

Megaphragma Timberlake (Hymenoptera: Trichogrammatidae), a newly recorded genus from Romania, with notes on morphology and taxonomy

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Abstract. The present paper represents a contribution to the knowledge regarding the current taxonomy and distribution of the rarely collected genus *Megaphragma* Timberlake. Genus *Megaphragma* Timberlake (Hymenoptera: Trichogrammatidae) is newly recorded from Romania. In our paper we provide illustrations that will help species identification. Regarding species habitat and hosts some notes are also given.

Key Words: *Megaphragma* sp. near *mymaripenne*, egg parasitoids, first record, Romania.

Introduction. The species that belong to *Megaphragma* Timberlake, a genus probably cosmopolitan, remain poorly known in Europe. This paper is justified because practically no data was published on the species of *Megaphragma* from Romania. *Megaphragma* Timberlake is here recorded for the first time from Romania. The material was collected by the first author and identified by both authors. Our specimens (measuring less than 0.3 mm) probably belong to the smallest insect species recorded from Romania.

Genus *Megaphragma* and species *Megaphragma mymaripenne* were described and properly illustrated by Timberlake (1924). For genera identification, a useful identification key was published by Pinto (2006). For species identification important works were published by Delvare (1993), Viggiani (1997), Viggiani & Bernardo (1997), Pintureau et al (1999) and Viggiani et al (2009). Viggiani & Bernardo (1997) provided also new data on the biology of the two European species. Noyes (2014) provided the database. For our study, the specimens of *Megaphragma* Timberlake were collected during 2010–2014 from different locations in Eastern Romania. All specimens are deposited in the insect collection of the Department of Biology, "Alexandru Ioan Cuza" University of Iasi, Romania. For species distribution, all regions are given according to Noyes (2014). Beside the Trichogrammatidae, also the Mymaridae are very small and exclusively egg parasitoids, important to the ecological balance (Pricop 2013). This paper continues our previous studies on the egg parasitoids of economic importance for Romania.

Material and Method. The species have been collected with an entomological sweep-net from forest vegetation and reared from parasitized eggs. The material was collected from some areas of Iasi (Figures 1a, b), Moldova Province (Romania). For accurate examination and measurements two specimens were slide mounted in Canada Balm. We have illustrated the morphology of the specimens utilizing microphotographs obtained with a "Canon" digital camera attached to the IOR optical microscope. We have illustrated the most discussed characters in this paper: female antennae, wings, legs, body and habitus of few specimens. The map was made using ArcView GIS 3.1 software. Abbreviations: elev. = elevation; F = funicle segments (articles); Leg. = the collector; UAIC = "Al. I. Cuza" Univ. of Iasi, IS = Iasi county; μm = micrometers (microns).

Results and Discussion. The Trichogrammatidae are poorly surveyed in Romania. Only eight Trichogrammatidae genera were previously recorded from Romania: *Lathromeris* Girault, *Oligosita* Walker, *Ophioneurus* Ratzeburg, *Prestwichia* Lubbock, *Pseudoligosita* Girault, *Trichogramma* Westwood, *Ufens* Girault and *Uscana* Girault. Regarding the Trichogrammatidae genera, previously recorded from Romania, work on fauna, taxonomy and biology was done by few specialists; we mention the studies of Botoc (1963, 1971), Peteanu (1970), Manolache & Tien (1973), Andriescu et al (1992), Ciochia & Constantin (1992), Traian et al (1995), Roman et al (1996), Muresan & Mustea (1997). Moldovan (2007) published (in part) a review of this faunistic data. Genus *Megaphragma* Timberlake is now newly recorded from Romania.

Genus *Megaphragma* Timberlake 1924 (= *Sethosiella* Kryger 1932, = *Paramegaphragma* Lin 1992 - synonymy by Delvare (1993))

Diagnosis. Very small, body length less than 0.4 mm; 3-segmented tarsi (Figure 1c). Antenna with or without a single funicle segment, clava 2 or 3 segmented, never with more than 3 postanellar segments; in the case of a 3-segmented clava, the funicle is absent (Pinto 2006). Maxillary palp small but present (Pinto 2006). Forewing extremely narrow (compared with the other Trichogrammatidae), belt-shaped, about 7 to 9 times as long as wide; forewing disk almost glabrous or with 1 or 2 rows of a few setae; in some species this setae can be absent (Pinto 2006). Metasomal tergum VII without spiracles (Pinto 2006; Noyes 2014).

