

## New finds of *Ephedrus* and *Toxares* species (Hymenoptera, Braconidae, Aphidiinae) from Finland

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Fourteen species of *Ephedrus* and one of *Toxares* have been recognized from Finland. Their distribution is presented in UTM-maps, and new provincial records are listed. The taxonomy, diagnosis and biology of some species is discussed. New species for Finland are *Ephedrus chaitophori* Gärdenfors, *E. longistigmus* Gärdenfors and *E. vaccinii* Gärdenfors.

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### 1. Introduction

A review of the study of Aphidiidae of Finland was published by Halme in 1977. Although this group has often been considered a separate family, there is now virtually universal agreement among braconid workers that it constitutes a specialized group of Braconidae (van Achterberg 1990). Mainly with the aid of a recent revision of the genus *Ephedrus* (Gärdenfors 1986), we have determined Finnish material of this genus and *Toxares*. One species new to science (Halme 1992) and three species new for Finland were found, and several new provincial records were made. The purpose of this article is to list the 15 Finnish species, present their distribution in Finland in UTM-maps (Fig. 3), and give more detailed faunistic information regarding the most

interesting species. The taxonomy, diagnosis and biology of some of the species are also discussed.

### 2. Material

Most of the material (about 700 specimens) was collected by sweeping by M. Koponen and is in the Department of Applied Zoology, University of Helsinki (abbreviated DAZH). Most of the reared material was collected by J. Halme and is in his collection. Some specimens in the Zoological Museum, University of Helsinki (MZH) have been investigated, and at least some of the hosts have been determined by Mr. O. Heikinheimo. The host names follow Huldén & Heikinheimo 1984. Abbreviations of collector names are JH = J. Halme, MK = M. Koponen, OH = O. Heikinheimo, YZ = Yang Zhongqi.

### 3. The Finnish species of *Ephedrus* and *Toxares*

*Ephedrus (Breviephedrus) brevis* Stelfox, 1941

*Ephedrus picticornis* Stelfox, 1941

Material: Reported by Mackauer (1968) from province Tb (Keuruu). New material is from N: Helsinki (668:38, 668:39), Nurmijärvi (671:37); Sr: Eura (677:23), Loimaa rural mun. (676:29), Säskylä (676:244), Yläne (675:24), (676:25); Ta: Janakkala (676:38), Jokioinen (675:30); Sa: Ristiina (682:50); Om: Kalajoki (713:35), Pyhäntä (711:46), Vimpeli (700:34); Ok: Vaala (716:50); Ob: Pudasjärvi (728:48), Tervola (734:39); Li: Inari (7615:517).

Based on the combinations of characters in our 17 female specimens we agree with Gärdenfors (1986) that *E. brevis* is a widely variable species consisting of specimens similar to the original types of *E. brevis* and *E. picticornis*.

*Ephedrus (Ephedrus) cerasicola* Starý, 1962

Material: Known specimens from Finland are from N: Helsinki (6680:390) 15.5.1980 1 ♀ (MK), Nurmijärvi (6715:376) 5.8.1979 1 ♂ (MK), Vantaa (6688:392) 8.5.1948 (OH); Sa: Kouvola (675:48) 7.7.1980 5 ♀♀ (JH), Valkeala (6782:507) 21.6.1975 (JH leg.).

The specimen reported (Peltonen 1976) as *cerasicola* from Sa: Taipalsaari is *E. validus* (det. Halme 1984) and from N: Vantaa 21.6.1952 ex *Hyperomyzus lactucae* (Linnaeus) (Halme 1977) is *E. lacertosus* (Haliday) (det. Gärdenfors 1984).

*Ephedrus (Ephedrus) chaitophori* Gärdenfors, 1986

Material: From Finland, 5 males and 6 females have been determined. N: Helsinki (6682:383) 26.6.1980 1 ♂ (MK); Ta: Kuusankoski (675:48) 4.8.1982 4 ♂♂ 4 ♀♀ (JH), Lammi (6777:392) 23.8.1981 1 ♀ (MK) and Om: Kokkola (7088:312) 17.8.1982 1 ♀ (MK leg.).

