I. Thresholds/Monitoring/Sampling

MONITORING *PHYTOCORIS RELATIVUS* KNIGHT (HEMIPTERA: MIRIDAE) WITH PHEROMONE TRAPS IN DECIDUOUS ORCHARDS

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Trap Design

The purpose of this trial was to determine which of several commercial trap designs already available for grower use are best suited for trapping *Phytocoris relativus*. This test was carried out in mature almonds near Selma, CA during early July 1997 using five replications for each of six different trap designs. The traps evaluated in this trial were: standard Jackson; tent, Pherocon 1C, and Pherocon V (Trécé, Inc., Salinas, CA); and Intercept A and Intercept C traps (IPM Technologies, Inc., Portland, OR). All traps were baited with standard University of California *Phytocoris relativus* rubber septa lures loaded with 5 mg of pheromone per lure. Traps were emplaced on a 200 x 200 ft grid on July 1, 1997, were counted at two- or three-day intervals, and were rotated to the next position in the trap grid after each count. The test was terminated on July 15, 1997.

The results of this trap comparison showed the Pherocon V (scale trap), the Pherocon 1C (standard wing trap), and Intercept C to be the most efficacious of the six traps evaluated (Table 1).

Table 1. Comparisons of pheromone traps for collection of *Phytocoris relativus* in orchards. Fresno County, California, July 1997.

Trap Type	Average No. *P. relativus* per replicate[1/]	
Intercept A	8.2	a
Tent	21.4	b
Jackson	25.4	b c
Intercept C	26.8	b c d
Pherocon IC	32.2	c d
Pherocon V	34.0	d

[1/] Means followed by the same letter are not significantly different at p. = 0.05, Fisher's Protected LSD test.

The lowest catches of *P. relativus* males occurred with the Intercept A trap, probably because the opening in this trap was too small and restricted for easy entrance of responding bugs into the trap. These results indicate that the least expensive of these traps, Pherocon V, will perform very well in routine monitoring of *Phytocoris* populations in orchard crop systems. This trap, however, is designed for collection of small insects such as male scale (California red scale, San Jose scale) and collections of *Phytocoris* probably would be adversely affected if large amounts of debris, such as dried flower petals, sepals or dirt collected on the exposed trapping surfaces over a period of time, or if trap servicing intervals were too long. If this occurred, one of the larger, covered traps could be substituted but at a greater expense than the Pherocon V (or similar) trap.

Phytocoris pheromone dispenser trials

Work in 1995-96 with *Phytocoris relativus* pheromone applied to rubber septa lures had shown that release of the very volatile pheromone was rapid, and field longevity was unacceptably short. This led to research in 1997 to find other types of *Phytocoris* pheromone lures that would extend efficacy and reduce monitoring costs to growers.

New *Phytocoris* pheromone lures were compared in field trials to the standard rubber septa lures provided by Dr. Jocelyn Millar, U.C. Riverside, in a mature plum orchard at the Kearney Agricultural Center. Four modifications of a small polymer reservoir lure (PTRE I-IV) were assembled by pheromone chemists at the Czech Academy of Sciences, Prague, Czech Republic, and provided through IPM Technologies, Portland, OR. These lures were loaded with the same amount of the two-isomer *Phytocoris relativus* pheromone blend as was used on the U.C. rubber septa standard lures. Lures were placed in wing traps spaced 200 ft apart, using five replications of each lure type in a randomized complete block array. Traps were placed 7 ft above the ground, serviced daily for seven days, then at 3-4 day intervals, and rotated to the next position in the array after each count. The test was emplaced on April 30 and terminated on June 4, 1997. Two treatments of the U.C. standard lures were compared to the PTRE lures. One U.C. lure was replaced weekly during the trial; the other U.C. lure and the PTRE lures were not replaced.

