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FIRST REPORT OF TWO GENERA *Angustibracon* Quicke AND *Pseudospinaria* Enderlein (Hymenoptera: Braconidae) FROM VIETNAM, WITH REDESCRIPTIONS OF SPECIES

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ABSTRACT

Two small genera of the subfamily Braconinae, *Angustibracon* Quicke, 1987 and *Pseudospinaria* Enderlein, 1905, are reported for the first time from Vietnam. Two *Angustibracon* species, *Angustibracon leptogaster* Cameron and *Angustibracon maculiabdominis* Zhou & You and one *Pseudospinaria* species, *Pseudospinaria attenuata* (Westwood) are newly recorded for Vietnam's braconid fauna. Additionally, the species are redescribed and illustrated. An illustrated key to the two known *Augustibracon* species and a mapped distribution of species in Vietnam are also given.

Keywords: Ichneumonoidea, Braconinae, new record, parasitoid, Oriental.

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INTRODUCTION

Braconinae is one of the most diverse subfamilies of the family Braconidae with more than 160 described genera (Quicke, 1987; Yu et al., 2016). Up to now, the family Braconidae of Vietnam in general and particularly the subfamily Braconinae are poorly studied yet. Most Braconinae are ectoparasitoids, but some are known as endoparasitoids of Coleoptera and Lepidoptera larvae (Quicke, 1987; van Achterberg & Mehrneijad, 2011; Yu et al., 2016). Up to date, the available information on braconine wasps recorded from Vietnam was summarized by Long & Belokobylskij (2003) and Long & van Achterberg (2014), but the two genera *Augustibracon* Quicke and *Pseudospinaria* Enderlein are lacking.

Augustibracon is a rare genus, that was named by Quicke in 1997 (type-species: *Bracon leptogaster* Cameron, 1899), and recently this genus contains two species from the Oriental region (Yu et al., 2016). The other small genus is *Pseudospinaria* Enderlein, 1905 (type-species: *Spinaria attenuata* Westwood, 1882) and this genus comprises two species and one subspecies from the Oriental region (Yu et al., 2016).

The detailed redescription of *Augustibracon* type-species, *Bracon leptogaster* Cameron, 1899, was given by Quicke (1987), and a second species, *Angustibracon maculiabdominis* Zhou & You, from China (Guangxi), has recently been described in Chinese with a short English summary and some line drawings (Zhou & You, 1992). In this study, we report these species of the genus *Angustibracon* and one species of the genus *Pseudospinaria*, *Pseudospinaria attenuata*, from Vietnam for the first time. All the species were originally described from the Oriental region and their biology is unknown.

Based on the specimens of *Angustibracon* and *Pseudospinaria* species collected from Vietnam, a key to the *Augustibracon* species and redescriptions of three above mentioned species are provided.

MATERIALS AND METHODS

Specimens from Vietnam is deposited in the parasitoid collection of the Department of Insect Ecology, Institute of Ecology and Biological Resources (IEBR), Ha Noi within the Vietnam Academy of Science and Technology (VAST). The code "Bracn.+number" is unique for specimens of Braconinae in the IEBR collection.

The specimens were observed under a stereomicroscope Olympus® SZ61, their photos were taken with a Sony-α 6000 digital camera attached to a Nikon® SMZ 800N binocular microscope and Helicon Focus® 8 stacking software. All the photographs were produced by KDL, for comparison we used some photographs of the holotype of *Angustibracon leptogaster*, which were sent by Dr Quicke. Adobe Photoshop CS5 was used to adjust the size and background, scale-lines are in mm. For the redescription, sculpture terms are based on Harris (1979); terminology used in this paper follows the modified Comstock-Needham system (van Achterberg, 1997). *Angustibracon* and *Pseudospinaria* may be recognised using the key to Old World braconine genera by Quicke (1987); for additional references and data, see Yu et al. (2016).

Abbreviations used in this paper are as follows: OD = diameter of posterior ocellus; OOL = ocular-ocellar line; POL = postocellar line; CH: Central Highlands; NE: Northeastern; NP: National Park; S: South; SC: South Central.

RESULTS

Taxonomy

Family Braconidae

Subfamily Braconinae Nees, 1811

Genus *Augustibracon* Quicke, 1987

Angustibracon Quicke, 1987 (type species: *Bracon leptogaster* Cameron, 1890).

Quicke, 1987: 139; Zhou & You, 1992: 139.

A detailed diagnosis of *Angustibracon* was given by Quicke (1987).

