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CONTRIBUTIONS TO THE STUDY OF WIRE WORMS (FAM. *ELATERIDAE*) POPULATION STRUCTURE AND BIOLOGY FROM BUCHAREST AND THE SURROUNDING AREA WITH PHEROMONE TRAPS

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Abstract

The results broaden the spectrum of species and biology of wire worms (Coleopteran order, Elaterid family). It was made a complex study, applying pheromone traps, resulting in information about the structure and bioecology of the family Elaterid Leach, numerical values of species with economically importance from Bucharest and the surrounding area. There were used VARb3 type traps for species A. ustulatus Schaller and A. rufipalpis Brulé and YATLOR funnel for species A. lineatus Linnaeus, A. litigiosus Rossi, A. obscurus Linnaeus, A. sputator Linnaeus, A. sordidus Illiger and A. brevis Candèze. The results of the dynamics of adult species genus Agriotes Eschscholtz highlighted trapping equipped with synthetic sex pheromone that the species Agriotes sputator Linnaeus appears first from soil, followed by A. brevis Candèze and A. rufipalpis Brulé in a period of 10 days, adults of species A. ustulatus Schäller appear last from the soil (late June or early July) due to different biological cycle of other species of the genus Agriotes Eschscholtz that overwinters both as larva and as adult, this species winters only in the larva stage. Agriotes litigiosus Rossi species was not collected in pheromone traps, indicating its absence in the research area.

INTRODUCTION

Many scientists, both globally and in our country, made detailed and complex studies on the biology and ecology of wire worms, recent research in this area have been undertaken by Furlan [1, 2, 3, 4], Parker [5]. In our country, the results of research in this area were done by different the authors: Radu and Greeceanu Alexandrina [6, 7], Florica Manolache et al. [8], Perju et al. [9], Margarit and others. [10]. A modern method of limiting wire worms is using synthetic sex pheromones. Esterk et al. [11] communicate the results of monitoring Agriotes Eschscholtz species using pheromone traps in several crops in the Netherlands. The main species which were monitored *Agriotes obscurus* L., *Agriotes lineatus* L., *Agriotes sputator* L. and *Agriotes ustulatus* Schall. Pheromone trap method is a new strategy for monitoring and control of harmful wire worms in plants cultures. This method was described by different authors, Furlan et al. [1, 2, 3, 4], Tóth et al. [12, 13, 14, 15], and in Romania by Radescu et al. [16]. The use of pheromone

traps is mainly aimed to determine pest and obtain information on their seasonal occurrence.

MATERIAL AND METHODS

To monitor the adult population we used the modern method of pheromone traps, described by Furlan et al. [1, 2, 3] and Tóth et al. [12, 15], which allowed us to capture a number of 2141 adult insects. We used specific pheromones for 8 species of the genus *Agriotes* Eschscholtz (*A. ustulatus* Schäller, *A. rufipalpis* Brullé, *A. lineatus* Linnaeus, *A. litigiosus* Rossi, *A. obscurus* Linnaeus, *A. sputator* Linnaeus, *A. sordidus* Illiger and *A. brevis* Candèze). We used traps type VARb3 [16], for the species *A. ustulatus* Schaller and *A. rufipalpis* Brulé and YATLOR funnel [16], for species *A. lineatus* Linnaeus, *A. litigiosus* Rossi, *A. obscurus* Linnaeus, *A. sputator* Linnaeus, *A. sordidus* Illiger şi *A. brevis* Candèze. We followed the dynamics of adult insects, the population and existing species in relation to climatic conditions of the studied area and selectivity of pheromone, which was high. We installed the traps on the ground in 2005, 2006, 2007, in sets, in a straight line at 20 m distance between traps in biotopes fruit orchards (USAMV-Bucharest) and alfalfa (Mogosoaia, farmer Gherlan Mihai) and pheromone lures were replaced from every 30 days. We controlled and noted traps weekly from date of installation in field (end of March) until traps could not have been catching for two weeks (end of August). Fauna collected was determined at level of genus and species, with identifying books of Dolina [17, 18, 19], Jagemann [20], Panin [21] and binocular magnifier MS XX.

RESULTS AND DISCUSSION

On the genus *Agriotes* Eschsch. adult collection using pheromone traps established their dynamics. The adults of *Agriotes lineatus* L. emerged from the soil in late April and early May until late July. The adults flight was reduced, flight distance rarely exceeding 100 meters. The maximum flight curve was recorded in the second decade of June (Figure 1).

