |
| 2. 1 ml. crude almond oil (Borregaard dispenser) | 332 |
| 3. 1 gram almond press cake w 1 ml. crude almond oil (Borregaard dispenser) | 727 |
| 4. Blank | 95 |

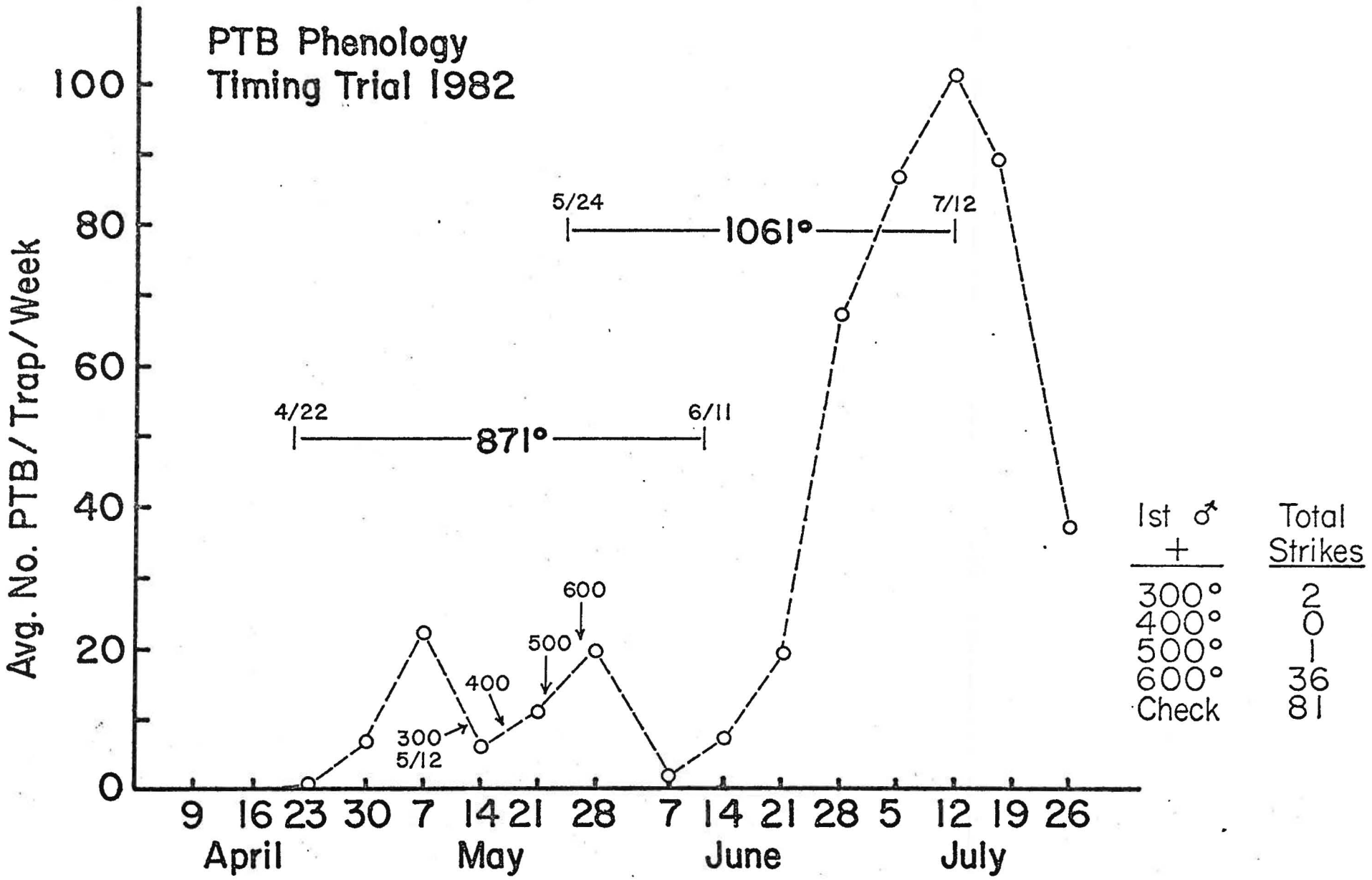
PTB Phenology
Timing Trial 1982
Avg. No. PTB/ Trap/Week
100
80
60
40
20
0
5/24
7/12
1061°
4/22
6/11
871°
300
5/12
400
500
600
9 16 23 30 7 14 21 28 7 14 21 28 5 12 19 26
April
May
June
July
1st ♂ + | Total Strikes
300° | 2
400° | 0
500° | 1
600° | 36
Check | 81