The results of this trial showed the expected rapid loss of attractancy in the unreplaced U.C. standard lure after only seven days of field exposure (Table 2). The PTRE I, II, and III lures were still comparable to the fresh U.C. standard lures through 21 days, but after 28 days, all PTRE lures had collections of *Phytocoris* significantly lower than the standard. These data showed that *Phytocoris* lure longevity could be improved significantly over the original rubber septa lures. A second *Phytocoris* lure efficacy trial in 1997 compared the U.C. standard rubber septa lure and the PTRE III lure to a new *Phytocoris* solid substrate lure manufactured by Scenturion, Inc., Clinton, WA. This lure was designed to have extended attractancy, perhaps season-long, compared to other lures. Five replications of each lure type were used in standard wing traps and placed in an almond orchard near Selma, CA on July 1, 1997. Traps were hung ca. 7 ft high in trees at 200 ft intervals in a randomized complete block design and were serviced and rotated at least twice weekly through September 30, and then weekly until November 11 when the test was terminated. In this test, the U.C. lures were replaced at two-week intervals, the PTRE III lures were replaced twice at four-week intervals (July 29, August 26) and the Scenturion lures were not replaced over the 4.5 month duration of the test. The U.C. and PTRE

lures were loaded with 5.0 mg of *Phytocoris* pheromone blend, the Scenturion lures were loaded with a much higher (unspecified) amount of pheromone.. Data from this test were not analyzed statistically because of the differences in lure load rates.

The results of this test (Fig. 1) showed the expected biweekly oscillations typical of the U.C. rubber septa lures. After each lure change, *Phytocoris* collections increased dramatically for one week, then dropped rapidly during the second week of lure exposure. The PTRE lures collected more *Phytocoris* during the first two weeks of exposure, then fell below the number of bugs collected by fresh U.C. lures during the third and fourth weeks. This confirmed the results observed with these two lures in the earlier test in May 1997 at Parlier (Table 2).

Collections of *Phytocoris* males in the Scenturion baited traps far exceeded the other two lures after the first week of trapping. This difference in attraction and collection persisted throughout the test, probably due to a greater amount of pheromone initially loaded in the Scenturion lures, and a much larger surface area releasing the pheromone. The number of bugs collected by these lures is probably greater than necessary for adequate, routine monitoring of *Phytocoris* in orchards. However, these data show that solid dispensers hold considerable promise for improved long-life lures that use volatile pheromones such as *Phytocoris*.

The more consistent release of pheromone from the Scenturion lures also provided a better understanding of *Phytocoris relativus* population fluctuations over time than the other two dispenser types. The second generation (July-August) and third generation (September-October) of *P. relativus* shown in Fig. 1 are very similar to these two generations shown in *relativus* seasonal monitoring data (Fig. 2).

Table 2. *Phytocoris relativus* lure longevity trial, April 30 - June 4, 1997. Kearney Agricultural Center, Parlier, California[1/]

	Mean No. *Phytocoris* Per Trap							
	Lure Exposure Time-Days							
Lure Type	**1**	**2**	**5**	**7**	**14**	**21**	**28**	**35**
U.C. Standard [2/]	3.50 a	2.32 a	2.86 a	1.50 a	2.32 a	1.82 a	1.06 a	1.06 a
PTRE I	3.04 a	2.26 a	3.40 a	2.80 b	4.53 d	3.52 b	1.98 a	0.97 a
PTRE II	2.81 a	1.70 a	3.28 a	2.89 b	2.90 ab	3.46 b	2.02 a	1.97 a
PTRE III	2.94 a	2.17 a	3.14 a	2.86 b	5.56 e	4.22 b	2.05 a	1.09 a
PTRE IV	2.99 a	1.63 a	2.48 a	1.93 ab	3.57 bc	2.39 a	1.79 a	1.26 a
U.C. Standard [3/]	3.43 a	2.20 a	3.12 a	2.09 ab	4.11 cd	4.29 b	3.57 b	4.13 b

[1/] 5.0 mg/lure; five replications/treatment. Data transformed to $\sqrt{x+0.5}$. Means in columns followed by the same letter are not statistically different, p. = 0.05, Fisher's Protected LSD test.

[2/] Not replaced.

[3/] Replaced weekly.