New to Finland. For further distribution, see Gärdenfors (1986).

*Ephedrus (Ephedrus) helleni* Mackauer, 1968

Material: The female type and female paratype (in MZH) are from Finland, N: Helsinki (Mackauer 1968, Gärdenfors 1986). Reported by Mackauer (1968) also from province Li (Ivalo). 4 ♂♂ 20 ♀♀ have been determined from N: Helsinki (6678:398, 668:38, 668:39), Nurmijärvi (671:37); Ta: Hämeenlinna (6771:361), Lammi (677:39);

Sa: Mikkeli rural mun. (6830:501, 6859:513), Ristiina (6826:502); Kl: Uukuniemi (6862:655); Oa: Kurikka (6945:267); Sb: Joroinen (690:54); Om: Himanka (7111:337), Kalajoki (7134:352); Ks: Kuusamo (7366:603).

*Ephedrus (Ephedrus) koponeni* Halme, 1992

This new species is described and discussed by Halme (1992). It is thus far known only from Finland.

*Ephedrus (Ephedrus) lacertosus* (Haliday, 1833)

The only species which has been collected from every province of Finland.

*Ephedrus (Ephedrus) laevicollis* (Thomson, 1895)

*Ephedrus plagiator* var. *minor* Stelfox, 1941 (Gärdenfors 1986).

*Ephedrus minor*: Mackauer & Starý 1967, Mackauer 1968, Halme 1977.

Material: Reported by Mackauer (1968) from Finland, province N. In our swept material there are 13 ♂♂ and 12 ♀♀. New provincial records are Ab: Perniö; Ta: Hämeenlinna (6771:361); Sa: Kouvola (675:48), Mikkeli rural mun. (6830:501, 6859:513), Valkeala (674:48); Oa: Kurikka (6945:267), Lapua (698:28); Sb: Joroinen (690:54); Om: Himanka (7111:337); Ks: Kuusamo (7366:603).

*Ephedrus (Ephedrus) longistigmus* Gärdenfors, 1986

Material: In DAZH there are 6 ♂ and 12 ♀♀ from Finland, Ab: Lohja rural municipality (6693:334) 19.6.1992 1 ♀; N: Nurmijärvi (6707:379) 31.5.1992 1 ♀, (6704:381) 26.6.1992 1 ♀, (6705:381) 28.6.1987 1 ♀, 30.6.1987 1 ♂, 20.6.1992 1 ♀, (6707:381) 6.6.1987 1 ♂, (6710:377) 20.6.1987 1 ♂ 1 ♀, (6711:377) 21.8.1987 2 ♀♀, 24.7.1992 1 ♀, Porvoo rural mun. (6694:436) 3.6.1982 1 ♂ (MK); Sa: Joroinen (690:54) 9.8.1982 1 ♀ (YZ), Pielavesi (7032:477) 28.6.1991 1 ♂; Ok: Paltamo (713:54) 3.7.1991 2 ♀♀; Lk: Kittilä (753:43) 8.7.1989 1 ♂ (MK leg.). Also in DAZH there is 1 ♂ from Estonia, Võru: Murati, 27.5.1991 (MK leg.).

A species new to the western Palearctic. Earlier known was only the type material from Japan, Taiwan and USA (Gärdenfors 1986).

*Ephedrus (Ephedrus) nacheri* Quilis, 1934

Material: Reported by Gärdenfors (1986) from Finland, province N (paratype of *E. helleni* Mackauer). Our swept

and determined material is 10 ♂♂ 25 ♀♀. New provincial records are *Ab*: Rymättylä (669:22); *Ta*: Lammi (677:39); *Sa*: Kouvola (675:48), Mikkeli rural mun. (6830:501), Ristiina (6826:502), Valkeala (674:48, 6772:483); *Ob*: Rovaniemi (734:44).