FIGURE 1

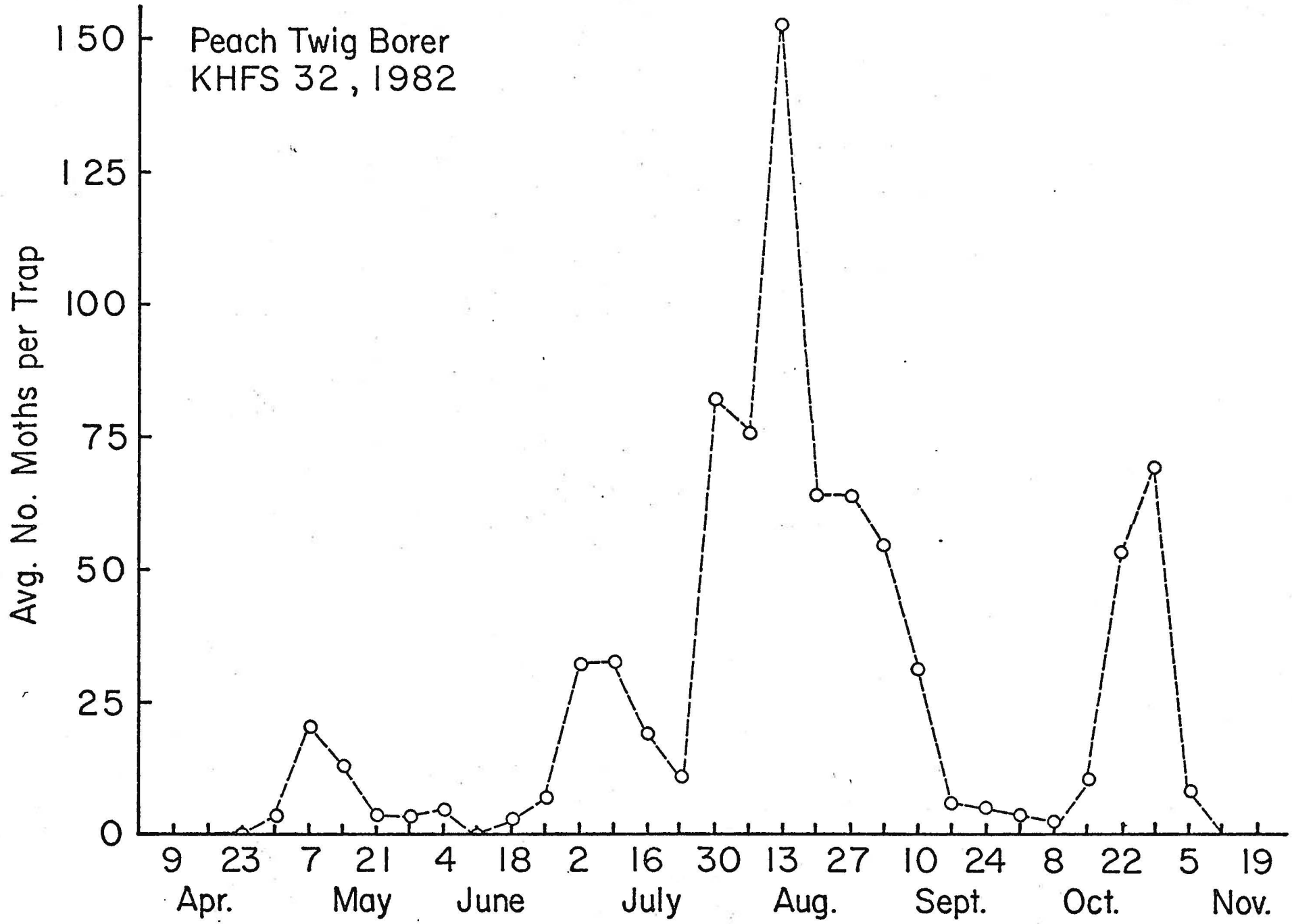
Peach Twig Borer
KHFS 32, 1982
Avg. No. Moths per Trap
150
125
100
75
50
25
0
9
23
7
21
4
18
2
16
30
13
27
10
24
8
22
5
19
Apr.
May
June
July
Aug.
Sept.
Oct.
Nov.

