

Aphid Parasitoids Sampled by Malaise Traps in the National Parks of Thailand (Hymenoptera, Braconidae, Aphidiinae)

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Abstract

Aphidiine parasitoids of aphids sampled by Malaise traps in different environments in Thailand are reviewed and some faunal relationships are discussed. A new species, *Areopraon thailandicum* is described and *Aphidius autriquei* Starý, known previously only from central Africa, is reported from Thailand for the first time.

Keywords: aphids, parasitoids, biodiversity, national parks, Thailand

Introduction

Thailand, like most of its neighboring countries, e.g., some parts of India (Starý and Ghosh, 1983), Bangladesh (Starý and van Harten, 1983), China (Chen and Shi, 2001), Vietnam (Starý and Zeleny, 1983), Laos, Cambodia, Malaysia (Ng and Starý, 1986), is poorly sampled for aphidiine parasitoids of aphids. The only apparent host record for the subfamily from Thailand is an undetermined *Aphidius* species reared from *Pentalonia nigronervosa* Coq. (Banpot and Pimpun, in Takada, 1992). Due to the lack of information on Thai aphidiine biodiversity studies are an important first step. We hope that this and future papers will also encourage Thai researchers to rear aphids to obtain host associations for their parasitoids.

There is no key to Thai Aphidiinae, but generic identification can be accomplished using the keys in Starý and Ghosh (1983), Raychaudhuri et al. (1990), or Chen and Shi (2001).

Materials and Methods

All of the specimens in this publication were collected as part of a three-year project (2006-2009) to sample the terrestrial arthropods of Thailand using Malaise traps. This paper deals with material collected in the first year of the study. Malaise traps were placed in national parks and the first year sites were mostly confined to the eastern and northern parts of the country. National parks were selected because it was predicted that they preserve the natural fauna. Fifty four specimens of Aphidiinae were collected. These are deposited in the Queen Sirikit Botanic Garden's insect collection in Chiang Mai (QSBG). Duplicate specimens are deposited in the collection of P. Starý (České Budějovice) and the Hymenoptera Institute (University of Kentucky). Complete locality data can be found at <http://sharkeylab.org/tiger/static.php?app=tiger&page=about>

Review of Species

Abbreviations: ♀ -female, ♂ -male, NP = National park, F = flagellomere.

Collectors' (leg.) names in brackets; YA = Y. Areeluck, otherwise in full.

T# = Collection number.

Aphidius autriquei Starý

Material: Chiang Mai, Doi Inthanon NP, checkpoint 2, 18°31.559'N, 98°29.941'E, 1700 m, 8-15.VII.2006, 2♀, 2♂, T67 (leg. YA). - Ditto, 15-22.VII.2006, 1♀, 1♂, T73 (leg. YA). - Ditto, 22.VII-2.VIII-2006, 2♀, 1♀, slide-mounted, 4♂, T121 (leg. YA). -Chiang Mai, Doi Inthanon NP, Kew Mae Pan, 18°33.163' N, 98°28.8'E, 2200 m, 5-12.X.2006, 1♀, T364 (leg. YA). Chiang Mai, Doi Inthanon NP, summit forest, 18°35.361'N, 98°29.157'E, 2500 m, 19-26.X.2006, 1♂, T375 (leg. YA).

Description: A full description can be found in Starý et al. (1985a,b).

Note: A higher variation of the number of antennal segments can be added to the original description: Female (15-16), male (18-19, rarely 17).

Distribution: Thus far, the detection of *Aphidius autriquei* Starý is the most remarkable record in Thailand. This species was described originally from Central Africa (Burundi) as a parasitoid of *Rhopalosiphum padi* (on *Zea mays*), *Rhopalosiphum maidis* (on *Zea mays*) and *Aulacorthum solani* (Starý et al., 1985a,b). This species was originally classified as endemic to tropical Africa. However, the authors hypothesized that, "*Rhopalosiphum rufiabdominalis* (Sasaki), a pantropical aphid of Oriental origin, could be the main host of *A. autriquei*. This aphid is rather common in all tropical countries (water yellow traps) but rarely observed on its host plants probably because of its radicolous behaviour, which also could explain the lack of any associated local aphidiine parasitoids. If such a hypothesis is confirmed in the future, then *A. autriquei* might have a pantropical distribution, as well as an oriental origin. Thus, despite of the lack of a host association, the newly recorded presence of *A. autriquei* in Thailand corroborates this hypothesis. In spite of identification difficulties within *Aphidius*, this species is easily distinguished from all other congeners due to the color of the antenna in which the apical portion is whitish.