Reared from *Hyperomyzus rhinanthi* (Schoulteden) by O. Heikinheimo (*N*: Helsinki rural mun.).

*Ephedrus (Ephedrus) niger* Gautier, Bonnamour & Gaumont, 1929

*Ephedrus campestris* Starý (Mackauer & Starý 1967).

Material: Reported as *E. campestris* by Mackauer (1968) from Finland, province *N*. Our swept material is 10 ♂♂ and 25 ♀♀. New provincial records are *Ab*: Perniö (669:22); *Ka*: Ylämaa (6740:550); *Ta*: Hattula (6773:361), Lammi (677:39), Ruovesi (6868:348); *Sa*: Kouvola (675:48), Mikkeli rural mun. (6830:501), Valkeala (674:48); *Sb*: Kuopio (697:53); *Ob*: Ii (7249:424); *Lk*: Sodankylä (748:48); *Li*: Inari (7591:478, 7615:517, 7617:521).

*Ephedrus (Ephedrus) persicae* Froggatt, 1904

*Ephedrus nitidus* Gahan, 1917 (Mackauer 1963). — Thuneberg 1963.

*Ephedrus pulchellus* Stelfox, 1941 (Mackauer 1963). — Starý 1962.

*Ephedrus holmani* Starý, 1958 (Mackauer 1963).

Material: Reported by Thuneberg (1963) and Mackauer (1968) from Finland, provinces *Ab* (Nystad = Uusikau-punki), *Ka* (Vehkalahti, Ulkotammio), *St* (Karkku), *Ta* (Sääksmäki), *Sa* (Joutseno), and *Ob* (Rovaniemi). At least some of these reports may refer to *E. (E.) chaitophori* Gärdenfors. Our swept and determined material is 4 ♂♂ and 15 ♀♀. New records are *Ab*: Perniö (6682:271); *N*: Helsinki (6682:393, 6680:390); *Ta*: Lammi (6773:394); *Sa*: Kouvola (675:48), Pertunmaa (6810:465), Valkeala (674:48); *Sb*: Kuopio (697:53); *Ks*: Salla (7377:560); *EnL*: Kil-pisjärvi (767:25).

All host records of this parasitoid must be reclassified owing to the similar structure of the diapause cocoon in *E. persicae* and *Pseudopauesia prunicola* Halme (Halme 1986). In *E. persicae* the cocoon is at first dark (Starý 1962) and probably later turns out to black-greyish (Starý 1970). In *P. prunicola* it is reddish brown from the very beginning and does not change coloration with age. The second author never succeeded in finding the dark diapause cocoons in southern Finland. This is quite surprising, because according to Starý (1970), in central Eu-

rope they have been found in lowlands, as well as in foothills and mountains. In southern Finland some of the ordinary hosts of *E. persicae* (Starý 1962): *Aphis idaei* van der Goot on *Rubus idaeus*, *Dysaphis* sp. on *Sorbus aucuparia* and *Rhopalosiphum padi* (Linnaeus) on *Prunus padus* were not occupied by this parasitoid. Instead, our *E. persicae* were reared from *Brachycaudus* spp. on *Silene dioica* (Thuneberg 1963), *S. latifolia* and *Spirea salicifolia* (leg. J. Halme).

*Ephedrus (Ephedrus) plagiator* (Nees, 1811)

Material: The most common *Ephedrus* species found in all Finnish provinces except *Ka*, *Sb*, *Kb* and *Ok*.