FIGURE 2

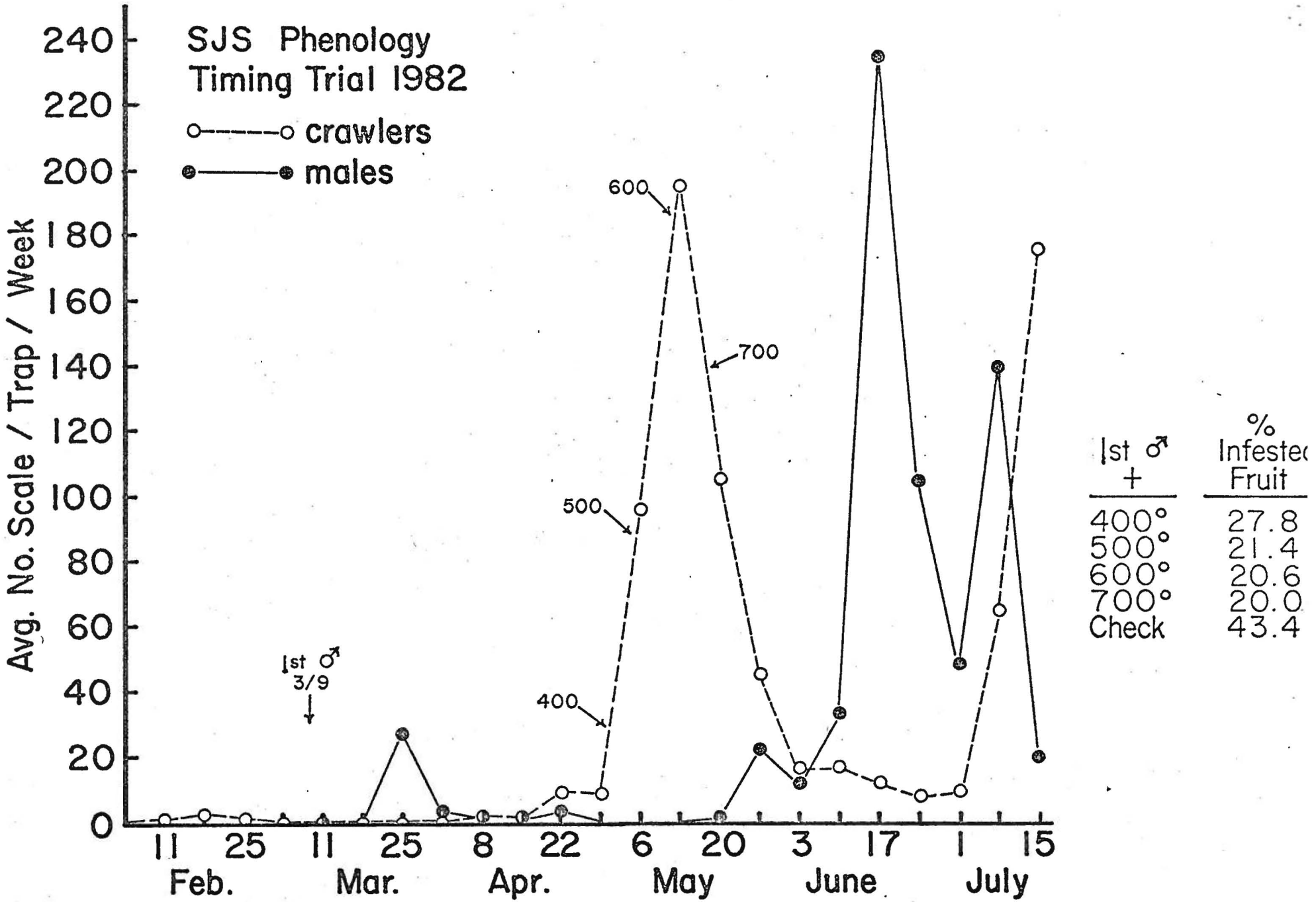
SJS Phenology
Timing Trial 1982
crawlers
males
Avg. No. Scale / Trap / Week
240
220
200
180
160
140
120
100
80
60
40
20
0
1st ♂
3/9
400
500
600
700
11 25 11 25 8 22 6 20 3 17 1 15
Feb. Mar. Apr. May June July
1st ♂ +
% Infested Fruit
400° 27.8
500° 21.4
600° 20.6
700° 20.0
Check 43.4