Fig. 1

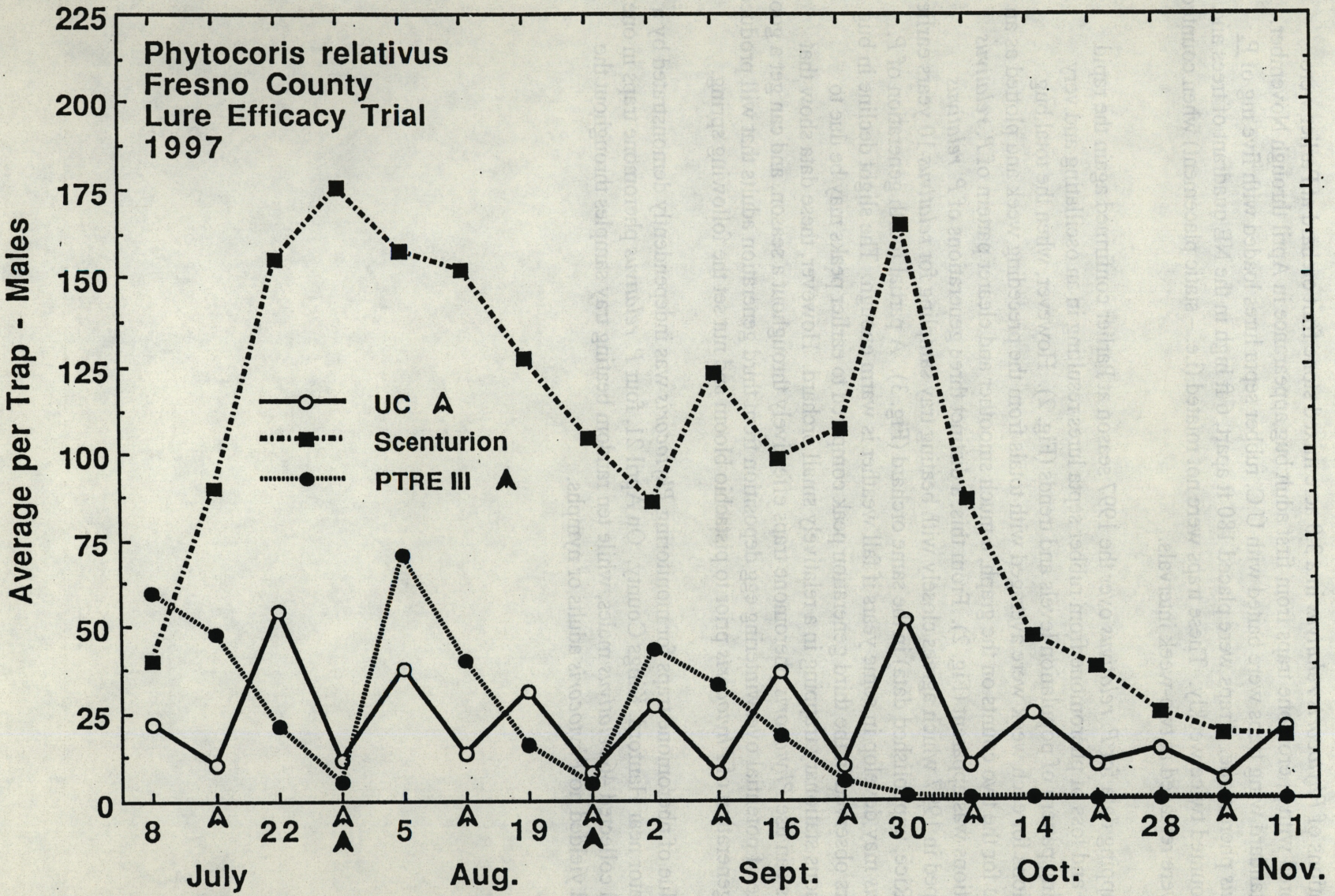

Figure 1. Collections of *Phytocoris relativus* in wing traps in response to three types of pheromone lures (rubber septa, liquid reservoir, solid matrix). Arrows indicate dates of lure replacement. Selma, Fresno County, CA.

***Phytocoris* seasonal monitoring**

Populations of *Phytocoris relativus* in a 3.0 acre mixed stone fruit orchard at Parlier were monitored with pheromone traps from first adult bug appearance in April through November. Four standard wing traps were baited with U.C. rubber septa lures loaded with five mg of P. *relativus* pheromone. Traps were placed 180 ft apart, 6 ft high in the NE quadrant of trees and were counted twice weekly. These traps were not rotated (i.e. – static placement) when counted; lures were replaced at two-week intervals.

The trapping data for *P. relativus* over the 1997 season at Parlier confirmed again the rapid release and loss of pheromone from rubber septa lures resulting in an oscillating and very confusing pattern of population levels and trends (Fig. 2). However, when the total bug collections for each week were averaged with totals from the preceding week and plotted as an average for the two counts on the graph, a much smoother and clearer pattern of *P. relativus* populations was apparent (Fig. 2). From this, a distinct three generations of *P. relativus* developed in 1997 which agrees closely with beating tray sampling for *relativus* 10 years earlier (R. E. Rice, unpublished data) in the same orchard (Fig. 3). A partial fourth generation of *P. relativus* may develop in some years if fall weather is warm enough. The slight decline in bug numbers observed in the third generation peak compared to earlier peaks may be due to continuous stationary trapping in a relatively small orchard. However, these data show that growers can use *Phytocoris* pheromone traps effectively throughout a season, and can get a good estimate of potential overwintering egg deposition from third generation adults that will produce a new generation of *Phytocoris* prior to pistachio bloom and nut set the following spring.

