New host-plant, habitat and distributional records of West Palaearctic Anthomyzidae (Diptera)

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Abstract: New data about the biology and distribution of the 22 West Palaearctic species of Anthomyzidae (Diptera) are given. Based on rearing and collecting records, new host plant species were recognized for Amygdalops thomasseti Lamb, 1914, Anagnota bicolor (Meigen, 1838), Anthomyza anderssoni Roháček, 1984, A. collini Andersson, 1976, A. dissors Collin, 1944, A. gracilis Fallén, 1823, A. neglecta Collin, 1944, A. pallida (Zetterstedt, 1838), A. paranegeta Elberg, 1968, Stiphrosoma cingulatum (Haliday, 1855), S. laetum (Meigen, 1830) and S. sabulosum (Haliday, 1837). The first potential host plant of Anagnota major Roháček & Freidberg, 1993, viz. Scirpus sylvaticus L., also is noted. A total of 29 host plant species (each being a new host plant of at least one of the above anthomyzid species) belonging to Equisetaceae, Cyperaceae, Juncaceae, Poaceae and Typhaceae are presented. The development of S. laetum in Juncaceae and of S. sabulosum in Cyperaceae and Juncaceae is demonstrated, thus widening the polyphagy of these species. In several species of Anthomyzidae the preferred habitats are also discussed. The distributions of all presented species are reviewed, with the first records of Amygdalops thomasseti from La Palma (Canary Islands, new northwesternmost distributional limit), Anthomyza anderssoni from The Netherlands, Carexomyza caricis (Roháček, 1999) and Fungomyza albimana (Meigen, 1830) from Finland, Santhomyza inermis Roháček, 1984 from Cyprus and Stiphrosoma cingulatum from Sweden. The second records are given of A. pallida and S. sabulosum from Italy and of the very rare C. caricis from Sweden.

Key words: Diptera, Anthomyzidae, host plants, habitat, distribution, West Palaearctic

Introduction

The currently available information about the biology and distribution of West Palaearctic species of Anthomyzidae was summarized by Roháček (2006, 2009) but some additional data have subsequently been published by Roháček (2010, 2011, 2012) and Roháček & Andrade (2011). The present paper provides a summary of collecting and rearing records obtained mainly by the author’s research on the European Anthomyzidae during 2009-2012, both from field work and from rearing experiments. However, the material of Anthomyzidae collected or reared by other dipterists during this period (both from the Czech Republic and abroad) has also been identified resulting in a number of interesting records. Besides the records dealing with host-plant or habitat associations, new faunistic records are also presented, particularly those of infrequently collected species. Records of more common anthomyzids are given only when they originate from under-explored countries or from areas lying at the distributional limits of the species treated. The main goal of this study is to supplement the knowledge of the biology and distribution of Anthomyzidae with this new information.

Material and methods

Material: The majority of the material of Anthomyzidae listed below was obtained in the years 2009-2012 by the author and is deposited in the Silesian Museum, Opava, Czech Republic (SMOC). In addition, some data were also obtained by specimens originating from institutional or private collections as follows: JKH – collection of J. Kahanpää, Helsinki (Finland), KWT – collection of K. Winqvist, Turku (Finland), MBP – collection of Prof. M. Barták, Praha (Czech Republic), MHNN – Muséum d’histoire naturelle of Neuchâtel (Switzerland), MVO – collection of Dr. M. Vála, Olomouc-Bystrovecy (Czech Republic), NHRS – Naturhistoriska Riksmuseet, Stockholm (Sweden), JZW – collection of J. W. van Zuilen, Waalwijk (The Netherlands).
Other abbreviations used: cr = collecting record of less than 10 adults from a plant species; cr(s) = collecting record of 10 or more adults from single-species plant growth, rr = rearing records, rr(h) = rearing record ex host plant, MT = Malaise trap, SMTP = Swedish Malaise Trap Project.

**Determination of host-plant associations:** Two methods were used, both described in detail by Roháček (2009):

1. Rearing of adult anthomyzids from field-collected host plants. Individual (one-species) samples = tussocks of graminoid plants including a root ball with soil (about 25 x 25 cm) were placed (single plant species per box) in plastic rearing boxes equipped with a collecting head of similar construction to that used in Malaise traps and containing a 0.5-L polyethylene bottle filled with 75% ethanol in which all emerged insects were caught, killed and preserved. In addition, a few reared specimens were also obtained from emergence traps installed in grass monocultures on cultivated meadows (experiments performed in the framework of the project by M. Barták).

2. Selective collections (by sweeping, tussocking, pootering/aspirating) in uniform (single-species) growths of prospective host plants. The collected flies were dry mounted or preserved in 75% ethanol. Using this method it is assumed that the host plant is probable when 10 or more specimens of a given species are captured in its growth. When more than 20 specimens are collected in the single-plant growth and no or only single specimens in the surrounding plant community, the host plant can be considered almost reliable.

Specimens of plants used in rearing experiments as well as those sampled for Anthomyzidae in the field were collected for identification by a botanist (Š. Cimalová) and usually also documented by photography. Some of the collected anthomyzid specimens were retained alive in plastic tubes to be photographed shortly after being captured in special boxes by means of a digital camera (Canon EOS 60D) with a macro lens (Canon MP-E 65 mm 1–5×) and ring macro flash (Canon MR-14EX). Dry-mounted or ethanol-preserved specimens have been examined using two types of binocular stereoscopic microscopes (Reichert, Olympus). When necessary male genitalia and female terminalia were examined after detachment, treating in hot 10% KOH, washing in water and dissection of the whole abdomen in a drop of glycerine under a binocular microscope. After examination, all parts were transferred to a small plastic tube in glycerine and pinned below the respective specimens.

**Results**

*Amygdalops thomasseti* Lamb, 1914

**Material examined (collecting):** SPAIN: CANARY Is., La Palma, Los Cancajos, 28°39’N, 17°45’W, swept from grass *Pennisetum setaceum*, 26.i.2010, 11♂ 5♀, 27.i.2010, 1♂ 1♀ M. Vála leg. (SMOC, MVO).