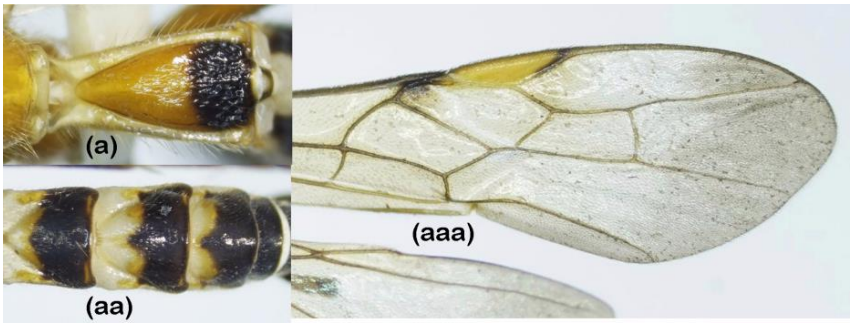
Biology. Unknown.

Distribution. Oriental.

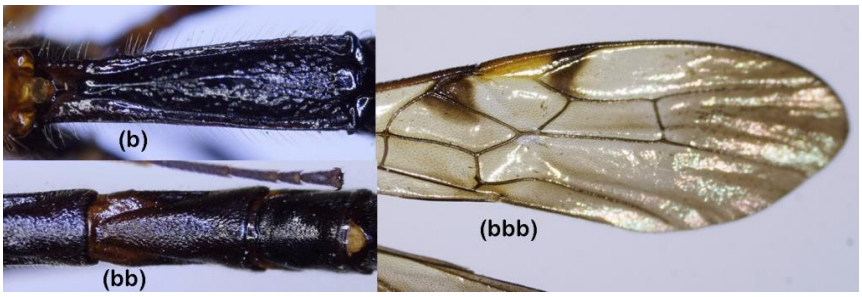
The genus *Angustibracon* is newly recorded from Vietnam. Up to date, this genus comprises two species, *A. leptogaster* and *A. maculiabdominis*, both of them are recorded for the first time from Vietnam.

Key to Vietnamese *Augustibracon* species (based on Vietnamese specimens)

1. Metasoma less than 2.2 × as long as head and mesosoma combined; first metasomal tergite robust and 1.5 × apical width (a); median length of fourth tergite 0.95 × its basal width (aa); metasomal tergites yellow basally and broadly black apically; fore wing vein 3-SR = 1.5 × 2-SR (aaa)..……*Angustibracon maculiabdominis* Zhou & You



- Metasoma more than 2.4 × as long as head and mesosoma combined; first metasomal tergite elongate and 2.8–3.3 × its apical width (b); median length of fourth tergite 2.2 × its basal width (bb); first metasomal tergite blackish-brown to black; fore wing vein 3-SR = 1.8–2.0 × 2-SR (bbb); second-sith metasomal tergites blackish brown……
……..….*Angustibracon leptogaster* (Cameron)



Descriptive taxonomy

***Augustibracon leptogaster* (Cameron, 1899)**

Augustibracon leptogaster (Cameron): Quicke, 1987: 141.

Material examined. "Bracn.**1070**" (IEBR), ♀, CH Vietnam: Gia Lai, Kon Ka Kinh NP, tram Vooc, 14°20'00"N - 108°22'00"E, 700 m, 13.vii.2012, NTP Lien; "Bracn.**1241**" (IEBR), ♀, SC Vietnam: Quang Nam, Dong Giang, P'Rao centre, 15.9273°N, 107.6393°E, 500–600 m, 28.v.2006, HV Tru; "Bracn.**1334**" (IEBR), ♀, S Vietnam: Dong Nai, Cat Tien NP, forest, 11°30'N - 107°20'E, 9.vi.2002, LX Hue.

Redescription. Based on "Bracn.**1070**" (IEBR), Figures 1, 2A–O, 7.

Female, body length 18.0 mm, fore wing length 11.5 mm, antenna 15.8 mm, ovipositor sheath 19.5 mm (Fig. 1).

Head. Antenna with 95 flagellomeres, scapus shorter dorsally than ventrally, length 1.5 × as long as maximum width (Fig. 2E); first flagellomere 1.4 × second flagellomere; apical flagellomere conical; in dorsal view,

head width 1.5 × its median length; median length of head 3.6 × as long as temple; in lateral view, transverse diameter of eye 2.0 × length of temple (Fig. 2B); eye length 1.4 × as long as wide; ocelli small, POL : OD : OOL = 4 : 5 : 12 (Fig. 2A); in frontal view, eye 2.2 × as high as broad; malar space 0.2 × as high as eye, and 0.75 × basal width of mandible; face width 0.9 × height of eye, and 1.05 × height of face and clypeus combined (Fig. 2G); hypoclypeal depression width 0.7 × as wide as distance from edge of depression to eye margin, 0.3 × as wide as face, and 0.8 × as wide as basal width of mandible; distance between tentorial pits as long as distance from pit to eye; length of maxillary palp 0.9 × height of head (without mandible); frons flat, with narrow median groove (Figs 2F, G), the groove runs to middle of face; and vertex smooth; temple sparsely punctate.

