Revision of *Zosteragathis* Sharkey of Thailand (Hymenoptera, Braconidae, Agathidinae, Agathidini)

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Digital Object Identifier (DOI)
https://doi.org/10.3897/dez.65.25772

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Revision of *Zosteragathis* Sharkey of Thailand (Hymenoptera, Braconidae, Agathidinae, Agathidini)

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http://zoobank.org/5A043F9D-93F8-4DD7-873A-1A0101C849FE

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Abstract

Based on cladistic analyses recently conducted by Sharkey and Chapman, the genus *Zosteragathis* Sharkey is revised. Twenty-two species are reported from Thailand, three previously described species, *Z. samensis*, *Z. contrasta* and *Z. nuichuaensis*, and 19 new species, i.e., *Z. chaiyaphumensis*, *Z. eukos*, *Z. hinensis*, *Z. hongensis*, *Z. inthanonensis*, *Z. krachanensis*, *Z. lampangensis*, *Z. lampooensis*, *Z. luangensis*, *Z. ngamensis*, *Z. perknos*, *Z. petchaburiensis*, *Z. phahompokensis*, *Z. phuphanensis*, *Z. sakaeratensis*, *Z. sakonensis*, *Z. samensis*, *Z. surinensis*, *Z. taemensis*, *Z. tonensis*. Members of *Zosteragathis* are known from the Australian, Ethiopian, Oceania, Oriental, and eastern Palaearctic regions.

Key Words

Insecta
identification key
taxonomy
systematics

Introduction

Agathidinae is a moderately large subfamily the members of which are koinobiont endoparasitoids of lepidopterous larvae. For more general information on Agathidinae see Sharkey et al. (2006). As of 2005, roughly 1,000 species were described (Yu et al. 2005). The senior author (MJS), based on the number of new species in recent revisions (see below), believes that there are a magnitude more undescribed species. *Zosteragathis* is restricted to the Old World. It is very diverse with species richness in the hundreds, but most of these are undescribed. This paper is part of a series that investigates members of the massively paraphyletic genus *Bassus* s.l. (Sharkey and Clutts 2011, Sharkey et al. 2011a and b, Sharkey and Stobelt 2012 and 2013, Sharkey and Chapman 2017a, b). The generic concept *Bassus* is now confined to a small clade restricted to The Palaearctic and Oriental realms, *Zosteragathis* Sharkey (Sharkey and Chapman 2017a), includes 25 previously described species (24 currently recognized as valid), all of which were previously included in the polyphyletic concepts of *Agathis* s.l., *Bassus* s.l. and *Therophilus* s.l. i.e.:

*Z. annuliferus* (Achterberg & Long, 2010), **comb. n.**, from *Therophilus*
*Z. annulus* (Chou & Sharkey, 1989), from *Bassus*
*Z. asper* (Chou & Sharkey, 1989), from *Bassus*
*Z. conformis* (Bhat & Gupta, 1977), from *Agathis*
*Z. contrasta* (Achterberg & Long, 2010), from *Therophilus* (as *contrastus*)
*Z. coryphe* (Nixon, 1950), from *Agathis*
*Z. depressa* (Chou & Sharkey, 1989), from *Bassus* (as *depressus*)
*Z. dravida* (Bhat & Gupta, 1977), from *Agathis*
*Z. elongator* (Achterberg & Long, 2010), from *Therophilus*
*Z. festiva* (Muesebeck, 1953), from *Agathis*
*Z. festivoides* (Sharkey, 1996), from *Bassus*
*Z. fujianicus* (Chen & Yang, 2006), from *Bassus*
*Z. gracilis* (Bhat & Gupta, 1977), from *Agathis*
Z. lienhuaichihensis (Chou & Sharkey, 1989), from Bassus
Z. lini (Chou & Sharkey, 1989), from Bassus
Z. masoni (Bhat & Gupta, 1977), from Agathis
Z. nigrolineatus (Achterberg & Long, 2010), from Therophilus
Z. nuichuaensis (Achterberg & Long, 2010), from Therophilus
Z. oranae (Watanabe, 1970), (syn. of Agathis festiva, by Sharkey 1996)
Z. parasper (Achterberg & Long, 2010), from Therophilus
Z. punctiscutum (Achterberg & Long, 2010), from Therophilus
Z. robusta (Achterberg & Long, 2010), from Therophilus (as robustus)
Z. scutellatus (Achterberg & Long, 2010), from Therophilus
Z. sungkangensis (Chou & Sharkey, 1989), from Bassus
Z. tanycoleosus (Chen & Yang, 2006), from Bassus

Methods

Morphological terms: The length of the first metasomal median tergite is measured from the apex of the tendon emanating from the propodeum to the posterior border of the tergite. Metasomal median tergites are abbreviated as follows, T1 = metasomal median tergite 1, T2 = metasomal median tergite 2. T2–3 = metasomal median syntergite 2 + 3. Other terms are from Sharkey and Wharton (1997). Morphological terms used in this revision can be found in the Hymenoptera Anatomy Ontology (HAO; Yoder et al. 2010). To find definitions for any structure search for the term at http://glossary.hymao.org.

Museum acronyms

HIC Hymenoptera Institute Collection, University of Kentucky, Department of Entomology, Lexington, Kentucky, USA.

QSBG Queen Sirikit Botanic Gardens, Chiang Mai, Thailand.

Species description format: Descriptions are of the holotype; variation is given in parentheses. Color is not extensively described because the images serve this purpose; however color characters that are variable or of diagnostic significance are detailed. All species are treated with a diagnosis and distributional data. They are illustrated with color photos using a JVC digital camera mounted on a Leica MZ16 microscope and Automontage® stacking software.

Species delimitation: We used evidence from molecular data (COI and 28S) and morphology to arrive at species concepts. Details are given in Sharkey and Stoeb (2013). Table 1 gives details on the COI distances within species of Zosteragathis as well as distances to the nearest species.

Species collection: As part of the inventory of Thai insects, three Malaise traps at each of 30 different localities throughout Thailand were operated from 2007–2010, comprising approximately 90 trap-years. The specimens dealt with here are primarily from these traps. Two numbers, beginning with the letters “H” and “T” are listed for each specimen collected by our collaborators in Thailand. The H-number is the specimen number. Specimen information is stored in the Symbiota database (Gries et al. 2014) under the Hymenoptera Institute Collection (HIC). (Symbiota Collections of Arthropods Network; http://symbiota4.acis.ufl.edu/scan/portal/). To search for a specimen in the database, do the following: Under the Search tab (upper left of the screen), select Search Collections. Deselect all collections, and scroll down the Southeast section, put a check in the box next to Hymenoptera Institute Collection, scroll back up and hit the Search > button (right side of screen). H-numbered specimens are stored with a 4- letter prefix (HICH) followed by a 6-digit number. Therefore, H660, as it appears in this publication, is stored as HICH000660. To search for this specimen, scroll down to the Specimen Criteria section, type this number in the box next to Catalog Number and hit the search button. This displays a page with a summary of the specimen information. Clicking on Full Record Details opens a new window with the full specimen record, including all available images. The T-number is the number associated with a single Malaise trap for a single trapping period (usually one week). A complete list of these numbers and associated collection events is available from the authors upon request.