**Biology:** The recent records from S. Turkey by Roháček (2011) confirmed the association of this species with *Arundo donax* because the species was not found by sweeping any other graminoid plant in this area. Therefore it is very surprising that *A. thomasseti* was swept by M. Vála from tufts of *Pennisetum setaceum* (see Fig. 3) in a site on La Palma island where no *Arundo* or other large grass occurred (Fig. 2) although previous records from the Canary Is. (Tenerife) have also been from *Arundo donax* (see Roháček 2006, 2009). Thus, *Pennisetum setaceum*, a common grass of disturbed rave beds in Canary Is., is a new host record of the species otherwise collected (apart from *A. donax*) only on *Phragmites australis* and (a doubtful record) *Bolboschoenus maritimus* (cf. Roháček 2009). Expansion of the host-plant range by addition of a rather delicate grass, *P. setaceum*, indicates that *A. thomasseti* obviously is not an oligophagous species as Roháček (2009) suggested but is probably able to utilize a much wider range of grass species even in situations where its preferred host plants are lacking.

**Distribution:** *Amygdalops thomasseti* (Fig. 1) is originally an Afrotropical species, now also widespread in the southern Palaeartic, including the Mediterraneaen and Macaronesian subregions (Roháček 2009, 2011). Because in Macaronesia it has only been known from Gran Canaria and Tenerife (see Roháček 2006, 2009), the above discovery from La Palma (first record) represents a new (north)westernmost distributional limit of this species.

*Anagnota bicolor* (Meigen, 1838)

**Material examined (collecting):** SWEDEN: Sm. Nybro kommun, Bückebo, Grytsjön naturreservat, 56°55’53.066’’N, 16°57’3.93’’E, old moist haymaking meadow in forest edge, MT, 13.-24.viii.2005, 1♂; Sö. Trosa
Figs 1-3: Amygdalops thomasseti Lamb, its habitat and unusual host plant. 1 – A. thomasseti, female; 2 – habitat in Los Cancajos (La Palma, Canary Is.); 3 – tuft of Pennisetum setaceum, the host plant of A. thomasseti in La Palma. Photo by J. Roháček (Fig. 1) and M. Vála (Figs 2-3).

Biology: Anagnota bicolor is a small, sexually dichroic (cf. mouthparts and abdomen, Figs 4-5) species considered to be polyphytosaprophagous in both mono- and dicotyledons. The previous rearing records (summarized by Roháček 2009) were from Carex acuta, Scirpus sylvaticus (Cyperaceae), Glyceria maxima, Phragmites australis (Poaceae), Typha latifolia (Typhaceae) and Silene dioica (Caryophyllaceae). Carex vesicaria (Fig. 7) is here added as a new host plant and Scirpus sylvaticus (Fig. 6) and Glyceria maxima were confirmed by additional rearings (see above). Other probable host plants (based on collecting records, see Roháček 2009) include Carex acutiformis, C. paniculata, C. rostrata, Juncus effusus, Deschampsia caespitosa and Elytrigia repens. The record of 8 specimens collected by means of pyramidal (= open emergence) trap installed over rotting wood also is interesting, but in this case they surely emerged from low vegetation under the trap, not from the wood.

Distribution: This is a widespread Palaearctic species known from most of northern and temperate Europe and also from western Siberia (Russia). For review of records see Roháček (2006, 2009). Because the previous records from Sweden are very scarce (see Roháček 2006), several more are added here.

Anagnota major Roháček & Freidberg, 1993

Material examined (collecting): CZECH REPUBLIC: N. Bohemia: Černousy, Dubák pond, 50°59'54"N, 15°02'32"E, 230 m, sweeping Scirpus sylvaticus in alder forest, 16.vi.2011, 2♂, J. Roháček leg. (SMOC); S. Bohemia: Vráž nr. Písek, 49°24'10"N, 14°07'03"E, 400 m, pyramidal trap, wood, 24.vi.-2.viii.2011, 1♀, M. Bartáček leg. (MBP).

Biology: Hitherto, no direct evidence has been available for any host-plant association of this uncommon Anagnota species because there is no rearing record and all collecting records are based on a few specimens. It can be presupposed that A. major is a polyphytosaprophagous species and, like its close relative A. bicolor, can possibly develop even in dicotyledonous plants (Roháček 2009: 140). The above record is important because it represents the first males from Bohemia. Further, Scirpus sylvaticus (Fig. 6) is a new potential host plant of this species (formerly recorded from large Carex species, cf. Roháček 2006, 2009).

Distribution: Although infrequently recorded, A. major is obviously widely distributed in Central Europe (Germany, Poland, Czech Republic, Slovakia, Hungary, Romania: Banat) and the Mediterranean area of the W. Palaearctic (known from Bulgaria, Greece, Italy, Portugal and also from Morocco in N. Africa); see Roháček (2009) and Roháček & Andrade (2011). Both above records originate from areas (S. and N. Bohemia in the Czech Republic) where the species was previously unknown.
Figs 4-7: Anagnota bicolor (Meigen) and its host plants. 4 – A. bicolor, male; 5 – same, female; 6 – flowering Scirpus sylvaticus in Přemyšov res. (Czech Republic); 7 – flowering Carex vesicaria in salty boggy meadow at Hrabětice-Trávní Dvůr (Czech Republic). Photo by J. Roháček.
**Anthemodyza anderssoni Roháček, 1984**


**Biology:** This species (Fig. 8) is obviously monophagous on reed-mace (Typha) species. Formerly only Typha latifolia was confirmed as the host plant (for details see Roháček 2009). The series recorded above was collected in a pure growth of Typha angustifolia (see Fig. 10) which can thus be considered another host plant species of A. anderssoni.

**Distribution:** A Submediterranean species mainly distributed in South and Central Europe (Bulgaria, Czech Republic, Germany, Great Britain, Greece, Italy, Poland, Romania, Slovakia, Spain, Sweden, Switzerland) but also known from Azerbaijan and Osetiya in Russia (Roháček 2006, 2009). The first record from The Netherlands is given above.

