

A study on the relationship of the Pterocommatinae and the Aphidinae, and their aphidiid parasites in (Central) Europe  
(Homoptera, Aphidoidea-Pterocommatinae, Aphidinae; Hymenoptera, Aphidiidae)

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### 1. Introduction

The results of using aphidiid parasites as biological control agents in aphid control show the importance of the mentioned group of hymenopterous parasites. For the successful application of different parasite species and full appreciation of their effectiveness in nature careful study of the whole group, its bionomics and ecology, etc., is necessary.

One of the aims of author's work is to show the general factors that influence their host-specificity in the Aphidiidae and aphid × parasite relations in general.

The present paper is a part of the general work and it deals with the relationship of two aphid subfamilies—the Pterocommatinae and the Aphidinae—and their aphidiid parasites in (Central) Europe. The material was collected for the most part in Czechoslovakia, and to a lesser degree in Germany, Poland, Hungary and northern Italy. The results are believed to be useful for whole of (Central) Europe.

Acknowledgments: I wish to express my sincere gratitude to my friend Dr. J. Holman for his kind determination of aphids and for many aphidological suggestions.

### 2. Host — parasite catalogue

#### PTEROCOMMATINAE

- Pterocomma populeum* (Kalt.): *Aphidius cingulatus* Ruthe (Populus sp.)  
*P. pilosum* Bekt.: *Aphidius cingulatus* Ruthe (Salix caprea)  
*P. salicis* (L.): *Aphidius cingulatus* Ruthe (Salix sp., Salix amygdalina).  
*P. sp.*: *Aphidius cingulatus* Ruthe (Salix caprea, Salix cinerea).

Note: One parasite—complex may be recognized: 1. Oligophagous species, the main hosts of which belong to the Pterocommatine group: *Aphidius cingulatus* Ruthe. It does not parasitize other aphid groups.

## APHIDINAE

## RHOPALOSIPHONINI

*Hyalopterus pruni* (Geoffr.): *Aphidius transcaspicus* Tel. (Phragmites communis). — *Ephedrus plagiator* (Nees) (Prunus domestica). — *Praon volucre* (Haliday) (Phragmites communis, Prunus domestica).

*Rhopalosiphum nymphaeae* (L.): *Lysiphlebus fabarum* (Marshall) (Ranunculus sp.). — *Praon necans* Mackauer (Hydrochaeris morsus-ranae, Menianthes trifolia, Nymphaea alba).

*R. oxyacanthae* (Schrk.): *Trioxys auctus* (Haliday) (Poa).

*R. padi* (L.): *Ephedrus plagiator* (Nees) (Padus racemosa). — *Praon abjectum* (Haliday) (Padus racemosa). — *Trioxys angelicae* (Haliday) (Padus racemosa).

*Schizaphis scirpi* (Kittel): *Aphidius* sp. (Typha angustifolia). — *Diaeretia rapae* (M'Intosh) (Typha angustifolia).

Note: Four parasite-complexes may be recognized: 1. Polyphagous species, the host-specificity of which is determined mainly by the mode of host-life: *Lysiphlebus fabarum* (Marshall), *Ephedrus plagiator* (Nees), *Praon volucre* (Haliday), *Trioxys angelicae* (Haliday). 2. Oligophagous species, the main hosts of which belong to the Rhopalosiphonine group: ? *Trioxys auctus* (Haliday). 3. Oligophagous species, the main hosts of which belong to other aphid groups than the Rhopalosiphonini: *Praon abjectum* (Haliday), *Diaeretia rapae* (M'Intosh). 4. Monophagous species: ? *Praon necans* Mackauer.

## APHIDINI

*Aphis bupleuri* (Boerner): *Ephedrus* sp. (Bupleurum falcatum). — *Lipolexis gracilis* Foerster (Bupleurum falcatum). — *Praon* sp. (Bupleurum falcatum).

*A. cognatella* Jones: *Trioxys angelicae* (Haliday) (Evonymus europaea).

*A. cracca* (L.): *Lipolexis gracilis* Foerster (Vicia cracca). — *Lysiphlebus fritzmulleri* Mackauer (Vicia cracca, Vicia sepium). *Trioxys acalephae* (Marsh).

