

THE ESTABLISHMENT OF THREE EXOTIC APHID PARASITES (HYMENOPTERA: APHIDIIDAE) IN BRITISH COLUMBIA

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ABSTRACT

Praon exsoletum palitans, ***Aphidius ervi ervi*** and the **Orange** phenotype of ***Aphidius smithi*** are recorded from British Columbia. Release data, present distribution, host records, and diagnostic criteria are included.

During the past 15 years an extensive campaign has been carried out to introduce and establish exotic hymenopterous parasites of various pest aphids in the continental United States and, to a lesser degree, in Canada. A number of the aphidiid parasites that were released in the mid-western and western United States subsequently spread and invaded adjoining parts of Canada. This paper reports on the recovery of three aphidiid species in southern British Columbia. The specimens were obtained in the course of a faunistic survey of aphids and aphid parasites, in particular of species associated with alfalfa fields.

General records on the taxonomy, distribution, and known host range of the three aphid parasites discussed below were given by Mackauer and Stary (1967).

***Praon exsoletum palitans* Muesebeck**

Praon palitans Muesebeck, 1956. Bull. Brooklyn ent. Soc. 51: 27-28, figs. 2, 2 a, ♀ ♂ (Orig. descr.).

Praon exoletum palitans: Mackauer, 1959. Beitr. Ent. 9: 828-833, figs. 8, 17, ♀ ♂ Geogr. subsp. of *Praon exsoletum* (Nees).

Praon exsoletum palitans: Mackauer, 1968. Hym. Cat., n. edit., 3: 16-17 (Tax., emend.).

The species was introduced from the Mediterranean area and was released against the spotted alfalfa aphid, *Therioaphis trifolii* (Monell), in California during 1955 and 1956. The parasite became established in southern California in 1956 and subsequently spread over large areas of that state (Van den Bosch *et al.* 1959). It was reported by Muesebeck (1967) from Arizona, California, Colorado, Kansas, Nebraska, Nevada, New Mexico, and Utah, and by Angalet (1970) from Delaware, Maryland, and New Jersey.

Two male specimens of *Praon exsoletum palitans* were collected near the Canada Department of Agriculture Research Station, at Kamloops, on 2 June 1971. The parasites were bred from one alate female and one apterous second or third instar nymph of the sweetclover aphid, *Therioaphis riehmii* (Börner), on white sweetclover, *Melilotus alba*. This record is the first record of the species from Canada.

Praon exsoletum palitans resembles the Nearctic species *P. negundinis* Smith in coloration, the pilosity of the mesoscutum, and in the average number of antennal segments. It can be distinguished chiefly by the recurrent vein of the forewings which is either incomplete or lacking and, in the female, by the broad ovipositor sheaths (Mackauer 1959, Smith 1944). The host range of *P. exsoletum* is restricted to *Therioaphis* species which feed on herbaceous legumes, whereas *P. negundinis* appears to be a specific parasite of *Periphyllus* species feeding on maples (Mackauer and Stary 1967).

Aphidius ervi ervi Haliday

Aphidius (Aphidius) ervi Haliday, 1834. Ent. Mag. 2: 100, ♀ ♂ (Orig. descr.).

Aphidius medicaginis Marshall in Andre, 1898. Spec. Hym. Eur. Alg., 5 bis: 249-250, ♀ ♂ (Orig. descr.).

Aphidius fumipennis Györfi, 1958. Acta Zool. hung. 4: 133, ♂ (Orig. descr.).

Aphidius ervi ervi: Mackauer, 1962. Beitr. Ent. 12: 641-642 (Geogr. subsp.).

Aphidius ervi ervi: Mackauer, 1968. Cat. Hym., n. edit., 3: 46-47 (Tax.).

Colonies of *Aphidius ervi ervi* which originated from various European localities were released against the pea aphid, *Acyrtosiphon pisum* (Harris), in the western United States between 1959 and 1965 (Table

TABLE I. Open releases of *Aphidius ervi ervi* Haliday in western North America.

