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Research Article

FIRST RECORD OF *ERYTHMELUS* (*PARALLELAPTERA*) *PANIS* (ENOCK, 1909) (HYMENOPTERA: MYMARIDAE) IN TURKEY, ASSOCIATED WITH *STEPHANITIS PYRI* (FABRICIUS, 1775) (HETEROPTERA: TINGIDAE)

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ABSTRACT. In this study, we investigated the parasitoids of *Stephanitis pyri* (Fabricius, 1775), this study was performed out in Tekirdağ province in 2011-2012 and 2022. As a result of the study, *Erythmelus* (Parallelaptera) *panis* (Enock, 1909) (Hymenoptera: Mymaridae) was recorded for the first time in the fauna of Turkey.

Keywords: *Erythmelus* (*Parallelaptera*) *panis*, *Stephanitis pyri*, *Tekirdağ, Turkey*

INTRODUCTION

The Chalcidoidea superfamily includes important parasitoids of insect pests [1,2]. About 22,000 species have been identified in this superfamily. The species belonging to this superfamily are quite small. For instance, the species, *Dicopomorpha echmepterygis* from the Mymaridae family is 0.11 mm long, probably the smallest known insect on earth. Members of the Mymaridae family, which are reported to contain 103 genera and 1424 species, are known as egg parasitoids of the insects. *Erythmelus* Enock, 1909 species in this family are cosmopolitan and egg parasitoids of important insect pests in agriculture [3]. It is known that these species parasitize the eggs of important insect pests in the belonging to Miridae and Tingidae (Hemiptera) families [4,5].

Different Tingidae species are known for the lace-like appearance of their front lacewings. Therefore, they are generally known as lace bugs in the world [6]. These Tingidae family members, which are mostly smaller than 5 mm in length, feed on plants, by sucking on the underside of the leaves of the host plants. As a result of their suction, they cause early defoliage of leaves and weakness of plants. Some species cause gall formation [7]. Within the Tingidae family, there are 2,500 species belonging to approximately 300 genera in the world and 89 species in Turkey [6,8]. It is known that many species of economic importance belong to the Tingidae family [9]. In this family; *Corythucha arcuata* (Say), *Corythucha ciliata* (Say), *Monosteira lobulifera* Reuter, *Monosteira unicostata* (Mulsant & Rey), *Physatocheila confinis* Horváth and *Stephanitis pyri* (Fabricius) species are reported as important pests in Turkey [7,10-14]. *Erythmelus* spp., are known to be associated with a few Miridae and Tingidae (Hemiptera) [5].

Stephanitis pyri, which is among the aforementioned species, is a common insect of the countries around the Mediterranean and the Palearctic region [15]. It is found in almost every region of Turkey. It causes damage especially to stone and pome fruit trees and ornamental plants of the Rosaceae family. It sucks plant sap under the host leaves and causes the leaves to dry. In this way, it causes weakness of its host, drop of fruits and, loss of yield and fruit quality [7,15]. Many studies reported that this species in the Tingidae family is one of the important insect pest in Turkey and the world [7,9,12,14-28].

According to many published studies, *Stephanitis pyri* has the potential as economically harmful insect. Also, it is the only species in the Tingidae family in Turkey, which is recommended for chemical control by the Ministry of Agriculture and Forestry [29]. There are two registered active substances (Malathion, Dimethoate) as the insecticide for this species in Turkey [30]. Accordingly, studies have been carried out in order to search for alternative to the negative effects of chemical control in its control [31,32]. This study, it is aiming to determine the parasitoids of *S. pyri* in Tekirdağ province and the first records of whether there is the case of being an alternative to chemical control or reduction of insecticide usage.

MATERIALS AND METHODS

The main material of the study are; Adults, nymphs and egg stages of *S. pyri* and its host plants. Surveys were carried out in the districts of Malkara, Saray, Süleymanpaşa and Şarköy in Tekirdağ province in 2011-2012, in the beginning of April- at the end of October, and only in the district of Süleymanpaşa in 2022. Sampling was performed by visual control and Steiner funnel [33]. Survey areas were controlled every 10 days.

Leaf samples contaminated with eggs, nymphs and adults were brought to the laboratory to determine the parasitoids. Leaf samples were cleared of other insect species under the stereomicroscope. Each biological stage of *S. pyri* was transferred to a petri-dish (9x1 cm) and to a glass tubes (25x150 mm) separately. Parasitoid adults emerging from each life stage with daily observations were placed in 70% ethyl-alcohol and labeled.