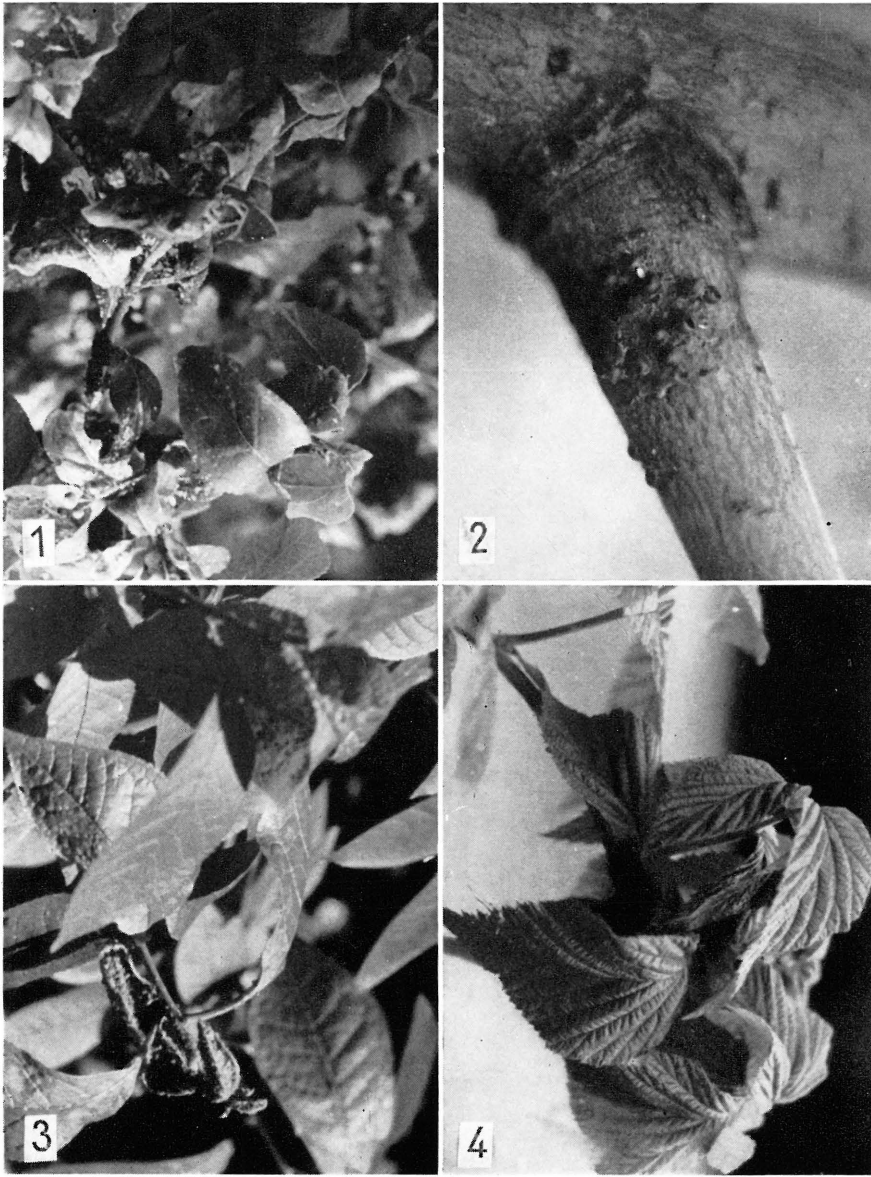
*A. craccivora* Koch: *Ephedrus plagiator* (Nees) (Robinia pseudoacacia). — *Lipolexis gracilis* Foerster (Medicago sativa, Onobrychis sativa, Trifolium pratense). — *Lysiphlebus fabarum* (Marshall) (Laburnum anagyroides). — *Praon abjectum* (Haliday) (Robinia pseudoacacia). — *Trioxys acalephae* (Haliday) (Onobrychis sativa, Trifolium pratense, Caragana arborescens, Robinia pseudoacacia).

*A. cystisorum* (Htg.): *Trioxys angelicae* (Haliday) (Laburnum anagyroides).

*A. euphorbiae* (Kalt.): *Lipolexis gracilis* Foerster (Euphorbia cyparissias). — *Lysiphlebus fabarum* (Marshall) (Euphorbia cyparissias). — *Trioxys acalephae* (Haliday) (Euphorbia cyparissias).

*A. evonymi* F.: *Lysiphlebus fabarum* (Marshall) (Solanum nigrum, Polygonum convulvum).

*A. fabae* Scop.: *Aphidius* sp. (Arctium lappa). — *Ephedrus persicae* Frog. (Matricaria inodora). (Euonymus europaea). — *Ephedrus plagiator* (Nees) (Euonymus europaea, Philadelphus coronaria, Chenopodium sp., Bo-



Examples of main bionomic types of the Pterocommatinae and Aphidinae.

1. *Aphis fabae* Scop. on *Euonymus europaea*.
2. *Pterocomma* sp. on *Salix caprea* (mummified colony, parasitized by *Aphidius cingulatus* Ruthe).
3. *Rhopalosiphum padi* (L.) on *Padus racemosa*.
4. *Aphis idaei* (v. d. G.) on *Rubus idaeus*.



5. *Hyalopterus pruni* (Geoffr.) on *Prunus amygdalus*. 6. *Aphis sedi* (Kalt.) on *Sedum* sp.  
7. *Aphis fabae* Scop. on *Chenopodium* sp. 8. *Aphis eryngii-glomeratus* Bozhko on  
*Eryngium planum*.





9. *Aphis genistae* (Scop.) on *Genista tinctoria*. 10. *Aphis intybi* (Koch) on *Cichorium intybus*. 11. *Aphis grossmannae* Boern. on *Peucedanum alsaticum* (ant runs). 12. *Cryptomyzus artemisiae* Boerner on *Artemisia vulgaris*.

rago officinalis, *Impatiens nollii* — tangere, *Epipactis latifolia*). — *Lipolexis gracilis* Foerster (Beta vulgaris, Cirsium arvense, Centaurea cyanus). — *Lysiphlebus ambiguus* (Haliday) (Eryngium planum) — *Lysiphlebus fabarum* (Marshall) (Carduus crispus, Beta vulgaris, Amaranthus retroflexus, Carduus sp., Dahlia variabilis, Euonymus europaea, Cirsium palustre, Matricaria inodora, Chenopodium bonus-henricus, Chenopodium album, Arctium sp., Carduus rigens, Matricaria suaveolens, Leucanthemum vulgare, Impatiens parviflora, Cirsium arvense, Campanula rapunculoides, Chenopodium rubrum, Podospermum canum, Scorzonera parviflora). — *Praon abjectum* (Haliday) (Euonymus europaea, Philadelphus coronaria, Cirsium rigens). — *Trioxys angelicae* (Haliday) (Euonymus europaea, Viburnum opulus, Philadelphus coronaria, Arctium sp., Beta vulgaris, Cirsium arvense, Campanula rapunculoides, Scorzonera parviflora). — *Trioxys acalephae* (Haliday) (Cirsium arvense).