Aphidius sp.

Material: Phetchabun, Khao Kho NP, office, 16°39.550'N, 101°08.123'E, 1200 m, 19-26.VII.2006, 1♀, T171 (leg. S. Chatchumnan and S. Singtong). - Phetchabun, Khao Kho NP, nursery, 16°52.581'N, 104°08.060'E, 520 m, 26.X-2.XI.2006, 1♂, T814 (leg. S. Chathumnan and S. Singtong). - Chiang Mai, Doi Inthanon NP, campground pond, 18°32.657'N, 98°31.482'E, 1200 m, 9-16.VIII.2006, 1♀, T176 (leg. YA). - Chiang Mai, Doi Inthanon NP, campground pond, 18°32.657'N, 98°31.482'E, 1200 m, 27.IX-5.X.2006, 1♀, T348, (leg. YA). - Chiang Mai, Doi Inthanon NP, Kew Mae Pan, 18°33.163'N, 98°28.8'E, 2200 m, 24-30.VIII.2006, 1♀, 1♂, T233 (leg. YA). - Nakhon Nayok, Khao Yai NP, behind headmaster's house, 14°24.781'N, 101°22.689'E, 770 m, 26.VII-2.VIII.2006, 1♀, 1♂, T153, slide mounted (leg. Pong Sandao).

Note: The species has 15-16 segmented antenna in the female. The localities above all refer to one species.

Aphidius spp.

These records refer to specimens of *Aphidius* that could not be reliably determined to species, usually because of broken or missing body parts.

Material: Chiang Mai, Doi Inthanon NP, checkpoint 2, 18°31.599'N, 98°29.941'E, 1700 m, 22.VII-2.VIII.2006, 1♂, T121 (leg. YA). -Ditto, 2-9.VIII.2006, 2♀, T127 (leg. YA). -Ditto, 9-16.VIII.2006, 1♂, T180 (leg. YA). - Chiang Mai, Doi Inthanon NP, Kew Mae Pan, 18°33.163'N, 98°28.8'E, 2200 m, 24-30.VIII.2006, 1♀, T233 (leg. YA). - Chiang Mai, Doi Inthanon NP, summit forest, 18°35.361'N, 98°29.157'E 19-26.X.2006, 2500 m, 1♂, T375 (leg. YA).- Chiang Mai, Doi Inthanon NP, summit marsh, 18°35.361'N, 98°29.157'E, 2500 m 6-13.IX.2006, T246, 1♀ (leg. YA). - Phetchabun, Nam Nao NP, forest check point, 16°43.695'N, 101°33.797'E, 921 m, 13-20.XI.2006, 1♀, T1020 (leg. Noopean Hongyothi).

Archaphidius greenideae Starý and Schlinger

Material: Phetchabun, Nam nao NP, forest check point, 16°43.687'N, 101°33.754'E, 924 m, 13-20.XI.2006, 1♀, T1019 (leg. Noopean Hongyothi).

Description. Full description can be found in Starý and Schlinger (1967), Starý and van Harten (1983), and Chen and Shi (2001).

Distribution. *Archaphidius greenideae* is an east Asian element, associated with Greenideinae aphids

(Starý and Schlinger, 1967; Starý and Ghosh, 1983; Starý and van Harten, 1983; Ahmad and Singh, 1995; Chen and Shi, 2001). These are of some interest (Wei et al., 2005; Ahmad and Singh, 1995) because the host group includes pests of figs and guava. Moreover, some of the potential hosts have been accidentally introduced and are becoming pests in non-indigenous areas (e.g., see Sousa-Silva et al., 2005 –Brazil, also for general information on the species).

Areopraon thailandicum Starý sp.n.

Figure 1a-1d, shows details of the body parts discussed below.