The identification of the resulting *E. panis* and *S. pyri* was made by Dr. Emilian PRICOP (Natural Sciences Museum, Piatra Neamţ, Petru Rareş No. 26, RO-610119, city: Piatra Neamț, Neamț County, Romania)'s is Dr. Berend AUKEMA (Kortenburg, 31 6704 AV Wageningen, Made by Netherland respectively).

RESULTS AND DISCUSSION

Erythmelus (*Parallelaptera*) *panis* (Enock, 1909) (Hymenoptera: Mymaridae) was recorded for the first time in Turkey with this study. As a result of the surveys, the species was found only in Süleymanpaşa district of Tekirdağ province. It was determined that very few collected species parasitized *S. pyri* eggs on pear and apple trees. Parasitized *S. pyri* eggs were collected in July, August and September.

Examined material: Tekirdağ, Süleymanpaşa, Hürriyet, 16 m (40°58,701'N, 27°33,086'E), 01.IX.2011, 5 specimens (1♀+4♂), *Pyrus communis*; 5 m (40°58,784'N, 27°33,138'E), 20.VII. 2011, 3 specimens (3♂), *Pyrus malus*; 44 m (40°58,950'N, 27°31,341'E), 12.IX.2012, 5 specimens (2♀+3♂), *P. malus*; 20 m (40°59,611'N,

27°34,780'E), 09.IX.2022, 10 specimens (9♀+1♂), *P. malus*; Değirmenaltı, 20 m (40°59,150'N, 27°34,691'E), 06.VIII.2022, 10 specimens (3♀), *P. communis*.

Distribution: Austria, Belgium, Bulgaria, Canary Islands, Cape Verde Islands, Congo, Democratic Republic of Congo (Zaire), Denmark, Finland, France, Germany, Greece, Hungary, India (Kerala, Puducherry, Tamil Nadu), Iran, Italy, Kenya, Kirgizia, Mali, Moldova, Netherlands, Norway, Peoples' Republic of China (Beijing (Peking), Xinjiang Uygur (Sinkiang)), Pakistan, Poland, Romania, Russia (Karachai-Cherkess AR, Primor'ye Kray), Rwanda, Serbia, Spain (Balearics), Sweden, Switzerland, Turkmenistan, United Kingdom, England [3,4,24,34-38].

Hosts: *C. ciliata*, *Habrochila ghesquierei* Schouteden, *S. pyri*, *Stephanitis typica* (Distant) ve *Tingis ampliata* (Herrich-Schaeffer) [3, 4,34, 39-42].

Diagnosis (Female): General color brown; head and lateral part of metasoma dark brown (Figure 1). Antenae, legs, axilae and basal part of the metasoma light brown. Antennae, legs, axillae and basal part of the metasoma light brown. Antennae: scape long 2,5x as long as pedicel, 4x longer than wigth; F1 and F2 equal in length; F3 - F4 combined, about equal in length with F5; F5 with two sensory ridges. Clava (club) with 5 sensory ridges, 4,5x longer than wide. Forewing about 7x as long as wide (FWL/FWW = 7), the longest marginal cilia 4-4,2x maximal forewing width. Mesosoma is usually notably longer than metasoma; ovipositor longer than gaster, a little exserted beyond apex (about 0,8); Ovipositor/ metatibia ratio is about 1,4 (modified from [34]). *E. panis* is a highly variable species, antennae and wings may vary and also the body color may vary from dark brown to light Brown. (Abbreviations: F1, F2, F3, F4, F5 = articles of the antennae or funicles; FWL= fore wing length; FWW = fore wing width).