*A. fagopyri* Holman: *Lysiphlebus fabarum* (Marshall) (*Fagopyrum convolvulus*).

*A. farinosa* (Gmel.): *Lysiphlebus ambiguus* (Haliday) (*Salix* sp.). — *Ephedrus plagiator* (Nees) (*Salix* sp.). — *Praon abjectum* (Haliday) (*Salix* sp.). — *T. acalephae* (Haliday) (*Salix* sp.). — *Trioxys angelicae* (Haliday) (*Salix* sp.).

*A. galii-scabri* (Schrk.): *Trioxys glaber*, n. sp. (*Asperula cynanchica*).

*A. genistae* (Scop.): *Trioxys genistae* Mackauer (*Genista tinctoria*).

*A. grosmanae* Boerner: *Lipolexis gracilis* Foerster (*Peucedanum alsaticum*). — *Praon* sp. (*Peucedanum alsaticum*).

*A. idaei* (v. d. G.): *Ephedrus plagiator* (Nees) (*Rubus idaeus*).

*A. intybi* (Koch): *Lipolexis gracilis* Foerster (*Cichorium intybus*). — *Lysiphlebus fabarum* (Marshall) (*Cichorium intybus*).

*A. lambersi* (Boerner): *Lysiphlebus fabarum* (Marshall) (*Daucus carota*).

*A. mordwilikiana* Dobrowlj.: *Trioxys acalephae* (Haliday) (*Rubus* sp.).

*A. nasturtii* (Kalt.): *Trioxys acalephae* (Marsch).

*A. newtoni* Theob.: *Lipolexis gracilis* Foerster (*Iris variegata*). — *Lysiphlebus fabarum* (Marshall) (*Iris variegata*).

*A. origani* (Pass.): *Lipolexis gracilis* Foerster (*Origanum vulgare*).

*A. plantaginis* (Goetze): *Lipolexis gracilis* Foerster (*Plantago* sp.). — *Lysiphlebus fabarum* (Marshall) (*Plantago media*).

*A. podagrariae* Schrk.: *Lysiphlebus ambiguus* (Haliday) (*Aegopodium podagraria*). — *Trioxys macroceratus* Mackauer (*Aegopodium podagraria*).

*A. polygonata* (Nees): *Lipolexis gracilis* Foerster (*Polygonum aviculare*). — *Lysiphlebus fabarum* (Marshall) (*Polygonum convolvulus*).

*A. pomi* (Deg.): *Ephedrus plagiator* (Nees) (*Crataegus monogyna*). — *Lysiphlebus fabarum* (Marshall) (*Malus silvestris*). — *Monoctonus cerasi* (Marshall) (*Malus silvestris*). — *Trioxys angelicae* (Haliday) (*Malus silvestris*, *Crataegus monogyna*).

*A. poterii* Boerner: *Lysiphlebus fabarum* (Marshall) (*Sanguisorba minor*). — *Praon* sp. (*Sanguisorba minor*).

*A. rumicis* L.: *Lysiphlebus fabarum* (Marshall) (*Rumex* sp.).

*A. roepkei* HRL.: *Lysiphlebus fabarum* (Marshall) (*Potentilla reptans*).

*A. salviae* (Walk.): *Lipolexis gracilis* Foerster (*Salvia nemorosa*, *Salvia*

pratensis). — *Lysiphlebus fabarum* (Marshall) (*Salvia pratensis*). — *Trioxys aculephae* (Haliday) (*Salvia nemorosa*, *Salvia pratensis*).

*A. sambuci* L.: *Praon abjectum* (Haliday) (*Sambucus nigra*). — *Trioxys angelicae* (Haliday) (*Sambucus nigra*).

*A. spiraeophaga* F. P. Mueller: *Ephedrus plagiator* (Nees) (*Spiraea* sp.). — *Trioxys aculephae* (Haliday) (*Spiraea* sp.). — *Trioxys angelicae* (Haliday) (*Spiraea* sp.).

*A. taraxacicola* (Boerner): *Lipolexis gracilis* Foerster (*Taraxacum officinale*). — *Lysiphlebus fabarum* (Marshall) (*Taraxacum officinale*).

*A. urticata* (F.): *Ephedrus plagiator* (Nees) (*Urtica* sp.). — *Lysiphlebus ambiguus* (Haliday) (*Urtica dioica*). — *Lysiphlebus fabarum* (Marshall) (*Urtica dioica*). — *Trioxys aculephae* (Haliday) (*Urtica dioica*).

*A. vanderhooti* Boerner: *Lysiphlebus fabarum* (Marshall) (*Achillea millefolium*).

*A. verbasci* (Schrk): *Lysiphlebus fabarum* (Marshall) (*Verbascum austriacum*).

*A. viburni* Scop.: *Trioxys angelicae* (Haliday) (*Viburnum opulus*).

*A. spp.*: *Trioxys aculephae* (Haliday) (*Epilobium montanum*, *Epilobium parviflorum*). — *Trioxys angelicae* (Haliday) (*Epilobium* sp.). — *Lysiphlebus fabarum* (Marshall) (*Galeopsis speciosa*, *Epilobium montanum*, *Salvia verticillata*). — *Monoctonus angustivalvus* Starý (*Doronicum pardalianthus*).