**Anthemodyza collini Andersson, 1976**

**Material examined (collecting):** SWEDEN: Stockholm, Norra Djurgården, behind university, 59°22'05"N, 18°04'01"E, 15-20 m, sweeping Phragmites australis at a small lake, 5.vi.2011, 1♀1♂; Stockholm, Norra Djurgården, sea coast, 59°22'01"N, 18°05'28"E, 1-2 m, sweeping Calamagrostis canescens at sea shore, 6.vi.2011, 1♀♂, all J. Roháček leg. (SMOC). FRANCE: Doubs, Lac de Remoray S, 852 m, prairie marécageuse, zones buissonneuses, rives de ruisseaux, source, 21.viii.1993, 1♀; J.-P. Haenni leg. (MHNN); Lons-le-Saunier, 46°41'11"N, 5°34'17"E, 280 m, meadow nr. forest, 14.v.2012, 1♂, M. Barták leg. (MBP). CZECH REPUBLIC: N. Bohemia: Višňov-Jizerka, 50°59'06"N, 15°01'38"E, 225 m, sweeping Calamagrostis canescens in boggy meadow, 14.vi.2011, 4♀6♂, same data but sweeping Carex nigra in boggy meadow, 17♂8♀, same data but sweeping Phragmites australis in boggy meadow, 11♂4♀; S. Moravia: Hrabětice-Trávní Dvůr 1 km SW, 48°47'N, 16°26'E, 173 m, sweeping Carex vesicaria in salty meadow, 18.v.2009, 28♂31♀, all J. Roháček leg. (SMOC).

**Biology:** This species (Fig. 9) is associated with a wide range of graminoid plants (Roháček 2009). Its preference for common reed (Phragmites australis) where it usually develops as an inquiline in galls (Fig. 11) of Lipara spp. (Chloropidae) is again confirmed here. The grass Calamagrostis canescens and sedges Carex vesicaria and C. nigra are here added as three more potential host species of A. collini. It was found that in some host plants where A. collini co-exists with other Anthemodyza species (typically with common A. gracilis, A. neglecta), adults of A. collini usually occur (prevail) first in the spring (May) while those of the other dominant species appear (and prevail) later (June, July).

**Distribution:** A widespread West Palaearctic species ranging from Portugal (Roháček et al. 2009; Roháček & Andrade 2011) and Spain to West Siberia in Russia but, hitherto, unrecorded from North Africa or southern areas of the Near East (for details see Roháček 2006, 2009). Two additional records from France are presented above.

**Anthemodyza dissors Collin, 1944**


**Biology:** This species is considered monophagous, developing in some large sedge species (Carex spp.). Hitherto, only Carex acuta and C. rostrata have been treated as the host plants...
Figs 8-11: *Anthomyza* species and their host plants. 8 – *A. anderssoni* Roháček, female; 9 – *A. collini* Andersson, male; 10 – growth of *Typha angustifolia* in basalt quarry pool at Heřmanice (Czech Republic); 11 – gall of *Lipara* sp. on *Phragmites australis* in a reed bed in Stockholm (Sweden) where a series of *A. collini* has been collected. Photo by J. Roháček.
based on collecting records (Roháček 2009). *C. acuta* is here confirmed as a host by the first rearing record and *C. vesicaria* (Fig. 7) is added as a new host plant based on two collecting records of series of (≥10) specimens. *A. dissors* is usually associated with wetland habitats at higher altitudes, often lagg meadows of raised peat bogs. However, there is an exceptional record of 2 females from a lowland boggy (partly salty) meadow at merely 173 m a.s.l. in southern Moravia (see material examined).

**Distribution:** Widespread in the northern belt of the Palaeartic Region ranging from Great Britain to the Far East of Russia but in temperate areas associated with higher altitudes (for details see Roháček 2006, 2009). An additional record from Sweden is listed above.

*Anthomyza gracilis* Fallén, 1823

**Material examined (collecting):** SWEDEN: Stockholm, Norra Djurgården, sea coast, 59°22'01"N, 18°05'28"E, 1-2 m, sweeping *Calamagrostis canescens* at sea shore, 6.vi.2011, 7♂7♀; Huddinge, Gömmaren lake res., 59°15'15"N, 17°55'40"E, 58 m, sweeping *Carex lasiocarpa* in peat-bog, 7.vii.2011, 8♂10♀, all J. Roháček leg. (SMOC). FRANCE: Doubs, Lac de Remoray SW, 852 m, tourbière boisée, prairie marécageuse, rive du lac, 22.viii.1992, 3♂3♀, 5.vi.1993, 1♂; Doubs, Remoray, SW du Lac, 850 m, prairie marécageuse, 7.vii.1985, 1♀; Doubs, Vallée de La Loue, 1 km NNE Viuillafans, 350 m, pâture boisé, proche du ruisseau, 1.vi.1992, 1♂; Doubs, Ornans 3 km E, Vallon de Cornebouche, 47°06'30"N, 6°11'30"E, 370 m, zone marécageuse à joncs et ruisseau dans pâture extensive, 7.v.1995, 1♂12♀; Doubs, Ornans 5 km EN, Vallon de Cornebouche, 47°06'50"N, 6°12'40"E, 400 m, zone fanèse à massettes et saules (bord ruisseau), dans forêt humide, 7.v.1995, 1♂1♀; Doubs, Ornans 4.2 km EN, SEules (La Combe), 47°07'N, 6°12'40"E, 400 m, zone fanèse à massettes et saules (bord ruisseau), dans forêt humide, 22.viii.2004, 550 m, anciennes vignes en terrasses (exp S), envoies de buissons/Peucedanum cervaria, 1♀; Cantal, Rion-ès-Montagnes, 5 km WSW: Valette, 960 m, bocage, bord ruisseau, près humides, 26.v.2001, 2♂♂; Jura, Dole 6 km SW, Forêt de Chaux (Sabl. de Goux), 232 m, ancienne sablière clairière dans pinède thermophile, 25.vi.1994, 1♂; Landes, Léon 5 km E (Escalus, r. de la Palue), prés tourbeux buissons, 19.vii.2001, 2♂♂, all J.-P. Haenni leg.; Alpes-Maritimes, St Auban 4 km SE, 1080 m, bord de ruisseau, bois clair, lisière de pinède, 14.vi.1994, 1♀; Alpes-de-Hte-Prov., Entrevaux 5.7 km NW, rive droite Var (Enriez), 580 m, zone alluviale à pins, saules, buissons, sable, gravier/canal irrigation, 15.vi.1994, 1♀; Alpes-de-Hte-Prov., St Auban 7 km W, Solelais, 1120 m, près humides marécageux (*Carex*, linaigrette, ruisseau, saules), 15.vi.1994, 1♀, all J.-P. Haenni & C. Dufour leg.; Dep. Creuse, St-Victor, La Villatte Billon, près a fleuri à dominance: Pissenlit, 20.i.2004, 1♂, M. Rapp leg. (all MHNN). ITALY: Weisslahnbad, 46°28'40"N, 11°34'11"E, 1400 m, edge of forest, 4.vii.2011, 1♂♂, M. Barták leg. (MBP). CZECH REPUBLIC: N. Bohemia: Jizerské hory Mt, rašeliniště Jizery res., 50°49'44"N, 15°20'13"E, 870 m, sweeping *Carex vesicaria* in meadow, 15.vi.2011, 2♂6♀, same data but sweeping *Scirpus sylvaticus*, 6♂6♀, same data but sweeping *Carex vesicaria*, 9♂11♀; same locality, sweeping *Carex vesicaria* in peat-bog meadow, 14.vi.2011, 9♂♀; Jizerské hory Mt, Bílý Potok 0.8 km N, 50°52'51"N, 15°13'08"E, 460 m, sweeping *Alopecurus pratensis* in boggy meadow, 15.vi.2011, 5♂2♀; Jizerské hory Mt, rašeliniště Jizery res., 50°51'00"N, 15°21'13"E, 830 m, sweeping *Melica caerulea* on Jizera river shore, 13.vi.2011, 4♂5♀; Višňová, Meandry Směď res., 50°59'06"N, 15°01'38"E, 225 m, sweeping *Eligserigia repens* in meadow, 14.vi.2011, 7♂♀; N. Moravia: Hrubý Jeseník Mt, Kouty nad Desnou env., Záměcký, 50°03'51"N, 17°11'54"E, 950 m, sweeping *Calamagrostis arundinacea* at brook, 21.vii.2009, 22♀14♀, same data but sweeping *Deschampsia caespitosa*, 15♀15♂, same but sweeping *Juncus effusus*, 16♂15♀; N. Moravia: Hertice 1 km SE, Breží, 49°54'06"N, 17°48'42"E, 320 m, sweeping *Festuca altissima* at forest track, 18.viii.2011, 33♂25♀, all J. Roháček leg. (SMOC). SLOVAKIA: E. Slovakia: Muránska planina NP, Tisovec 2.8 km WSW, Hlboký jarak res., 48°40'17"N, 19°54'27"E, 500 m, sweeping *Festuca arundinae* in pasture meadow, 23.vi.2012, 5♂7♀; Muránska planina NP, Tisovec 1 km S, nr. pond, 48°39'56"N, 19°56'30"E, 385 m, sweeping *Carex acuta* in boggy meadow, 23.vi.2012, 4♂7♀; Muránska planina NP, Stožky gamekeeper’s lodge, 48°49'14"N, 19°56'07"E, 870 m, sweeping *Equisetum palustre* at path, 24.vi.2012, 6♂5♀; same locality, sweeping *Glyceria fluitans* in boggy pond shore, 24.vi.2012, 25♀14♀; Muránska planina NP, Patina gamekeeper’s lodge, 48°47'10"N, 19°56'11"E, 800 m, sweeping *Calamagrostis villosa* in spruce forest margin, 6♂12♀, all J. Roháček leg. (SMOC).

