

# Seasonal Flight Patterns Of *Anarsia lineatella* Zeller (Lepidoptera: Gelechiidae) In South-East Turkey\*

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**Abstract**—Seasonal monitoring of *Anarsia lineatella* Zeller was organized in five localities in Hatay province of South East Turkey: Alahan, Delibekirli, Soğuksu and Vakıflı in 2009 and in Alahan, Döver and Vakıflı in 2010. For the field work pheromone baits for *A. lineatella* purchased from CSALOMON® (Plant Protection Institute, Budapest, Hungary) and home-made sticky Delta traps of a transparent PVC foil were used. Catches of *A. lineatella* were observed in all of the investigated sites in both years. In 2009 the earliest catches were registered on April 22 in Alahan and the latest ones on October 28 in Delibekirli, In 2010 the earliest catches were observed in Alahan and Döver on April 24 and the latest ones were recorded on October 26 in Vakıflı. Only at the latter site three well defined flight periods, most probably representing three generations, were observed in both 2009 (end of April – end of May; beginning-middle of June – middle-end of July and beginning-middle of August – middle of September) and 2010 (beginning-middle of May – end of July, beginning of August – beginning-middle of September and middle of September – end of October). In the rest of the sites such periods were not so well defined – it seems that the first and second generation overlapped while the third one was more or less well defined.

**Keywords**—*Anarsia lineatella*; *Gelechiidae*; *pheromone traps*; *seasonal flight*; *Hatay*; *Turkey*

## I. INTRODUCTION

*Anarsia lineatella* Z. is an orchard pest distributed in West Europe, Mediterraneans, North Africa, Asia minor, Near East, Iran, India, Australia and North America [14]. The pest develops two generation in Central Europe:

Czech republic [7] and Slovenia [16] and three or four generations in South Europe: Italy [10], Bulgaria [5] and Greece [3].

*A. lineatella* is known as a serious pest throughout all regions of Turkey [2]. Its caterpillars damage on peach, apricot, nectarine, plum, cherry, almond and

apple. Previous studies on the biology of the pest in Adana, Mersin, Malatya and Bursa provinces revealed that the first moths appeared in April to May and the flight ended in October to November depending upon the [11]; [4]; [8]; [11]. However, in the study carried out in peach orchards of İzmir an earlier start of the flight - late March or early April, was found [1]. In different regions of Turkey, the pest develops 2 to 5 generations [13]; [11]; [4]; [8]; [12]; [2].

[15] identified two pheromone compounds in *A. lineatella* females: (E)-5 decenyl acetate and (E)-5-decenol in a ratio of 7:1. Later some more pheromone components were identified for this species but none of them was active in field [9]. Intensive field tests in Israel have shown that the optimal ratios of E5:10Ac and E15:10OH for attracting *A. lineatella* males were 72:28 or 83:17. In addition funnel traps was found to be more effective than sticky traps at high population levels of the pest while at the lower population levels the sticky traps were better [6].

Pheromone traps for seasonal monitoring of *A. lineatella* have already been used in different countries where the pest occurs, e.g. Czech Republic [7], Bulgaria [5], Greece [3] etc. In Turkey results of such monitoring were reported for Bursa province, Thrace region of Turkey [8], Adana and Mersin provinces, South-East Turkey [12]; [11]; [4] and İzmir and Aydın provinces, Aegean region of Turkey [1].

The goal of our investigations was to establish the patterns of the seasonal flight of *A. lineatella* in few localities in Hatay, east Mediterranean Turkey.

## II. Materials and methods

Sex pheromone baits for *A. lineatella* were purchased from CSALOMON® (Plant Protection Institute, Budapest, Hungary). For the field work we used home-made sticky Delta traps of a transparent PVC foil with removable sticky layers covered with TANGLEFOOT® (Grand Rapids, Michigan, USA) insect glue. The pheromone baits were renewed at five week intervals, as recommended by the producer and the sticky layers – after getting contaminated.