*Protaphis carlinae* Boerner: *Lysiphlebus fabarum* (Marshall) (*Carlina vulgaris*).

Note: Four parasite-complexes may be recognized: 1. Polyphagous species, the host-specificity of which is determined mainly by the mode of host-life. *Ephedrus persicae* Frog. *Ephedrus plagiator* (Nees), *Lipolexis gracilis* Foerster, *Lysiphlebus fabarum* (Marshall), *Praon volucre* (Haliday), *Trioxys angelicae* (Haliday). 2. Oligophagous species, the main hosts of which belong to the Aphidine group: *Lysiphlebus ambiguus* (Haliday), *Praon abjectum* (Haliday), *Trioxys aculephae* (Haliday), 3. Oligophagous species, the main hosts of which belong to other groups than to the Aphidini: *Monoctonus cerasi* (Marshall), *Monoctonus angustivalvus* Starý, 4. Monophagous species: *Lysiphlebus fritzmulleri* Mackauer, *Trioxys genistae* Mackauer, *Trioxys macroceratus* Mackauer, *Trioxys glaber*, n. sp.

#### CRYPTOSIPHONINI

*Cryptosiphum artemisiae* Bekt.: *Ephedrus nacheri* Quilis M. P. (*Artemisia vulgaris*). — *Lysaphidus* sp. (*Artemisia vulgaris*).

Note: One parasite-complex may be recognized: 1. Oligophagous species, the main hosts of which belong to groups other than to the *Cryptosiphonini*: *Ephedrus nacheri* Quilis M. P.

### 3. Ecological characteristics of parasites

*Aphidius cingulatus* Ruthe Typical oligophagous parasite of *Pterocomma* spp. in forest-type habitats. Hosts: *Pterocomma populeum* (Kalt.) on *Populus* sp., *P. pilosum* Bekt. on *Salix caprea*, *P. salicis* (L.) on *Salix* sp., *Salix amygdalina*.

*Diaeretiella rapae* (M'Intosh): Oligophagous parasite, the main hosts of which belong to the tribe Brachycolini. It occurs in steppe-type habitats. Hosts: *Brachycaudus rumexicolens* Patch on *Rumex acetosella*, *Brevicoryne brassicae* L. on Brassicaceae, *Hayhurstia atriplicis* (L.) on *Chenopodium* spp., *Myzodes persicae* Sulz. on *Beta vulgaris*, *Solanum tuberosum*, *Schizaphis scirpi* (Kittel) on *Typha angustifolia*, *Sitobium* sp. on *Lolium* sp.

*Ephedrus nacheri* Quilis M. P.: Typical parasite of some species of leaf-curling aphids, occurring in steppe-type habitats. Hosts: *Cryptosiphum artemisiae* Bekt. on *Artemisia vulgaris*, *Hayhurstia atriplicis* (L.) on *Chenopodium* spp.

*Ephedrus persicae* Frog. Typical polyphagous parasite of various leaf-curling aphids, namely species of the Anuraphidine and Myzine groups. It occurs in forest-type and intermediate habitats. Hosts: *Allocotaphis quaestio-nis* (Boerner) on *Malus silvestris*, *Aphis fabae* Scop. on *Euonymus europaea*, *Aphis idaei* (d. G.) on *Rubus idaeus*, *Brachycaudus helichrysi* (Kalt.) on *Prunus persica*, *Anthemis* sp., *Melandrium* sp., *Brachycaudus* sp. on *Prunus domestica*, *Dysaphis devecta* (Walk.) on *Malus silvestris*, *Dysaphis* spp. on *Crataegus oxyacantha*, *Pyrus communis*, *Malus silvestris*, *Sorbus torminalis*, *Sorbus aucuparia*, *Myzodes ligustri* (Mosl.) on *Ligustrum vulgare*, *Hyadaphis mellifera* Hottes on *Lonicera xylosteum*, *Myzus cerasi* (F.) on *Prunus avium*, *Prunus cerasus*, *Phorodon humuli* (Schrk.) on *Prunus domestica*, *Rhopalosiphum padi* (L.) on *Padus racemosa*, *Roepkea marchali* (Boerner) on *Prunus mahaleb*.

*Ephedrus plagiator* (Nees): Widely polyphagous species, parasite of leaf-curling aphid and of aphids living in dense colonies, it occurs mainly in forest-type or intermediate habitats. Hosts: *Acyrtosiphon caraganae* (Chol.) on *Caragana arborescens*, *Aphis idaei* (v. d. G.) on *Rubus* sp., *Aphis fabae* Scop. on *Euonymus europaea*, *Philadelphus coronaria*, *Brachycaudus cardui* (L.) on *Prunus domestica*, *Prunus spinosa*, *Ceruraphis eriophori* (Walk.) on *Viburnum opulus*, *Dysaphis* spp. on *Malus silvestris*, *Sorbus aucuparia*, *Hyperomyzus lactucae* (L.) on *Ribes rubrum*, *Macrosiphum rosae* (L.) on *Rosa* sp., *Myzus cerasi* (F.) on *Prunus* sp., *Prociphilus fraxini* (Htg.) on *Fraxinus excelsior*, *Rhopalosiphum padi* (L.) on *Padus racemosa*, *Schizoneura ulmi* (L.) on *Ulmus laevis*, etc.