28.vii.2010, all J. Roháček leg. (SMOC); E. Moravia: Zubří, Nad alejí, 49°28'00.0"N, 18°04'42.2"E, 358 m, emergence trap (J3), from growth of Festuca rubra, 1♂ emerged 25.vi.-28.vii.2009, 1♀ emerged 28.vi.-27.vii.2010; Zubří, U stanice, 49°27'14.7"N, 18°02'43.5"E, 349 m, emergence trap (K1), from growth of Trisetum flavescens, 1♂1♀ emerged 28.iv.-26.v.2009, all J. Frydrych leg. (MBP).

**Biology:** This commonest species of Anthomyzidae in Europe is known to be associated with a number of host plants of Poaceae, Cyperaceae and Juncaceae and is, therefore, considered polyphagous; there is even one isolated rearing record from a dicotyledonous plant, *Heracleum sphondylium*, see Roháček (2009). Despite being such a common and frequently collected species, there have been very few rearing records of *A. gracilis* (from only *Carex acuta* and *Phragmites australis*). Here, four more grasses are given from which *A. gracilis* was reared, viz. *Alopecurus pratensis*, *Festuca rubra*, *Poa trivialis* and *Trisetum flavescens*. In addition, the following plants can also be considered hosts of *A. gracilis* based on new cr(s): *Carex flacca*, *C. lasiocarpa*, *C. vesicaria*, *Scirpus sylvaticus* (all Cyperaceae), *Calamagrostis arundinacea*, *Elytrigia repens*, *Festuca altissima*, *F. arundinacea* and *Molinia caerulea* (all Poaceae), and, most interestingly, also the marsh horsetail (*Equisetum palustre*). Hitherto, no species of horsetails (*Equisetopsida*) has been recorded as a host plant of the European Anthomyzidae but in the Nearctic Region at least one species of *Equisetum* is known to serve as such to two *Anthomyza* species (K. N. Barber, pers. comm. 2010).

**Distribution:** A transpalaearctic species ranging from N. Spain to Kamchatka in Russia (see Roháček 2006, 2009). Because there are few published records from more southern latitudes, new occurrence data from France and Italy are listed here (material examined).

**Anthomyza macra** Czerny, 1928

**Material examined (collecting):** SWEDEN: Sö. Trosa kommun, Hunga Södergård nr 1, 58°55.244'N, 15°02'45''E, 250 m, sweeping vegetation dominated by *Scirpus sylvaticus*, J. Roháček leg. (SMOC). CZECH REPUBLIC: N. Bohemia: Černousy, Dubáš pond, 50°59'54"N, 16°26'E, 230 m, sweeping *Scirpus sylvaticus* in alder forest, 16.vi.2011, 10♂5♀; Černousy, V Poli env., 50°59'47"N, 15°02'45"E, 250 m, sweeping *Scirpus sylvaticus* in boggy meadow, 12.vii.2012, 5♂3♀; S. Moravia: Hrabětic-Trávní Dvůr 1 km SW, 48°47'N, 16°26'E, 173 m, sweeping *Carex vesicaria* in salty meadow, 7.vii.2009, 49°35'55"N, J. Roháček leg. (SMOC).

**Biology:** This species is uncommon in N. Europe. It seems to be associated with dicotyledonous undergrowth of mainly deciduous forests (Roháček 2006, 2009) but concrete host plants remain unknown.