The monitoring was organized in five provinces in south-east Turkey: Alahan, Delibekirli, Soğuksu and Vakıflı in 2009 and in Alahan, Döver and Vakıflı in

2010; for details see Table 1. The traps were hung on the tree branches at a high of about 1.5 m. The traps were visited and the catches counted weekly. Data on temperature were obtained from the meteorological station for all locations in 2009 and 2010.

**Table 1.** Localities and terms of field observations, and crops in the orchards where traps were installed. In bold – the kind of the fruit-tree(s) on which the trap(s) were hung

Locality (number of traps)	Date of setting up the trap	Date of removing the traps, date	Crop
Alahan (1 trap)	15.IV.2009	13.XI. 2009	Pomegranate, apple, <b>peach</b> , olive and citrus
Delibekirli (1 trap)	15.IV.2009	13.XI. 2009	<b>Apricot</b> and pomegranate
Soğuksu (1 trap)	22.IV. 2009	13.XI. 2009	<b>Apricot</b> and pomegranate
Vakıflı (1 trap)	15.IV. 2009	13.XI. 2009	<b>Peach, plum, apricot, olive and citrus</b>
Alahan (2 traps)	15.IV. 2010	5.XI.2010	<b>Pomegranate, peach, olive and citrus etc.</b>
Dover (2 traps)	17.IV. 2010	5.XI.2010	<b>Peach, plum, apricot, olive and citrus trees</b>
Vakıflı (2 traps)	24 April 2010	5 November 2010	<b>Peach, plum, apricot, olive and citrus</b>

### III. Results

The flight patterns of the seasonal flight of *A. lineatella* in 2009 and 2010 in the investigated sites are presented on figure 1-4 and figure 5-7 respectively. Catches of *A. lineatella* were observed in all of the investigated sites in both years. In 2009 the most numerous catches were found in Delibekirli – 380 moths against 158 in Alahan, 211 in Soğuksu and 215 in Vakıflı. The earliest catches were registered on April 22 in Alahan. Although this was the first check of the trap after its installing in the field on April 15 and we can not exclude earlier flight, the single moth caught on the next visit indicates rather that this was the start of the flight. Most probably the start of the flight was missed in Soğuksu where the trap was installed on April 22 and 23 moths caught were registered at the first visit on April 29. The latest catches in 2009 were registered on October 28 in Delibekirli, the site where the population level as presenting by the number of moths caught was highest. The highest catches in 2009 was in Soğuksu on July 01 at 29,7 °C.

In 2010 the most numerous catches were observed in Dover–377 moths against 263 and 240 in

Alahan and Vakıflı respectively. The earliest catches were observed in Alahan and Döver on April 24. Again, because the catches were found at the first visit of the traps after their installing in the field we can not exclude earlier appearance of the moths at those sites. The highest catches in 2010 were in Döver and Alahan on May 01 and August 28, at 16,2 °C and 29,5 °C, respectively.

In 2009 only in Vakıflı three quiet well flight periods, most probably representing three generations, could be defined: end of April – end of May; beginning-middle of June–middle-end of July and beginning-middle of August – middle of September. In the rest of the sites such periods were not so well defined – it seems that the first and second generation overlapped while the third one was more or less well defined.

In 2010 again in Vakıflı three flight periods could be defined: beginning-middle of May–end of July, early August–beginning-middle of September and middle of September–end of October. In Alahan and Döver again only the third generation was more clearly separated.

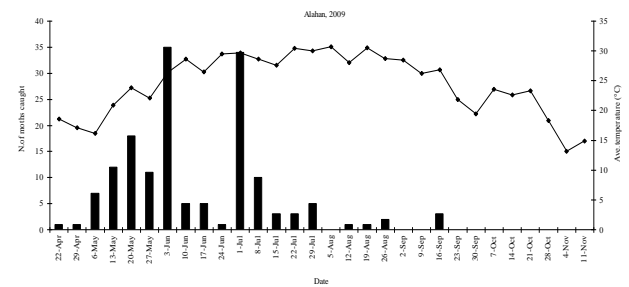


Fig. 1. Catches of *Anarsia lineatella* Zeller in Alahan, 2009; 1 trap per site.

