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Aphid Parasitoids in the Sub-Antarctic

(Hymenoptera, Aphidiidae)

By **Petr Starý**

Institute of Entomology, Czechoslovak Academy of Sciences

and

Michael Vogel

Fachbereich Biologie/Zoologie, Philipps Universität Marburg

Abstract

Aphidius subantarcticus sp. n., a presumed parasitoid of the aphid *Jacksonia papillata* Theo. from the Falkland Islands is described. It is classified as a member of a new faunal complex of parasitoids associated with the subantarctic tundra. A comparison of the aphid parasitoids occuring in the subarctic and subantarctic areas shows that extensive information has been achieved in the tundra and forest-tundra zone of the holarctic region, while the finding of *A. subantarcticus* is the first record in a similar floral zone of the southern hemisphere.

Introduction

This account presents results of the examination of aphid parasitoid material collected by M. Vogel in the course of the project "Zur Ökologie antarktischer Landinsekten" carried out on South Georgia and on the Falkland Islands during December 1981 to April 1982*.

Material and methods

Aphid and parasitoid material was mostly obtained from pitfall traps (plastic beakers with a top diameter of 7 cm and a volume of ca. 200 ml, containing a mixture of formaldehyde [7%], water and a detergent) set out in several localities in the outlying areas of Port Stanley:

Port Stanley: pitfall traps, 17. 3. 1982–23. 3. 1982 in a meadow at the boundary of the "Live Firing Area" of the Royal Marines. The vegetation consists mainly of different grass species, which were heavily grazed by sheep (see fig. 1).

Port Stanley: pitfall traps, 17. 3. 1982–23. 3. 1982 inside the "Live Firing Area". The vegetation consists mainly of different grass species (i. e. *Poa* sp., *Festuca* sp.). *Juncus* sp., *Rostkovia* sp. and *Acaena magellanica* were identified from the other plants.

Port Stanley: hand collection, 26. 12. 1981

Animals swept by net from grass at the boundary of the "Live Firing Area" (as above where pitfall traps were set out).

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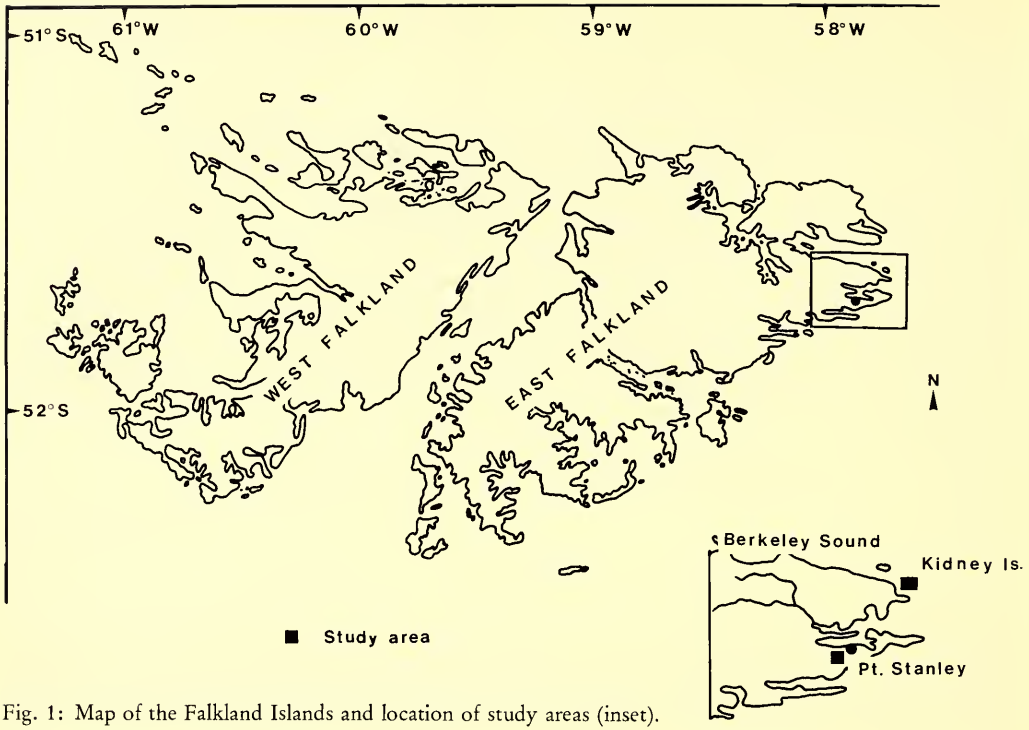


Fig. 1: Map of the Falkland Islands and location of study areas (inset).