**Distribution:** Although a widespread transpalaearctic species ranging from Great Britain to the Far East of Russia (see Roháček 2009), it seems to be restricted to the temperate belt (zone of deciduous forests). There are only a few records from Sweden (Roháček 2006) and, therefore, an additional record is given above.

**Anthomyza neglecta** Collin, 1944

240 m, B37, reared ex Scirpus sylvaticus collected at creek in forest 9.vi.2010, 1♂ emerged 24.vi.-28.vii.2010, all J. Roháček leg. (SMOC).

**Biology:** Although primarily associated with large species of Carex and Scirpus in marshland habitats at lower altitudes, *A. neglecta* is considered a polyphagous species because it is also able to utilize some species of Typhaceae and Juncaceae as host plants (Roháček 2009). This is again confirmed by the rearing of two specimens from dead *Typha latifolia* (see material examined). Based on the above rearing records, *Carex elongata* is a new host, and *C. acuta, C. vesicaria* (Fig. 7) and *Scirpus sylvaticus* (Fig. 6) are definitely confirmed as host plants of *A. neglecta*.

**Distribution:** Hitherto, this species is known only from North, Central and northern part of South Europe, with southernmost records from northern Italy and Romania (Roháček 2006, 2009). It has been rarely recorded from Sweden, and, therefore, a few additional records from this country are listed above.

*Anthomyza pallida* (Zetterstedt, 1838)

**Material examined (collecting):** SWEDEN: Stockholm, Norra Djurgården, behind university, 59°22′05″N, 18°04′01″E, 15–20 m, sweeping *Calamagrostis arundinacea* in deciduous forest, 5.vii.2011, 20♂10♀; Stockholm, Norra Djurgården, sea coast, 59°22′01″N, 18°05′28″E, 1–2 m, sweeping *Calamagrostis canescens* at sea shore, 6.vii.2011, 5♂4♀; Huddinge, Gömmaren lake res., 59°15′34″N, 17°56′13″E, 55 m, sweeping vegetation dominated by *Scirpus sylvaticus* in forest swamp, 7.vii.2011, 2♂, all J. Roháček leg. (SMOC). CZECH REPUBLIC: N. Bohemia: Jizerské hory Mts, Kořenov-Jizerka, 50°49′24″N, 15°20′18″E, 860 m, sweeping *Molinia caerulea* in montane meadow, 16.vi.2011, 48♂57♀; Jizerské hory Mts, rašeliniště Jizery res., 50°51′00″N, 15°21′13″E, 830 m, sweeping *Molinia caerulea* on Jizera river shore, 13.vi.2011, 14♂22♀; N. Moravia: Hrubý Jeseník Mts, Kouty nad Desnou env., Zámčisko 50°03′51″N, 17°11′54″E, 950 m, sweeping *Calamagrostis arundinacea* at brook, 21.vii.2009, 15♂7♀; same data but sweeping *Deschampsia caespitosa*, 9♂10♀, all J. Roháček leg. (SMOC). SLOVAKIA: C. Slovakia: Poľana B.R., Kyslinky-chata Dudáš, 48°39′N, 19°28′E, 1100 m, sweeping *Dactylis glomerata* along forest path, 24.vi.2012, 19♂10♀; Patina gamekeeper’s lodge, 48°47′10″N, 19°36′11″E, 800 m, sweeping *Calamagrostis villosa* in spruce forest margin, 5♂9♀, all J. Roháček leg. (SMOC). ITALY: Weisslahnbad, 46°28′40″N, 11°34′11″E, 1400 m, edge of forest, 4.vi.2011, 2♂1♀, M. Barták leg. (MBP).

**Biology:** Hitherto, no host plant of this species (Fig. 13) frequently occurring in mountains has been confirmed by rearings. Based on several collecting records the species is treated as oligophagous by Roháček (2009) because of its restriction to larger grasses (Poaceae). However, apart from *Calamagrostis villosa* in which adults of *A. pallida* were collected repeatedly (confirmed by an additional record here), no other recorded grass has been considered a really reliable host plant. Based on the above records from single-species plant growths the following plants can be added to the list of hosts of this species: *Calamagrostis arundinacea, C. canescens, Molinia caerulea, Dactylis glomerata* and *Brachypodium pinnatum*. Moreover, *Deschampsia caespitosa*, recorded as a probable host plant by Andersson (1984), is also confirmed by an additional record here. The distinct association of *A. pallida* with *Molinia caerulea* in the Jizerské hory Mts can be demonstrated by the author’s observation of thousands of specimens (only a sample of about 100 specimens collected) crawling on tips of young tillers of this grass (Fig. 15) in the warm evening on 16 June 2011.

**Distribution:** This transpalaeartic species is widespread in the northern and temperate belts (ranging from Great Britain to the Far East of Russia) but restricted to mountains in more southern latitudes. An additional finding from Italy (the second record from the country) is listed above.
Figs 12-15: *Anthomyza* species and their host plants. 12 – *A. paraneglecta* Elberg, male; 13 – *A. pallida* (Zetterstedt), mating pair on a grass leaf; 14 – *Calamagrostis canescens* at sea shore in Stockholm (Sweden), growth in which four species of *Anthomyza* (including *A. paraneglecta*) were found; 15 – *Molinia caerulea*, sprouting clumps in the Jizerské hory Mts (Czech Republic). Photo by J. Roháček.
**Anthomyza paraneglecta** Elberg, 1968


**Biology:** In *A. paraneglecta* (Fig. 12) as well, no host plant has been confirmed by rearings, so its association with large sedges (*Carex acuta, C. riparia, Scirpus sylvaticus*, possibly also *C. paniculata, C. rostrata, C. vesicaria*) is only judged from the collecting records (see Roháček 2009). Based on these records it was considered to be oligophagous on sedges but the above Swedish record (albeit of only 4 females) from the grass *Calamagrostis canescens* indicates that this may not be true, at least in some areas. This host record might be considered peculiar but it is reliable because no sedge (*Carex* or *Scirpus*) occurred in the wide vicinity of the growth of *Calamagrostis canescens* (see Fig. 14) on the sea shore where the 4 specimens of *A. paraneglecta* were collected together with 9 specimens of *A. pallida*, 14 specimens of *A. gracilis* and 6 specimens of *A. collini*.

**Distribution:** This uncommon species is known only from North and Central Europe, viz. from the Czech Republic, Denmark, Estonia, Finland, Germany, Great Britain, Latvia, Poland, Slovakia and Sweden (Roháček 2006, 2009). Because there are only a few records from the latter country (see Andersson 1984; Roháček 2006), a few additional records are added here.

