



Taxonomic Paper

First report of the genus *Phytodietus* Gravenhorst, 1829 (Hymenoptera: Ichneumonidae: Tryphoninae) from Thailand

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Academic editor: Dominique Zimmermann

Received: 03 Feb 2016 | Accepted: 22 Apr 2016 | Published: 28 Apr 2016

Citation: Kostro-Ambroziak A, Reshchikov A (2016) First report of the genus *Phytodietus* Gravenhorst, 1829 (Hymenoptera: Ichneumonidae: Tryphoninae) from Thailand. Biodiversity Data Journal 4: e8027. doi: [10.3897/BDJ.4.e8027](https://doi.org/10.3897/BDJ.4.e8027)

Abstract

Background

The genus *Phytodietus* Gravenhorst, 1829 is a species rich group of ichneumonid parasitoid wasps. It is represented in all zoogeographical regions, but knowledge of *Phytodietus* species in the Oriental region is patchy and restricted to some countries.

New information

Here the genus *Phytodietus* is recorded from Thailand for the first time based on three species. Diagnosis and illustrations of *P. longicauda* (Uchida, 1931), *P. pitambari* Kaur et Jonathan, 1979 and *P. spinipes* (Cameron, 1905) are given. Furthermore, known distributional and biological data of the species are summarised and an identification key to the species is provided.

Keywords

Ichneumonidae, *P. longicauda*, *P. pitambari*, *P. spinipes*, parasitoid wasp, Oriental region, South East Asia

Introduction

Phytodietus Gravenhorst, 1829 (Hymenoptera, Ichneumonidae) belonging to the subfamily Tryphoninae, tribe Phytodietini, consists of species that are koinobiont ectoparasitoids of semi-concealed larvae of several families of Lepidoptera, mainly Tortricidae and Pyralidae (Bennett 2015). The genus is distributed worldwide and currently includes 122 described species (Bennett 2015, Kasparyan and Khalaim 2013, Kostro-Ambroziak 2011a, Kostro-Ambroziak 2011b, Kostro-Ambroziak 2012, Kostro-Ambroziak and Broad 2016). To date, 22 species of *Phytodietus* have been recorded in the Oriental region: 10 species from India, 7 from Philippines, 6 from Myanmar, 5 from China, 4 from Taiwan, 3 from Indonesia and 1 from Sri Lanka (Gupta 1987, Kaur and Jonathan 1979, Yu et al. 2012). Based on distributional data, some of the *Phytodietus* species were expected to occur also in other countries of South East Asia, but no species of this genus had been recorded from Thailand so far.

Here three species of the genus *Phytodietus* are recorded as new to Thailand and an identification key to these taxa is provided.

Materials and methods

The current study was based on material collected by the TIGER project, a collaborative effort between staff at the Queen Sirikit Botanic Garden (QSBG), the Thai Forestry Group, the Hymenoptera Institute of the University of Kentucky, and the Natural History Museum of Los Angeles County. Photographs were taken using an opto-digital microscope DSX110 in the Laboratory of Ecology and Evolutionary Biology of Insects (University of Bialystok, Poland). Morphological terminology follows Gauld et al. 1997.

Taxon treatments

Phytodietus longicauda (Uchida, 1931)

Material

- a. country: Thailand; verbatimLocality: Petchaburi, Kaeng Krachan National Park, km33/helipad; verbatimElevation: 735 m; verbatimLatitude: 12°50.177'N; verbatimLongitude: 99°20.688'E; eventDate: 25.v-1.vi.2009; individualCount: 1; sex: female; catalogNumber:

T5259; recordedBy: Sirichai; identifiedBy: Agata Kostro-Ambroziak; institutionCode: QSBG

Diagnosis

P. longicauda (Figs 1, 2) differs from other congeners, with the exception of an undescribed species from Papua New Guinea (Kostro-Ambroziak, unpubl.), in the presence of a pleural carina (Fig. 2d). This species is distinguished from other *Phytodietus* species known from Thailand also by the following features: epomia present (Fig. 2c), distinct wrinkles on propodeum and metapleuron (Fig. 2d) and a constriction between the base and spiracles of the first metasomal segment (Fig. 3a).

Figure 1.

Phytodietus longicauda, lateral view.