Kidney Island: hand collection, 27. 12. 1981

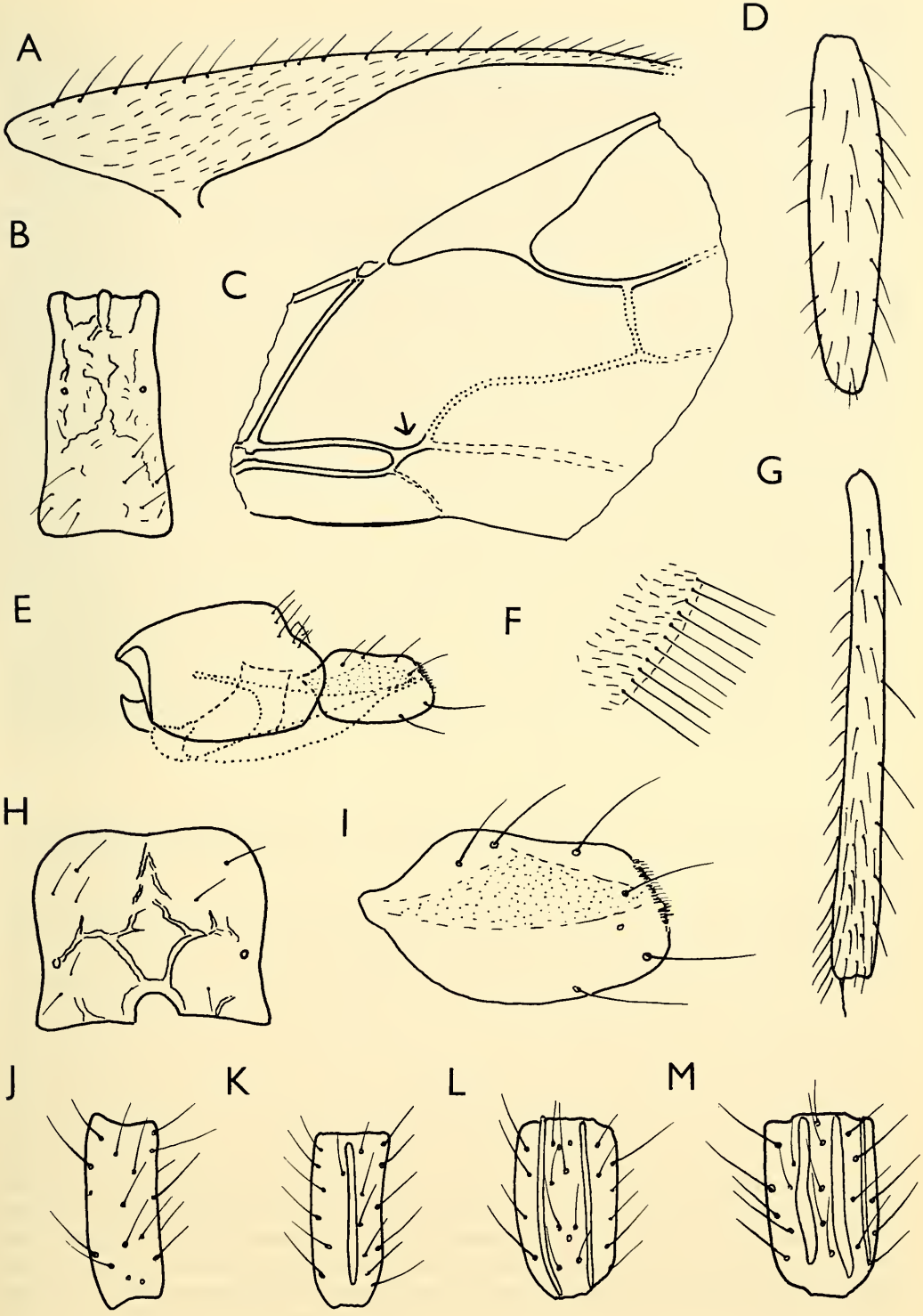
Animals swept by net from tussock grass *Poa flabellata*. Kidney Island is a small and protected island north east of Port Stanley (see fig. 1). The main vegetation consists of tussock grass *Poa flabellata*, which can reach a height of up to 3 meters.

Results

Aphidius subantarcticus sp. n.