Links to species maps in this paper were generated from the Symbiota database. These are not static maps and as georeferenced specimens are added to the database, the maps will update in real time such that a reader

<table>
<thead>
<tr>
<th>Species</th>
<th>Intraspecific variation</th>
<th>Interspecific variation</th>
<th>Nearest species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z. contrastus</td>
<td>0.318%</td>
<td>3.899%</td>
<td>Z. taemensis</td>
</tr>
<tr>
<td>Z. eukos</td>
<td>–</td>
<td>5.234%</td>
<td>Z. ngamensis</td>
</tr>
<tr>
<td>Z. hongensis</td>
<td>–</td>
<td>1.414%</td>
<td>Z. sakonensis</td>
</tr>
<tr>
<td>Z. inthanonensis</td>
<td>–</td>
<td>5.801%</td>
<td>Z. rechameri</td>
</tr>
<tr>
<td>Z. krachanensis</td>
<td>–</td>
<td>4.683%</td>
<td>Z. nuichuaensis</td>
</tr>
<tr>
<td>Z. lampangensis</td>
<td>0.491%</td>
<td>5.2365%</td>
<td>Z. inthanonensis</td>
</tr>
<tr>
<td>Z. lampsoensis</td>
<td>0%</td>
<td>1.514%</td>
<td>Z. taemensis</td>
</tr>
<tr>
<td>Z. lunagensis</td>
<td>–</td>
<td>0%</td>
<td>Z. lampsoensis, sp. n. 2</td>
</tr>
<tr>
<td>Z. ngamensis</td>
<td>–</td>
<td>5.801%</td>
<td>Z. inthanonensis</td>
</tr>
<tr>
<td>Z. nuichuaensis</td>
<td>0%</td>
<td>3.038%</td>
<td>Z. lampsoensis, sp. n. 2</td>
</tr>
<tr>
<td>Z. perkins</td>
<td>–</td>
<td>5.221%</td>
<td>Z. ngamensis</td>
</tr>
<tr>
<td>Z. petchaburiensis</td>
<td>–</td>
<td>6.428%</td>
<td>Z. contrastus</td>
</tr>
<tr>
<td>Z. phahompokenisi</td>
<td>–</td>
<td>1.972%</td>
<td>Z. tonensis</td>
</tr>
<tr>
<td>Z. sakonensis</td>
<td>–</td>
<td>1.414%</td>
<td>Z. hongensis</td>
</tr>
<tr>
<td>Z. samensis</td>
<td>0.920%</td>
<td>4.074%</td>
<td>Z. surinensis</td>
</tr>
</tbody>
</table>

Table 1. COI divergence data COI data for each species. If a species has more than one terminal, both intra- and interspecific uncorrected p-distances are reported. Interspecific p-distances are to the nearest OTU in the COI tree (not shown). Values are averaged if two or more comparisons are made.
Figure 1. Tree of highest log-likelihood from 20 ML search reps of a combined COI+28S data set with bootstrap values ≥50% (500 search replicates) plotted at the nodes. Tree modified from Sharkey and Chapman (2017a).
following a map link will see a map of all of the specimens of the taxon at hand in the database, including those that may have been added after this paper is published. Clicking on the dots on these maps links to the specimen record in the database.

**Phylogenetic methods:** The data set and analyses presented herein is from Sharkey and Chapman (2017a). In that paper, the *Zosteragathis* terminals were largely unnamed, leaving species descriptions for this paper. In short, we conducted maximum likelihood (ML) phylogenetic analyses on a concatenated COI + 28S dataset (1,313 total characters) using Garli (v. 2.01; Zwickl 2006). The 28S multiple alignment was assembled using the default settings on the MAFFT server (http://mafft.cbrc.jp/alignment/server; v. 7; Katoh et al. 2006), and employing the Q-INS-i strategy which takes secondary RNA structure into account. All 28S bases were included in subsequent phylogenetic analyses. The data were partitioned by gene region and codon position (COI: 3 partitions; 28S: un-partitioned, total of 4 partitions). The most complex model available (GTR+I+G; Rodriguez et al. 1990) was applied to each partition as per recommendations of Huelsenbeck and Rannala (2004). A 20-replicate ML search for the tree of highest log-likelihood and a 500-replicate ML bootstrap analysis (Felsenstein 1985) were conducted using the default settings. Outgroup genera (*Alabagrus, Braunsia, Aerophilus, Camptothlipsis* and *Neothlipsis*) were selected based on two criteria: (1) they comprise genera that are members of three clades that are successively sister to the ingroup clade in the phylogeny in Sharkey and Chapman (2017b), and (2) full length sequences of COI and 28S were available for most of these OTUs. The data set analyzed herein is available from the authors upon request. All of the specimens for which we have DNA sequences are listed in Appendix I, including their accession numbers.

**Phylogenetic considerations:** Sharkey and Chapman (2017b) revised the agathidine tribes and showed that *Zosteragathis* falls within the Agathidini. They could not demonstrate the monophyly of *Zosteragathis*, but conformed with the choice of erecting four genera for morphologically uniform clades, or one genus for the lot, they opted for the latter. The cladogram in Figure 1 shows that none of basal clades that separate the four *Zosteragathis* clades have support, therefore it is entirely possible that the genus is monophyletic.

### Results and discussion

Below is a discussion of the taxonomy of *Zosteragathis*, a key to the Thai species of this genus, and descriptions of each species.

#### Taxonomy

**Zosteragathis Sharkey, 2017**

**Type species.** *Zosteragathis samensis* Sharkey, 2017

**Diagnosis.** Most species can be recognized as members of this genus by the combination of finely microsculptured striae on T2 that end abruptly just anterior to the posterior margin of the tergite; this in combination with a pale colored band in the anterior half of T2, or T2 entirely black. Some species have reduced striae on T2 and are recognized by the lack of apomorphic structures that distinguish other closely related genera, e.g., claws not simple; interantennal space without a sharply declivous keel; T1 without prominent lateral carinae or medial carina; fore tarsus without spines or pegs.