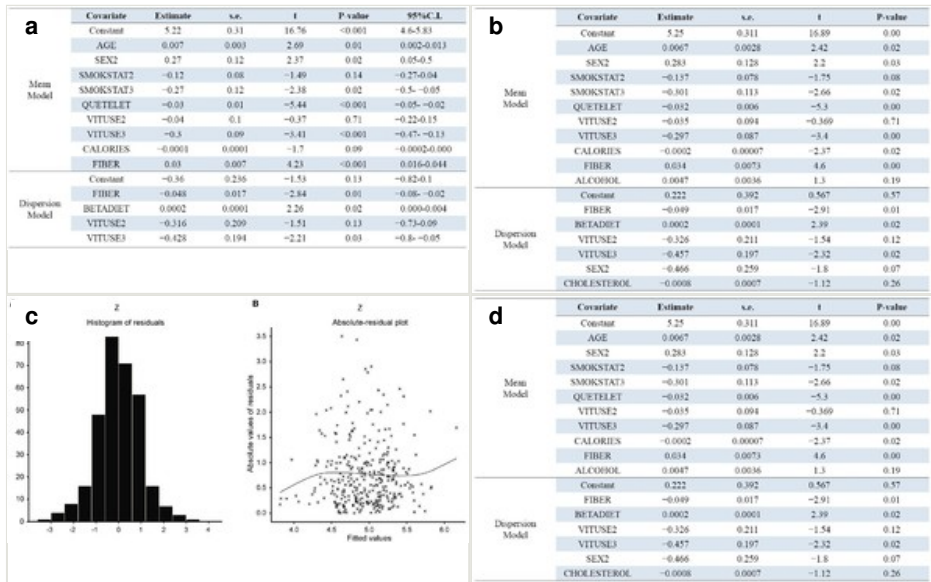


Figure 2.

Phytodietus longicauda:

- a: head, facial view,
- b: head, dorsoposterior view,
- c: pronotum, arrow points to epomia,
- d: metapleuron and lateral part of propodeum, arrows point to: a - pleural carina, b - submetapleural carina expanded anteriorly into a lobe.

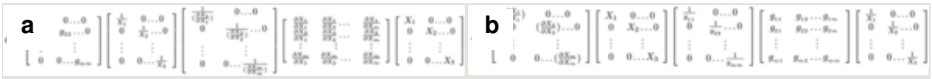


Figure 3.

First metasomal segment:

a: *P. longicauda*,

b: *P. pitambari*,

c: *P. spinipes*,

d: *P. spinipes*.

Distribution

P. longicauda is one of the most widely distributed species of *Phytodietus* and has already been recorded in China, India, Japan, Myanmar, Russia and Taiwan (Yu et al. 2012).

Biology

P. longicauda probably has more than one generation per year. It has been recorded in: May in India (Kaur and Jonathan 1979) and Thailand, June in Myanmar (Kasparyan 1998), July in Amami-Oshima island within the Ryukyu Archipelago (Japan) (Momoi 1970), August in Russia (Kasparyan and Tolkanitz 1999), October in Japan (Kaur and Jonathan 1979), December in Taiwan (Cushman 1933) and Japan (Kasparyan and Tolkanitz 1999). *P. longicauda* also occurs over a wide range of altitudes and has been noted at 2000 m a.s.l. in Myanmar (Kasparyan 1998), 1700-2286 m a.s.l. in India (Kaur and Jonathan 1979), 300 m a.s.l. in Amami-Oshima island (Momoi 1970) and 735 m a.s.l. in Thailand. There are no current host records.

Phytodietus pitambari Kaur et Jonathan, 1979

Material

- a. country: Thailand; verbatimLocality: Chiang Mai, Doi Inthanon National Park, Vachiratharn Falls; verbatimElevation: 700 m; verbatimLatitude: 18°32.311'N; verbatimLongitude: 98°36.048'E; eventDate: 2-9.viii.2006; individualCount: 2; sex: female; catalogNumber: T112; recordedBy: AreeLuck Y.; identifiedBy: Agata Kostro-Ambroziak; institutionCode: QSBG

Diagnosis

P. pitambari (Figs 4, 5) can be easily recognized from the two congeneric species known from Thailand by the following characters: areolet of the fore wing absent (Fig. 4) and submetapleural carina not expanded anteriorly into a lobe (Fig. 6). It is distinguished from other species of *Phytodietus* lacking the areolet by having the first abscissa of *Cu* 1 shorter than *cu-a*. *P. pitambari* is similar in colour to the Oriental species *P. namkumensis* Kaur et Jonathan but differs in having the occipital carina

present (absent in *P. namkumensis*) and the distance between *2rs-m* and *2m-cu* 1.8 times length of *2rs-m* (3.4 for *P. namkumensis*).

Figure 4.

