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**Population Fluctuations of *Tingis sideritis* Štusák (Heteroptera, Tingidae)
on Wild Mountain Tea *Sideritis scardica* Griseb. (Lamiaceae)
of Mount Vermion in Greece**

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Abstract: The aim of this study was to record the population and the fluctuations of *Tingis sideritis* Štusák, on a wild population of *Sideritis scardica* Griseb. of mount Vermion, Greece. This is the first reference for the presence of *T. sideritis* in Greece, a new enemy of *S. scardica*. In year 2005, recordings of *T. sideritis* population started at 15 of May and lasted until 4 of July. These recordings were repeated every 10 days (6 periods in total) on 50 wild tea plants selected in random. Two branches of each wild tea plant were studied. In year 2006, recordings of *T. sideritis* population started at 12 of May and lasted until 1 of July (with the same procedure as in 2005). In the laboratory, the insects of each branch were measured under a stereoscope and total replications were 100 (50 plants X2 branches). Period of recordings x year interaction found statistically significant at $p < 0.001$. In general, year 2006 showed lower total number of adult insects in comparison to year 2005, may be due to the presence of natural enemies of *T. sideritis*, but most important is the different population fluctuations between the two years and it seems to be a common biological phenomenon in insects. If we take in consideration that a *Sideritis* plant may possess about 9-10 branches, then we can find about 100 adult insects/plant.

Key words: *Tingis sideritis*, *Sideritis scardica*, population fluctuations

INTRODUCTION

S. scardica Griseb. (Lamiaceae), is the wild mountain tea of Greece, usually found in mountain Olympos and in some other mountains of Greece such as Taygetos, Paikon, Voras, Vermion etc. In general, genus *Sideritis* sp. has no serious enemies. The most common enemy found in South-Eastern Europe is *T. sideritis* Štusák, 1973 (Heteroptera, Tingidae). *T. sideritis* sp., was found for the first time in Bulgaria on *S. montana* L. (basic host-plant) and later on *S. comosa* Stank (Štusák, 1973). Little is known about *T. sideritis*, a grayish brown with dark spots insect of the family Tingidae, usually dimorphic (macropterous and brachypterous) with blackish armed head (Štusák, 1973), a bug of the family Tingidae with many other species that are enemies in various cultivations (Drake and Ruhoff, 1965; Štusák, 1974). Generally, there are not references of great damages on *Sideritis* sp. Most important are considered the immature stages of these bugs and thus many studies have been conducted in the past (Mathur, 1955; Maa, 1957; Štusák, 1968, 1973, 1974). *Sideritis* has many species but all can be distinguished by proper keys of recognition (Wetmore, 1996).

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The aim of this study was to record the population and the fluctuation of *T. sideritis* on wild population of *S. scardica* of mount Vermion, Greece. This is the first reference for the presence of *T. sideritis* in Greece, a new enemy of *S. scardica*.

MATERIALS AND METHODS

After many years (2000-2006) of monitoring various insects on wild species, the laboratory of Entomology of the Technological Education Institution of W. Macedonia/Branch of Florina, Department of Plant Production, discovered *T. sideritis* on mount Vermion in Greece in 2005. In the region of Servia, Kozani (on mount Vermion) a population of wild mountain tea (*S. scardica*) was selected for the study of *T. sideritis*. The study was conducted in years 2005 and 2006 at an altitude of 650 m and the total area covered by the wild mountain tea population was nearly 0.4 ha. In year 2005, recordings of *T. sideritis* population started at 15 of May and lasted until 4 of July. These recordings were repeated every 10 days (6 periods in total) on 50 wild tea plants selected in random. Two branches of each wild tea plant were studied. In year 2006, recordings of *T. sideritis* population started at 12 of May and lasted until 1 of July (with the same procedure as in 2005). In the laboratory, the branches were shaken by a small vibrator and the insects were collected on a membrane. Then the insects of each branch were measured under a stereoscope and total replications were 100 (50 plants X 2 branches). Afterwards these insects were killed in a small glass bottle (6×2.5 cm) filled with pure alcohol. The genus recognition was easy according to earlier studies (Štusák, 1974) but species *T. sideritis* was specified by the Department of Entomology at the National History Museum, London-England, from specimens sent for this purpose. ANOVA was based on two factors: the year (2005 and 2006) and the period of the recordings (6 in each year). Transformation of data and ANOVA were based on the procedures described by Snedecor and Cochran (1980) as they were utilized in previous studies on different insect species by Deligeorgidis and Ipsilandis (2004) and Deligeorgidis *et al.* (2007). Original data are reported in tables.