Figure 1. Augustibracon leptogaster (Cameron). Female, lateral view, "Bracn.**1070**" (IEBR)

Mesosoma. Length of mesosoma 2.0 × as long as height; pronotal trough shallow, almost smooth (Fig. 2C); mesopleuron finely punctate anteriorly, smooth posteriorly; metapleuron smooth; mesoscutum largely smooth; notauli shallow, smooth; scutellar depression narrow, crenulate; scutellum almost smooth, with sparse punctures; propodeum long, narrowed posteriorly, smooth (Fig. 2H).

Wings. Fore wing 4.1 × as long as its maximum width; pterostigma 4.25 × as long as wide; vein r arising before middle of pterostigma; vein SR1 1.4 × as long as pterostigma; vein 3-SR 2.2 × vein r, 0.5 × vein SR1 and 1.85 × vein 2-SR (Fig. 2D); second submarginal cell of fore wing slightly widened apically, its apical width 1.2 × basal width; vein 1-CU1 short, nearly quadrate; vein cu-a interstitial (Fig. 2D) [vein cu-a distinctly antefurcal in the original description, see Fig. 310 in Quicke 1987: 140], and 0.35 × 2-CU1; hind wing 6.6 × as long as its maximum width; vein 2-SC+R of hind wing with 4 bristles; vein SC+R1 with 3 hamuli.

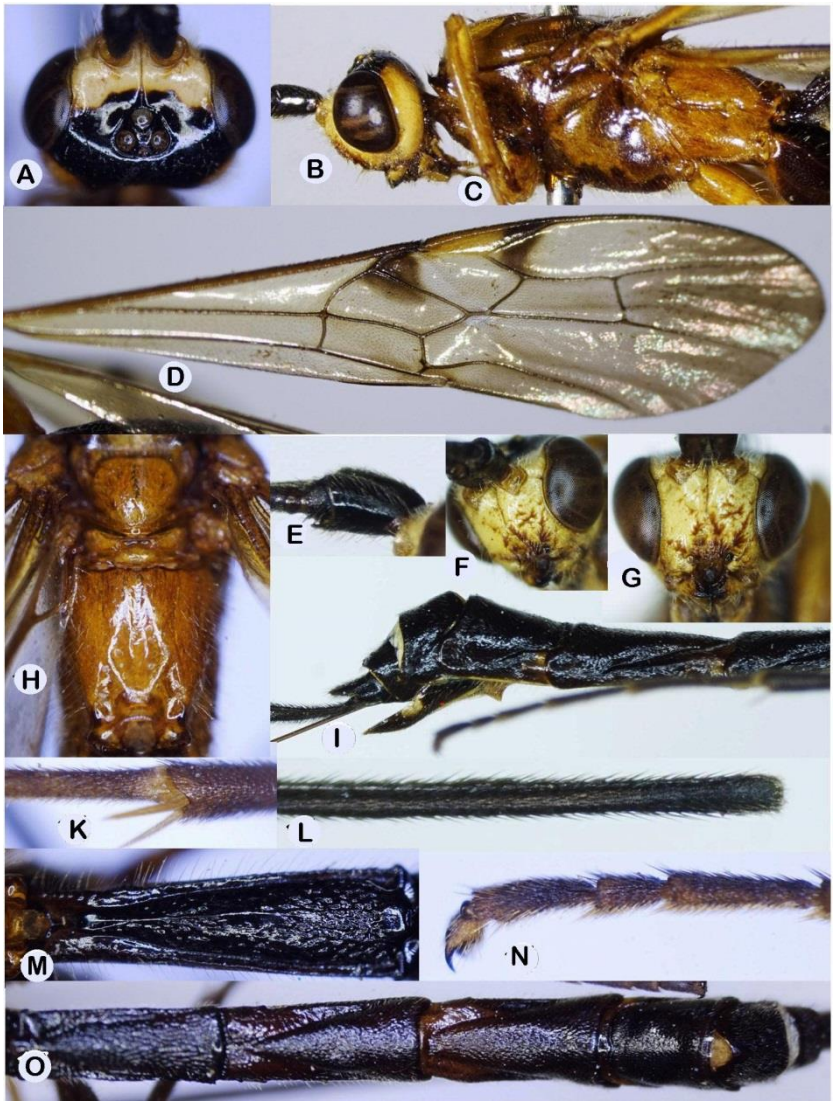


Figure 2. Augustibracon leptogaster (Cameron). Female, "Bracn.**1070**" (IEBR). **A** Head, dorsal, **B** Head, lateral, **C** Mesopleuron, **D** Fore wing, **E** Scapus, lateral, **F** Head, latero-frontal, **G** Head, frontal, **H** Propodeum, **I** Apex of metasoma, lateral, **K** Hind tibial spurs, **L** Apex of ovipositor sheath, **M** First metasomal tergite, **N** Third-fifth segments of hind tarsus and tarsal claw, **O** Second-fifth metasomal tergites