**Description.** See Sharkey and Chapman 2017a.

**Biology.** Hosts are unknown for all Thai species however there are records for three extra-Thailand species. These appear to suggest that the host range is wide. The records are: *Zosteragathis coryphe* was reared from *Phycodes radiata* (Sesioidae: Brachodidae) (Nixon 1950). *Zosteragathis festiva* (Muesebeck) was reared from *Grapholitha molesta*, oriental fruit moth, (Tortricoidae: Tortricidae) and many other Lepidoptera from a wide range of families, i.e., Blastobasidae, Gelechiidae, Cossidae, Carposinidae, Noctuidae, and Pyralidae. See Yu (2012) for a complete list. *Zosteragathis robusta* (Achterberg and Long) from Vietnam was reared from “*Omidoes indicata* (Lepidoptera: Pyralidae: Pyraustinae) on soybean (*Glycine max* Linnaeus), according to the label data”, (van Achterberg and Long 2010).

**Distribution.** Australian, Ethiopian, Oceania, Oriental, and eastern Palearctic regions.

**Etymology.** From the Greek *zoster*, meaning “belt or girdle” and *agathis* the type genus of the subfamily. *Zoster* is a reference to the diagnostic pale colored transverse band that is usually present on T2. The gender is feminine.

### Key to Thai species of *Zosteragathis*

1. A. Mesoscutum pale, yellow to orange ............................................................... 2
   - B. Mesoscutum melanic, black ................................................................. 4
2 A. Scutellum rugose; T2 distinctly longer than wide; head mostly or entirely yellow to orange ...................... Z. ngamensis
   – B. Scutellum smooth with punctures; T2 as wide as long or wider; head mostly or entirely black; pale color, if present restricted to the gena .................................................. 3

3 A. T1 mostly or entirely pale (white to yellow) ...................................................................................... Z. hongensis
   – B. T1 mostly or entirely melanic (brown to black) .......................................................................... Z. contrasta

4 A. Scutellum rugose ................................................................................................................................. 5
   – B. Scutellum smooth with punctures .................................................................................................. 7

5 A. T2 as wide as long or wider .................................................................................................................. Z. nuichuaensis
   – B. T2 distinctly longer than wide ...................................................................................................... 6

6 A. T2 entirely or almost entirely (80%) pale (white to yellow) ................................................................. Z. krachanensis
   – B. T2 mostly pale (white to yellow) in anterior half and mostly melanic (brown to black) in posterior half ... Z. luangensis

7 A. T2 as wide as long or wider .................................................................................................................. 18
   – B. T2 distinctly longer than wide ....................................................................................................... 8
A. Pronotum melanic dorsomedially, concolorous with lateral surfaces of pronotum

B. Pronotum pale dorsomedially (yellow to orange), contrasting with melanic lateral surfaces of pronotum

A. T2 entirely or almost entirely (>70%) pale (white to yellow) .................................................. Z. lampangensis

B. T2 entirely or almost entirely (>70%) melanic (dark brown to black) .................................................. 10

C. T2 mostly pale (white to yellow) in anterior half and mostly melanic (brown to black) in posterior half ... Z. inthanonensis

A. Fore wing with a small infuscate area posterior to stigma; apex of T1 yellow ........................................ Z. inthanonensis

B. Fore wing without a small infuscate area posterior to stigma; apex of T1 melanic (brown to black) .......... Z. perknos

A. Hind femur mostly or entirely pale, yellow to orange .................................................................................. 12

B. Hind femur mostly or entirely melanic, brown to black ............................................................................. 13

A. T2 entirely or almost entirely (80%) pale (white to yellow) ........................................................................ Z. lampangensis

B. T2 mostly pale (white to yellow) in anterior half and mostly melanic (brown to black) in posterior half ... Z. surinensis

A. Striae of T2 curving towards the midline ........................................................................................................... 14

B. Striae of T2 relatively straight ............................................................................................................................ 15

A. T2 entirely or almost entirely (>70%) pale (white to yellow) ................................................................. Z. lampangensis

B. T2 entirely or almost entirely (>70%) melanic (dark brown to black); or C. T2 mostly pale (white to yellow) in anterior half and mostly melanic (brown to black) in posterior half .................................................. Z. phuphanensis
15  A. T2 entirely or almost entirely (>70%) pale (white to yellow) .................................................. \textit{Z. lampangensis}
    - B. T2 entirely or almost entirely (>70%) melanic (dark brown to black) .................................. \textit{Z. lampooensis}
    - C. T2 mostly pale (white to yellow) in anterior half and mostly melanic (brown to black) in posterior half .......... 16

16  A. Exposed portion of ovipositor longer than body length .................................................................. \textit{Z. tonensis}
    - B. Exposed portion of ovipositor equal to or shorter than body length ........................................ 17

17  A. Fore coxa mostly or entirely yellow .................................................................................. \textit{Z. lampooensis}
    - B. Fore coxa mostly or entirely melanic ................................................................................. \textit{Z. hinensis}

18  A. T2 entirely or almost entirely (>70%) pale (white to yellow) .................................................. \textit{Z. sakonensis}
    - B. T2 entirely or almost entirely (>70%) melanic (dark brown to black) .................................. 19
    - C. T2 mostly pale (white to yellow) in anterior half and mostly melanic (brown to black) in posterior half .......... 22

19  A. Hind femur mostly or entirely pale, yellow to orange .......................................................... \textit{Z. sakaeratensis}
    - B. Hind femur mostly or entirely melanic, brown to black ........................................................ 20

20  A. Fore wing with a small infuscate area posterior to stigma .................................................. \textit{Z. chaiyaphumensis}
    - B. Fore wing without a small infuscate area posterior to stigma ................................................ 21
21 A. T2 almost entirely melanic.................................................................Z. eukos
   B. T2 mostly melanic, but pale, yellow to orange, anteriorly and anterolaterally ...................... Z. petchaburiensis

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22 A. T1 extensively pale, white to yellow, basally...............................................Z. phahompokensis
   B. T1 mostly or entirely melanic basally.............................................................................. 23

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23 A. Scutellar groove pale, yellowish brown, significantly lighter than remainder of mesonotum...........Z. taemensis
   B. Scutellar groove melanic, concolorous with remainder of mesonotum................................. Z. samensis

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Species descriptions

**Zosteragathis chayaphumensis** Sharkey, sp. n.

http://zoobank.org/E98CD31C-4FC2-469C-995B-CB9AFBC9B0C5

**Diagnosis.** Fore wing with a small infuscate area posterior to stigma. T2 entirely or almost entirely (80%) melanic. T2 as wide as long or wider.