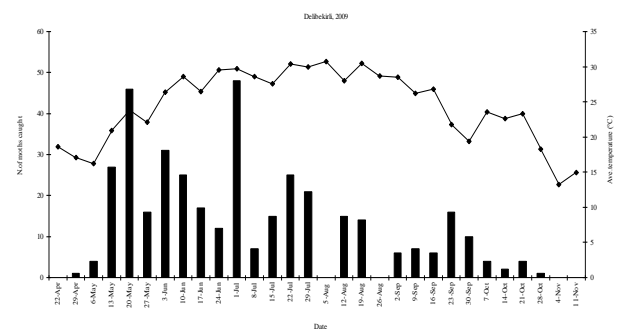


Fig. 2. Catches of *Anarsia lineatella* Zeller Delibekirli, 2009; 1 trap per site.

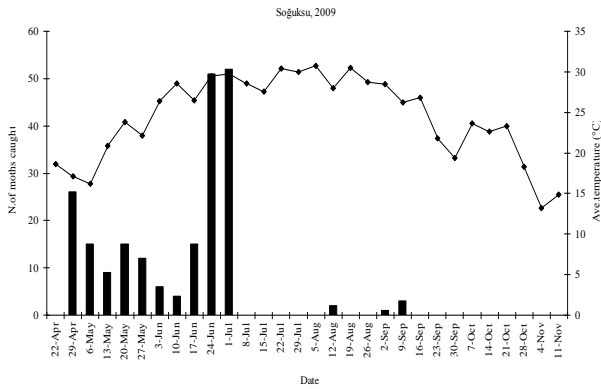


Fig. 3. Catches of *Anarsia lineatella* Zeller in Soğuksu, 2009; 1 trap per site.

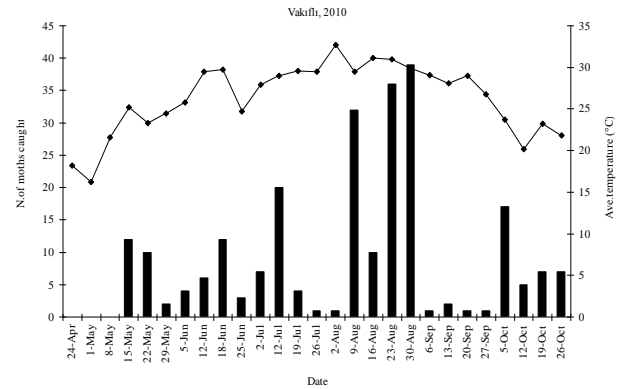


Fig. 7. Catches of *Anarsia lineatella* Zeller in Vakıflı, 2010; 2 traps per site.

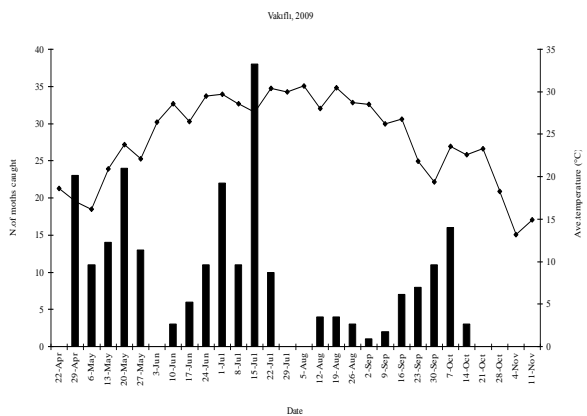


Fig. 4. Catches of *Anarsia lineatella* Zeller in Vakıflı, 2009; 1 trap per site.