Distribution. Almost worldwide: North, Central and South America, Europe, Asia, Japan, Africa, India, Taiwan, Hawaii, Haiti, Caribbean, Australia (Noyes 2014). In Europe, species of this genus were recorded from Italy, Greece, France, Portugal (Noyes 2014) and now Romania.

Diversity. Fifteen valid species are described as belonging to *Megaphragma*. Only two valid species occur in Europe: *Megaphragma amalphanum* Viggiani, 1997 (described from Italy) and *Megaphragma mymaripenne* Timberlake, 1924 (a widespread species), from Noyes (2014).

Discussion. This genus is easy to identify because of the very small body size, extremely narrow fore wings, antennae with three or fewer postanellar segments (Pinto 2006). As closes genera are given *Prestwichia* and *Sinepalpigrama* (Pinto 2006).

New record. *Megaphragma* Timberlake is recorded for the first time from Romania – Eastern Europe. Our specimens, measuring less than 0.25 mm are among the smallest insects in the world.

Hosts. Mainly Thysanoptera but also Hemiptera (Pinto 2006; Noyes 2014). The recorded hosts: *Heliothrips haemorrhoidalis* Bouche, *Hercinothrips femoralis* Reuter, *Megalurothrips sjostedti* Trybom, *Panchaetothrips noxius* Priesner, *Pseudodendrothrips mori* Niwa, *Retithrips syriacus* Mayet, *Scirtothrips dorsalis* Hood, *Selenothrips rubrocinctus* Giard (Thysanoptera) and *Empoasca formosana* Paoli (Hemiptera: Cicadellidae), data from Noyes (2014).

Megaphragma* sp. near *mymaripenne

Material examined. 1♂ - 05.09.2010, collected with the sweep net from Breazu Forest area (Figure 1a, b), near Iasi city, IS (leg. E. Pricop); 1♀ - 18.08.2011, collected with the sweep net from Uricani Forest Reserve, Miroszlava, near Iași, IS (leg. E. Pricop); 1♀ - 29.07.2014, reared from thrips eggs, Breazu, Iasi, IS (leg. E. Pricop).

Hosts. Eggs of Thysanoptera.

Distribution. *Megaphragma* sp. near *mymaripenne* is recorded for the first time from Romania.

Taxonomic notes. Our specimens are very close to *Megaphragma mymaripenne* Timberlake. A close species to this is also *M. amalphanum* Viggiani. Both species are recorded from Europe, but *Megaphragma mymaripenne* is more widespread. In Figures 1a, b we show species habitat and distribution and in Figures 1c, d, e, f, g, h, i we reveal the female and male morphology; all figures are original.