Year	Release area	Origin	Authority
1959	California	France	J.R. Coulson ¹⁾
1961	Arizona, Washington	France	J.R. Coulson ²⁾
1961	Oregon, Washington	France, Germany	B.J. Landis ³⁾
1962	Idaho	Poland	J.R. Coulson
1963	Idaho, Washington	eastern U.S.A.	J.R. Coulson ⁴⁾
1965	California	Lebanon	D.A. Chant, ³⁾ R.L. Doutt

1) Reported originally as *Aphidius medicaginis* and field-released according to Univ. of California records.

2) Reported originally as *Aphidius* sp. (ex pea aphid) and *Aphidius urticae*.

3) Reported in Mackauer and Finlayson (1967).

4) Reported originally as *Aphidius* sp. and *Aphidius ervi* collected in New Jersey and Pennsylvania. This record requires verification as the released material in fact may have belonged to *A. ervi pulcher* and not to *ervi ervi*.

1). The overall similarity between this species and the indigenous *A. ervi pulcher* and the fact that both species interbreed, it was suggested by Mackauer (1969, 1971), may be the reasons why proof of the establishment of *ervi ervi* in any of the United States release areas has been lacking so far.

The first specimens which were suspected to belong to *A. ervi* were collected near Kamloops during the summer of 1970. During 1971 additional material was obtained from the following localities: C.D.A. Research Station Kamloops (June-October), 5 mi S of Round Lake (8 August), Winfield (30 July), and Chilliwack (6 August, 15 September). All parasites were reared from pea aphids on alfalfa. The percent contribution of *ervi ervi* to the total number of primary parasites attacking the pea aphid in each locality ranged from 0.1 to 1.3%, except for Chilliwack where 88.2% out of a total of 304 parasites examined belonged to *ervi ervi*. In addition, some representatives of the species were bred from parasitized pea aphids that had been collected near Burlington, Washington, on 20 June 1970. Our records are the first evidence of the successful colonization and establishment of *A. ervi ervi* in Canada and the United States.

Of the three *Aphidius* parasites of the pea aphid which are known to occur in western Canada the yellowish-orange coloured *A. smithi* may be separated from the

predominantly fuscous-to-black coloured *A. ervi ervi* and *ervi pulcher* on the basis of colour and the relative length of the third antennal segment (Mackauer and Finlayson 1967). Differences in the female genitalia (Figs. 4, 6, 3f) are helpful but do not permit an accurate identification. The diagnostic criteria of the petiole that were described by Eady (1969) were found to be useful for the determination of between 90 and 95% of all specimens examined. Typically the anterolateral area of the petiole shows a rugose sculpture in *A. ervi ervi* (Fig. 3), while in *ervi pulcher* and *smithi* the same area is striated (Figs. 5, 7). The centrodorsal area of the petiole is coarsely sculptured in *ervi pulcher* (Fig. 1) but comparatively smooth in *smithi* (Fig. 2). These characteristics vary with the size of the specimen in that smaller specimens tend to show a less distinct sculpture. If live material is available for breeding all identifications should be verified by determining the colour and range of coloration under known temperature and humidity conditions in the laboratory.

Aphidius smithi Sharma and Subba Rao
Aphidius (*Aphidius*) *smithi* Sharma and Subba Rao, (1958) 1959, Indian J. Ent. 20: 183, 186-187, Pl. II, 1-5, Pl. III, 1-3, ♀ ♂ (Orig. descr.).

Aphidius smithi: Mackauer, 1968, Cat. Hym., n. edit., 3: 56 (Tax.).