Diagnosis: The second author reared many *Ephedrus* parasitoids from *Sitobion avenae* (Fabricius) and *Dysaphis sorbi* (Kaltenbach). The samples included *E. plagiator* exclusively, with some of the largest individuals showing the colour pattern typical of *E. blattnyi* Starý and *E. prociphili* Starý. From among the former species these individuals were separated by means of wing venation. They have one quarter to one third of F1 yellowish, which conforms with the Nearctic population of *E. prociphili* (Gärdenfors 1986) but not with the European population of this species (Starý 1982): F1 usually prevalently yellow. Furthermore, *S. avenae* as a host does not conform with the European *E. prociphili* (Starý 1982): propagation impossible on *S. avenae*.

Among the largest swept *E. plagiator*-like parasitoids we found individuals fully corresponding to the redescription of *E. blattnyi* Starý, 1973 (Gärdenfors 1986). These individuals were not included in this paper because the distinguishing characters are not very reliable (information in letter from Dr. U. Gärdenfors 1991). In southern Finland the second author never found *E. blattnyi* among *Ephedrus*-parasitoids reared from *Pterocomma* spp., the hosts of the species (Starý & Leclant 1973).

*Ephedrus (Ephedrus) vaccinii* Gärdenfors, 1986

Material: Records from Finland are *Ab*: Nauvo, Seili (669:22) 18.7.1978 1 ♀ (MK); *N*: Kirkkonummi (665:36) 9.7.1977 1 ♂ reared from *Aulacorthum flavum* Börner on *Vaccinium uliginosum* (JH), Nurmijärvi (6715:376) 3.9.1977 1m (MK); *Ta*: Kuusankoski (675:48) 4.8.1982 1 ♂ (JH leg.).

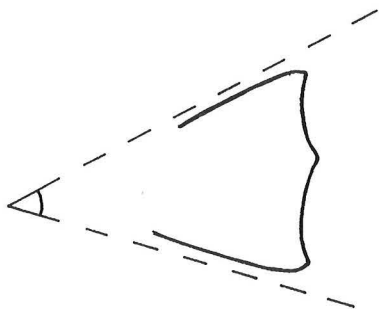


Fig. 1. Measurement of angle of ovipositor sheath of *Toxares*.

New to Finland. The host species was recently reported from Finland by Heikinheimo (1990). For further distribution, see Gärdenfors 1986.

*Ephedrus (Lysephedrus) validus* (Haliday, 1833)

Material studied in DAZH (19 ♂♂ 5 ♀♀) is from *N*: Anjala (673:48), Helsinki (668:39), Nurmijärvi (6709:375, 6708:380, 6715:376), Sipoo (6687:407); *Ta*: Hämeenlinna (6768:364), Tampere; *Sa*: Taipalsaari (6800:564); *Tb*: Rautalampi (6961:484); *Sb*: Pieksämäki rural mun. (6924:487); *Lk*: Kittilä (753:43), Kolari (7475:362); *Lk*: Sodankylä (7481:483); *Le*: Hetta (759:36); *Li*: Utsjoki (7753:500).

Reported by Mackauer (1968) from Finland, provinces *Ab* (Lojo = Lohja, Nystad = Uusikaupunki), *N* (Ekenäs = Tammisaari), *St* (Karkku), *Oa* (Maxmo = Maksamaa), *Tb* (Keuru = Keuruu, Pihtipudas), *Li* (Utsjoki).

*Toxares deltiger* (Haliday, 1840)

*Toxares flaveolus* (Györfi, 1958).

Material: Reported by Mackauer (1968) from Finland, provinces *Al*, *Sa* and *Sb*. New provincial records are *Ab*: Västanfjärd (6669:261); *N*: Helsinki (668:39), Nurmijärvi (6715:376), Tammisaari (6657:302), Vantaa (6688:392); *Tb*: Pihtipudas (7027:430), Ähtäri (6940:348); *Om*: Perho (7011:364); *Ok*: Kuhmo (710:66), Paltamo (7144:547), Puolanka (720:53), Ristijärvi (7152:554, 7164:549); *Ob*: Tornio (7312:385), Yli-Ii (7248:444); *Ks*: Kuusamo (7366:604); *Lk*: Kemijärvi (7395:528), Kolari (7475:362) and Sodankylä (7582:516).