*Lipolexis gracilis* Foerster: Widely polyphagous parasite, the main hosts, of which belong to the genera *Aphis* and *Brachycaudus*. It occurs in steppe-type habitats, rarely on the edges of woods, parks, i.e. in intermediate habitats. Hosts: *Anoecia* sp. on *Cornus sanguinea*, *Aphis fabae* Scop. on *Beta vulgaris*, *Centaurea cyanus*, *Cirsium arvense*, *Aphis newtoni* Theob. on *Iris variegata*, *Aphis bupleuri* (Boerner) on *Bupleurum falcatum*, *Aphis origani* (Pass.) on *Origanum vulgare*, *Aphis polygonata* (Nevs.) on *Polygonum aviculare*, *Aphis craccae* (Koch) on *Vicia cracca*, *Aphis craccivora* (Koch) on *Medicago sativa*, *Aphis euphorbiae* Kalt. on *Euphorbia cyparissias*, *Aphis intybi* L. on *Cichorium intybus*, *Aphis salviae* Walk. on *Salvia nemorosa*, *Salvia pratensis*, *Aphis plantaginis* (Goetze) on *Plantago* sp., *Aphis taraxacicola* Boerner on *Taraxacum officinale*, *Brachycaudus cardui* (L.) on *Carduus* sp., *Brachycaudus helichrysi* (Kalt.) on *Melandrium album*, *Brachycaudus mordwilkoii* Boerner on *Echium vulgare*, *Myzus cerasi* (F.) on *Prunus avium*.

*Lysiphlebus ambiguus* (Haliday): Oligophagous parasite of *Aphis* spp. It occurs in steppe- and intermediate type of habitats. Hosts: *Aphis farinosa* Gmel. on *Salix* sp., *Aphis fabae* Scop. on *Eryngium planum*, *Aphis podagrariae* Schrk. on *Aegopodium podagraria*.

*Lysiphlebus fabarum* (Marshall): Widely polyphagous species, the main hosts of which belong to the genera *Aphis* and *Brachycaudus*. It occurs in steppe-type of habitats. Hosts: *Aphis urticata* (F.) on *Urtica dioica*, *Aphis evonymi* (F.) on *Solanum nigrum*, *Aphis fabae* Scop. on a number of secondary hostplants (see: Starý, 1963, l. c.), *Aphis rumicis* L. on *Rumex crispus*, *Aphis newtoni* Theo. on *Iris variegata*, *Aphis polygonata* (Nevs.) on *Fagopyrum convolvulus*, *Aphis poterii* Boerner on *Sanguisorba minor*, *Aphis roepkei* HRL. on *Potentilla reptans*, *Aphis verbasci* (Schrk.) on *Verbascum austriacum*, (*Aphis intybi* (Koch) on *Cichorium intybus*, *Aphis eryngii-glomeratus* Bosh. on *Eryngium campestre*, *Aphis euphorbiae* (Kalt.) on *Euphorbia cyparissias*, *Aphis craccivora* (Koch) on *Medicago sativa*, *Onobrychis viciae-folia*, *Trifolium pratense*, *Aphis salviae* (Walk.) on *Salvia pratensis*, *Aphis lambersi* (Boerner) on *Daucus carota*, *Aphis plantaginis* (Goetze) on *Plantago media*, *Aphis taraxacicola* (Boerner) on *Taraxacum officinale*, *Aphis vanderghooti* Boerner on *Achillea millefolium*, *Brachycaudus tragopogonis* (Kalt.) on *Tragopogon pratensis*, *Brachycaudus cardui* (L.) on *Arctium lappa*, *Carduus acanthoides*, *Carduus crispus*, *Carduus nutans*, *Chrysanthemum leucanthemum*, *Matricaria maritima*, *Prunus spinosa*, *Brachycaudus rumexicolens* Patch on *Rumex acetosella*, *Hyperomyzus lactucae* (L.) on *Sonchus oleraceus*, *Paczoskia major* Boerner on *Echinops sphaerocephalus*, *Pemphigus* sp. on *Helichrysum arenarium*, *Protaphis carlinae* (Boerner) on *Carlina acaulis*, *Rhopalosiphum nymphaeae* (L.) on *Ranunculus* sp., *Sitobium avenae* (Fabr.) on *Festuca* sp.

*Lysiphlebus fritzmuelleri* Mackauer: Monophagous parasite, occurring in steppe-type habitats. Host: *Aphis cracciae* (L.) on *Vicia cracca*.

*Monoctonus angustivalvus* Starý: Oligophagous parasite of *Nasonovia* spp. It occurs in forest-type habitats. Hosts: *Nasonovia nigra* HRL. on *Hieracium silvaticum*.

*Monoctonus cerasi* (Marshall): Probably polyphagous parasite of some leaf-curling aphids. It occurs in forest type habitats. Hosts: *Myzodes ligustri* (Mosl.) on *Ligustrum vulgare*, *Aphis pomi* Deg. on *Malus silvestris*.

*Praon abjectum* (Haliday): Oligophagous parasite of *Aphis* spp. in forest-type habitats. Hosts: *Rhopalosiphum padi* (L.) on *Padus racemosa*, *Aphis craccivora* Koch on *Robinia pseudoacacia*, *Aphis fabae* Scop. on *Euonymus europaea*, *Philadelphus coronaria*, *Cirsium rigens*, *Aphis farinosa* Gm. on *Salix* sp., *Aphis sambuci* L. on *Sambucus nigra*.