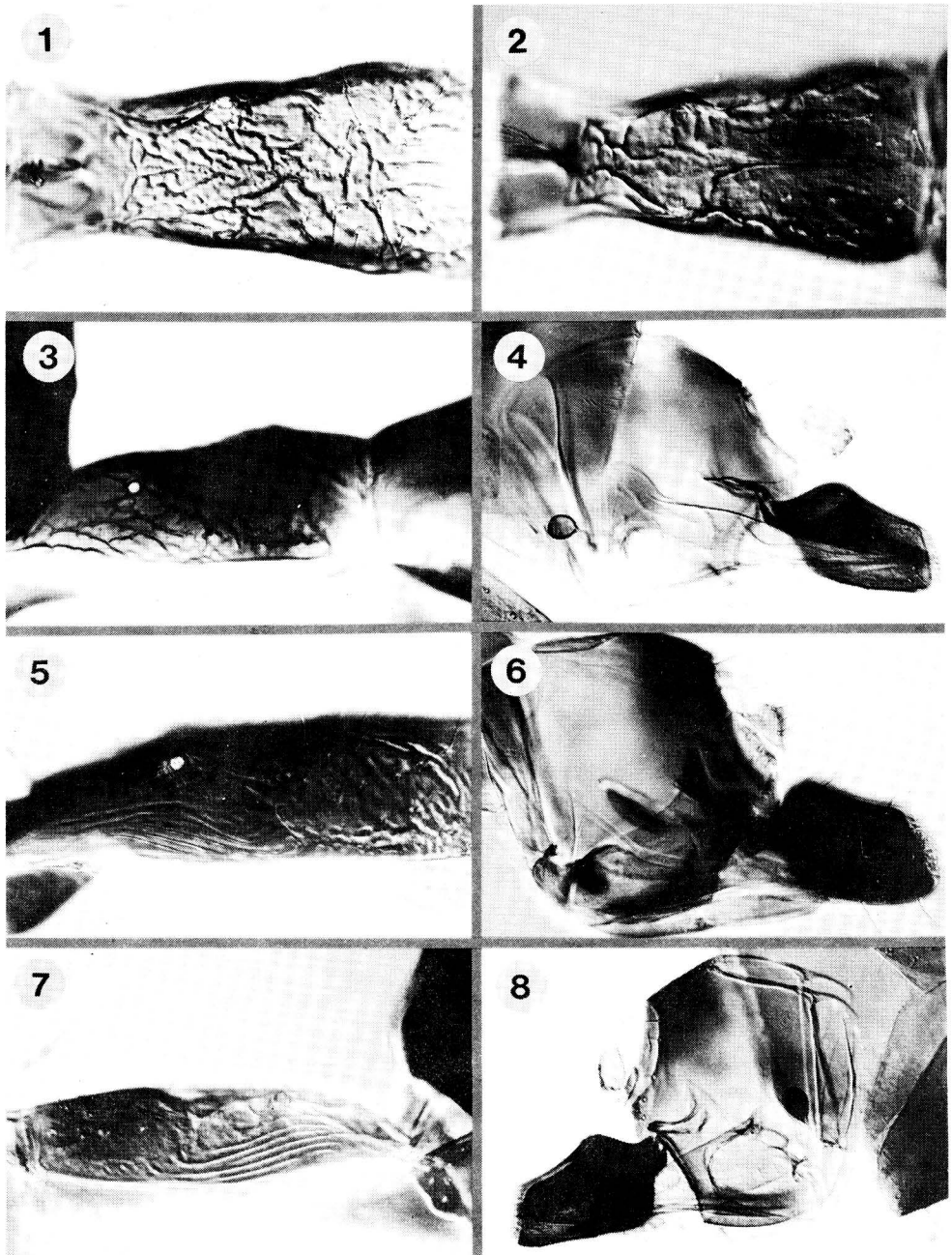


Fig. 1. *Aphidius ervi pulcher*, ♀, centrodorsal area of petiole.

Fig. 2. *Aphidius smithi*, ♀, centrodorsal area of petiole.

Figs. 3, 4. *Aphidius ervi ervi*, ♀. 3, anterolateral area of petiole; 4, genitalia.

Figs. 5, 6. *Aphidius ervi pulcher*, ♀. 5, anterolateral area of petiole; 6, genitalia.

Figs. 7, 8. *Aphidius smithi*, ♀. 7, anterolateral area of petiole; 8, genitalia.

(See text for details. Nomarski differential-interference contrast photographs of unstained specimens mounted in Hoyer's medium.)