**Description.** Body length 5.6 mm. Ovipositor length 3.7 mm. Ovipositor 0.7× body length. Number of flagellomeres 32. Notauli sculpture not significantly wider posteriorly. Scutellum smooth with punctures. Mid tibia with 4 apical and 3 preapical spines. Hind tibia with 10 spines/pegs. Second submarginal cell diameter large, about same size as pedicel length. Wing hyaline with an infuscate patch posterior to stigma. T2 0.9× longer than wide. T2 entirely striate, striae converging anteromedially.

**Color.** Head black except gena yellow; mesosoma black; fore and mid coxa black; T1 entirely black; anterior margin of T2 yellow.

**Etymology.** Named after the type locality Chaiyaphum Provence.


For a map of examined material, see: https://bit.ly/2DZycUy

**Zosteragathis contrasta** (Achterberg & Long)

**Therophilus contrastus** Achterberg & Long, 2010

**Diagnosis.** Head black; mesoscutum orange.

**Description.** Body length 5.2 mm. Ovipositor length 3.5 mm. Ovipositor 0.7× body length. Number of flagellomeres 34 (32–39). Sculpture of notauli slightly increasing in width posteriorly but not extending onto lateral lobes of mesoscutum. Scutellum smooth with punctures. Mid tibia with 2 apical and 3 preapical spines. Hind tibia with 7 spines/pegs. Second submarginal cell diameter small, not much larger than width of pedicel. Wing hyaline, without distinct infuscate areas. T2 1× longer than wide. T2 mostly smooth with hints of longitudinal striae especially medially. **Color:** head black except lower gena yellow; pro and mesothorax orange except ventral mesopleuron melanic; metathorax and propodeum melanic; fore and mid coxae mostly yellow; apex of T1 and lateral and anterior margins of T2 yellow.

**Material examined.** Holotype: not examined. Paratypes: not examined. Non-type specimens: All female: Thailand: Hua Khakhaer 6, iii.1986 (H5908, H5998,
Figure 2. *Z. chaiyaphumensis*: a) lateral habitus. b) wings. c) dorsal head. d) lateral head. e) lateral mesosoma. f) dorsal propodeum and T1-2. g) dorsal habitus.

Figure 3. *Z. contrasta*: a) lateral habitus. b) fore wing. c) anterior head. d) lateral head. e) lateral mesosoma. f) dorsal mesoscutellum. g) propodeum. h) T1-3.

H5999), M.G. Allen; Chaiyaphum, Pa Hin Ngam NP, Dry dipterocarp, 15.635°N, 101.399°E, 698 m elev., Malaise trap, 18–24.viii.2006 (H1855, T448), Katae Sa-nog & Buakaw Adnafai; Chaiyaphum, Pa Hin Ngam NP, Dry evergreen next to creek, 15.676°N, 101.445°E, 461 m elev., Malaise trap, 19–23.xii.2006 (H5916, T1353), Katae Sa-nog & Buakaw Adnafai; Chaiyaphum, Pa Hin Ngam NP, Mixed deciduous forest (Thepana waterfall), 15.649°N,
Zosteragathis eukos Sharkey, sp. n.

http://zoobank.org/0F316EA6-9110-4218-8415-79F01AD086F6

Etymology. *Eukos* is Greek for milky white; here it is a reference to the color of the base of the hind tibia.

Diagnosis. T2 almost entirely melanic and longer than wide; fore wing lacking infuscate patch posterior to stigma; similar to *Z. annuliferus* (Achterberg and Long 2010) but dimensions of T1 and T2 differ.

Description. Body length 4.9 mm. Ovipositor length/body length ratio = 0.8. Interantennal space with a flat triangular elevation that narrows to a short ridge posteriorly and then divides into two short indistinct carinae that approach the median ocellus. Antenna with 32 flagellomeres. Third submarginal cell diameter minute, about equal to width of pedicel. Wing hyaline, without distinct infuscate areas. T2 0.8× longer than wide. T2 mostly smooth with fine wrinkles, only a hint of longitudinal striae. Color: head black except lower gena and clypeus yellow; pronotum and mesonotum orange; propodeum, mesopleuron and metapleuron black; hind tibia with 7 spines/pegs. Second submarginal cell diameter large, about same size as pedicel length. Wing hyaline with an infuscate patch posterior to stigma. T2 0.9× longer than wide. T2 entirely striate, striae relative straight throughout.

Zosteragathis hinensis Sharkey, sp. n.

http://zoobank.org/3D4A0CE0-16B9-442F-9B17-3110C1EADD9B

Diagnosis. Mesoscutum black. Fore coxa mostly melanic. Hind femur melanic, brown to black. T2 mostly pale in anterior half and mostly melanic in posterior half. T2 as wide as long or wider.

Zosteragathis hongensis Sharkey, sp. n.

http://zoobank.org/44EBAC09-1B13-44BD-8AD1-0CCB808F5E05

Diagnosis. Pronotum melanic dorsomedially, concolorous with lateral surfaces of pronotum.
Figure 4. *Zosteragathis eukos* holotype female. a) lateral habitus. b) wings. c) anterodorsal head. d) lateral head. e) lateral mesosoma. f) dorsal thorax. g) propodeum and metasomal terga 1-3.

Figure 5. *Z. hinensis*: a) lateral habitus. b) fore wing. c) hind wing. d) dorsal head. e) lateral head. f) lateral mesosoma. g) dorsal mesoscutum h) dorsal propodeum and T1–3.
Figure 6. *Z. hongensis*: a) lateral habitus. b) fore wing. c) hind wing. d) anterior head. e) lateral head. f) lateral mesosoma. g) dorsal mesoscutum. h) propodeum. i) T1–5.

Figure 7. *Z. inthanonensis*: a) lateral habitus. b) fore wing. c) hind wing. d) dorsal head. e) lateral head. f) lateral mesosoma. g) dorsal mesoscutum. h) propodeum. i) T1–3.
Scutellum sculpture smooth with punctures.

**Description.** Body length 4.7 mm. Ovipositor length 3.7 mm. Ovipositor 0.8× body length. Number of flagellomeres 34. Notauli sculpture not significantly wider posteriorly. Scutellum smooth with punctures. Mid tibia with 2 apical and 3 preapical spines. Hind tibia with 6 spines/pegs. Second submarginal cell diameter small, slightly larger than pedicel width (varying to minute and about the same size as width of pedicel). Wing hyaline with an infuscate patch posterior to stigma. T2 1.1× longer than wide. T2 entirely striate, striae relative straight throughout. **Color:** head black; mesosoma black; fore and mid coxa yellow; posterior border of T1 yellow; T2 yellow anteriorly and anterolaterally (varying to yellow in entire anterior half).