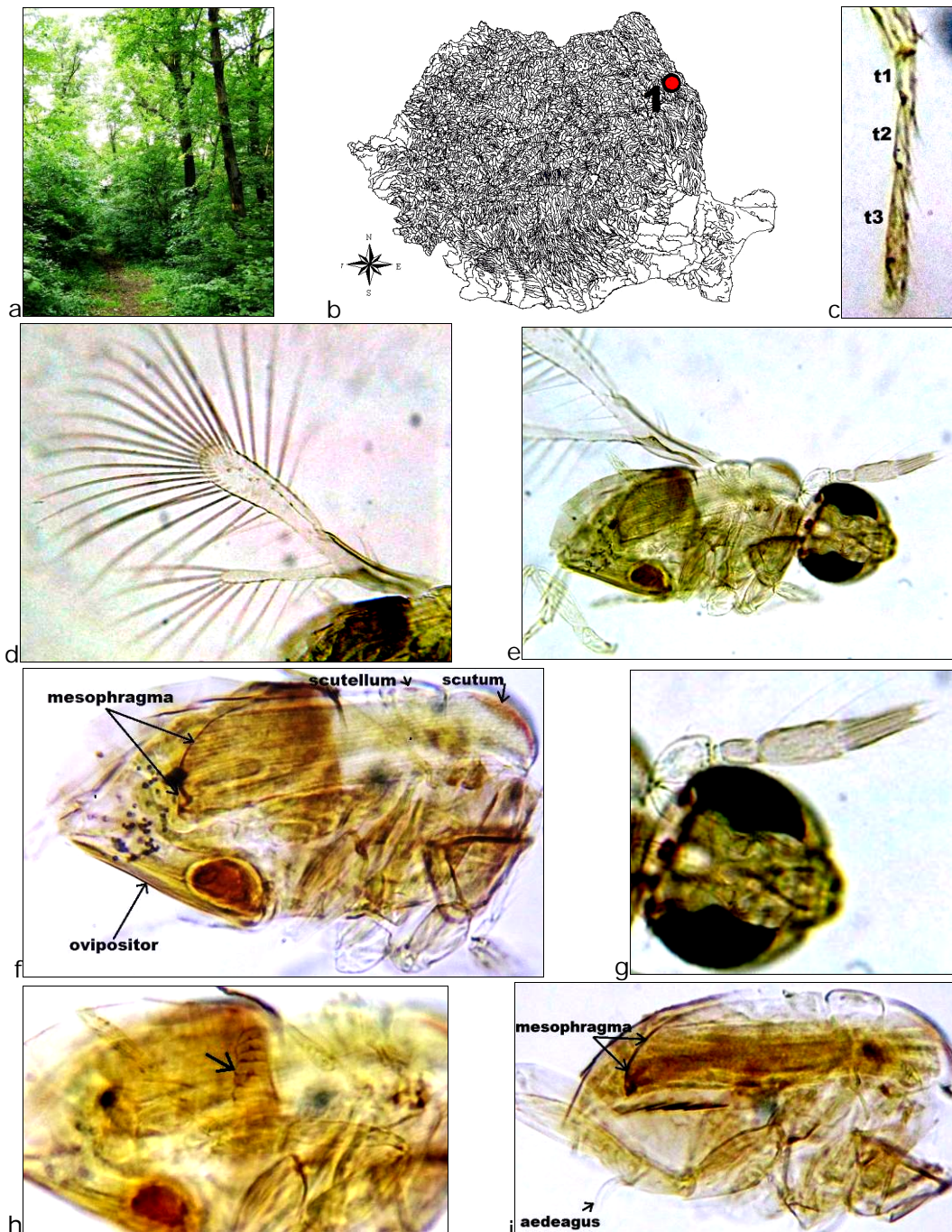


Figure 1 (original). *Megaphragma* sp. near *mymaripenne*: a – species habitat from Breazu forest; b – map of Romania showing the distribution from Iasi; c - the 3 segmented hind tarsus; d – female wings; e – female habitus; f – the basic morphology of female body; g - female head and antenna; h – female body showing the sculptured basal tergite of metasoma; i – male body revealing the male genitalia; regarding the specimens all images are greatly enlarged.

Why *Megaphragma*? Because “Mega” means big, and “phragma”, or “meso-phragma” is the inner structure of the mesosoma that is projecting deep into the metasoma (Figures 1f, i); because in this small insect, the mesophragma looks big (compared with the body of this parasitoid); the mesophragma is almost reaching the apex of the metasoma (Figures 1f, i); and “*mymaripenne*” because resembles with a mymarid (referring to the shape and structure of the wings).