Legs. Fore tarsus 1.4 × as long as fore tibia; hind femur, tibia and basitarsus 4.6, 15.0, and 12.0 × their maximum width, respectively; inner hind tibial spur 0.3 × as long as hind basitarsus (Fig. 2K); outer spur 0.2 × as long as hind basitarsus; hind tarsus 0.5 × as long as hind tibia; basitarsus 0.7 × as long as second-fifth tarsal segments combined; second tarsal segment 0.6 × as long as basitarsus; fourth tarsal segment 0.55 × as long as telotarsus; hind tarsal claw with rather large basal lobe (Fig. 2N).

Metasoma. Metasoma 2.4 × as long as head and mesosoma combined; length of first metasomal tergite 3.35 × its apical width, and 2.5 × length of propodeum medially; first metasomal tergite almost smooth basally, rugulose apically (Fig. 2M); second tergite

parallel-sided, median length of second, third and fourth tergites 2.75, 2.5 and 2.2 × their median width, respectively; median length of third tergite 0.9 × second tergite, and 1.1 × longer than fourth tergites, longitudinally rugulose; metasomal tergites 3–5 protruding latero-posteriorly (Fig. 2I); third-fourth tergites coriaceous-rugulose; fifth-sixth tergites finely rugose-punctate (Fig. 2O); ovipositor sheath truncate apically, obliquely densely setose (Fig. 2L).

Colour. Body mainly yellow and black; scapus, pedicellus and flagellum black; head yellow, except stemmaticum, vertex and occiput black; mesosoma, fore and middle legs yellow; parastigma blackish brown, large blackish brown spot beneath it extended to vein 1-SR and basal half of vein 1-SR+M (Fig. 2D); pterostigma yellow but blackish brown in apical 0.3 and blackish brown spot beneath it; wing veins dark brown; wing membrane yellow, dark apically; hind leg brown, except coxa basally, trochantellus and spurs yellow; metasoma and ovipositor sheath black.

Variation. 2♀, "Bracn.**1241**" and "Bracn.**1334**" (IEBR): length of first metasomal tergite 3.0–3.4 × its apical width, and 2.3 × length of propodeum; vein r of fore wing 2.1–2.5 × 3-SR; 1.2–1.3 × 2-SR; 3-SR 0.5 × SR1; vein 2-SC+R of hind wing with 4 bristles; vein SC+R1 with 3 hamuli; hind femur, tibia and basitarsus 4.6, 10.8–13.0 and 9.5 × their maximum width, respectively; length of second tergite 2.45–2.60 × its apical width; median length of third tergite 0.9 × second tergite, and 1.0–1.1 × fourth tergite.

Male: Unknown.

Biology. Unknown.

Distribution. SC Vietnam: Quang Nam; CH Vietnam: Gia Lai; S Vietnam: Dong Nai. Outside Vietnam: India.

Notes. Female specimens of *A. leptogaster* from Vietnam have similar characters as holotype of *A. leptogaster*, except more flagellomeres, 95 *vs* 98 in holotype of *A. leptogaster* (Quicke, 1987), and vein cu-a interstitial (Fig. 2D) vs distinctly antefurcal in the original description (see Fig. 310 in Quicke, 1987: 140).

***Augustibracon maculiabdominis* Zhou & You, 1992**

Augustibracon maculiabdominis Zhou & You, 1992: 140.

Figure 3. Angustibracon maculiabdominis Zhou & You. Female, lateral, "Bracn.**1450**" (IEBR). **A** Habitus, lateral view, **B** Apex of metasoma, lateral view

Material examined. "Bracn.**1450**" (IEBR), ♀, SC Vietnam: Quang Ngai, Ly Son, An Hai, Thon Dong, foot hill, 15.3813°N, 109.1345°E, sweep, 05.vii.2017, DT Hoa.

Redescription. Based on "Bracn.**1450**" (IEBR), Figures 3 A–B, 4A–H, 7.

Female, body length 11.7 mm, fore wing length 9.3 mm, antenna 12.6 mm, ovipositor 11.0 mm (Fig. 3A).