**Anthomyza pleuralis** Czerny, 1928

**Material examined (collecting):** SWEDEN: Sm. Gränna kommun, Lönnemålen, 58°02.935'N, 14°34.382'E, Norway spruce forest w. big harvested ashes, MT, 19.vii.-12.viii.2003, 1♀; Sm. Torsås kommun, Söderåkra, Påboda, 625636N, 151637E, in garden, MT, 1.-16.viii.2008, 1♀, both SMTP leg. (NHRS).

**Biology:** This species seems to have similar requirements to those of its close relative *A. macra* and mainly occurs in undergrowth of deciduous or mixed forests. In contrast to the latter, it can also live in northern areas and in mountains (even above timber line, Roháček 2006).

**Distribution:** A widely distributed species ranging from Great Britain to the Far East of Russia (Roháček 2009) in the northern and middle (temperate) belts of the Palaearctic Region. Despite this fact, it has been recorded infrequently from northern Europe (Roháček 2006) and, therefore, two additional records from Sweden are given above.

**Arganthomyza socculata** (Zetterstedt, 1847)


**Biology:** This species seems to be associated with various grassland habitats in northern or montane areas but its host plants have, hitherto, not been recognized; it is suspected that larvae mainly develop in larger species of Poaceae (Andersson 1976; Roháček 2006, 2009).

**Distribution:** *A. socculata* is a Boreo-alpine species being widespread in the northern belt of the Palaearctic Region (from Iceland to Kamchatka) and also occurring in montane ranges of more southern areas (Roháček 2009). Recently, it has also been recorded from the Nearctic
Region but only in Alaska (USA), see Roháček & Barber (2013). Although the species is widely distributed, its precise distribution is not known sufficiently and, therefore, additional records from Sweden obtained by SMTP are presented here.

**Carexomyza caricis** (Roháček, 1999)


**Biology:** This is one of the rarest species of Anthomyzidae in Europe. The available biological information (see Roháček 1999, 2006, as *Paranthomyza*) indicates its distinct association with *Carex paniculata* (in England) and, therefore, Roháček (2009) considered it to be a monophagous species. However, *C. caricis* can possibly develop also in other *Carex* species forming dense tussocks, particularly in other areas. The above Finnish record of one male originates from the *Carex*-dominated shoreline of a small lake Kyyynäjrvi where, however, *Carex paniculata* does not occur (J. Kahanpää, personal communication, 2013).

**Distribution:** Hitherto, *C. caricis* has only been known from two localities in Great Britain (England: Hants, Wilts) and one in northern Sweden (record of single female), see Roháček (1999, 2006, as *Paranthomyza*). Therefore, the above records from the southern part of Sweden, and, particularly, the first record from Finland (new easternmost distributional limit), are important and indicate that the species can be more widespread in NE. Europe or even more easterly (cf. also note by Roháček 2009: 161).

**Fungomyza albimana** (Meigen, 1830)


**Biology:** This is the only mycophagous species of Anthomyzidae in Europe. It is able to develop in rotting sporocarps of various macrofungi (for details see Roháček 2009) and is, therefore, considered a polymycophagous species. Its preferred habitats are light and relatively warm deciduous forests, groves and parks (Roháček 1999, 2006). The above records from Sweden demonstrate that it can also live in coniferous and mixed forest.

**Distribution:** This species is known from most of Europe and from Turkey (Roháček 2006, 2009). The records listed above are presented to update the distribution of the species in Finland (first records), Sweden and Switzerland.

**Paranthomyza nitida** (Meigen, 1838)

**Biology:** This common species is known to develop in partly damaged stems of dicotyledonous plants, particularly in those with soft tissues and growing in undergrowth of humid deciduous or mixed forests (Roháček 1999, 2006, 2009). However, *P. nitida* was recently found also to be associated with the monocotyledonous *Tradescantia fluminensis* in Portugal (Roháček & Andrade 2011), a plant with similarly soft tissue in the stems. Thus, it is clearly a widely polyphagous species.

**Distribution:** A widespread W. Palaearctic species ranging from Portugal to W. Siberia (Altai in Russia) but, hitherto, unknown from N. Africa (southernmost records are from Portugal, Spain, Bulgaria (Roháček 2006, 2009, Roháček & Andrade 2011). The records from Sweden and France are presented here to update the distribution of the species in these countries.

*Santhomyza inermis* Roháček, 1984

**Material examined (collecting):** CYPRUS: Protaras, 36°59′40″N, 34°03′11″E, 75 m, fruit grove, MT, 25.iii.-23.iv.2010, 2♀, M. Barták leg. (MBP).

**Biology:** Although the definitive host plants of *S. inermis* remain unknown, this species is distinctive for its association with coastal salt marshes (Roháček 2006, 2009) and salty habitats in oases (Roháček & Freidberg 1993) whose plant communities are described by Roháček & Freidberg (1993).

**Distribution:** This is a typical Mediterranean species, hitherto recorded from southern Spain and France, Malta, Greece, Tunisia, Egypt and Israel (for details see Roháček 2006). The first record from Cyprus is given above (see material examined).

*Stiphrosoma cingulatum* (Haliday, 1855)


**Biology:** Roháček (2009) placed *S. cingulatum* among polyphagous species because its known host plants belong to two graminoid families, viz. Poaceae and Cyperaceae. The above rearing records confirmed its association with *Glyceria maxima*, *Carex acuta* and *Scirpus sylvaticus* (the latter formerly only known from adult collecting records) and two more host plants are added here, viz. *Carex elongata* and *Carex vesicaria*. Interestingly, 3 of the reared specimens emerged one year after the host plant samples (*Carex acuta*, *Glyceria maxima*) were collected indicating a likely induction of diapause in late summer (assuming immature larvae present at the time of collection).