**Etymology.** Named after the type locality Doi Inthanon National park.

**Material examined. Holotype:** Female: Thailand, Chiang Mai, Doi Inthanon NP, Kew Maepan Trail, 18.553°N, 98.48°E, 2200 m elev., Malaise trap, 22–29. iv.2007 (H080, T1847), Y. Areeluck.


For a map of examined material, see: https://bit.ly/2uqJOjH

**Zosteragathis krachanensis Sharkey, sp. n.**

http://zoobank.org/CBD43CE1-12C1-4605-A5B0-845B450CD449

**Diagnosis.** Scutellar triangle rugose; T2 elongate (1.6× longer than wide); t2 entirely pale yellow.

**Description.** Body length 6.7 mm. Ovipositor length 6.4 mm. Ovipositor 1.0× body length. Number of flagellomeres broken after the 33rd flagellomere. Sculpture of notauli increasing in width posteriorly where it extends over onto lateral lobes of mesoscutum. Scutellum sculpture smooth. Mid tibia with 1 apical and 2 preapical spines. Hind tibia with 7 spines/pegs. Second submarginal cell diameter small, slightly larger than pedicel width (varying to minute and about the same size as width of pedicel). Wing hyaline with an infuscate patch posterior to stigma. T2 1.1× longer than wide. T2 entirely striate, striae relative straight throughout. **Color:** head black; mesosoma black; fore and mid coxa yellow; posterior border of T1 yellow; T2 yellow anteriorly and anterolaterally (varying to yellow in entire anterior half).

**Etymology.** Named after the type locality Lampang Provence.


For a map of examined material, see: https://bit.ly/2utGnJc

**Zosteragathis lampangensis Sharkey, sp. n.**

http://zoobank.org/4F684A4F-BB25-A431-8DB4-07A2BC5E34F5

**Diagnosis.** Clypeus melanic. Mesoscutum black. Scutellum sculpture smooth with punctures. T2 entirely or almost entirely (80%) pale.

**Description.** Body length 4.2 mm. Ovipositor length 3.1 mm. Ovipositor 0.7× body length. Number of flagellomeres 29. Notauli sculpture not significantly wider posteriorly. Scutellum smooth with punctures. Mid tibia with 4 apical and 4 preapical spines. Hind tibia with 9 spines/pegs. Second submarginal cell diameter minute, about equal to width of pedicel. Wing hyaline, without distinct infuscate areas. T2 1× longer than wide. T2 entirely striate, striae relatively straight. **Color:** head black; mesosoma black; fore and mid coxa yellow; anterior and posterior borders of T1 yellow; T2 yellow; anterior margin of T3 yellow.

**Etymology.** Named after the type locality Lampang Provence.


For a map of examined material, see: https://bit.ly/2pK371W

**Zosteragathis lampooensis Sharkey, sp. n.**

http://zoobank.org/482BC0EC-C427-4352-AE96-5BC323A27286

**Diagnosis.** Subgenal groove poorly developed, shallow and narrow. Scutellum sculpture smooth with punctures. Mesoscutum black. Hind femur melanic. Fore wing not distinctly infuscate in apical half. T1 color mostly or entirely melanic (brown to black) in basal 1/5, sometimes extreme base pale. T2 distinctly longer than wide. Striae of T2 relatively straight. Exposed portion of ovipositor shorter than body length.

**Description.** Body length 4.6 mm. Ovipositor length 4.7 mm. Ovipositor 1.0× body length. Number of flagellomeres 31. Notauli sculpture not significantly wider posteriorly. Scutellum smooth with punctures. Mid tibia with 3 apical and 3 preapical spines. Hind tibia with 10 spines/pegs. Second submarginal cell diameter minute, about equal to width of pedicel. Wing hyaline with an infuscate patch posterior to stigma. T2 1.1× longer than wide. T2 entirely striate, striae relative straight throughout. **Color:** Head and mesosoma melanic, except tegula and lowermost extremity of gena yellow; fore coxa yel-
Figure 8. Z. krachanensis: a) lateral habitus. b) fore wing. c) hind wing. d) anterior head. e) lateral head. f) lateral mesosoma. g) dorsal mesoscutum h) propodeum. i) T1–3.

Figure 9. Z. lampangensis: a) lateral habitus. b) fore wing. c) hind wing. d) dorsal head. e) lateral head. f) lateral mesosoma. g) dorsal mesoscutum h) propodeum and T1–3.
low; mid coxa mostly melanic; T1 mostly melanic except posterior margin pale yellow; T2 pale yellow anterior to transverse depression.

**Etymology.** Named after the type locality Nong Bua Lampoo Provence.

**Material examined.** **Holotype:** Female, Thailand, Nong Bua Lampoo, Phu Kao-Phu Phan Kham NP, far from the old house 100 m (east), 16.81°N, 102.614°E, 100 m elev., Malaise trap, 27.vii-2.viii.2006 (H122, T85), Rakkiat Singhatip. **Paratypes:** All female: Thailand, Nakhon Si Thammarat, Namtok Yong NP, TV aerial, 8.238°N, 99.805°E, 966 m elev., Malaise trap, 1–8. ix.2008 (H995, T3538), Paiboon; Phetchabun, Khao Kho NP, Mix deciduous forest, 16.542°N, 101.041°E, 524 m elev., Malaise trap, 26.vi-2.vii.2007 (H650, T2460), Somchai Chachumnan & Saink Singtong; Ubon Ratchathani, Pha Taem NP, Pha Taem foothill, 15.6664°N, 105.5078°E, 238 m elev., Malaise trap, 2–9.vi.2007 (H1636, T2206), Tongcam & Banlu; Nong Bua Lampoo, Phu Kao-Phu Phan Kham NP, tank, 16.807°N, 102.615°E, 199 m elev., Malaise trap, 27.vii-2.viii.2006 (H121, T89), Rakkiat Singhatip.

For a map of examined material, see: https://bit.ly/2Gccq5J

**Zosteragathis luangensis** Sharkey, sp. n.

http://zoobank.org/68E596E9-F85C-40E9-8945-0BFA8A916771

**Diagnosis.** Ovipositor slightly more than 1/2 body length; scutellum rugose.

**Description.** Body length 4.0 mm. Ovipositor length 2.3 mm. Ovipositor 0.6× body length. Number of flagellomeres 30. Sculpture of notauli increasing in width posteriorly where it extends over onto lateral lobes of mesoscutum. Scutellum rugose. Mid tibia with 2 apical and 2 preapical spines. Hind tibia with 4 spines/pegs. Second submarginal cell diameter small, smaller than pedicel length, but larger than pedicel width. Wing hyaline with a weak infuscate area posterior to stigma. T2 1.2× longer than wide. T2 striate, striae straight and weak to absent anteriorly. **Color:** head black except lower gena and clypeus partly yellow; mesosoma black; fore and hind coxa melanic; T1 whitish yellow basally and apically; T2 whitish yellow in basal 1/2.