Head. Antenna with 91 flagellomeres; scapus longer ventrally than dorsally; third antennomere 1.3 × fourth antennomere; apical flagellomere conical; in dorsal view, head width 1.6 × its median length; median length of head 3.0 × as long as temple; ocelli large, POL : OD : OOL = 5 : 6 : 14; in lateral view, transverse diameter of eye 2.2 × length of temple; eye length 1.5 × as long as wide; in frontal view, height of head 1.1 × as long as maxillary palp; eye 2.0 × as high as broad; malar space 0.3 × as high as eye, and 1.1 × basal width of mandible; face width 0.9 × height of eye, and 1.1 × height of face and clypeus combined (Fig. 4A); hypoclypeal depression width 0.7 × distance from edge of depression to eye margin, 0.3 × face, and 1.1 × as wide as basal width of mandible; distance between tentorial pits 1.1 × distance from pit to eye; face punctulate; frons flat, finely strigate medially; area between frons and vertex finely granulate; vertex with fine transverse striae; occiput and temple coriaceous-punctate.

Mesosoma. Length of mesosoma 1.7 × as long as height (Fig. 4B); pronotal trough smooth anteriorly, crenulate posteriorly; propleuron longitudinally striate; mesopleuron largely smooth; metapleuron rugose-punctate; median lobe of mesoscutum roundly protruding above pronotum, smooth anteriorly, sparsely punctate posteriorly; lateral lobes almost smooth; notauli wide, smooth (Fig. 4C); scutellar depression narrow, flat; scutellum convex, distinctly higher level of mesoscutum; metanotum pointed in leteral view; propodeum setose, sparsely rugose-punctate (Fig. 4E).

Wings. Fore wing 1.85 × as long as its maximum width; pterostigma 4.7 × as long as wide; vein r arising before middle of pterostigma; vein SR1 1.4 × as long as pterostigma (Fig. 4G); vein 3-SR 1.8 × vein r, 0.4 × vein SR1, and 1.5 × vein 2-SR; second submarginal cell of fore wing slightly widened apically, its apical width 1.1 × basal width; vein 1-CU1 short, nearly quadrate; vein cu-a interstitial (Fig. 4G); hind wing 5.3 × as long as its maximum width; vein 2-SC+R of hind wing with 3 bristles; vein SC+ R1 with 3 hamuli (Fig. 4H).

Legs. Fore tarsus 1.3 × as long as fore tibia; hind femur, tibia and basitarsus 4.1, 11.0 and 8.0 × their maximum width, respectively; inner hind tibial spur 0.4 × as long as hind basitarsus; hind tarsus 1.1 × as long as hind tibia; basitarsus 0.7 × as long as second-fifth tarsal segments combined; second tarsal segment 0.5 × as long as basitarsus, and 1.3 × as long as fifth tarsal segment (without pretarsus); fourth tarsus 0.4 × as long as fifth tarsal segment; hind tarsal claw with large basal lobe.

Metasoma. Metasoma 2.0 × as long as head and mesosoma combined; length of first metasomal tergite 1.5 × its apical width (Fig. 4D), and 1.7 × length of propodeum; median length of second tergite 1.25 × its apical width; median length of second, third and fourth tergites 1.1, 1.1. and 0.95 × their median width, respectively; median length of third tergite 1.1 × length of second tergite; third tergite subequal to fourth tergite (Fig. 4F); first metasomal tergite largely smooth dorsally, only rugose apically; second tergite coriaceous basally, rugulose medio-apically; third-fifth tergites smooth; ovipositor sheath densely setose (Fig. 3B).

Colour. Body mainly yellow; scapus black dorsally, yellow ventrally (Fig. 4A); pedicellus yellow; flagellum dark brown; head yellow, stemmaticum yellow but surrounding area of ocelli black (Fig. 4B); wing membrane yellow, smoky apically; pterostigma yellow, dark brown in extreme apex; parastigma blackish brown; fore and middle legs yellow;

hind coxa yellow, except apico-ventrally dark brown; hind femur yellow, but dark brown baso-ventrally; hind tibia pale brown, but yellow basally; hind tarsus brownish yellow; first tergite reddish-yellow basally, black apically; second-fifth tergites whitish-yellow basally, black apically; sixth tergite blackish-brown, except baso-lateral corner whitish-yellow; ovipositor sheath blackish brown; ovipositor yellow.