Some characteristic features of our species are those of the forewings (forewings are very narrow), antennae (funicle one-segmented, clava two segmented) and metasoma (the basal tergite is sculptured). Female wings as in Figure 1d. Forewings are

narrow (length/wide ratio = 8) and with 2 rows of several setae on disk membrane, also forewing marginal fringe is composed of 26 to 29 marginal cilia; the marginal cilia (this fringe) is very long (Figure 1d). Fore wing vein with two long setae, these setae are close to each other in the middle of this vein. Hind wings are very narrow and with about 12 to 14 marginal cilia (Figure 1d), no setae are present on hind wing disk. Antennal scape relatively long, pedicellus almost ovoid and as broad as clava, funicle one-segmented and about 1.5 times longer than wide, clava two segmented, only the distal segment with sensory ridges (the proximal segment or basal segment of clava with two long setae and few shorter ones, the distal segment of clava with few medium length setae and few sensory ridges that are projecting out from the apex). In Figure 1g we show the head and antenna of a female (on the head all three ocelli are present, the compound eyes are dark). The relative measurements of female antenna (25 μm = 17 divisions): scape: 27-28; pedicellus: 14-15; anellus: 2; funicle segment: 9-10; clava: 40 (including the distal part of the sensory ridges). General body color light brown to yellow, legs and wings pale (Figures 1e, f, h, i), body is clearly high and convex. All tarsi are 3 - segmented, t3 from hind tarsus (Figure 1c) is clearly the longest segment. Metasoma with the basal tergite sculptured (Figure 1h), the longitudinal sculpture is more clear (Figure 1h). Ovipositor length/mid tibia length ratio = 1.2, mesophragma clearly is overlapping about half of the ovipositors length. From this characters, our specimens resembles the most with *M. mymaripenne*, but the segments of the female antennae, especially in the clava are a little longer and slender than in the original description, this could be due to the intra-specific variations, but we do not know this for sure. Although our specimens are very close to *M. mymaripenne* and the wings are almost similar, the antennal segments are clearly longer than in the note published by Viggiani (1997).

Our slide mounted female specimen of *Megaphragma* sp. near *mymaripenne* measures only 221 μm and is certainly the record for the smallest (adult) parasitoid wasp collected and recorded from Romania, and possible this is also the record for the smallest insect collected from our country. Recorded from Romania, almost as small as *Megaphragma*, are also some mymarid species belonging to genera like *Dicopus* and *Alaptus* (Pricop 2013).

The male of *Megaphragma* sp. near *mymaripenne* is similar to the female except for the antennae and genitalia. The male is just a little smaller than the female. Male genitalia is simple (somewhat reduced), the aedeagus and the two parameres are visible. Male antennae are a little slender than females antennae.

Conclusions. *Megaphragma* Timberlake is here reported for the first time from Romania. Species of *Megaphragma* are rarely collected in this area and belong to forest ecosystems. We collected the material from broadleaf forest vegetation near the city Iași. *Megaphragma* sp. near *mymaripenne* was currently only found in this two forests from Breazu and Uricani, above 200m elevation, Iași county. In a future paper we hope to give an updated list with all the recorded Trichogrammatidae species from Romania and also new data.

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References

Andriescu I., Moglan V., Moglan I., Gaidău G., 1992 [Spontaneous efficiency of *Trichogramma* (Hymenoptera, Trichogrammatidae) in cabbage crops with different degrees of phytosanitary maintenance in Romania]. Revista Prot Plantelor "Transilvania" II(6): 77-78 [in Romanian].