**Etymology.** Named after the type locality Thung Salaeng Luang National Park.

**Material examined.** **Holotype:** Female, Thailand, Phitsanulok, Thung Salaeng Luang NP, Moist evergreen forest, 16.844°N, 100.882°E, 557 m elev., Malaise trap, 25.viii-1.ix.2006 (H1859, T572), Pongpitak Pranee.

For a map of examined material, see: https://bit.ly/2pMnf3r

**Zosteragathis ngamensis** Sharkey, sp. n.

http://zoobank.org/F48AA80D-60AB-4E7C-A2C3-6B95C23C787A

**Diagnosis.** Head, prothorax and mesothorax yellow; ovipositor short, about 1/2 body length; scutellar triangle rugose.
Figure 11. *Z. luangensis*: 

- **a)** lateral habitus. 
- **b)** anterior head. 
- **c)** fore wing. 
- **d)** hind wing. 
- **e)** dorsal head and mesoscutum. 
- **f)** lateral head and mesosoma. 
- **g)** dorsal propodeum and T1–3.

Figure 12. *Z. ngamensis*: 

- **a)** lateral habitus. 
- **b)** fore wing. 
- **c)** hind wing. 
- **d)** anterior head. 
- **e)** lateral head. 
- **f)** lateral mesosoma. 
- **g)** dorsal mesoscutum. 
- **h)** propodeum and T1–3.
**Description.** Body length 4.1 mm. Ovipositor length 2.0 mm. Ovipositor 0.5 x body length. Number of flagellomeres 34. Sculpture of notauli increasing in width posteriorly where it extends over onto lateral lobes of mesoscutum. Scutellum rugose. Mid tibia with no apical and 2 preapical spines. Hind tibia with 5 spines/pegs. Second submarginal cell diameter large, about as high as pedicel. Wing hyaline, apical half of wing weakly infuscate, as is area posterior to stigma (infuscate areas may not be evident unless lighting is optimal). T2 1.2 x longer than wide. T2 entirely striate, striae relative straight throughout. **Color:** head, prothorax and mesothorax yellow, metathorax and propodeum black; fore and mid coxae yellow; basal 1/3 and apical margin of T1 yellow; anterior 1/2 of T2 yellow.

**Etymology.** Named after the type locality Pa Hin Ngam National Park.


For a map of examined material, see: https://bit.ly/2Gcc9iQ

**Zosteragathis nuichuaensis (Achterberg & Long)**

*B. n. nachuaensis* Achterberg & Long, 2010

**Diagnosis.** Scutellar triangle rugose.

**Description.** Body length 3.2 mm. Ovipositor length 2.7 mm. Ovipositor 0.8 x body length. Number of flagellomeres (26–28 in Thai specimens) incomplete in holotype. Sculpture of notauli increasing in width posteriorly where it extends over onto lateral lobes of mesoscutum. Scutellum rugose. Mid tibia with 2 apical and 3 preapical spines. Hind tibia with 6 spines/pegs. Second submarginal cell diameter almost as large as pedicel length. Wing hyaline, without distinct infuscate areas. T2 0.9 x longer than wide. T2 mostly smooth with striae indicated especially posteromediaally (to entirely striate, with striae weaker medially), striae relatively straight. **Color:** head black except gena yellow ventrally; fore and mid coxae mostly melanic; apex of T1 and anterior half of T2 yellow.


For a map of examined material, see: https://bit.ly/2pGpC8T

**Zosteragathis perknos Sharkey, sp. n.**

For a map of examined material, see: http://zoobank.org/1FC70495-DB98-45B3-857B-6CF146CB6025

**Diagnosis.** Fore wing clear basally, infuscate in apical half; T2 much narrower basally than apically; close to *Z. nigrolineatus* (Achterberg & Long, 2010), but differing in the dimensions of T2.

**Description.** Body length 6.2 mm. Ovipositor length/body length ratio = 0.8. Interantennal space with a flat triangular elevation that narrows to a short ridge posteriorly and then divides into two short indistinct carinae that approach the median ocellus. Antenna with 35 flagellomeres. Third labial (penultimate) palpomere small, 1/3 as long as apical palpomere. Scutellar groove with 3 longitudinal ridges. Fore tibia lacking thickened spines; mid tibia with 4 pegs; hind tibia with 8 pegs.

**Etymology.** Perknos is Greek for dusky; here it is a reference to the dark color of the base of the hind tibia.

**Specimens examined.** Holotype ♀, THAILAND, Chiang Mai, Doi Phahompok NP, Doi Phalung, 20°1.06’N, 99°59.254’E, 228 m elev., Malaise trap, 26.viii-2.ix.2007 (H970, T4386), Sirichai leg. ♂, Mae Hong Son, Namtok Mae Surin NP, visitor’s center, 19°21.593’N, 97°59.254’E, 228 m elev., Malaise trap, 26.viii-2.ix.2007 (H958, T5874), Manu Namadkum leg.

For a map of examined material, see: https://bit.ly/2GbdAP7

**Zosteragathis petchaburiensis Sharkey sp. n.**

For a map of examined material, see: http://zoobank.org/15DCE0F9-7207-4D97-A957-C3A7C7CB7F61

**Diagnosis.** Ovipositor longer than body; T2 almost entirely black; fore and mid femur partly black; propodeum smooth along posterior margin.

**Description.** Body length 3.6 mm. Ovipositor length 3.8 mm. Ovipositor 1.0 x body length. Number of flagellomeres 33. Notauli sculpture not significantly wider posteriorly. Scutellum smooth with punctures. Mid tibia with 7 apical and 2 preapical spines. Hind tibia with 10 spines/pegs. Second submarginal cell diameter small, smaller than pedicel length, but larger than pedicel width. Wing mostly hyaline, weakly infuscate in distal half, not distinctly infuscate posterior to stigma. T2 1.2 x longer than...
Figure 13. *Z. nuichuaensis*: a) lateral habitus. b) fore wing. c) hind wing. d) dorsal head. e) lateral head. f) lateral mesosoma. g) dorsal mesoscutum. h) propodeum. i) T1–3.

Figure 14. *Zosteragathis perknos* holotype female. a) lateral habitus. b) wings. c) dorsal head. d) lateral head. e) lateral mesosoma. f) dorsal thorax. g) propodeum and metasomal terga 1–3.
wide. T2 entirely striate, striae converging somewhat posteromedially. **Color:** head black; mesosoma black; mid and fore coxa black; fore femur partly black; mid femur mostly black; T1 entirely black; T2 mostly black except anterior and anterolateral margins yellow.