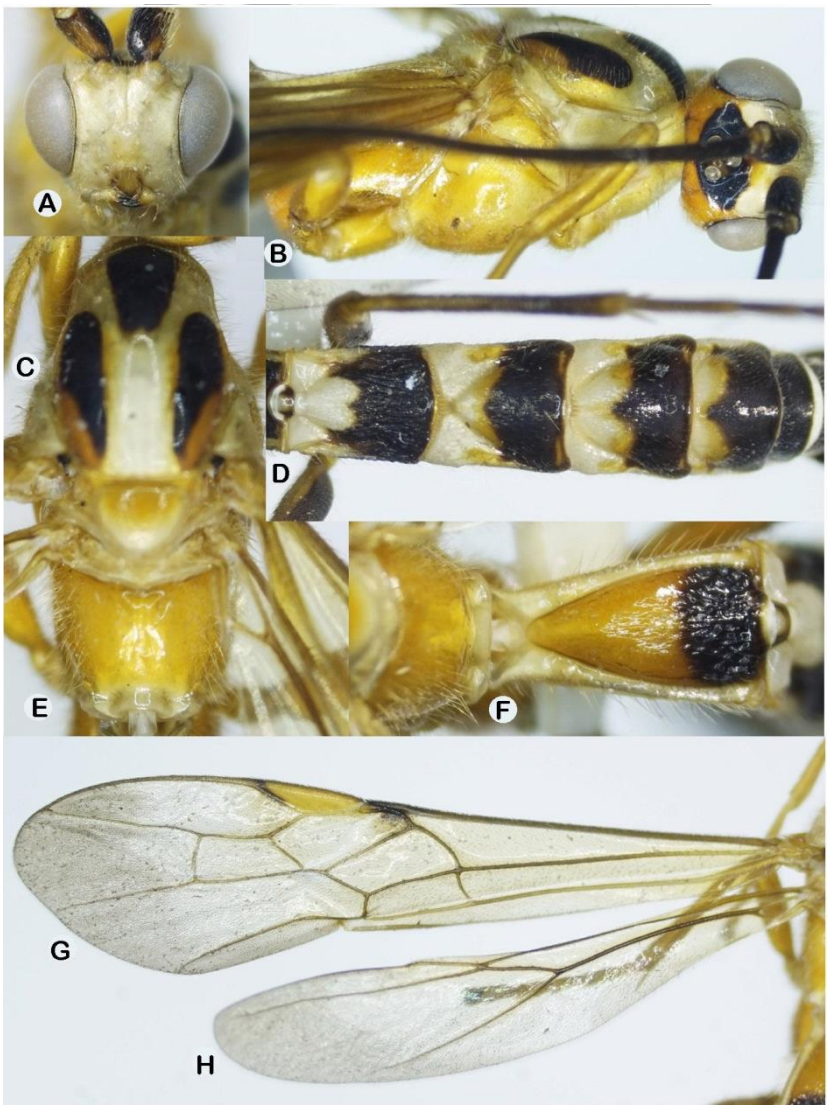


Figure 4. Augustibracon maculiabdominis Zhou & You. Female, "Bracn.**1450**" (IEBR)
A Head, frontal, **B** Mesopleuron, **C** Mesonotum, **D** Second-fifth metasomal tergites, **E** Propodeum, **F** First metasomal tergite, **G** Fore wing, **H** Hind wing

Male. Unknown.

Biology. Unknown.

Distribution. SC Vietnam (Quang Ngai province). Outside Vietnam: China (Guangxi).

Notes. Female specimen of *A. maculiabdominis* from Vietnam have more flagellomeres, i.e. 91 *vs* 74 in holotype of *A. maculiabdominis* from China (Zhou & You, 1992), the other characters are similar.

Genus *Pseudospinaria* Enderlein, 1905

Pseudospinaria Enderlein, 1905: 229; Quicke 1987: 127; Li et al. 2021: 154. Type species: *Spinaria attenuata* Westwood, 1882 (monobasic and original designation).

A detailed diagnosis of *Pseudospinaria* was given by Li et al. (2021).

Biology. Unknown.

Distribution. Oriental.

This genus is newly recorded from Vietnam, and one species, *Pseudospinaria attenuata* (Westwood), is recorded for the first time from Vietnam.

***Pseudospinaria attenuata* (Westwood, 1882)**

Spinaria attenuata Westwood, 1882: 30; Szépligeti, 1902: 45.

Pseudospinaria attenuata (Westwood): Enderlein, 1905: 229; Li et al., 2021: 155.

Redescription (based on "Bracn.**949**" (IEBR), Figures 5, 6A–F, 7.

Material examined. Female, "Bracn.**949**" (IEBR), NE. Vietnam: Bac Giang, Son Dong, Thanh Luan, forest, 150 m, 2.vii.2010, PH Phong.

Female, body length 12.0 mm, fore wing length 11.3 mm, antenna 13.9 mm, ovipositor 4.4 mm (Fig. 5).