*Praon necans* Mackauer: As far as it is known, this is a monophagous parasite of *Rhopalosiphum nymphaeae* (L.) on *Hydrochaeris morsus-ranae*, *Menianthes trifoliata*, *Nymphaea*, etc.

*Praon volucre* (Haliday): Widely polyphagous species, occurring in forest-type or intermediate habitats. Hosts: *Acyrtosiphon caraganae* Chol. on *Caragana arborescens*, *Brachycaudus lychnidis* (L.) on *Melandrium* sp., *Brevicoryne brassicae* (L.) on *Brassicaceae*, *Hyalopterus pruni* (Geoffr.) on *Prunus domestica*, *Phragmites communis*, *Prunus spinosa*, *Microlophium evansi* (Theo.)

on *Urtica dioica*, *Macrosiphum rosae* (L.) on *Rosa* sp., *Hyperomyzus lactucae* (L.) on *Sonchus oleraceus*.

*Trioxyx acalephae* (Haliday): Typical oligophagous parasite of *Aphis* spp., eurytopic species, occurring mainly in steppe and intermediate type habitats.

Hosts: *Aphis craccivora* Koch on *Onobrychis sativa*, *Trifolium pratense*, *Caragana arborescens*, *Robinia pseudoacacia*, *Aphis euphorbiae* (Kalt.) on *Euphorbia cyparissias*, *Aphis fabae* Scop. on *Cirsium arvense*, *Aphis farinosa* Gmel. on *Salix* sp., *Aphis mordwilikiana* Dobrowlj. on *Rubus* sp., *Aphis salviae* Walk. on *Salvia nemorosa*, *Salvia pratensis*, *Aphis spiraephaga* F. P. Mueller on *Spiraea* spp., *Aphis urticata* (F.) on *Urtica dioica*, *Aphis* sp. *Epilobium montanum*, *Epilobium parviflorum*. *Aphis cracca* (L.) on *Vicia cracca*.

*Trioxyx angelicae* (Haliday): Polyphagous species, its main hosts belong to the Aphidine group. It occurs in forest and intermediate type of habitats. Hosts: *Aphis fabae* Scop. on *Euonymus europaea*, *Philadelphus coronarius*, *Arctium* sp., *Beta vulgaris*, *Campanula rapunculoides*, *Impatiens noli-tangere*, *Aphis cognatella* Jones on *Euonymus europaea*, *Aphis spiraephaga* F. P. Mueller on *Spiraea* spp., *Aphis craccivora* (Koch) on *Laburnum vulgare*, *Caragana arborescens*, *Cytisus nigricans*, *Aphis farinosa* Gmel. on *Salix* sp., *Aphis sambuci* L. on *Sambucus nigra*, *Aphis pomi* Deg. on *Malus silvestris*, *Aphis viburni* Scop. on *Viburnum opulus*, *Aphis* sp. on *Salvia verticillata*, *Brachycaudus helichrysi* (Kalt.) on *Persica vulgaris*, *Brachycaudus* sp. on *Rumex acetosella*, *Dysaphis devectora* (Walk.) on *Malus silvestris*, *Rhopalosiphum padi* (L.) on *Padus racemosa*.

*Trioxyx auctus* (Haliday): As far as it is known, this is a parasite of *Rhopalosiphum oxyacanthae* (Schrk.) on *Poa* sp.

*Trioxyx glaber*, n. sp.: Probably monophagous parasite of *Aphis galii-scabri* (Schrk.) on *Asperula cynanchica*.

*Trioxyx genistae* Mackauer: It is known as a monophagous parasite of *Aphis genistae* (Schrk.) on *Genista tinctoria* in intermediate type habitats.

*Trioxyx macroceratus* Mackauer: A single record of the host of this species is that of *Aphis podagrariae* Schrk. on *Aegopodium podagraria* in steppe-type habitats.

#### 4. Discussion

Subfamily Pterocommatinae. This group is a very natural group of aphids in general appearance and life-history (fig. 2). The parasites, being represented by one species (*Aphidius cingulatus* Ruthe in Europe, are rather specialized oligophagous species that do not parasitize other aphid groups. Their specificity is evidently conditioned by the life-history of the host and phylogenetical host  $\times$  parasite relationship.

Subfamily Aphidinae. This is a natural relatively rather homogeneous aphid group in general appearance and life-history. There is only one exception — the tribe Cryptosiphonini (fig. 12), which have an altogether peculiar position. They were also included in an other subfamily, the Anuraphidinae, by some authors. In the Aphidinae belong species that live mostly in more or less dense colonies on leaves, stems, flowers, roots, etc. (figs. 1, 3, 4, 5, 6, 7, 8, 9, 10, 11). We may expect, therefore, the parasites with also belong to a great extent to oligophagous and polyphagous species.



As for the host-specificity of parasites four following groups may be recognized:

I. Monophagous species: *Lysiphlebus fritzmuelleri* Mackauer, *Praon necans* Mackauer, *Trioxys genistae* Mackauer, *Trioxys glaber*, n. sp., *Trioxys macroceratus* Mackauer,

The greatest part of this group represent species of the genus *Trioxys* Hal., which is the most specialized genus in the Aphidiidae.

II. Oligophagous species, the main hosts of which belong to the Aphidinae: *Lysiphlebus ambiguus* (Haliday), *Praon abjectum* (Haliday), *Trioxys aculephae* (Haliday), (?) *Trioxys auctus* (Haliday). The host-specificity range of these species include only the Aphidinae, they do not parasitize other groups.