The name of the new species is derived from the establishment of a representative of the genus *Aphidius* in the cold temperate subantarctic area. The new species (female) is characterized by having the tentorial index 0.45–0.50, antennae 14–15 segmented, and by characters in the wing-venation: metacarpus equal to or somewhat longer than half the pterostigma length; a part of the cubital vein subsequent to cubital cell 2 and before insertion of the intermedian vein is unusually long (for *Aphidius*). The male has 10 – segmented antennae. The tentorial index and the number of antennal segments bring the new species close to *Aphidius hortensis* Marsh. which is a parasitoid of *Liosomaphis berberidis* Kalt. in the holarctic. However, characters in the wing-venation, coloration and the host complex area are rather different. The geographically closest relative, *A. similis* Starý and Carver distributed in Australia is similar by the tentorial index value, but differs in the number of antennal segments (15–16) and less thickened antennae, and by characters of the wing-venation.

Fig. 2: *Aphidius subantarcticus* sp. n., female paratype. Drawings due on different relative scales. A: Forewing, detail of pterostigma and metacarpus. B: Tergite 1. C: A part of the forewing. D: Hind femur. E: Genitalia. F: Marginal hairs, forewing. G: Hind tibia. H: Propodeum. I: Ovipositor sheath, detail. J: Flagellar segment 1. K: Flagellar segment 2. L: Middle flagellar segment. M: Praeapical flagellar segment.



Female:

Eyes medium sized. Gena equal to $^1/_5$ of eye length, or to tentorio-ocular line. Face with sparse hairs over all surface. Tentorial index (i. e. tentorio-ocular line over intertentorial line, relative length) 0.45–0.50. Antennae 14–15 segmented, thickened to the apex, reaching to the middle of abdomen. Flagellar segment 1 (= F_1) (Fig. 2 J) 2.5 times as long as wide, the hairs subequal to its width; without rhinaria. F_2 (Fig. 2 K) as long as but slightly wider than F_1, somewhat more than twice as long as wide. The hairs are slightly shorter than the segment diameter. With 0–1 rhinaria. Middle F segments (Fig. 2 L) less as twice as long as wide, the hairs about $^1/_3$ shorter than the segment diameter. Preapical F segment (Fig. 2 M) distinctly less than twice as long as wide, about 1.5 times wider than F_1, and about $^1/_7$ wider than the middle F segments. Mesonotum with longitudinal rows of sparse hairs along the effaced notaulices on the disc. Propodeum (Fig. 2 H) areolated, central areola irregular in the upper part. Forewing (Fig. 2 C): Pterostigma 3.5–5 times as long as wide. The metacarpus is intermediate, about $^1/_3$ to almost $^1/_2$ shorter than the pterostigma. The upper marginal hairs of the pterostigma and the metacarpus are semierect, distinctly longer than those on the pterostigma surface (Fig. 2 A). The venation is rather feeble, only the pterostigma, the metacarpus and the radial abscissae are well pigmented. The interradial vein, the intermedian and median vein on the lowerside of the radial and median cell are poorly distinguishable. A part of the cubital vein subsequent to cubital cell 2 and before the insertion of the intermedian vein is unusually long (Fig. 2 C, see the arrow). Apical marginal hairs are distinctly longer than those on the surface (Fig. 2 F). The radial abscissa 1 is twice as long as abscissa 2. Intermedian vein slightly longer than radial abscissa 2. Hind femur (Fig 2 D) with sparse semierect hairs that are equal to half of its middle width. Hind tibia (Fig. 2 G) with sparse semierect hairs on the outer surface that are equal to the middle width of tibia, and with denser hairs on the inner surface. Tergite 1 (Fig 2 B) 2.5 times as long as wide at spiracles, rugose, with a keeliform rugosity along the middle third. With sparse hairs. Anterolateral area is costulate, with about 9 costulae. Genitalia see Fig. 2 E and Fig. 2 I.

Coloration: Head brown. The lower part of temples, genae, the lower part of clypeus and the mouthparts are yellowish. Antennae brown. F_1 with narrow, yellowish basal ring. Thorax uniformly brown. The wings are subhyaline with brown venation. Fore and middle legs yellow brownish, hind legs brown. Abdomen brown. The length of the body is ca. 2.4 mm.

Male:

Antennae 19-segmented. The coloration is much darker than in the female, prevalently dark brown.

Material:

Falkland Islands: Kidney Island, 27.12.1981, holotype ♀, 2♂♂ paratypes (M. Vogel). Port Stanley, 26.12.1981, 1♂ paratype, Live Firing Area (M. Vogel).

Deposition: Coll. P. Starý (Czechosl. Acad. Sci.); 1 paratype in Coll. University of Marburg.