Figure 5. Pseudospinaria attenuata (Westwood). Female, lateral view, "Bracn.**949**" (IEBR)

Head. Antenna incomplete, with 42 flagellomeres; scapus longer ventrally than dorsally (Fig. 6B); third antennomere 1.1 × fourth antennomere; in dorsal view, head width 1.65 × its median length; median length of head 5.8 × as long as temple; ocelli large, POL : OD : OOL = 6 : 8 : 12 (Fig. 6A); in lateral view, transverse diameter of eye 2.55 × length of temple; eye length 1.3 × as long as wide (Fig. 6B); in frontal view, eye 2.3 × as high as broad; malar space 0.24 × as high as eye, and 0.9 × basal width of mandible; face width 0.9 × height of eye and 2.3 × height of face and clypeus combined; hypoclypeal depression as wide as distance from edge of depression to eye margin, 0.4 × width of face, and 1.1 × as wide as basal width of mandible; distance between tentorial pits 1.4 × distance from pit to eye; maxillary palp missing; face punctulate; frons flat, strigate medially (having convergent fine striae); area between frons and vertex finely granulate; vertex with fine transverse striae; occiput and temple coriaceous-punctate.

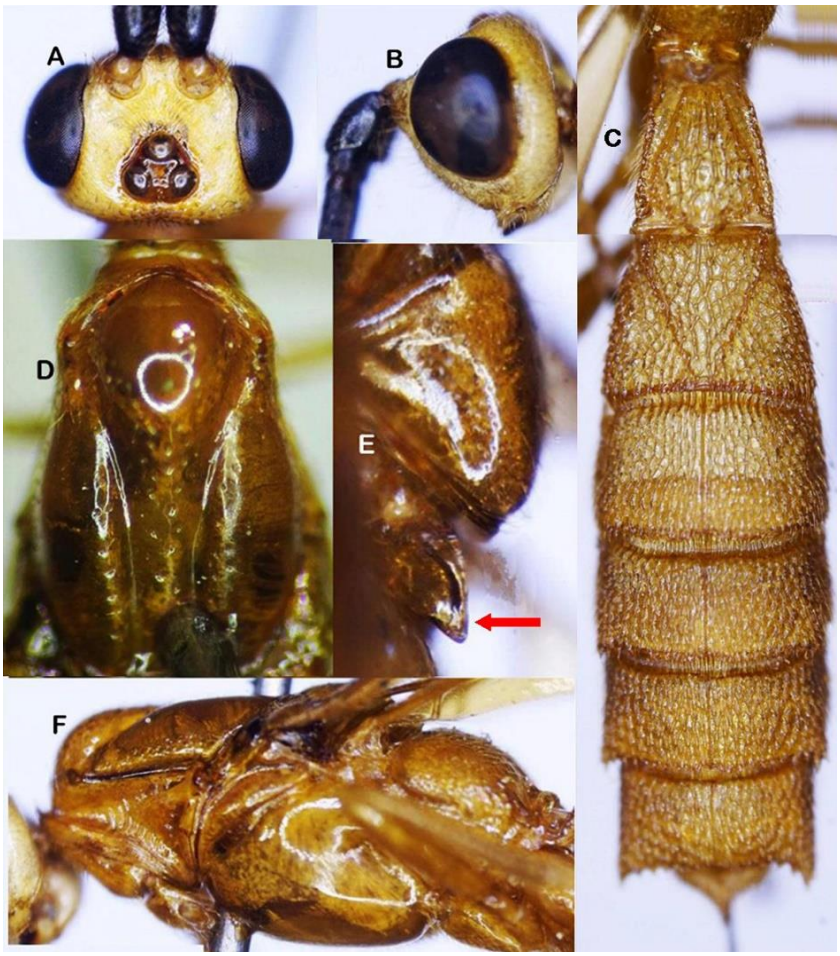


Figure 6. Pseudospinaria attenuata (Westwood). Female, "Bracn.949" (IEBR). **A** Head, dorsal, **B** Head, lateral, **C** Metasoma, dorsal, **D** Mesonotum, **E** Scutellum and metanotum, lateral, arrow indicates pointed metanotal protuberance, **F** Mesopleuron

Mesosoma. Length of mesosoma 2.0 × as long as height (Fig. 6F); pronotal trough smooth anteriorly, crenulate posteriorly (Fig. 6F); propleuron longitudinally striate; mesopleuron largely smooth; metapleuron rugose-punctate; median lobe of mesoscutum roundly protruding above pronotum (in lateral view), smooth anteriorly, sparsely punctate posteriorly; lateral lobes almost smooth; notauli wide, smooth, parallel-sided posteriorly (Fig. 6D); scutellar depression narrow, flat; scutellum convex posteriorly, distinctly higher level of mesoscutum; metanotum strongly protruding posteriorly, pointed in lateral view (Fig. 6E); propodeum rugose-punctate.