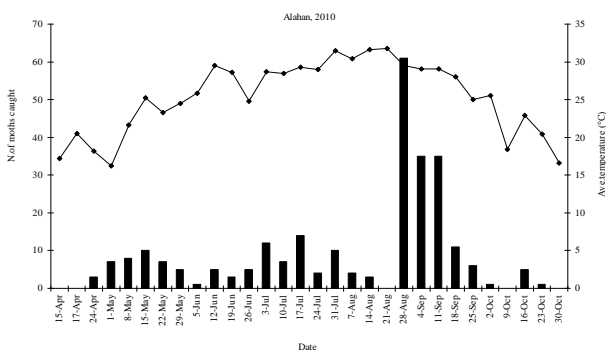


Fig. 5. Catches of *Anarsia lineatella* Zeller in Alahan, 2010; 2 traps per site.

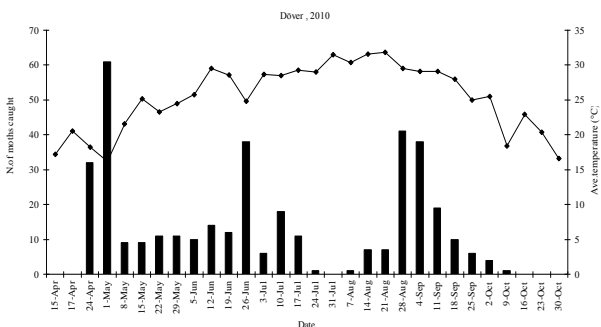


Fig. 6. Catches of *Anarsia lineatella* Zeller in Döver, 2010; 2 traps per site.

#### IV. Discussion

Sex pheromone traps for seasonal monitoring of *A. lineatella* have been used in several countries in Europe. In Central Europe two generation of the pest were revealed by means of pheromone traps: Czech Republic (Bohemia) [7] and Slovenia [16]. Three or four generations of the pest have been indicated by pheromone traps in South European: Bulgaria [5] and Greece [3].

Pheromone traps researches in Turkey have revealed different terms of seasonal flight of *A. lineatella* and different number of generations. [8] used pheromone traps for seasonal monitoring of the pest in 1983 in peach orchards in Bursa province. They found that the flight started on May 3 and lasted 162-169 days. They determined three flight periods) May 2 – end of June; beginning of July – middle of August; second half or end of August – October) which should correspond to three generations, including overwintering one. The results of seasonal monitoring of *A. lineatella* by pheromone traps in South-East Turkey, the region where the present investigation was organized, are somewhat contradictive. [12] reported about two main flight periods: May-July and August-September and two or three peaks of *A. lineatella* populations in apricot orchards in Malatya province in 2001-2002. The flight in these investigations started on May 3-10 and lasted until October 15-25. [4] reported about four-five adult flight peaks and four-five generation of *A. lineatella* per year in peach and nectarine orchards in Adana and Mersin province with the flight starting in April-May and ceased in November. [1], determined the fluctuations of the flight of *Grapholita molesta* Busck (Lepidoptera: Tortricidae) and *Anarsia lineatella* (Lepidoptera: Gelechiidae) by pheromones traps at peach orchards in Kuşadası, Sultanhisar (Aydın) and Selçuk (İzmir) provinces in 2005 and 2006. The results of this study showed that the adult flight of *A. lineatella* started in late March or early April and lasted up to the end of November. Air temperatures did not strongly influence during flight period of *A. lineatella* at all localities.

What could be concluded from the recent results obtained by us in the regions and years investigated is that the flight of *A. lineatella* starts in middle-late April and lasted until late October. Speculations

about distinct pest generations could be done only in few of the sites monitored, where more or less clear diminishing of the catches, corresponding to the bound between separate generations, was observed. As a whole, because of overlapping of the flight of moths of the different generations, pheromone trap monitoring of *A. lineatella* can not show clearly the start and end of the separate generations. We accept that our results show a presence of three generation of *A. lineatella* in the sites of the investigations but not exclude partial fourth one overlapping with the third generation.

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