Phytodietus pitambari, lateral view.

$$\mathbf{a} \begin{bmatrix} \dot{X}_1 \\ \dot{X}_2 \\ \vdots \\ \dot{X}_n \end{bmatrix} = \begin{bmatrix} \alpha_1 \cdot \prod_{j=1}^n X_j^{g_{1j}} \\ \alpha_2 \cdot \prod_{j=1}^n X_j^{g_{2j}} \\ \vdots \\ \alpha_n \cdot \prod_{j=1}^n X_j^{g_{nj}} \end{bmatrix} \quad \mathbf{b} \begin{bmatrix} \log(\dot{X}_1) \\ \log(\dot{X}_2) \\ \vdots \\ \log(\dot{X}_n) \end{bmatrix} = \begin{bmatrix} \log(\alpha_1) & g_{11} & g_{12} & \dots & g_{1n} \\ \log(\alpha_2) & g_{21} & g_{22} & \dots & g_{2n} \\ \vdots & \vdots & \vdots & \dots & \vdots \\ \log(\alpha_n) & g_{n1} & g_{n2} & \dots & g_{nn} \end{bmatrix} \cdot \begin{bmatrix} 1 \\ \log(X_1) \\ \log(X_2) \\ \vdots \\ \log(X_n) \end{bmatrix}$$

Figure 5.

Phytodietus pitambari:

a: head, facial view,

b: head, dorsoposterior view.



Figure 6.

Metapleuron and lateral part of propodeum:

a: *P. pitambari*, arrow points to submetapleural carina not expanded into a lobe,

b: *P. spinipes*, arrow points to submetapleural carina expanded into a lobe.

Distribution

This species has already been recorded in India, Philippines (Jonathan 1995, Kaur and Jonathan 1979) and Japan (Shimizu and Watanabe 2015).

Biology

P. pitambari has been recorded in: April in Philippines, April and May in India (Kaur and Jonathan 1979), May, July, August in Japan (Shimizu and Watanabe 2015), and the beginning of August in Thailand suggesting that it has more than one generation per year. It has been noted at an altitude of 1228 and 610 m a.s.l. in India, and 455 m a.s.l. in Philippines (Kaur and Jonathan 1979). In Thailand *P. pitambari* was collected at 700 m a.s.l. in a mixed deciduous forest with *Dipterocarpus* sp., *Lagerstroemia* sp., *Pterocarpus macrocarpus* Kurz, *Terminalia* sp. and *Xylia xylocarpa* (Roxb.) Taub. being the dominant tree species and various grasses including i.a. *Imperata cylindrica* (L.) and *Chrysopogon zizanioides* (L.) in the shrub layer. No hosts are currently known.

***Phytodietus spinipes* (Cameron, 1905)**

Materials

- a. country: Thailand; verbatimLocality: Chiang Mai, Doi Phahompok National Park, Doi Phaluang; verbatimElevation: 1449 m; verbatimLatitude: 20°1.06'N; verbatimLongitude: 99°9.581'E; eventDate: 28.v.-7.vi. 2008; individualCount: 1; sex: female; catalogNumber: T6109; recordedBy: Wongchai, P.; identifiedBy: Agata Kostro-Ambroziak; institutionCode: QSBG
- b. country: Thailand; verbatimLocality: Chiang Mai, Doi Pha Hom Pok National Park, Kewlom1/montane forest; verbatimElevation: 2174 m; verbatimLatitude: 20°3.549'N; verbatimLongitude: 99°8.552'E; eventDate: 14-21.ii.2008; individualCount: 3; sex: female; catalogNumber: T2964; recordedBy: Seesom. K; identifiedBy: Agata Kostro-Ambroziak; institutionCode: QSBG
- c. country: Thailand; verbatimLocality: Chiang Mai, Huai Nam Dang National Park, Guest house; verbatimLatitude: 19°18.803'N; verbatimLongitude: 98°36.395'E; eventDate: 7-14.i.2008; individualCount: 1; sex: female; catalogNumber: T5587; recordedBy: Anuchart; identifiedBy: Agata Kostro-Ambroziak; institutionCode: QSBG
- d. country: Thailand; verbatimLocality: Chiang Mai, Huai Nam Dang National Park, Thung Buatong View Point; verbatimLatitude: 19°17.56'N; verbatimLongitude: 98°36.029'E; eventDate: 9-10.ii.2008; individualCount: 1; sex: female; catalogNumber: T5615; recordedBy: Anuchart & Thawatchai; identifiedBy: Agata Kostro-Ambroziak; institutionCode: QSBG
- e. country: Thailand; stateProvince: Chiangmai; county: Fang; locality: Doi Pha Hom Pok National Park; verbatimLocality: Route to summit; verbatimElevation: 2036; verbatimLatitude: 20°03'01.5"N; verbatimLongitude: 99°08'38.6"E; samplingEffort: Malaise trap; verbatimEventDate: 28.i-28.ii.2014; individualCount: 1; sex: female; recordedBy: W. Srisuka R. Sawkord S. Pilakantha C. Sulin and T. Somboonchai; otherCatalogNumbers: QSBG2014-67; identifiedBy: Alexey Reshchikov; institutionCode: QSBG
- f. country: Thailand; stateProvince: Chiangmai; county: Fang; locality: Doi Pha Hom Pok National Park; verbatimLocality: Route to summit; verbatimElevation: 2105 m; verbatimLatitude: 20°03'17.7"N; verbatimLongitude: 99°08'32.6"E; samplingEffort: Malaise trap; verbatimEventDate: 1-30. iv. 2014; individualCount: 1; sex: female; recordedBy: W. Srisuka R. Sawkord T. Somboonchai and S. Suriya; otherCatalogNumbers: QSBG2014-140; identifiedBy: Alexey Reshchikov; institutionCode: QSBG