**Distribution:** This species is widespread in the northern and temperate belts of the Palaearctic Region (ranging from Ireland to W. Siberia) but, hitherto, unrecorded from Fennoscandia (Roháček 2006, 2009). Therefore the first record from Sweden (listed above) is an important addition to its distribution.
Figs 16-19: *Stiphrosoma* species and their less frequent host plants. 16 – *S. laetum* (Meigen), female; 17 – *S. sabulosum* (Haliday), pair of brachypterous specimens on a grass stalk (male on left); 18 – flowering rush *Juncus effusus* (Czech Republic), host of both *S. laetum* and *S. sabulosum*; 19 – flowering sedge *Carex brizoides* (Czech Republic), new host of *S. sabulosum*. Photo by J. Roháček.
**Stiphrosoma humerale** Roháček & Barber, 2005

**Material examined (collecting):** CZECH REPUBLIC: N. Bohemia: Krkonoše Mts, Pekelský potok, 50°38’13.3”N, 14°40’29.3”E, 550 m, MT nr. brook, 30.vi.-30.vii.2009, 1♂; J. Vaněk leg. (MBP).

**Biology:** The biology of this species in poorly known. Roháček & Barber (2005) noted its association with some grasses and other graminoids in drier habitats, particularly with *Pascopyrum smithii* in Canada (though it has been collected from communities where this grass does not occur; K. N. Barber, pers. comm. 2013). Hitherto, no data about host plants are available in the Palaeartic Region (Roháček 2006).

**Distribution:** This naturally Holarctic species is widespread both in the Nearctic (see Roháček & Barber 2005) and Palaeartic Regions (Roháček 2006, 2009) but those from the latter are scarce, with slightly more records from the E. Palaeartic (North Korea, Russia: Far East). It seems to be extremely rare in Europe, hitherto only recorded from Latvia and the Czech Republic. To date, only 2 females have been found in the latter country, both from Bohemia (see Roháček 2006, 2009). A third female (also from Bohemia) is recorded above.

**Stiphrosoma laetum** (Meigen, 1830)


**Biology:** *Stiphrosoma laetum* (Fig. 16) is a polyphagous species developing not only in various Poaceae but also in some Cyperaceae and Juncaceae as demonstrated by Roháček (2009). The grasses *Agrostis gigantea* and *Festuca pratensis* are new additions to the list of host plants of *S. laetum* (see the rearing records above) and *Festuca arundinacea* is an additional potential host. The rush *Juncus effusus* (Fig. 18) is again confirmed by rearing as a non-grass host plant here.

**Distribution:** This species seems to be restricted to North and Central Europe, viz. Czech Republic, Denmark, Finland, Germany, Great Britain, N. Italy, Latvia, Netherlands, Norway, Poland, Russia (North and Central European Territory), Slovakia and Sweden (Roháček 2009). Formerly, the species was rarely recorded from northern Europe including the relatively well-explored Sweden (see Roháček 1996). The above records from the latter country obtained by SMTP indicate that *S. laetum* is, in fact, a common species in the north of Europe.

*Stiphrosoma sabulosum* (Haliday, 1837)

**Material examined (collecting):** SLOVAKIA: C. Slovakia: Poľana B.R., Zákl'ucky Mt., 48°42′N, 19°33′E, 950 m, aspirated from tufts of *Poa pratensis*, 16.vi.2009, 1♂ 1♀ f. brach.; same data but aspirated from tufts of *Agrostis capillaris*, 1♂ 1♀ f. brach.; same data but aspirated from tufts of *Dactylis glomerata*, 4.7-4.8 f. brach.; E. Slovakia: Muránska planina NP, Tisovec 2.8 km WSW, Hliboký jarok res., 48°40′17″N, 18°28′11″E, 500 m, aspirated from tufts of the grass *Festuca arundinacea* in pasture meadow, 23.vi.2012, 2♂ 1♀ f. brach., all J. Roháček leg. (SMOC). ITALY: Weisslahnbad, 46°28′40″N, 11°34′11″E, 1400 m, edge of forest, 4.vii.2011, 1♂ f. brach., M. Barták leg. (MBP).


**Biology:** Like other European *Stiphrosoma* species, *S. sabulosum* (Fig. 17) is also a polyphagous species developing in various (including small) Poaceae (Roháček 2009) but there is also a single record from the sedge *Carex praecox* (see Panteleeva 1997) and even (probably accidental – single female) a rearing from the dicotyledonous *Urtica urens* (also by Panteleeva 1997). The new rearing experiments (see above) confirmed several host species (grasses *Arrhenatherum elatius*, *Deschampsia caespitosa*, *Holcus lanatus*) but also added new host plants, viz. the grass *Trisetum flavescens*, the sedges *Carex hirta* and *C. brizoides* (Fig. 19), and even the rush *Juncus effusus* (Fig. 18). Thus, the polyphagy of *S. sabulosum* is widened by the addition of another plant family, the Juncaceae. Other new potential host plants (based on collecting records above) are *Agrostis capillaris*, *Festuca arundinacea* and *Poa pratensis*.

**Distribution:** This species is widespread in the temperate and northern belts of the Palaearctic Region ranging from Ireland and France to W. Siberia in Russia (for details see Roháček 2006, 2009) but it is also known from the Nearctic Region (Canada, USA) although
it remains unknown whether the latter distribution is natural or resulting from recent introductions (see Roháček & Barber 2005). Records from more southern latitudes are very rare in Europe and, therefore, the second record from Italy is presented above (material examined).

**Typhamyza bifasciata** (Wood, 1911)


**Biology:** The monophagy of this species developing in *Typha* species is well known (see Roháček 1992, 2006, 2009). Both formerly known host plants, viz. *Typha angustifolia* (Fig. 10) and *T. latifolia*, are confirmed here by additional rearing and collecting records (see material examined).

**Distribution:** *Typhamyza bifasciata* is widely distributed in the Palaearctic Region, ranging from Spain (Mallorca) and Great Britain to Kazakhstan and the Novosibirsk region in W. Siberia (for details see Roháček 2009). Most recently it was also recorded from southern Turkey, this representing a new southernmost distribution limit of this species (Roháček 2011).