Material: ♀ HOLOTYPE: Phetchabun, Khao Kho NP, nursery 16°52.573'N, 101°08.077'E, 520 m, 26.X-2.XI.2006, T812 (leg. S. Chathumnan and S. Singtong) (condition: right antenna missing). - PARATYPE: ♀, Phetchabun, Khao Kho NP, nursery 16°52.573'N, 101°08.077'E, 520m, 12-19.X-2006, T806 (leg. S. Chathumnan and S. Singtong) (condition: dissected, mounted as a slide, mostly broken; the following parts are preserved: forewing, propodeum, petiole, mesoscutum).

Diagnosis: The new species is the only one known from the area. It differs from its congeners from other areas (see Tomanović et al., 2006) in the presence of two divergent carinae on the distal part of propodeum and in the hairless mesoscutum. The ovipositor sheaths are less densely setose than in the other species.

Derivation of name: The name of the new species was derived from the country of collection.

Description:

Female: Head. Eye oval, length/width = 10/7, hairless. Tentorio-ocular line equal to 1/5 intertentorial line. Tentorial pit large. Maxillary palpus 4-, labial palpus 3-segmented. Antenna 12-segmented, filiform, not thickened to the apex, as long as head and mesosoma combined. F1 (= flagellar segment 1) longer than F2, with sparse setae that are subequal to F diameter.

Mesosoma. Mesoscutum (Figure 1a) with complete and deep notauli, shiny, almost hairless except sparse setae along the notauli in the median lobe. Propodeum (Figure 1d) with two short divergent carinae in lower portion, almost hairless. Forewing (Figure 1a): Stigma triangular, 3.5 times as long as wide. Metacarp (= R1) short, equal to about 1/3 of stigma length. Rs+M vein colourless but faintly indicated. Forewing posterior marginal setae distinctly longer than surface setae;

m-cu cross vein absent. Hind femur with sparse semierected setae.

Metasoma. Petiole (Figure 1c) with two arched parallel carinae along and close to the margins. Spiracle prominent laterally, situated at the posterior end of the anterior third of the petiole, distance of spiracles from apex 1/4 longer than width across spiracles; almost hairless, a few setae near the spiracles. Distal dorsal part of second metasomal tergite with very prominent horizontal longitudinal protuberance (Note: For this character, see Tomanović et al. 2008). Genitalia: Ovipositor sheath slightly arcuate dorsally, with a few slightly curved short setae distally, apical setae not dilated (note: dilated setae occur in the genus *Praon*). Coloration: Head dark brown. Clypeus light brown. Mandible yellow with brown margins. Palpi light yellow. Antenna brown, scape, pedicel and F1 yellow, F2 pale brown. Mesosoma dark brown. Wings hyaline, venation light brown. Legs yellow, apices of tarsi infuscated. Metasoma prevailing yellow, distal margins of terga brownish. Ovipositor sheath dark brown, darker than any other part of the metasoma. Body length 1.4 mm (dried specimen); combined length of head and mesosoma slightly shorter than metasoma.

Male: Unknown.

Deposition: Holotype in the Queen Sirikit Botanic Garden Entomological Collection. Paratype in coll. P. Starý (České Budejovice).

Distribution: There are five described species of *Areopraon*, which are parasitoids of dendrophilous aphids in the Palearctic: *A. chaitophori* Tomanović and Petrović (*Chaitophorus*-species on *Populus*, SE Europe), *A. helleni* (Starý) Europe-Finland, host unknown), *A. lepellei* (Waterston) (*Eriosoma*-species on *Ulmus*, W. Europe, Georgia, India-Kashmir, Russian Far East), *A. pilosum* (Waterston) (*Pterocomma*-species on *Salix*, W. and E. Europe), *A. silvestre* (Starý) (*Periphyllus*-species on *Acer*, W. Europe, Russian Far East, Davidian 2007, Starý and Ghosh 1983, Tomanović et al., 2006, 2008).

A key to the European species is given in Tomanović et al. (2008) and to the Far East Asian species by Davidian (2007).

Areopraon thailandicum is the sixth known species of the genus, and the first one known from the oriental region. Its phylogenetic affinities and its host aphids remain unclear.

Biology: Unknown.