The evolutionary cycle of the species *Agriotes obscurus* L. is 4-5 years, over winter in the soil as the larva of different ages and adults. Adults appear in August and remain in the soil, lodges stern until the following spring, coming from the soil surface from the third decade of May until the second decade of July. Maximum flight curve was recorded in the second decade of June (Figure 2).

The adults of species *Agriotes sputator* L. leave the soil surface in late March early April. The flight is spread over a long period (120 days). Maximum flight curve was recorded in the second half of June (Figure 3).

The evolutionary cycle of the species *Agriotes ustulatus* Schaller is 5 years. Unlike other species of the genus *Agriotes* Eschscholtz, this species over winters only in

the larval stage at various ages. The active period of adults is short (50 days), maximum flight was recorded in the third decade of July (Figure 4).

The evolutionary cycle of *Agriotes sordidus* Illiger species takes place over 2-3 years, over winters in the soil as the larva of different ages and adults. In the last year of development, in May, the larvae turn into pupae in the ground inside the lodges built of particles of soil. Pupae stage takes on average 16 days at a temperature of 25^0C, after emerging adults who remain in the soil until the following spring when they come out at surface from May until the second half of July, with an average flight (80 days). In the area investigated, the maximum flight was recorded in the second decade of June (Figure 5).

The *Agriotes brevis* Candèze has a generation in 2-3 years as larva over winter in soil in different ages and as an adult. In the last year of development, in May, takes place pupal stage, stage lasting on average 15-20 days after emerging adults who remain in the soil until the following spring. Adult insects emerging from the ground from the second decade of April, their flight is till the end of July (110 days), maximum recorded flight into the second decade of June (Figure 6).

In the area studied, the adults of species *Agriotes rufipalpis* Brullé occur in soil from the second decade of April and until the second decade of August (130 days long period), with a maximum flight in the second decade of June (Figure 7). There are not captures of *A. litigiosus* Rossi on pheromone traps.

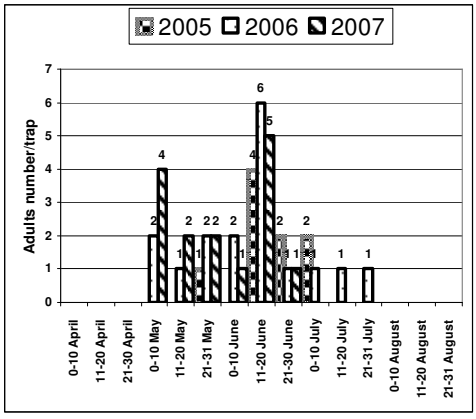

Fig. 1. Flight curve of adult species *A. lineatus* L.

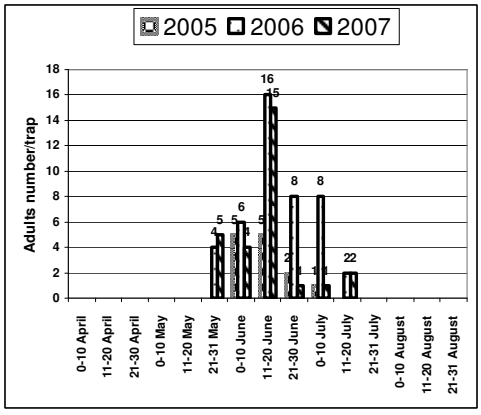

Fig. 2. Flight curve of adult species *A. obscurus* L.

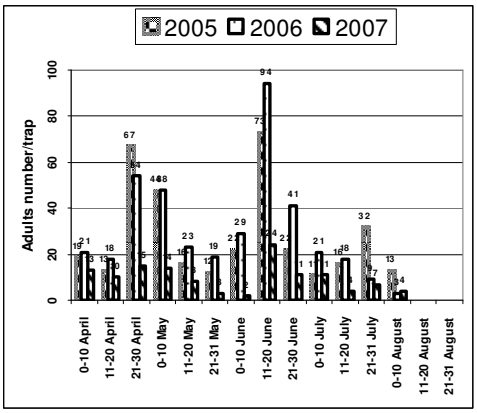

Fig. 3. Flight curve of adult species *A. sputator* L.