**Etymology.** Named after the type locality Petchaburi Provence.

**Specimens examined.** **Holotype:** Female: Thailand, Petchaburi, Kaeng Krachan NP, Panernthung km 27, 12.822°N, 99.371°E, 950 m elev., Malaise trap, 4–11.i.2009 (H473, T4402), Sirichai.

For a map of examined material, see: https://bit.ly/2u-mu41q

**Zosteragathis phahompokensis** Sharkey, sp. n.

Diagnosis. Scutellum smooth with punctures. T1 mostly or entirely pale in basal 1/5 or more. T2 mostly pale in anterior half and mostly melan in posterior half.

**Description.** Body length 4.1 mm. Ovipositor length 3.2 mm. Ovipositor 0.8× body length. Number of flagellomeres 31. Notauli sculpture not significantly wider posteriorly. Scutellum smooth with punctures. Mid tibia with 2 apical and 4 preapical spines. Hind tibia with 7 spines/pegs. Second submarginal cell diameter large, about same size as pedicel length (to 1/3 length of pedicel but always wider than pedicel). Wing hyaline, without distinct infuscate areas. T2 0.9× longer than wide. T2 mostly smooth with short longitudinal carinae restricted to area near median transverse depression. **Color:** head black except ventral gena and ventral clypeus yellow; mesosoma black; fore and mid coxa yellow; T1 yellow with large black patch posteromedially; T2 yellow in anterior half.

**Etymology.** Named after the type locality Doi Phahompokens National Park.

**Material examined.** **Holotype:** Female: Thailand, Chiang Mai, Doi Phahompok NP, Headquarter, 19.966°N, 99.156°E, 569 m elev., Malaise trap, 28.ii-7.iii.2008 (H1858, T2939), Seesom, K. **Paratype:** Female: Thailand, Sakon Nakhon, Phu Phan NP, Behind national park office, 17.058°N, 103.975°E, 318 m elev., Malaise trap, 23–30.i.2007 (H097, T1527), Saikom Tongboonchai.

For a map of examined material, see: https://bit.ly/2pIAjA

**Zosteragathis phuphanensis** Sharkey, sp. n.

Diagnosis. Scutellum smooth with punctures. Mesoscutum black. Fore wing with a small infuscate area posterior to stigma. T2 distinctly longer than wide. Striae of T2 curving towards the midline, especially anteromedially.
Figure 16. *Z. phahompokensis*: a) anterior head. b) lateral habitus. c) fore wing. d) hind wing. e) dorsal head and mesoscutum. f) lateral head and mesosoma. g) propodeum. h) T1–3.

Figure 17. *Z. phuphanensis*: a) lateral habitus. b) fore wing. c) hind wing. d) dorsal head. e) lateral head. f) lateral mesosoma. g) dorsal mesoscutum. h) propodeum. i) T1–3.

Color. Head black except ventral extremity of gena yellow; mesosoma black; fore and mid coxa yellow; posterior margin of T1 yellow; T2 yellow anterolaterally and anterolaterally.

Etymology. Named after the type locality Phu Phan National Park.


For a map of examined material, see: https://bit.ly/2DYkTUg

Zosteragathis sakaeratensis Sharkey, sp. n.
http://zoobank.org/39028CA9-4ABA-43C6-8485-457E9F88D7B9

Diagnosis. Fore wing without a small insursive area posterior to stigma. T2 entirely or almost entirely (80%) melanic. T2 as wide as long or wider.

Description. Body length 4.2 mm. Ovipositor length 2.8 mm. Ovipositor 0.7× body length. Number of flagellomeres 29. Notauli sculpture not significantly wider posteriorly. Scutellum smooth with punctures. Mid tibia with 3 apical and 1 preapical spines. Hind tibia with 9 spines/pegs. Second submarginal cell diameter small, slightly smaller than pedicel length. Wing hyaline with a slight insurrection posterior to stigma. T2 0.8× longer than wide. T2 entirely striate, striae relative straight throughout. Color: fore coxa melanic; mid coxa yellow; hind femur yellowish brown; T1 and T2 mostly melanic; posterior margin of T1 pale; T2 with some pale infusions medially and anterolaterally.

Etymology. Named after the type locality Sakaerat Experimental Station.


For a map of examined material, see: https://bit.ly/2Gvhsd0

Zosteragathis samensis Sharkey, sp. n.
http://zoobank.org/39CBB49C-FAE4-4034-8670-D2B1CBF988DE

Diagnosis. Fore coxa yellow. Hind femur black. T2 mostly pale in anterior half and mostly melanic in posterior half. Scutellum smooth with punctures. T2 dimensions as wide as long or wider.

Description. Body length 3.6 mm. Ovipositor length 3.0 mm. Ovipositor 0.8× body length. Number of flagellomeres 29. Notauli sculpture not significantly wider posteriorly. Scutellum smooth with punctures. Mid tibia with 2 apical and 3 preapical spines. Hind tibia with 6 spines/pegs. Second submarginal cell diameter about equal to width of vein. Wing hyaline with an insursive patch posterior to stigma. T2 weakly striate, striae almost absent anteromedially, weakly converging in posterior half. Color: head black except clypeus and lower gena yellow; mesosoma black; fore and mid coxa yellow; T1 and T2 predominantly pale yellow, T1 with a large melanic spot in basal half, T2 with (or without) melanic infusion postero-medially; second submarginal cell minute pedicel much longer than cell height, diameter about equal to width of pedicel.

Etymology. Named after the type locality Sakon Nakhon Provence.


For a map of examined material, see: https://bit.ly/2Gg3UTu

Zosteragathis sakoensens Sharkey, sp. n.
http://zoobank.org/77739620-FD6B-4ECE-8C7B-D960CD6A221C

Diagnosis. Head black except clypeus and lower gena yellow, T1 and T2 predominantly pale yellow, T1 with a large melanice spot in basal half, T2 with (or without) melanic infusion postero-medially; second submarginal cell minute pedicel much longer than cell height, diameter about equal to width of pedicel.

Description. Body length 3.4 mm. Ovipositor length 3.3 mm. Ovipositor 0.6× body length. Number of flagellomeres 31. Notauli sculpture not significantly wider posteriorly. Scutellum smooth with punctures. Mid tibia with 3 apical and 2 preapical spines. Hind tibia with 8 spines/pegs. Second submarginal cell diameter small, smaller than pedicel length, but larger than pedicel width. Wing hyaline with an insursive patch posterior to stigma. T2 0.9× longer than wide. T2 entirely striate, striae weak anteromedially where they converge medially. Color: head black except gena yellow; mesosoma black; fore and mid coxa yellow; posterior margin of T1 yellow; anterior half of T2 yellow.