The structure of Finnish individuals lies somewhere between the Central European *T.*

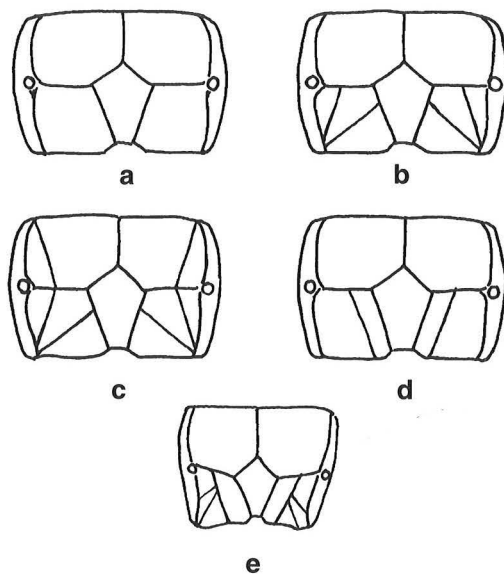


Fig. 2a-e. Carination patterns of propodeum of *Toxares deltiger* (Haliday) in Finland (a-d) and in Czechoslovakia (e, according to Starý 1958).

*deltiger* samples (Starý 1958) and the East Palearctic *T. shigai* Takada (Takada 1965). The angle of the ovipositor sheath (Fig. 1) in the type of *T. shigai* (30°) and in our 12 measured specimens (mean 36°, *SD* 3.516) does not differ significantly ( $t = 1.706$ ). The other features, however, support the specific status of *T. shigai*. The radius index (length of second radial abscissa per length of third radial abscissa) of the type of *T. shigai* (0.825) differs from the radius indexes of our specimens (mean 0.620, *SD* 0.081) fairly significantly ( $t = 2.555^*$ ). The petiolus index (width of petiolus at spiracles per length of petiolus) of *T. shigai* (3.3) differs from that of our Finnish specimens (mean 2.367, *SD* 0.285) significantly ( $t = 3.274^{**}$ ). Shuja-Uddin (1974) constructed a key which distinguishes the females of *T. deltiger* and *T. shigai* (several Indian records) on the basis of the number of antennal segments: *shigai* with 17 and *deltiger* with more than 18. In Finland *deltiger* has 18–20 antennal segments (18 in 6, 19 in 3 and 20 in 3 individuals). The intra-areal carination of the propodeum of *T. deltiger* is widely variable (Fig. 2: 3 individuals of type a, 6 of b, 2 of c, 1 of d, and 1 of e). In this

respect only one of our specimens (Fig. 2d) was similar to the type (Fig. 2e) described by Starý (1958) from Central Europe.

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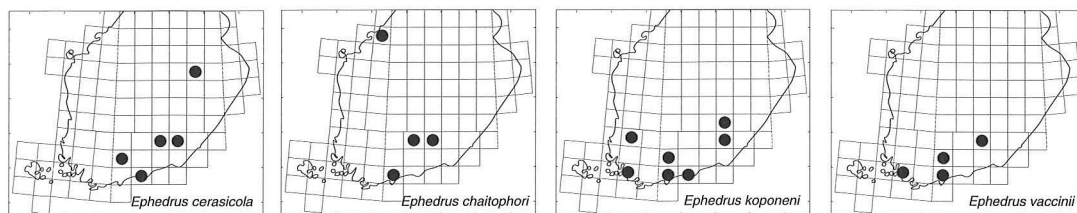


Fig. 3. UTM distribution maps for the Finnish species of *Ephedrus* and *Toxares* (continued on next page).