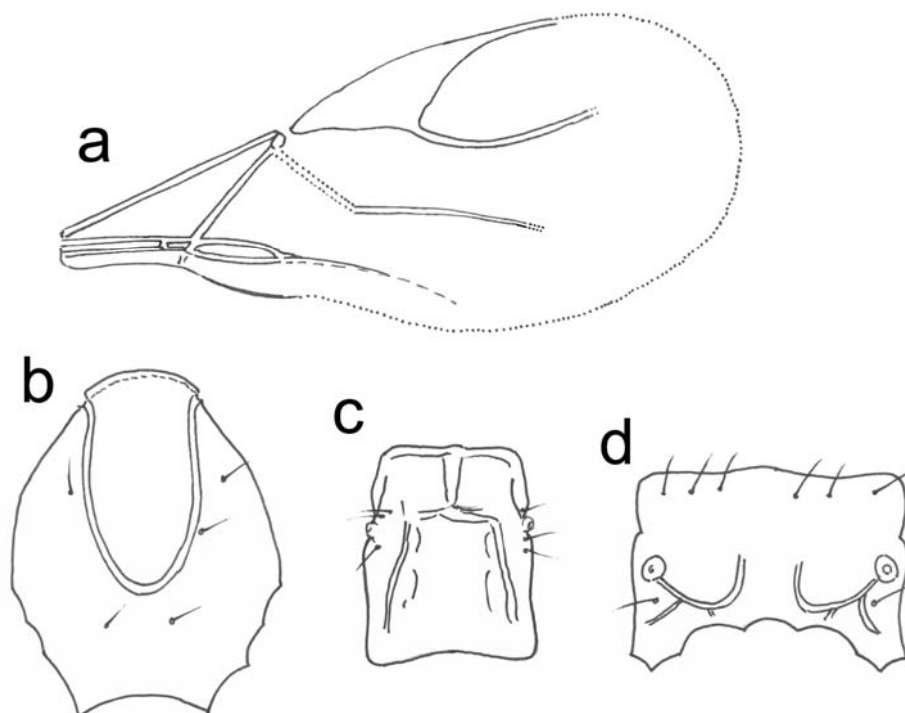


Figure 1 Female paratype of *Areopraon thailandicum* sp.n.; (a) Forewing, (b) Mesonotum, (c) Petiole, (d) Propodeum (Figures not drawn in equal scale).

***Binodoxys* sp. 1**

Material: Chiang Mai, Doi Inthanon NP, campground pond, 18°32.657'N, 98°31.482'E, 1200 m, 6-13.IX.2006, 1♂, T243 (leg. YA).

***Binodoxys* sp. 2**

Material: Phetchabun, Khao Kho NP, savanna at nursery 16°52.568'N, 101°08.104'E, 520 m, 28.X-2.XI.2006, 1♀, T813 (leg. S. Chatchumnan and S. Singtong).

***Ephedrus* cf. *longistigmus* Gärdenfors**

Material: Chiang Mai, Doi Inthanon NP, checkpoint 2, 18°31.399'N, 98°29.941'E, 1700 m, 22.VII-2.VIII.2006, 1♀, 2♂, T121 (leg. YA). - Chiang Mai, Doi Inthanon NP, summit marsh, 18°35.361'N, 98°29.157'E, 2500 m, 16-24. VIII.2006, 1♂, T184 (leg. YA).

Note: The series of specimens differs from described specimens of *E. longistigmus* Gärdenfors (Gärdenfors 1986) in that they lack small distinct fovea on the mesoscutum.

Description: A full description can be found in Gärdenfors (1986).

Distribution: Japan, Taiwan, USA. Host unknown (Gärdenfors 1986).

***Fissicaudus confucius* (Mackauer)**

Material: Nakhon Nayok, Khao Yai NP, Lam Takong view point, 14°25.820'N, 101°23.754'E, 744 m, 26.X-2.XI.2006, 1♀, T751 (leg. Pong Sandao).

Description: Full descriptions can be found in Mackauer (1962), Starý and Schlinger (1967), Takada (1968), Starý and Ghosh (1983), and Chen and Shi (2001).

Distribution: East Asian in distribution.

Hosts: Associated with Greenideinae aphids (Starý and Schlinger, 1967; Starý and Ghosh, 1983; Starý and van Harten, 1983; Ahmad and Singh, 1995; Chen and Shi, 2001). As with *Fissicaudus confucius* these are of some interest (Ahmad and Singh, 1995; Wei et al., 2005) because the host group includes pests of figs and guava. Moreover, some of the potential hosts have been accidentally introduced and are becoming pests in non-indigenous areas (Sousa-Silva et al., 2005 –Brazil, also for a general information).