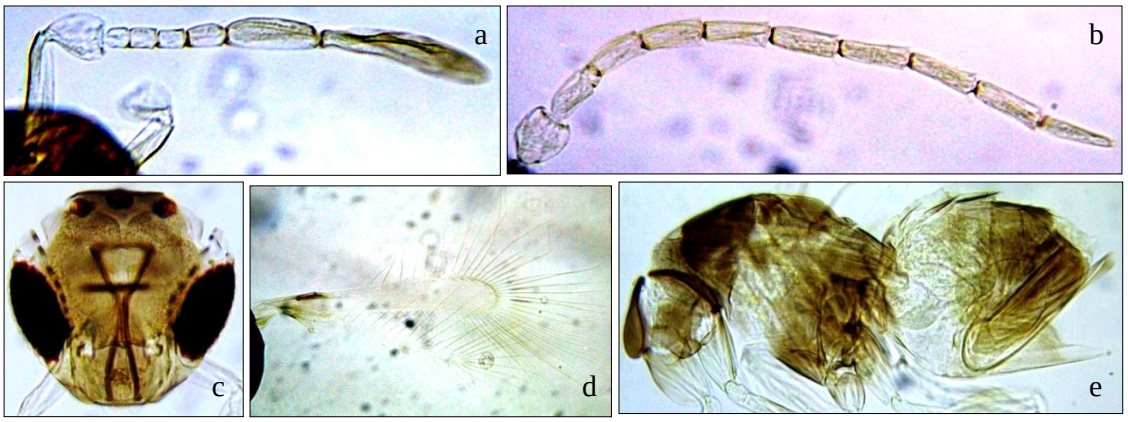

Figure 1. *Female antennae (a), male antennae (b), head (c), wing (d) and female general body view (e) of Erythmelus (Parallelaptera) panis (Picture by Dr. E. Pricop)*

It has been reported that many species belonging to the *Erytmelus* genus from the Mymaridae family, Hymenoptera order, are egg parasitoids of the Tingidae family species, and *E. panis* is the best known and rarely collected egg parasitoid of *S. pyri* among these species [4,5,9,43]. It has been determined that this species parasitizes the eggs of the Pear lace bug on apple trees [24,35]. Another species is *Erythmelus* (*Paralellaptera*) *teleonemiae* (Subba Rao) in this genus. Maral et al. [44] made the first record of this species as egg parasitoid of *Monosteira lobulifera*. In addition, there were also records that this species was egg parasitod of *S. pyri* [4].

In the literature, there are studies in which the hosts of species belonging to the genus *Erythmelus* were determined. It has been reported that *Erythmelus* (*Parallelaptera*)

rex (Girault) may be one of the most common and collected species [1,2]. It has been determined that this species parasitizes the eggs of *Corythaica venusta* (Champion), *Dictyla nassata* and *Derephysia foliacea* (Fallén) species [4]. It was determined that *Erythmelus tingitiphagus* (Soares) is the parasitoid of *Corythaica cyathicollis* (Costa), *Corythaica monacha* (Stål), *Gargaphia lunulata* (Mayr), *Leptodictya tabida* (Herrich-Schaeffer) and *Leptopharsa heveae* Drake & Poor specie. [4,45]. *Erythmelus* (*Parallelaptera*) *vladimir* S. Triapitsyn et Fidalgo belonging to this genus is the natural enemy of the *Acanthocheila armigera* (Stel) species [46]. It was also recorded that *Erythmelus clopomor* Triapitsyn is parasitoid of *C. arcuata* [47] and *Pseudacysta perseae* (Heidemann) [48,49].

CONCLUSION

E. panis was first time recorded after surveys in Tekirdağ province. In this study, limited number insects were collected and its prevalence was low in the surveyed areas in Tekirdağ province The eggs of *S. pyri* are 0.41 mm in length and 0.12 mm in width [15], and *S. pyri* lays eggs on the leaf tissue. For this reason, in order to observe the eggs of the species, the leaves should be brought to the laboratory and examined under stereomicroscope. It is important to keep the leaves fresh in order to observe the emergence of *E. panis* adults from these eggs. In addition, *E. panis* species is too small to be seen with the naked eye. For all these reasons, it is very difficult to detect *E. panis* in field conditions. In addition to these, there is a need for a suitable method for keeping leaves with eggs fresh under laboratory conditions. In addition to these, there is a need for a suitable method for keeping leaves with eggs fresh under laboratory conditions. These existing difficulties make it difficult to observe *E. panis*, which prevents the determination of the true population and its distribution in the field. Experts studying on the genus *Erytmelus* also reaported that species belonging to this genus had an important role in classical biological control programs and were effective in regulating populations of many agriculturally harmful Tingidae family species. However, it has been stated that these parasitoids, which have the potential to be used in biological control programs, can not be used in practice due to the lack of sufficient information on their ecology and biology [4,36,50].

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