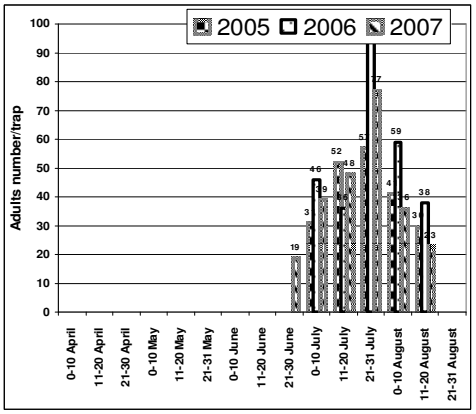

Fig. 4. Flight curve of adult species *A. ustulatus* Schäll.

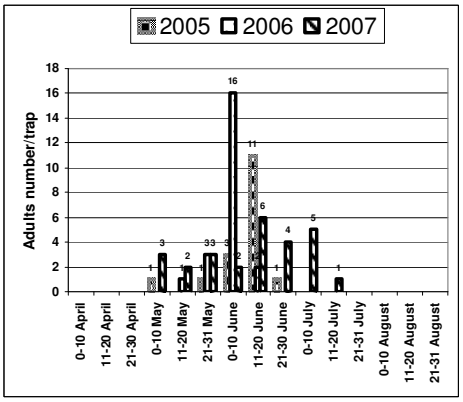

Fig. 5. Flight curve of adult species *A. sordidus* Illig.

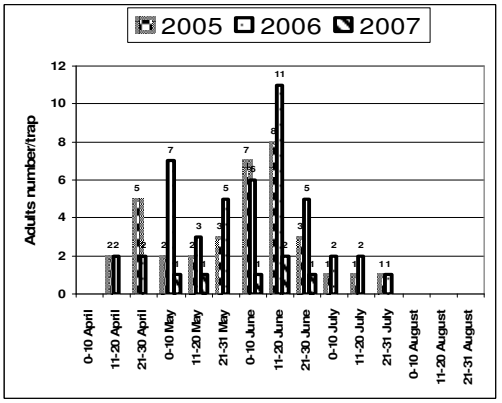

Fig. 6. Flight curve of adult species *A. brevis* Candèze

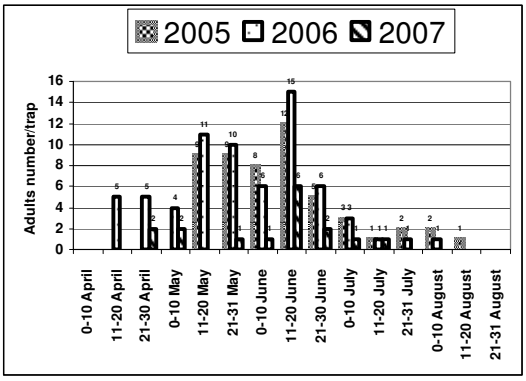

Fig. 7. Flight curve of adult species *A. rufipalpis* Brullé

The data presented on the dynamics of adult species genus *Agriotes* Eschscholtz highlighted by traps equipped with synthetic sex pheromone that *Agriotes sputator* L. appear first from soil, followed by *A. brevis* and *A. rufipalpis* Brulé Candle in a period of 10 days. Our data referring on the time when the adult insects emerge from the soil, existing species in studied area, the population level, maximum flight, provide the information necessary to improve methods of forecasting and warning for control of wire worms adults stage and confirm the effectiveness of sex pheromone traps equipped with synthesis as a method of studying bio ecology of these pests.

CONCLUSIONS

1. The use of synthetic sex pheromone is a new strategy for monitoring and control of wire worms and allowed studying their bio ecology providing accurate data on adult emergence from the soil, their dynamics, and population structure.
2. The results of the dynamics of adult species genus *Agriotes* Eschscholtz highlighted that trapping with synthetic sex pheromone results that *Agriotes sputator* L. appears first from soil, followed by *A. brevis* Candèze şi *A. rufipalpis* Brullé in a period of 10 days, adults of species *A. ustulatus* Schällér appear last from the soil (late June or early July) due to different biological cycle of the other species of the genus Agriotes Eschscholtz that winters both as larva and as adult, this species winters only in the larva stage.
3. The species *Agriotes litigiosus* Rossi was not collected in pheromone traps, indicating it's absence from the analyzed zone. Our research confirms data from literature concerning the area of spread of this species.

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