Discussion

1. Host range of *Aphidius subantarcticus*

The host range of *Aphidius subantarcticus* remains unknown as the material was taken by pitfall traps in a meadow habitat. However, the known aphid fauna of the area near Port Stanley includes *Tuberolachnus salignus* (Gmel.), *Jacksonia papillata* Theo., *Rhopalosiphum padi* (L.) (Eastop 1970). *Brachycaudus helichrysi* Kalt. was found also in one of the present samples in the Stanley area. *Tuberolachnus salignus* may be omitted as its parasitoids have not yet been found in any part of the world. Moreover, the parasitoid is too small for such a large aphid species. Therefore, we may presume that the

host of *A. subantarcticus* is an aphid associated with the Gramineae, and it might be the most common species in the Falkland Islands, *Jacksonia papillata*. *Jacksonia papillata* is reported to live on the bases of grass stems and more rarely on the elevated parts of dicotyledons. It occurs in wetter and cooler climates than many other aphids. It is recorded from Macquarie I., South Georgia, New Zealand, USA (Idaho), Argentina, Iceland, Norway and some other European countries (EASTOP 1970). Parasitoids of *J. papillata* have not yet been reported from any other area of its range.

2. Distribution and relationship of *A. subantarcticus*

None of the aphid species found in the areas studied are endemic species. Consequently, we may presume a similar situation to occur in the established parasitoid, *A. subantarcticus*. At the present state of our knowledge it is possible merely to summarize that a similar species has not been found in South America. However, the southern part of the Neotropical America has remained poorly known. A relative better situation is found in Australia, Tasmania and New Zealand from where the basic evidence of the fauna of aphid parasitoids occurs (CARVER & STARÝ 1974, STARÝ & CARVER 1971, 1979). Note: The updated information of various authors on the importation of parasitoid species within the framework of biocontrol of *Acyrthosiphon pisum* (Harr.), *A. kondoi* Shinji and *Therioaphis trifolii* (Mon.) in this area is not dealt with. All parasitoids are new imports and they are also associated with other host species than those in the subantarctic area. – We do not have, however, records on parasitoids of *Jacksonia papillata* from this area. – The situation is somewhat different in *Rhopalosiphum* and *Brachycaudus* aphids in which parasitoids are known from Australia (CARVER & STARÝ 1974, STARÝ & CARVER 1971, 1979): *Aphidius similis* Starý and Carver and *Aphidius colemani* Vier. (= *platensis* Brèth.). Generally in both of them, namely *A. colemani*, the commonest parasitoid species in Australia, the dispersal by air streams to the subantarctic area could be presumed. However, both species seem to be distributed in warmer climatic areas. Conclusively, present evidence does not show another record on distribution of *A. subantarcticus* outside the Falkland Islands.

3. Comparison of the subantarctic and subarctic parasitoid faunas

A simple comparison shows that extensive information has relatively been achieved in the northern areas of the holarctic region (tundra and forest-tundra zone) while the evidence of *A. subantarcticus* is the first record in a similar zone of the southern hemisphere. STARÝ (1970) divided the world parasitoid fauna into the particular faunal complexes (FC) that correspond, in general, to the particular vegetation zones. Correspondingly, the northern elements on the Holarctic were included into the Holarctic forest-tundra FC. Species of this complex occur in the tundra and forest-tundra zone, but commonly also in the deciduous and mixed forests, parks and penetrate sometimes further southwards (mountain ranges, rivers). At the present state, this FC has become already rather numerous. Its members are parasitoids of various aphids associated mainly with *Betula, Alnus, Ribes, Populus,* and with some Gramineae, Cyperaceae, mosses and some other plant groups (Table 1). In some cases, their host range somewhat increases in other floral zones. In principle, the species number included in this FC fits perfectly with the general situation of the whole group which is prevalently holarctic and oriental, although biosystematically important groups are found in the southern hemisphere. On the contrary, the parasitoid fauna of the subantarctic, cold temperate area is rather poor, doubtlessly due also to a low number of aphid species occurring in this area. The newly established species, *A. subantarcticus,* is presumed to be associated with aphids on grasses in this area. In our opinion, *A. subantarcticus* is a representative of a new faunal complex in the parasitoid fauna, which is determined as the "subantarctic tundra FC". The closest relative due to floral zonation seems to be the "southern forest FC (Australia)" represented by *Parephedrus relictus* Starý and Carver, a parasite of *Sensoriaphis* associated with *No-*

Tab. 1: Parasitoid species included in the holarctic forest-tundra FC, arranged in a parasitoid species – aphid genus – plant genus system.