***Lipolexis gracilis* Förster**

Material: Chiang Mai, Doi Inthanon NP, campground pond, 18°32.657'N, 98°31.482'E, 1200m, 9-16.VII.2006, 1♂, T176 (leg. YA). - Ditto, 6-12.IX.2006, 1♀, T243 (leg. YA).

- Phetchabun, Khao Kho NP, office, 16°39.550'N, 101°08.123'E, 230m, 5-12.VII.2006, 1♀, T165 (leg. S. Chatchumnan and S. Singtong). - Loei, Phu Ruea NP, Subnonghin, 17°28.772'N, 101°21.308'E, 860m, 19-26.VII.2006, 1♀, T316 (leg. Nukoonchai Jaroenchai). - Sakon Nakhon, Phu Pha Yon NP, channel, 16°55.639'N, 104°10.748'E, 295 m, 23-29.VII.2006, 1♀, T298 (leg. Manop Ngoyjansri and Chatree Cheaukamjan).

Description: Full descriptions can be found in Starý and Schlinger (1967), Starý and Ghosh (1983), and Chen and Shi (2001).

Distribution: *L. gracilis* is transpalearctic and has some extension into the Oriental region (Starý and Schlinger, 1967; Starý, 1975; Starý and Ghosh, 1983; Chen and Shi, 2001).

Hosts: A variety of aphidine aphids (namely *Aphis*, *Brachycaudus*, and others (Starý and Schlinger, 1967; Starý and Ghosh, 1983; Chen and Shi, 2001).

***Lipolexis oregmae* (Gahan)**

(= *L. scutellaris* Mackauer)

Material: Chiang Mai, Doi Inthanon NP, campground pond, 18°32.657'N, 98°31.482'E, 1200 m, 27-IX-5-X-2006, 3♀, T348 (leg. YA). - Chiang Mai, Doi Inthanon NP, Kew Mae Pan, 18°33.163'N, 98°28.8'E, 2200 m, 24-30-VIII-2006, 1♀, 1♂, T233 (leg. YA). - Chiang Mai, Doi Inthanon NP, summit forest, 18°35.361'N, 98°29.157'E, 250 m, 10.IX.2006, 1♀, T255 (leg. YA). - Chiang Mai, Doi Inthanon NP, Vachiratharn Falls, 18°32.311'N, 98°36.048'E, 700 m, 30.VIII-6.IX.2006, 1♀, T236 (leg. YA). - Loei, Phu Ruea NP, Subnonghin, 17°28.772'N, 101°21.308'E, 860 m, 12-19.VII.2006, 1♀, 1♂, T313 (leg. Patikhom Tamtip). - Nakhon Sri Thammarat, Khao Luang NP, Krung Ching, 8°43.27'N, 99°40.243'E, 15-17.I.2007, 1♂, T622 (leg. M. Sharkey). - Nakhon Nayok, Khao Yai NP, behind vegetable garden, 14°24.761'N, 101°22.815'E, 26.VII-2.VIII.2006, 1♀, T152 (leg. Pong Sandao). - Nakhon, Nayok, Khao Yai NP, Lam Takong view point, 14°25.762'N, 101°23.527'E, 732 m, 26.X-2.XI-2006, 1♀, T750 (leg. Pong Sandao). - Nakhon