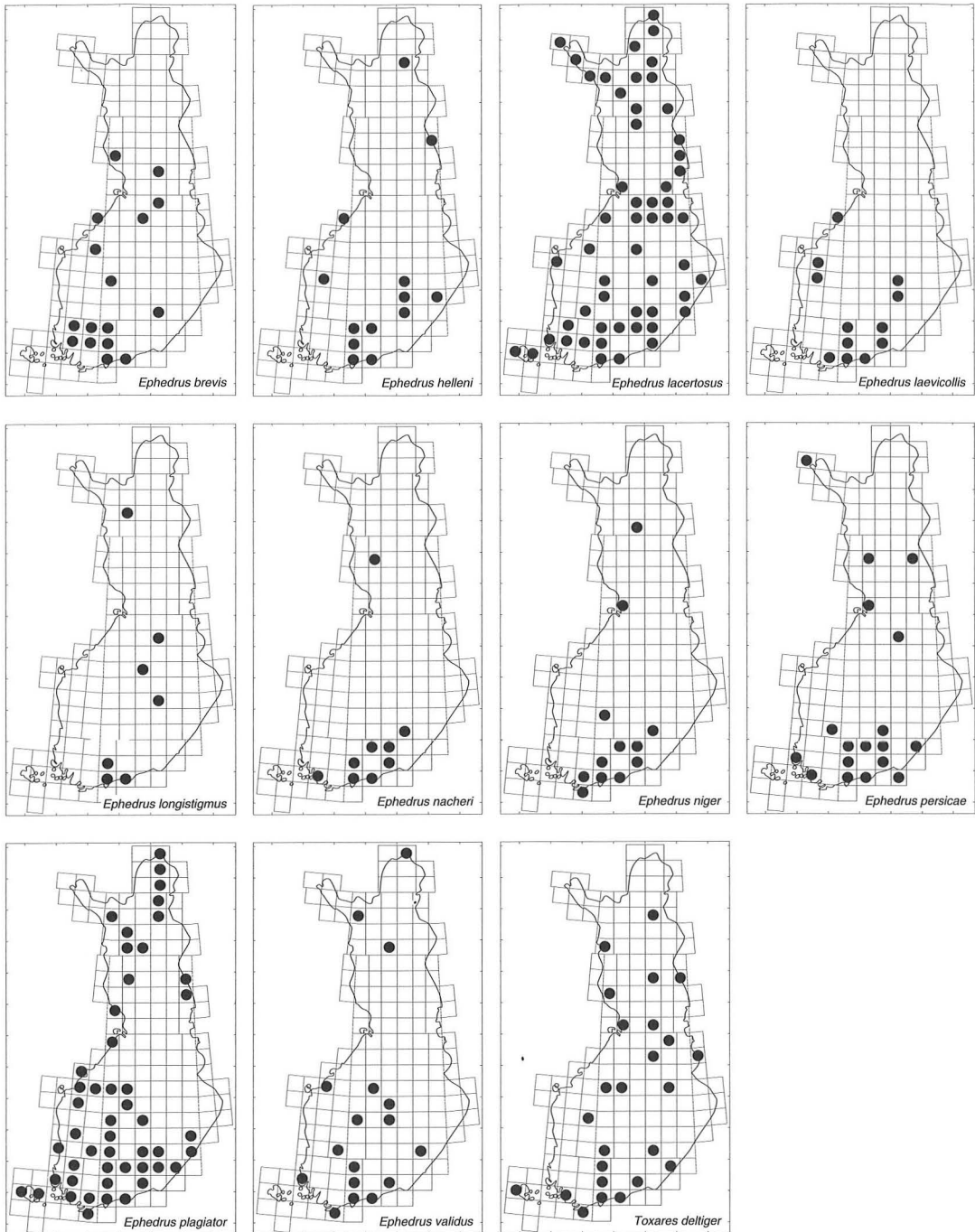


Fig. 3 (continued). UTM distribution maps for the Finnish species of *Ephedrus* and *Toxares*.