Etymology. Named after the type locality Khao Sam Roi Yot National Park.

Material examined. Holotype: Female: Thailand, Prachub Khiri Khan, Khao Sam Roi Yot NP, Khao Look...
Figure 18. *Z. sakaeratensis*: a) lateral habitus. b) fore wing. c) hind wing. d) dorsal head. e) lateral head. f) lateral mesosoma. g) dorsal mesoscutum. h) propodeum and T1–3.

Figure 19. *Z. sakonensis*: a) lateral habitus. b) fore wing. c) hind wing. d) dorsal head. e) lateral head. f) lateral mesosoma. g) dorsal mesoscutum. h) propodeum. i) T1–3.
Figure 20. Z. samensis: a) lateral habitus. b) fore wing. c) hind wing. d) anterior head. e) lateral head. f) lateral mesosoma. g) dorsal mesoscutum. h) propodeum and T1–3.

Glang, 12.107°N, 99.955°E, 20 m elev., Malaise trap, 8–15.iii.2009 (H2418, T4214), Yai Amnad. **Paratypes:**


For a map of examined material, see: https://bit.ly/2IZCper

**Zosteragathis surinensis** Sharkey, sp. n.

http://zoobank.org/5FCED594-58B2-4EED-BD95-BC2D4A875A67

**Diagnosis.** Hind femur yellow, hind coxa mostly yellow; hind tibia with many spines (9 or more).

**Description.** Body length 3.6 mm. Ovipositor length 3.4 mm. Ovipositor 1.0× body length. Number of flagellomeres 29. Notauli sculpture not significantly wider posteriorly. Scutellum smooth with punctures. Mid tibia with 3 apical and 3 preapical spines. Hind tibia with 11 spines/pegs. Second submarginal cell diameter large, larger than length of pedicel. Wing hyaline, without distinct infuscate areas. T2 1.2× longer than wide. T2 entirely striate, striae weak anteromedially, striae relatively straight.

**Color:** head black except gena ventrally and clypeus yellow; mesosoma melanic; fore and mid coxae yellow; hind coxa yellow in apical half; hind femur yellow; apex of T1 yellow; T2 yellow in basal half.

**Etymology.** Named after the type locality Namtok Mae Surin National Park.

**Material examined. Holotype:** Female: **Thailand**, Mae Hong Son, Namtok Mae Surin NP, E Huai Fai Kor reservoir, 19.344°N, 97.988°E, 311 m elev., Malaise trap, 18–25.v.2008 (H598, T3518), Kamkoon, A.

For a map of examined material, see: https://bit.ly/2IZCper

**Zosteragathis taemensis** Sharkey, sp. n.

http://zoobank.org/038CCAA1-97ED-42BB-8433-39D600685C15

**Diagnosis.** Fore and mid coxae mostly melanic; scutellar groove pale; area posterior to fore wing stigma distinctly infuscate.

**Description.** Body length 6.1 mm. Ovipositor length 5.3 mm. Ovipositor 0.9× body length. Number of flagellomeres 34. Notauli sculpture not significantly wider posteriorly. Scutellum smooth with punctures. Mid tibia with 4 apical and 4 preapical spines. Hind tibia with 9 spines/
Figure 21. *Z. surinensis*: a) lateral habitus. b) fore wing. c) hind wing. d) anterior head. e) lateral head. f) lateral mesosoma. g) dorsal mesoscutum. h) propodeum and T1–3.

Figure 22. *Z. taemensis*: a) lateral habitus. b) fore wing. c) hind wing. d) dorsal head. e) lateral head. f) lateral mesosoma. g) dorsal mesoscutum. h) propodeum and T1–3.
pegs. Second submarginal cell diameter minute, about equal to width of vein. Wing hyaline with an infuscate patch posterior to stigma. T2 0.9× longer than wide. T2 entirely striate, semicircular pattern anteromedially, striae converging posterior to this pattern. Color: head black except ventral gena and ventral clypeus yellow; mesosoma black except scutellar groove pale; fore and mid coxae predominantly melanic; T1 black except posterior margin yellow; T2 yellow in anterior half.

**Etymology.** Named after the type locality Pha Taem National Park.

**Material examined.** Holotype: Female: Thailand, Ubon Ratchathani, Pha Taem NP, Phu Krajeaw foothill, 15.666°N, 105.508°E, 238 m elev., Malaise trap, 2–9. vi.2007 (H279, T2206), Tongcam & Banlu.

For a map of examined material, see: https://bit.ly/2uq1wnv

**Zosteragathis tonensis** Sharkey, sp. n.

http://zoobank.org/7B26BD3D-743D-41B7-8F4F-D86A7D4EA605

**Diagnosis.** Ovipositor longer than body.

**Description.** Body length 4.5 mm. Ovipositor length 5.2 mm. Ovipositor 1.2× body length. Number of flagellomeres 31. Notauli sculpture not significantly wider posteriorly. Scutellum smooth with punctures. Mid tibia with 3 apical and 3 preapical spines. Hind tibia with 7 spines/pegs. Second submarginal cell diameter small, smaller than pedicel length, but larger than pedicel width. Wing hyaline with an infuscate patch posterior to stigma. T2 1.1× longer than wide. T2 entirely striate, striae relatively straight. Color: head black except ventral gena yellow; mesosoma black; fore and hind coxa black; posterior margin of T1 yellow; T2 mostly yellow in basal half with melanic tones posteromedially.

**Etymology.** Named after the type locality Tat Tone National Park.


For a map of examined material, see: https://bit.ly/2I-W47ZC

**Acknowledgements**

We thank the staff at Queen Sirikit Botanic Garden in Chaing Mai, Thailand for sorting the many hundreds of samples and for the Thai park staff for operating Malaise traps and other collection devices. A special thanks to Chaweewan Hutarharern for managing the Thai end of the TIGER project. Special thanks also to Kees van Achterberg for lending specimens and types from Vietnam. Funding was provided by NSF grants DEB-0542864 and EF-0337220 and by Hatch projects KY008041 and KY008065 (to MJS). The information reported in this paper (No. 18-08-052) is part of a project of the Kentucky Agricultural Experiment Station and is published with the approval of the Director. Many thanks to Drs Jim Whitfield and Donald Quicke who reviewed the manuscript.

**Figure 23.** Z. tonensis: a) lateral habitus. b) fore wing. c) hind wing. d) anterior head. e) lateral head. f) lateral mesosoma. g) dorsal mesoscutum. h) scutellum and propodeum. i) T1–3.
References


Appendix 1

Table 2. Specimens used in the phylogenetic analyses, including specimen numbers, and GenBank and BOLD accession numbers and rough geographical information.

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