FIGURE 3

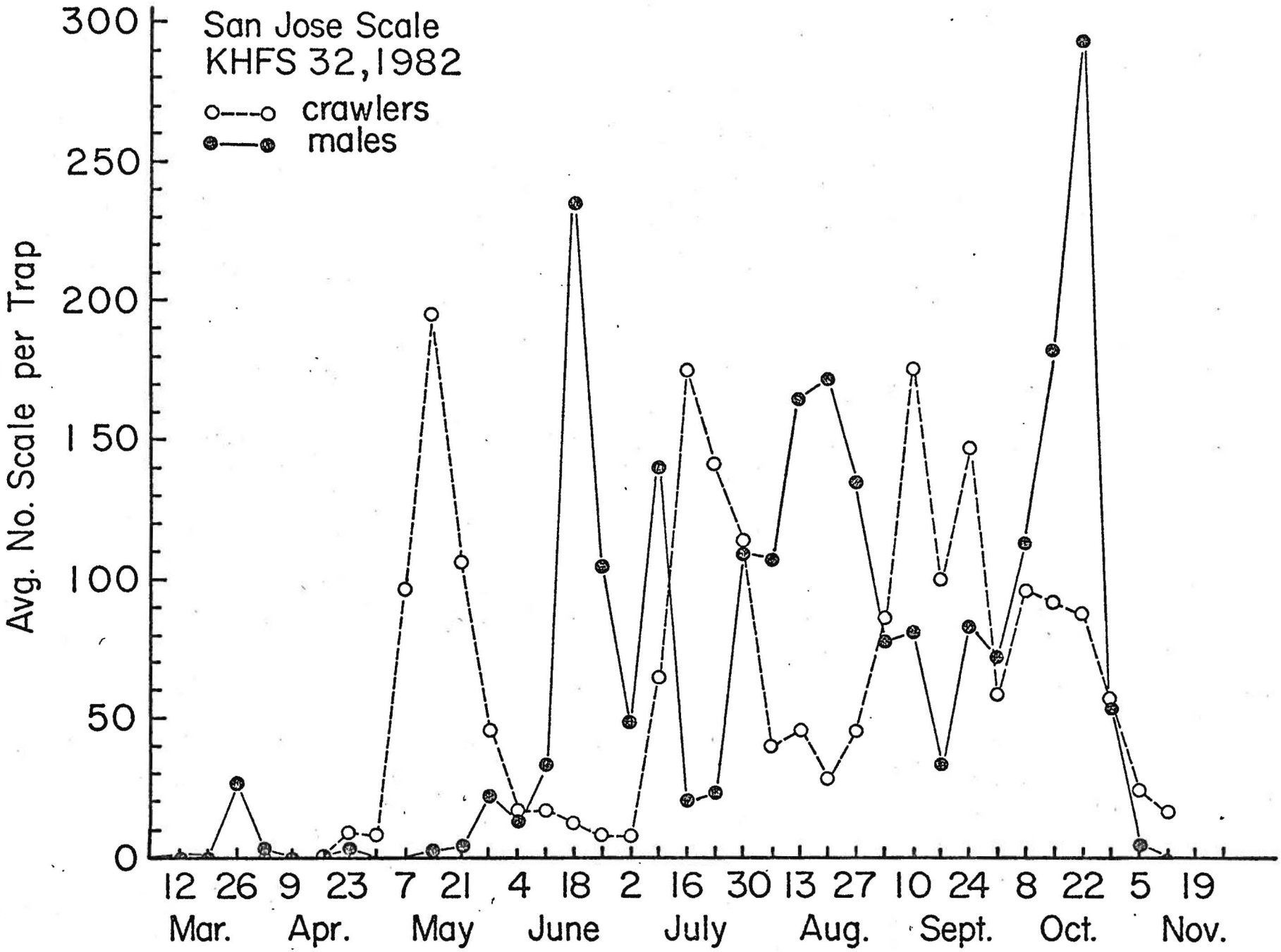
San Jose Scale
KHFS 32,1982
crawlers
males
Avg. No. Scale per Trap
300
250
200
150
100
50
0
12 26 9 23 7 21 4 18 2 16 30 13 27 10 24 8 22 5 19
Mar. Apr. May June July Aug. Sept. Oct. Nov.

FIGURE 4

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December 22, 1982

Mr. Bob Curtis
Almond Board of California
P.O. Box 15920
Sacramento, Calif. 95852

Dear Bob:

Enclosed are 3 copies of my 1982 Annual Report for the Almond Board. Please let me know if you have questions or comments on this.

Best wishes for the Holidays and New Year.

Sincerely yours,

Richard E. Rice
Entomologist

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Enclosure