Nayok, Khao Yai NP, Lam Takong view point, 14°25.820'N, 101°23.754'E, 744 m, 5-12.X.2006, 1♀, T742 (leg. Wirat Sook-Kho). - Phetchabun, Nam Nao NP, forest check point, 18°43.693'N, 101°33.836'E, 917 m, 6-13.XI.2006, 2♂, T1018 (leg. Leng Janteab). - Phetchabun, Nam Nao NP, forest check point, 16°43.693'N, 101°33.836'E, 517 m, 23-30.X.2006, T1012 (leg. Leng Janteab). - Phetchabun, Khao Kho NP, savanna at nursery, 16°52.568'N, 101°08.104'E, 620 m, 12-18.X.2006, 1♀, T807 (leg. S. Chathumnan and S. Singtong). - Phetchabun, Khao Kho NP, nursery 16°52.573'N, 101°08.077'E, 520 m, 26.X-2.XI.2006, 1♀, T812 (leg. S. Chathumnan and S. Singtong). - Phetchabun, Khao Kho NP, nursery 16°52.573'N, 101°08.077'E, 520 m, 5-12.X.2006, 1♀, T803 (leg. S. Chathumnan and S. Singtong). - Phetchabun, Khao Kho NP, savanna at nursery 16°52.573'N, 101°08.077'E, 520 m, 5-12.X.2006, 1♀, T804 (leg. S. Chathumnan and S. Singtong). - Phetchabun, Khao Kho NP, savanna at nursery 16°52.573'N, 101°08.077'E, 520 m, 19-26.X.2005, 1♀, T810 (leg. S. Chathumnan and S. Singtong). - Phetchabun, Khao Kho NP, nursery 12-19.X.2006, 16°52.573'N, 101°08.077'E, 520 m, 19-26.X.2006, 2♀, T806 (leg. S. Chathumnan and S. Singtong). - Phetchabun, Khao Kho NP, nursery, 16°52.573'N, 101°08.077'E, 520 m, 19-26.X.2006, 2♀, T809 (leg. S. Chathumnan and S. Singtong).

Distribution: *L. oregmae* is a broadly distributed Oriental species (Starý, 1975; Starý and Schlinger, 1967; Starý and Ghosh, 1983; Chen and Shi, 2001; Miller et al., 2002). It has been used as an introduced biocontrol agent against *Toxoptera citricidus* (Kirk.) in Florida (Hoy, 2005; also for history and references) and Jamaica (Hoy et al., 2007).

Hosts: A variety of aphids, *Aphis*, *Brachycaudus*, *Toxoptera*, and others (see, Starý and Ghosh, 1983; Starý and vanHarten, 1983; Ng and Starý, 1986; Starý and Zelený, 1983; Chen and Shi, 2001; Miller et al., 2002).

***Pauesia* spp.**

Material: Chiang Mai, Doi Inthanon NP, campground pond, 18°32.657'N, 98°31.482'E, 1200m, 22.VII-2.VIII.2006, 1♂, T117 (leg. YA). - Phetchabun, Nam Nao NP, forest check point, 16°43.695'N, 101°33.797'E, 921 m, 23-30.X.2006, 1♂, T1011 (leg. Leng Janteab).

Distribution and hosts: The species of *Pauesia* are uniformly known as parasitoids of the Lachnine aphids, prevailing of *Cinara*-species on conifers in the Holarctic, with some species in the oriental region (Starý and Schlinger, 1967; Starý and Ghosh, 1983; Raychaudhuri et al., 1990; Chen and Shi, 2001).

***Praon* spp.**

Material: Chiang Mai, Doi Inthanon NP, summit forest, 18°35.361'N, 98°29.157'E, 2500 m, 26.X-2.XI.2006, 1♂, T381 (leg. YA). -Chiang Mai, Doi Inthanon NP, Kew Mae Pan, 18°33.163'N, 98°28.8'E, 2200 m, 24-30.VIII.2006, 1♂, T233 (leg. YA). -Chiang Mai, Doi Inthanon NP, campground pond, 18°32.657'N, 98°31.482'E, 1200 m, 9-16.VIII.2006, 1♀, T176 (leg. YA).

***Toxares shigai* Takada**

Material: Chiang Mai, Doi Inthanon NP, Kew Mae Pan, 18°33.163'N, 98°28.8'E, 2200 m, 22.VII-2.VIII.2006, 1♂, T120 (leg. YA).

Description: Takada (1965, 1968), Shuja-Uddin (1975), Starý and Ghosh (1983), Raychaudhuri et al. (1990).

Distribution: *Toxares shigai* is an Oriental species, known from Japan, some parts of India and Pakistan (Takada, 1965, 1968; Starý and Ghosh, 1983; Raychaudhuri et al., 1990).

Hosts: *Aphis*, *Brachycaudus*, *Myzus*, *Rhopalosiphum* and some other aphidine aphids (Takada, 1968; Starý and Ghosh, 1983).

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