RESULTS AND DISCUSSION

Figure 1 shows the adult insect *T. sideritis* present in Greece, identified by the Department of Entomology at the National History Museum, London-England, about 2 mm long and usually

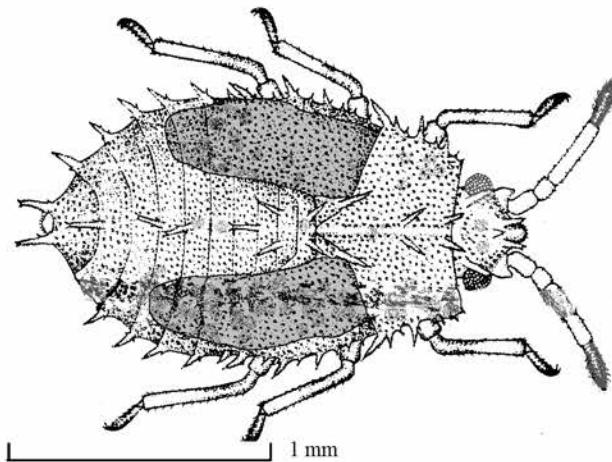


Fig. 1: *Tingis sideritis*, adult insect, brachypterous (First reference in Greece, adaptation from our observations)

Table 1: Mean number of adult insects (*T. sideritis*) at each period of recording (6 periods), for the two years (2005 and 2006) and mean of the years (period x year interaction found statistically significant at $p < 0.001$)

Period of recording	2005	2006	Mean
1st	8.15	6.62	7.39
2nd	8.81	7.75	8.28
3rd	10.63	9.65	10.14
4th	11.57	8.48	10.03
5th	12.17	11.01	11.59
6th	4.61	5.12	4.87

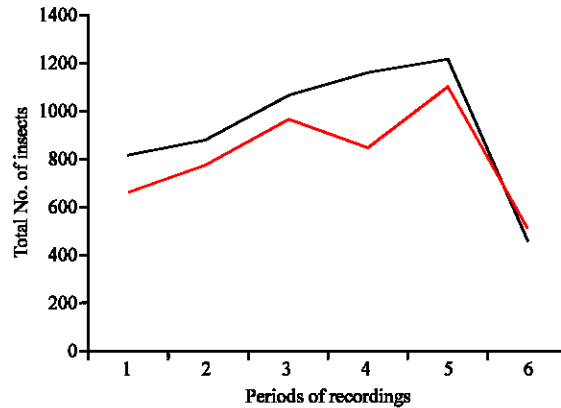


Fig. 2: Population fluctuation across the six periods of recordings for the two years (2005 = upper line and 2006 = lower line)

brachypterous. Table 1, shows original data from the two years (2005 and 2006). Mean number of adult insects (*T. sideritis*) from the selected 100 branches at each period of recording (6 periods) within each year are included and additionally, the mean of the years (period x year interaction found statistically significant at $p < 0.001$). In year 2005 there were found 4.61-12.17 adult insects/branch, while in 2006 about 5.12-11.01 adult insects/branch. Figure 2 shows population fluctuation across the six periods of recordings for the two years (2005 and 2006). It is obvious that, the two years had a different total number of adult insects and a different distribution across the periods of recordings. In general, year 2006 showed lower total number of adult insects in comparison to year 2005, may be due to the presence of natural enemies of *T. sideritis*, such as some birds or a few mites (A.C. Bent and P.N. Deligeorgidis, unpublished data), but most important is the different population fluctuation between the two years and it seems to be a common biological phenomenon in insects (Deligeorgidis *et al.*, 2007). Year conditions are an important parameter for the development of insects and this was obvious because of the interaction with the period of recordings, where there was found a different population density for the two years. In year 2005 there was an increasing insect population until the sixth period of recording where started the decreasing period (in early July), possibly due to a renewal of insect population (a new generation) and the maturity of host plants of *Sideritis*, which become harder. A part of the population may migrate to other host plants. Up to now, only *S. montana* L., *S. comosa* (Rochel) Stank and *S. taurica* Steph are referred as host plants of *T. sideritis* (Štusák, 1973), but *S. scardica* Griseb., *S. athoa* Papan. and Kokkini and other wild species may included too, according to our newer observations on Greek *Sideritis* species. In year 2006 there were two phases of decreasing population: in the fourth and sixth period of recording. The first phase of decreasing may be due to an extensive renewal of population in relation to the lack of abundance of food, for this specific year. If we take in consideration that a *Sideritis* plant may possess about 9-10 branches (Goliaris and Roupakias, 1997, 1998), then we can find about 100 adult insects/plant.

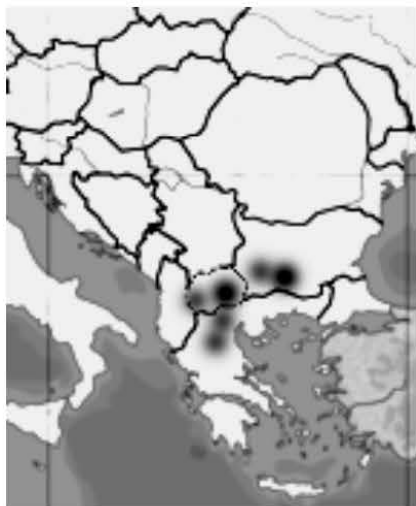


Fig. 3: Possible distribution of *Tingis sideritis* in South-Eastern Europe (Greece, Bulgaria, FYROM)

Figure 3 presents possible distribution of *T. sideritis* in South-Eastern Europe (Greece, Bulgaria, FYROM) according to present study and previous data (Štusák, 1973, 1974; Périkart, 1983; Périkart and Golub, 1996). Monitoring of this species will continue because of the importance that may have for the productivity of *S. scardica*.

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