- Botoc M., 1963 Nouvelle contributions à l'étude des chalcidoïdes de Roumaine (8). *Studia Universitatis Babes-Bolyai, Cluj (Ser Biol)* 1963(1):95-109 [in French].
- Botoc M., 1971 Some Trichogrammatidae (Chalcidoidea, Trichogrammatidae) new for Romania's fauna. *Studia Universitatis Babes-Bolyai, Cluj (Ser Biol)* 16(2):89-90.
- Ciochia V., Constantin L., 1992 Activités de quelques espèces de trichogrammes en Roumanie (Hym. Trichogrammatidae). *Mémoires de la Société Royale Entomologie de Belgique* 35(1):255-258 [in French].
- Delvare G., 1993 Sur les *Megaphragma* de Guadeloupe avec la description d'une espèce nouvelle (Hymenoptera, Trichogrammatidae). *Revue Française d'Entomologie (nouvelle série)* 15(4):149-152 [in French].
- Manolache C., Tien N., 1973 Contributions to the morphology of two species of *Trichogramma*: *Trichogramma evanescens* Westw. and *Trichogramma chilonis* Ishii (Hymenoptera - Trichogrammatidae) and results of releasing them in the field for the control of the corn borer (*Ostrinia nubilalis* Hbn.). *Analele Institutului de Cercetari pentru Protectia Plantelor* 9:349-361.
- Moldovan O. T., 2007 Hymenoptera (excluding Pteromalidae, Ichneumonidae, Formicidae). *Lista faunistica a Romaniei (specii terestre si de apa dulce). Checklist of Romanian Fauna (terrestrial and freshwater species)*. pp. 271 (Eds: Moldovan O. T., Cimpean M., Borda D., Lepure S., Ilie V.), Institutul de Speologie "Emil Racovita", Cluj, Romania (ISBN978-973-133-130-0).
- Muresan F., Mustea D., 1997 Efficacy of biological treatment with *Trichogramma maidis* in controlling the European corn borer (*Ostrinia nubilalis* Hbn.) in some maize hybrids. *Analele Institutului de Cercetari pentru Cerealele si Plante Tehnice, Fundulea* 64:247-251.
- Noyes J. S., 2014 Universal Chalcidoidea Database. World Wide Web electronic publication: <http://www.nhm.ac.uk/chalcidoids> (Accessed: 7 September 2014).
- Peteanu S., 1970 Research on the use of the oophagous wasp *Trichogramma evanescens* Westw. for the control of the hemp moth (*Grapholitha delineaana* Walker). *Analele Institutului de Cercetari pentru Cerealele si Plante Tehnice, Fundulea* 38:317-322.
- Pinto J. D., 2006 A review of the New World genera of Trichogrammatidae (Hymenoptera). *Journal of Hymenoptera Research* 15(1):38-163.
- Pintureau B., Lassablière F., Khatchadourian C., Daumal J., 1999 Egg parasitoids and symbionts of two European thrips. *Annales de la Société Entomologique de France* 35:416-420.
- Pricop E., 2013 Identification key to European genera of the Mymaridae (Hymenoptera: Chalcidoidea), with additional notes. *ELBA Bioflux* 5(1):69-81.
- Roman T., Negru G., Szabo A., Tudose M., Glavan L., Calin M., 1996 Utilization possibilities of the oophagous parasite *Trichogramma evanescens* Westw. in the complex of phytosanitary protection measures of cruciferous crops. *Mededelingen Faculteit Landbouwkundige en Toegepaste Biologische Wetenschappen Universiteit Gent* 61(3B):927-936.
- Timberlake P. H., 1924 Descriptions of new chalcid-flies from Hawaii and Mexico (Hymenoptera). *Proceedings of the Hawaiian Entomological Society* 5:395-417.
- Traian R., Fabritius K., Negru G., Szabo A., Tudose M., Glavan L., Calin M., 1995 Dynamics of the egg parasite *Trichogramma evanescens* Westw. and possibilities to restore its natural ability to control the Noctuidae Lepidoptera in the cabbage crops. *Colloques de l'INRA* 73:169-172.
- Viggiani G., 1997 Notes on the type of *Megaphragma* Timberlake (Hymenoptera: Trichogrammatidae), with description of a new species. *Bollettino del Laboratorio di Entomologia Agraria 'Filippo Silvestri', Portici* 53:117-122.
- Viggiani G., Bernardo U., 1997 Two species of *Megaphragma* (Hymenoptera Trichogrammatidae), egg-parasitoids of *Heliothrips haemorrhoidalis* Bouché (Thysanoptera) in southern Italy, with description of a new species. *Bollettino di Zoologia Agraria e Bachicoltura, Milano* (2) 29(1):51-55.
- Viggiani G., Albarracin E. L., Virla E., 2009 The species of *Megaphragma* Timberlake (Hymenoptera: Trichogrammatidae) from Argentina. *Zootaxa* 2308:65-68.

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