The value of pheromone traps for monitoring *Phytocoris* was independently demonstrated by a cooperator near Hanford, Kings County. On April 21, four *P. relativus* pheromone traps in one orchard collected 46 *relativus* males, while ten random beating tray samples throughout the orchard yielded no *Phytocoris* adults or nymphs.

Fig. 2

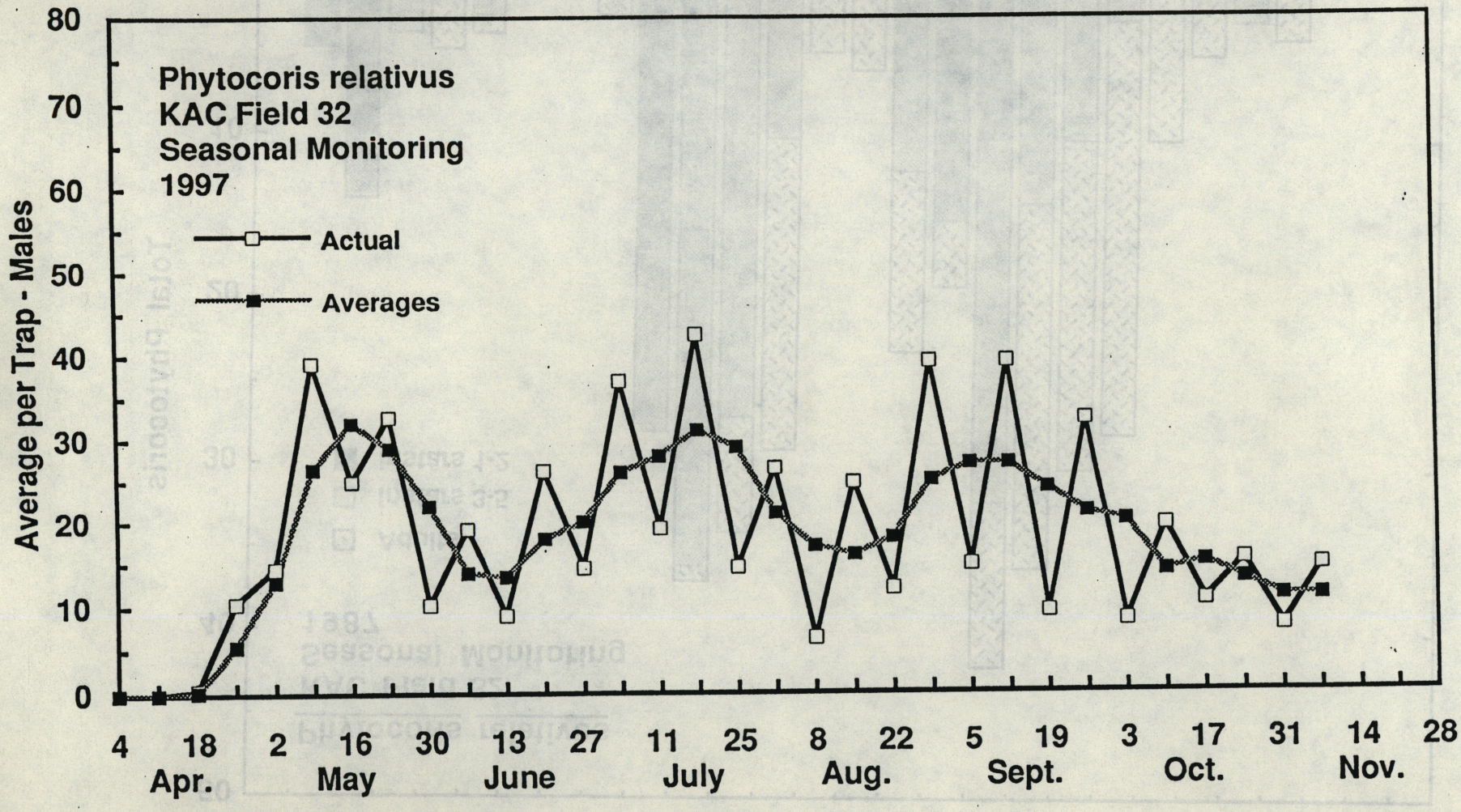

Figure 2. Seasonal monitoring of *Phytocoris relativus* using rubber septa lures in wing traps. Lures were replaced at two-week intervals. Kearney Agricultural Center, Parlier, Fresno County, CA.