III. Oligophagous species, the main hosts of which belong to groups other than to the Aphidinae: *Diaeretiella rapae* (M'Intosh), Starý, *Ephedrus nacheri* Quilis, *Monoctonus angustivalvus* Starý. In all these species, except *Ephedrus nacheri* Quilis, the Aphidinae represent only facultative hosts. *Ephedrus nacheri* Quilis is a typical parasite of *Hayhurstia atroplicis* (L.) (Myzinae), which is a gall-producing species similarly to *Cryptosiphum artemisiae* Bekt.

IV. Polyphagous species: *Ephedrus persicae* Frog. *Ephedrus plagiator* (Nees), *Lipolexis gracilis* Foerster, *Lysiphlebus fabarum* (Marshall), *Monoctonus cerasi* (Marshall), *Praon volucre* (Haliday), *Trioxys angelicae* (Haliday).

In the host-specificity of all the mentioned species the habitat and the mode of host-life play a rather important role, although it is evident that certain phylogenetic relations determine even so wide host-range of these parasites on some (although numerous) aphid groups only. These parasites are evidently phylogenetically progressive species with a wide possibility of adaptation.

As our previous studies have shown, the host-specificity in the Aphidiidae is determined by the following two main factors: 1. By the habitat, 2. by the presence of suitable hosts in the frame of this habitat. The host — suitability is determined by the phylogenetic adaptation of a parasite to a given host and by the ability of a parasite to infest and develop in a host that has a similar mode of life but different phylogeny when compared with the original "phylogenetic" host (see Starý, 1962, l. c.)

Just in dioecious species of the subfamily Aphidinae it is apparent how big is the influence of a habitat on the host-specificity of parasites. In quite a number of dioecious species (*Rhopalosiphum padi* (L.), *Aphis craccivora* Koch, *Aphis fabae* Scop., *Aphis sambuci* L., etc.) there are evidently different parasite-complexes on primary and secondary host plants, as primary and secondary host plants are in different types of habitats (forest × steppe). The influence of habitat is distinct in such cases, when the secondary host plant is in the same habitat as the primary host plant, in which case the parasite complex is identical both on primary and secondary host plants as they are in the same type of habitat. Example: 1. In *Aphis fabae* Scop. the primary host plants are in the forest type and secondary host plants in steppe type of habitats, but sometimes the secondary host plants are on edges of parks, various clearings, waste-places, etc. in forest type habitats. 2. In *Hyalopterus pruni* (Geoffr.) both primary and secondary host plants are in more or less the same type of habitat

and for this reason the composition of parasite-complex is identical both on primary and secondary host plants.

In monoecious aphids, on the contrary, which occur in the same type of habitat during the whole season, the composition of parasite-complexes is also the same during the whole season. Example: *Aphis bupleuri* (Boerner), *Aphis cognatella* Jones, *Aphis craccae* (L.), *Aphis euphorbiae* (Kalt.), *Aphis farinosa* (Gmel.), *Aphis intybi* (Koch), *Aphis salviae* (Walk), etc.

### 5. Conclusions

1. The aphidiid parasites of the Pterocommatinae represent a strongly specialized oligophagous group that does not parasitize other aphid groups.

2. In the parasites of the Aphidinae the following four groups may be recognized:

I. Monophagous species, II. Oligophagous species, which main hosts belong to the Aphidinae, III. Oligophagous species, the main hosts of which belong to other aphid groups, IV. Polyphagous species.

3. Results of our studies on the Pterocommatinae, Aphidinae × aphidiid parasites relationship confirm our previous opinion that the host-specificity in the Aphidiidae is determined by two main factors: 1. By the habitat, 2. By the occurrence of suitable hosts in the frame of this habitat. The host-suitability is determined by the phylogenetic adaptation of the parasite and by the ability of the parasite to infest and develop in a host that has a similar mode of life but different phylogenetic relations.