PARASITOID SPECIES	APHID GENUS	PLANT GENUS
Adialytus salicaphis (Fitch)	Chaitophorus	Salix, Populus
Adialytus veronicaecola Starý	Aphis	Veronica
Aphidius aquilus Mack.	Monaphis, Betulaphis, Calaphis, Callipterinella, Glyphina	Betula
Aphidius cingulatus Ruthe	Pterocomma	Populus, Salix
Aphidius ribis Hal.	Cryptomyzus	Ribes
Aphidius salicis Hal.	Cavariella	Salix, Umelliferae
Betuloxys compressicornis (Ruthe)	Euceraphis	Betula
Calaphidius elegans Mack.	Hamamelistes	Betula
Diaeretellus ephippium (Hal.)	Decrosiphon	mosses
Diaeretellus macrocarpus (Mack.)	Saltusaphis, Iziphya, Trichocallis	Cyperaceae, grasses
Diaeretellus palustris Sedlag	Rhopalosiphum	Sagittaria, etc.
Ephedrus blattnyi Starý	Pterocomma	Salix
Ephedrus brevis Stelfox	? Euceraphis	Betula
Ephedrus cerasicola Starý	Cryptomyzus, Myzus, Hyperomyzus	Galeopsis, Ribes
Monoctonus caricis (Hal.)	Hyalopteroides, Metopolophium, Sitobion	grasses
Monoctonus rufus (Cam.)	? aphids	Betula
Praon cavariellae Starý	Cavariella	Salix, Umbelliferae
Praon flavinode (Hal.)	Betulaphis, Euceraphis	Betula
Praon necans Mack.	Rhopalosiphum	Alysma, Caltha
Remaudierea plocamaphidis Starý	Plocamaphis	Salix
Trioxys auctus (Hal.)	Rhopalosiphum	Padus, Triticum
Trioxys betulae (Marsh.)	Sydobius	Betula, Betacallis, Alnus
Trioxys ibis Mack.	Betulaphis	Betula

thofagus in New South Wales, Australia (Starý & Carver 1971). Through *Nothofagus*, too, there is some relation to the preliminary defined FC "tropical cloud forest FC" of the neotropical America. This FC is represented by several *Pseudephedrus* parasitoid species that are mostly associated with *Neuquenaphis* aphid species on *Nothofagus*. This complex follows the tropical cloud forest zone apparently from Central America (Great Antilles, Cuba) to the south throughout the whole continent. Unfortunately, the most southern information comes from Chile (Starý 1976) and we do not have information from Patagonia and related areas. The faunal complexes associated with *Nothofagus* are representatives of the "southern" or "antarctic" element, the components of which are fairly plesiomorphic in character and have a pattern of distribution in the southern parts of the southern continents, whith occasional extensions into temperate Holarctica (Starý & Carver 1971). Biosystematical comparison of the parasitoid members of the aforementioned complexes occurring in the sub-antarctic area shows that obviously the *Nothofagus* associated aphid-parasitoid situation are much more primitive and ancient than the sub-antarctic grassland (tundra) associates. In this respect it is a parellel to the situation of tundra and forest-tundra in relation to the forest in the northern hemisphere.

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References

CARVER, M. & STARÝ, P. 1974: A preliminary review of the Aphidiidae (Hymenoptera, Ichneumonoidea) of Australia and New Zealand. – J. Aust. Ent. Soc. 13, 235–240

EASTOP, V. F. 1970: Hemiptera: Homoptera: Aphididae of South Georgia. – Pac. Ins. Monogr. 23, 227

STARÝ, P. 1970: Biology of aphid parasites (Hymenoptera, Aphidiidae) with respect to integrated control. – Series entomologica 6, 643 pp.

— — 1976: Two new *Pseudephedrus* Starý, aphid parasites (Hymenoptera, Aphidiidae) associated with *Nothofagus* in South America. With notes on the continental drift. – Ent. scand. 7, 24–30

STARÝ, P. & CARVER, M. 1971: A new genus and species of Aphidiidae (Hymenoptera) parasitizing *Sensoriaphis* (Hemiptera) on *Nothofagus* in New South Wales. – J. Aust. Ent. Soc. 10, 175–178

— — 1979: Two new species of *Aphidius* Nees (Hymenoptera, Ichneumonoidea, Aphidiidae) from Australia. – J. Aust. Ent. Soc. 18, 337–341

VOGEL, M.: The distribution and ecology of epigeic invertebrates on the subantarctic island of South Georgia. – Spixiana (in press)

Adresses of authors:
Petr Starý, Institute of Entomology, Czechoslovak Academy of Sciences,
Na sádkách 702, 370 České Budějovice,
Czechoslovakia

Michael Vogel,
Fachbereich Biologie/Zoologie, Philipps Universität Marburg,
P. O. B. 1929, D-3550 Marburg/Lahn, F. R. G.