The parasite was imported from India and released against the pea aphid, *Acyrtosiphon pisum*, in large areas of the United States and eastern Canada between 1958 and 1967 (Mackauer 1971, Mackauer and Bisdee 1965). It became established almost immediately upon its release in California (Hagen and Schlinger 1960) but was not recovered in the eastern United States and Canada until the fall of 1964 (Angalet and Coles 1966, Mackauer and Bisdee 1965). The present distribution of *A. smithi* includes California, Colorado, Idaho, Kansas, and Washington in the Western United States (Musebeck 1967), and Alberta (new record) and British Columbia in western Canada.

Further examinations showed that western populations of *A. smithi* are monomorphic, or largely so, with regard to a gene *Orange (O)* which affects the abdominal pigmentation, while eastern populations are generally dimorphic for the character. It was suggested by Mackauer (1968, 1971) that the *Orange* gene arose as a new mutation among released specimens in the eastern United States and, in fact, may have been involved in the establishment of the species under initially adverse

climatic conditions.

In July 1965 *A. smithi* was collected near Christina Lake indicating that the parasite had successfully invaded British Columbia from release sites in the western United States (Mackauer and Finlayson 1967). These first specimens were all wild-type. Since 1965 the species has spread through most of southern British Columbia and in 1971 was the most common of the primary parasites of the pea aphid in the interior of the Province. The first representatives of the *Orange* phenotype were collected W of Bridesville and near Kamloops in the summer of 1971, where they contributed 0.6 and 0.2%, respectively to the total number of pea aphid parasites.

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THE LEAFHOPPER GENUS *EMPOASCA* SUBGENUS *KYBOS* IN THE SOUTHERN INTERIOR OF BRITISH COLUMBIA

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ABSTRACT

The 22 species reported here represent 7 new species, 10 new Canadian records, and 5 previous records. *E. caesarsi*, *E. columbiana*, *E. coronata*, *E. dissimilaris*, *E. empusa*, *E. rossi*, and *E. tigris* n. spp. are described and illustrated. New Canadian records are *E. alaskana* Ross, *E. andresia* Ross, *E. betulicola* Wagner, *E. copula* DeLong, *E. exiguae* Ross, *E. fontana* Ross, *E. gelbata* DeLong & Davison, *E. portola* Ross, *E. rubrata* DeLong & Davidson, and *E. trifasciata* Gillette. Brief descriptions and a key are provided.

One of the most poorly studied genera of Canadian leafhoppers is *Empoasca* Walsh. This is a very large genus of small, green to orange insects that feed on a wide variety of forages, shrubs, and trees; many species are common, and quite a few are considered economically important, both for the damage they cause in feeding and for the transmission of "viral" diseases of crops.

The genus is divided into three subgenera: *Empoasca* sensu stricto, *Kyboasca* Zachvatkin and *Kybos* Fieber. The first encompasses the majority of species, which feed mainly on forages and shrubs. There are many species complexes in this group, requiring much biological data to determine the specific limits. The available information is too incomplete at present to permit adequate treatment of this subgenus. *Kyboasca* is a small subgenus, characterized by the numerous tergal apodemes in the male abdomen. The species feed on a variety of trees, other than willow and poplar. All but two species collected in British Columbia have been previously recorded from Canada by Beirne (1956). The third subgenus is a moderately large group of species feeding almost exclusively on willows (*Salix* spp.) and

poplars (*Populus* spp.). *Kybos* is very well represented in British Columbia; I have taken 22 species in the interior, and others probably await discovery. Only 4 of these were previously recorded by Beirne, and another by Ross (1963). Most of the new Canadian records are of species found in adjacent areas in the United States.

The subgenus *Kybos* is characterized by male genitalia in which the anal hooks are strongly curved, and the minutely serrate style apices are curved and bear very long, fine setae. The subgenus may be more readily recognized by the chaetotaxy of the plates. The macrosetae are longer than the width of the plates, and either scattered over the ventral surface or arranged in many rows, instead of being short and biserrate, as in the other subgenera.

Characters used in identifying the species are the shape of the anal hooks and brachones (ventral pygofer processes), and the chaetotaxy of the base of the sub-genital plates. The apodemes of the second sternite and the third and fourth tergites (2S, 3T, 4T) of the male abdomen are also useful, although parasitized specimens are often encountered in which these are greatly reduced. Some species have distinctive colour patterns, and may thus be

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