Diagnosis

P. spinipes (Figs 7, 8) can be distinguished from other Thai species of *Phytodietus* by having the dorsolateral margins of the first metasomal tergite sharp along the whole length (Fig. 3c, d) (mostly rounded in the other species (Fig. 3a, b)), and the body predominantly black (Fig. 7), with numerous yellow marks (predominantly yellow in the other two species (Figs 1, 4)). Among other Oriental species of *Phytodietus* which are similar in colour pattern *P. spinipes* is relatively easy to recognize by the following combination of characters: eye orbits yellow (Fig. 8a), face completely or largely yellow

(sometimes very pale yellow), hind femur orange, and hind tibia and tarsus black (sometimes tibia slightly paler basally).

Figure 7.

Phytodietus spinipes, lateral view.

$$\mathbf{a} \quad \frac{\partial X_j}{\partial X_k} = \frac{X_j}{X_k} \cdot \left(\frac{\partial X_i}{\partial X_j} \right) \quad \mathbf{b} \quad \begin{bmatrix} \log(\alpha_1) & g_{11} & g_{12} & \cdots & g_{1n} \\ \log(\alpha_2) & g_{21} & g_{22} & \cdots & g_{2n} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ \log(\alpha_n) & g_{n1} & g_{n2} & \cdots & g_{nn} \end{bmatrix}.$$

Figure 8.

Phytodietus spinipes:

a: head, facial view,

b: head, dorsoposterior view.

Distribution

P. spinipes was originally described from Sri Lanka (Cameron 1905) but it has also been recorded in China, India, Indonesia, Myanmar and Taiwan (Yu et al. 2012).

Biology

Data suggests that *P. spinipes* also has more than one generation per year. It has been recorded in: March in Myanmar, October in Java (Kaur and Jonathan 1979), January, February, April, May and the beginning of the June in Thailand. It has been collected at an altitude of 1000 m a.s.l. in Myanmar (Kaur and Jonathan 1979) and 1449-2174 m a.s.l. in Thailand. *P. spinipes* was collected in different types of forest in Thailand: (a) A moist evergreen montane forest with *Cinnamomum verum* J. Presl., *Prunus cerasoides* D. Don, *Schima wallichii* (DC.) Korth. and *Strychnos axillaris* Colebr. covered with mosses, ferns, lichens, orchids and other epiphytes, (b) In hill evergreen forest with *Acer oblongum* Wall. ex DC., *Anneslea fragrans* Wall., *Betula alnoides* Buch.-Ham. ex D. Don, *Litsea cubeba* (Lour.) Pers., *Magnolia hodgsonii* (Hook. f. & Thomson) H. Keng, *Pinus kesiya* Royle ex Gordon, *Quercus kingiana* Craib, *Quercus semiserrata* Roxb., (c) In a pine forest with *Pinus kesiya* Royle ex Gordon and *Pinus merkusii* Jungh. et de Vriese being the dominant tree species.

P. spinipes is known to be a parasitoid of *Homona coffearia* (Nietner) (Tortricidae), the tea Tortrix in Sri Lanka, Taiwan (Gupta 1987) and India (Muraleedharan and Selvasundaram 1991). In Java this species has been reared from *Homona* sp. (Kaur and Jonathan 1979).

Identification keys

Key to the species of <i>Phytodietus</i> Gravenhorst, 1829 from Thailand		
1	Areolet of fore wing absent, submetapleural carina not expanded anteriorly into a lobe	<i>P. pitambari</i> Kaur et Jonathan, 1979
–	Areolet of fore wing present, submetapleural carina expanded anteriorly into a lobe	2
2	Pleural carina and epomia absent, body in general black with yellow marks	<i>P. spinipes</i> (Cameron, 1905)
–	Pleural carina and epomia present, body in general yellow with black marks	<i>P. longicauda</i> (Uchida, 1931)

Acknowledgements

The authors are deeply grateful to Wichai Srisuka (Queen Sirikit Botanic Garden), Michael Sharkey and Stephanie Clutts (The University of Kentucky) for providing specimens and Girish Kumar (Indian Insect Survey, Calcutta) for help with literature. We would also like to thank Tony Hunter and the reviewers, Andrew Bennett and Mark Shaw for helpful editorial suggestions. The present study was funded by Swedish Taxonomy Initiative and the European Community - Research Infrastructure Action under the Seventh Framework Programme (SYNTHESYS project SE-TAF4-135).

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