Fig 3

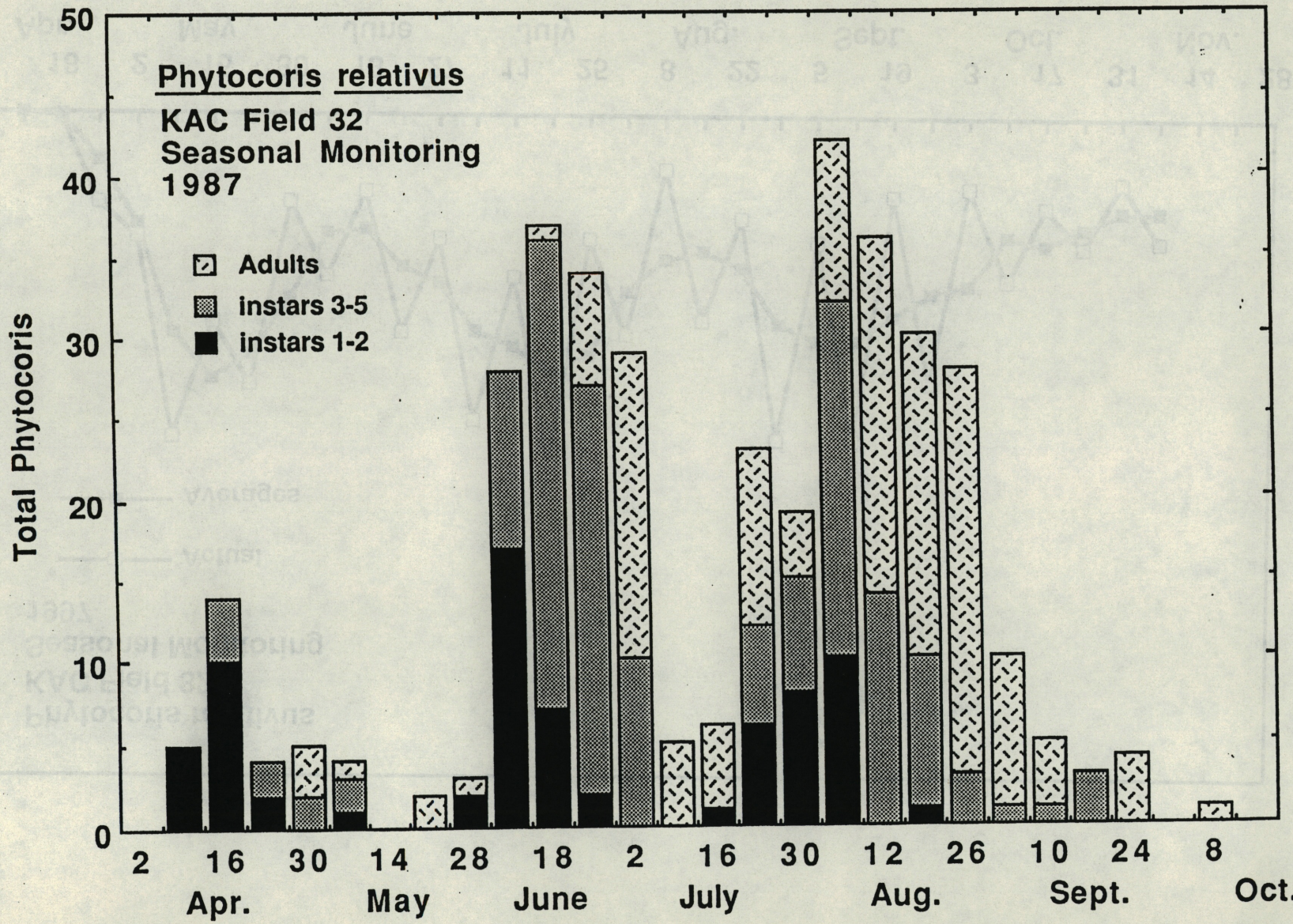

Figure 3. Beating tray collections of *Phytocoris relativus* in French prunes. Kearney Agricultural Center, Fresno County, CA.