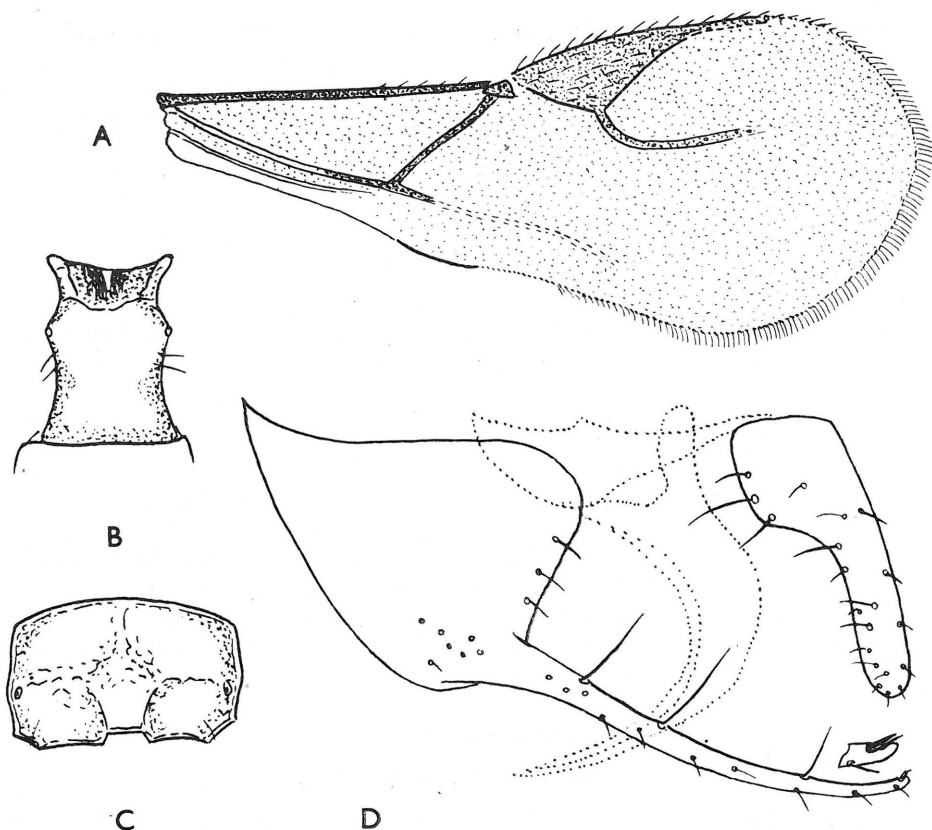
### 6. Description of new species

#### *Trioxys (Trioxys) glaber*, n. sp.

Closely related to *Trioxys (Trioxys) parauctus* Starý, differing from the latter in the shape and size of the eyes, and further characters on the head, in the coloration and host-complex, in being a parasite of *Aphis galliiscabri* Schrk., while *T. parauctus* Starý is a parasite of *Hydaphias* spp. on the same host plants and in the same habitats.

Note: In the original description of *T. parauctus* Starý "*Aphis* sp." (instead aphid sp.) is given in the host-list. The type material was revised and it was ascertained that "*Aphis* sp." is a *Hydaphias* sp., which is the typical host of *T. parauctus* Starý. There is also numerous further material of *T. parauctus* Starý in our collection and in any case it was not bred from an *Aphis*, but always from *Hydaphias* sp.

Female. — Head transverse, rounded, smooth, shiny, sparsely haired, wider than thorax at tegulae. Occiput margined. Temple  $\frac{1}{4}$ — $\frac{1}{3}$  narrower than transverse eye-diameter. Gena equal to  $\frac{1}{5}$  of longitudinal eye-diameter. Eyes elongate oval, of medium size, sparsely haired, strongly convergent towards clypeus, Interocular 1. nearly twice longer than transfacial 1., somewhat shorter than facial 1., Clypeus with 4 long hairs. Tentorio-ocular 1. equal to  $\frac{1}{4}$  of intertentorial 1. Antennae 11-segmented, filiform, reaching apex of tergite 1.  $F_1 = F_2$ , 2,5 times as long as wide. Antennal socket diameter equal to socket-ocular 1.



*Trioxys (Troxys) glaber*, n. sp. — A: wing, B: tergite 1. C: propodeum, D: genitalia.

Mesoscutum falling vertically to pronotum, smooth, shiny; along the margins and effaced notaulices on the disc with sparse long hairs. Notaulices crenulate, deep, narrow, distinct at the ascendent part and effaced on the disc. Propodeum (fig. C) with feeble pentagonal central wide areola to nearly smooth, otherwise slightly rugose to nearly smooth, sparsely haired. Wing (fig. A): pterostigma 3 times as long as wide. Metacarp  $\frac{1}{3}$  shorter than pterostigma. Radial v. equal to length of pterostigma.

Abdomen rounded. Tergite 1 (fig. B) less than twice as long as wide at spiracles, smooth, shiny, slightly convex, sparsely haired. Spiracular tubercles situated somewhat before half way, prominent laterally. Distance between spiracles and apex of tergite a little shorter than width at spiracles. Genitalia figured (fig. D). Appendages slender, slightly arcuate, with 3—4 long hairs on dorsal side and with 2 apical bristles.

Coloration: Head black brown; mouthparts and clypeus yellow brown. Antennae brown, apex of pedicel and base of  $F_1$  slightly yellowish. Thorax

black brown. Wings almost hyaline, venation brownish. Legs dark brown, base of tibiae more or less yellowish. Abdomen brown, sometimes base and apex of tergite 1 and base of tergite 2 yellowish. Ovipositor sheaths brownish, last sternite and appendages yellowish brown, distinctly distinguishable from the brown abdomen.

Body length about 1.4 mm.

Male. — Antennae 12—13-segmented. Head black brown, mouthparts brownish. Antennae brown, apex of pedicel yellowish. Thorax black brown. Legs dark brown. Abdomen dark brown, tergite 1 lighter. Otherwise like the female except sexual differences.

General distribution: Europe (Czechoslovakia).

Material examined: Czechoslovakia: Slovakia-Plešivec, 10. VI. 1961, *Aphis galii-scabri* on *Asperula cynanchica*, stone steppe, ♀ holotype, ♂ allotype, numerous paratypes ♀♀ ♂♂, lgt. P. Starý.

Habitat: H. of steppe type.

Host: *Aphis galii-scabri* Schrk.: On *Asperula cynanchica*, Czechoslovakia.

Note: All the type material is deposited in the author's collection.

### Summary

The paper deals with the Pterocommatinae, Aphidinae × aphidiid parasites relationships and it represents a further part of the author's studies on the relationship of various aphid groups and their aphidiid parasites in (Central) Europe. It includes: 1. Host-parasite catalogue with notes on parasite-complexes of the given groups. 2. Ecological characteristics of parasites, which include notes on the host-specificity of various aphidiid species and their occurrence in various types of habitats. 3. Host-parasite relationships are discussed. 4. A new species, *Trioxys (Trioxys) glaber*, n. sp., a parasite of *Aphis galii-scabri* Schrk. on *Asperula cynanchica*, in Czechoslovakia, s described.

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