**Discussion and conclusions**

The knowledge of host-plant association of the W. Palaearctic Anthomyzidae has been rather fragmentary. While for most of the more common species occurring in Central and North Europe the information about host plants and preferred habitats has recently been extended (cf. Roháček 2009 and the present paper), the anthomyzids living in southern areas (the Mediterranean and Macaronesian subregions) remain very poorly known in this respect. A few new data about host-plant and habitat associations of *Amygdalops thomasseti*, *Anagnota coccinea* Roháček & Freidberg, 1993 and *Paranthomyza nitida* in these southern territories have recently been reported by Roháček (2011) and Roháček & Andrade (2011) but in most of the Mediterranean and Macaronesian species the host plants have, hitherto, not been recognized. This particularly includes all species of *Santhomyza* Roháček, 1984, viz. *S. biseta* Roháček & Báez, 1988, *S. bezii* (Czerny, 1902) and even the most frequently encountered *S. inermis* Roháček, 1984, as well as *Amygdalops ruftor* Roháček & Freidberg, 1993, *Anthomyza umbrosa* Roháček, 2006, *Cercagnota collini* (Czerny, 1928) and the mysterious *Receprix receptrix* (Roháček & Freidberg, 1993). No concrete host-plant species are known for a few other European species, viz. *Anagnota oriens* Roháček, 2006, *Anthomyza clara* Roháček, 2006 and *Stiphrosoma humerale* Roháček & Barber, 2005, all of which are rare and very local in Europe, but also for three rather frequently collected species, *Anthomyza machra*, *A. pleuralis* and *Arganthomyza socculata*, the two former species being associated with dicotyledonous plants, the latter with graminoids. Consequently, these species should be particularly targeted in future rearing experiments and collecting in monoculture growths.
Survey of new host plant records

Note: new rearing records for the species already associated with host plants on the basis of field-collecting records are also included.

Amygdalops thomasseti Lamb, 1914
Pennisetum setaceum – cr(s)

Anagnota bicolor (Meigen, 1838)
Carex vesicaria – rr(h)

Anagnota major Roháček & Freidberg, 1993
Scirpus sylvaticus – cr

Anthomyza anderssoni Roháček, 1984
Typha angustifolia – cr(s)

Anthomyza dissors Collin, 1944
Carex acuta – rr(h)
Carex vesicaria – cr(s)

Anthomyza gracilis Fallén, 1823
Alopecurus pratensis – rr(h)
Calamagrostis arundinacea – cr(s)
Carex flacca – cr(s)
Carex lasiocarpa – cr(s)
Carex vesicaria – cr(s)
Elytrigia repens – cr(s)
Equisetum palustre – cr(s)
Festuca altissima – cr(s)
Festuca arundinacea – cr(s)
Festuca rubra – rr(h)
Molinia caerulea – cr
Poa trivialis – rr(h)
Scirpus sylvaticus – cr(s)
Trisetum flavescens – rr(h)

Anthomyza neglecta Collin, 1944
Carex elongata – rr(h)
Carex vesicaria – rr(h)
Scirpus sylvaticus – rr(h)

Anthomyza pallida (Zetterstedt, 1838)
Brachypodium pinnatum – cr(s)
Calamagrostis arundinacea – cr(s)
Calamagrostis canescens – cr
Dactylis glomerata – cr(s)
Deschampsia caespitosa – cr(s)
Molinia caerulea – cr(s)

Anthomyza paraneuglecta Elberg, 1968
Calamagrostis canescens – cr

Stiphrosoma cingulatum (Haliday, 1855)
Carex elongata – rr(h)
Carex vesicaria – rr(h)
Scirpus sylvaticus – rr(h)

Stiphrosoma laetum (Meigen, 1830)
Agrostis capillaris – cr
Carex brizoides – rr(h)
Carex hirta – rr(h)
Festuca arundinacea – cr
Festuca pratensis – rr(h)

Stiphrosoma sabulosum (Haliday, 1837)
Agrostis capillaris – cr
Carex brizoides – rr(h)
Carex hirta – rr(h)
Festuca arundinacea – cr
Festuca pratensis – rr(h)
Juncus effusus – rr(h)
Poa pratensis – cr(s)
Trisetum flavescens – rr(h)

List of new host plants with associated species of Anthomyzidae

Equisetaceae
Equisetum palustre L. – Anthomyza gracilis

Cyperaceae
Carex acuta L. – Anthomyza dissors
Carex brizoides – Stiphrosoma sabulosum
Carex elongata L. – Anthomyza neglecta, Stiphrosoma cingulatum
Carex flacca Schreber – Anthomyza gracilis
Carex hirta L. – Stiphrosoma sabulosum
Carex lasiocarpa Ehrh. – Anthomyza gracilis
Carex nigra (L.) Reichardt – Anthomyza collini
Carex vesicaria L. – Anagnota bicolor, Anthomyza collini, Anthomyza dissors, Anthomyza gracilis, Anthomyza neglecta, Stiphrosoma cingulatum

Scirpus sylvaticus L. – Anagnota major, Anthomyza gracilis, Anthomyza neglecta, Stiphrosoma cingulatum

Juncaceae
Juncus effusus L. – Stiphrosoma sabulosum

Poaceae
Agrostis capillaris L. – Stiphrosoma sabulosum
Agrostis gigantea Roth – Stiphrosoma laetum
Alopecurus pratensis L. – Anthomyza gracilis
Brachypodium pinnatum (L.) P. B. – Anthomyza pallida
Calamagrostis arundinacea (L.) Roth – Anthomyza gracilis, Anthomyza pallida
Calamagrostis canescens (Weber) Roth – Anthomyza collini, Anthomyza pallida, Anthomyza paraneglecta
Dactylis glomerata L. – Anthomyza gracilis
Deschampsia caespitosa (Weber) Roth – Anthomyza pallida
Elytrigia repens (L.) Nevski – Anthomyza gracilis
Festuca altissima All. – Anthomyza gracilis
Festuca arundinacea Schreber – Anthomyza gracilis, Stiphrosoma laetum, Stiphrosoma sabulosum
Festuca pratensis Huds. – Stiphrosoma laetum, Stiphrosoma sabulosum
Festuca rubra L. – Anthomyza gracilis, Stiphrosoma laetum, Stiphrosoma sabulosum
Festuca pratensis Huds. – Stiphrosoma laetum, Stiphrosoma sabulosum
Festuca rubra L. – Anthomyza gracilis
Molinia caerulea (L.) Moench. – Anthomyza gracilis, Anthomyza pallida
Pennisetum setaceum (Forssk.) Chiov. – Amygdalops thomasseti
Poa pratensis L. – Stiphrosoma sabulosum
Poa trivialis L. – Anthomyza gracilis
Trisetum flavescens (L.) P. B. – Anthomyza gracilis, Stiphrosoma sabulosum
Typhaceae
Typha angustifolia L. – Anthomyza anderssoni

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References

Nové údaje o hostitelských rostlinách, biotopech a rozšíření druhů čeledi Anthomyzidae (Diptera) západní části Palearktické oblasti


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