Wings. Fore wing 4.2 × as long as its maximum width; pterostigma 3.9 × as long as wide; vein r arising before middle of pterostigma; vein 1-R1 1.6 × as long as pterostigma; vein 3-SR 1.85 × vein r, 0.75 × vein SR1, and 1.8 × vein 2-SR; second submarginal cell of fore wing slightly widened apically, basal length 3.15 × its maximum width; vein 1-CU1 short, 0.14 × 2-CU1; vein cu-a slightly postfurcal, 0.3 × 2-CU1; hind wing 5.1 × as long as its maximum width; hind wing with three hamuli.

Legs. Fore tarsus 1.1 × as long as fore tibia; hind femur, tibia and basitarsus 2.8, 9.4, and 5.5 × their maximum width, respectively;

inner hind tibial spur 0.7 × as long as hind basitarsus; outer hind tibial spur l 0.6 × as long as hind basitarsus; hind tarsus 1.4 × as long as hind tibia; basitarsus 0.6 × as long as second-fifth tarsal segments combined; second tarsal segment 0.6 × as long as basitarsus, and 1.1 × as long as fifth tarsal segment (without pretarsus); fourth tarsal segment 0.4 × as long as telotarsus; hind tarsal claw with large basal lobe.

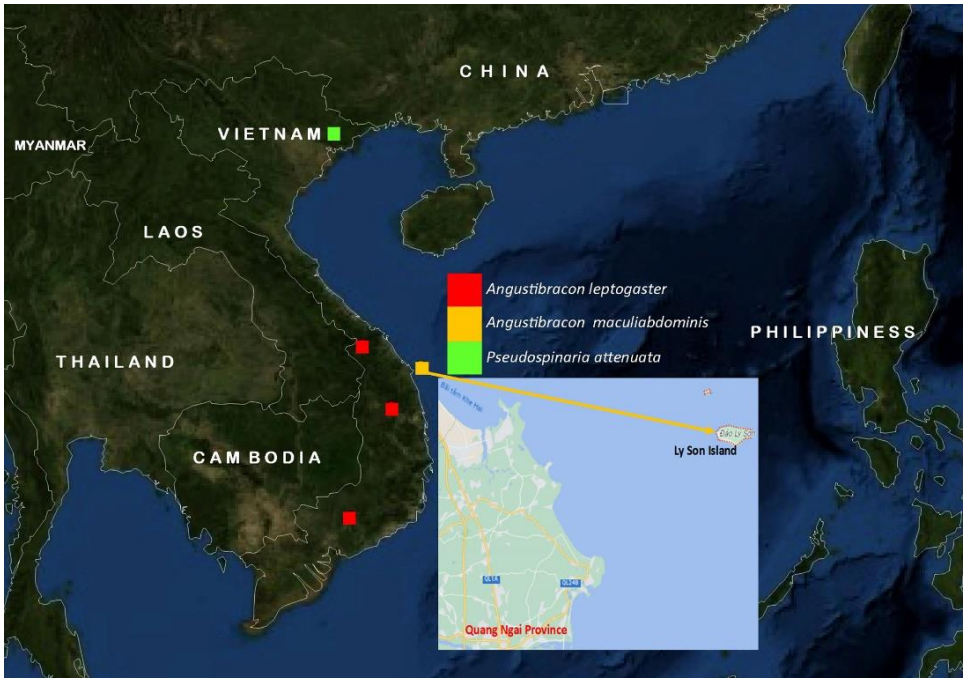


Figure 7. Distribution map of *Angustibracon* and *Pseudospinaria* species in Vietnam, Arrow indicates Ly Son island (South Central Vietnam: Quang Ngai province) distal to the seashore

Metasoma. Metasoma 1.4 × as long as head and mesosoma combined; length of first metasomal tergite 1.3 × its apical width and 6.4 × length of propodeum; median length of second tergite with apical area 1.5 × length of third tergite (Fig. 6C); first-second tergites areolate-rugulose; third tergite alveolate; the remainder striate-rugose (Fig. 6G).

Colour. Body yellow to pale brown; antenna dark brown to black; wings yellow basally, dark brown in apical 0.3, with large median blackish brown spot beneath parastigma.

Male: Unknown.

Biology. Unknown.

Distribution. NE Vietnam (Bac Giang province). Outside Vietnam: China (Hainan, Yunnan); Laos; Malaysia (Sarawak).

DISCUSSION

Based on the treated large-sized braconine wasps collected by sweeping in Vietnam, it is obvious that species of the genus *Angustibracon* are *A. leptogaster* and *A. maculiabdominis*, tended to be mostly found in the Central Highlands and South Central Vietnam, whereas *Pseudospinaria* was collected only in Northern Vietnam (Fig. 7). The discovery of those two rare Oriental genera *Angustibracon* and *Pseudospinaria* clearly supports the opinion that our knowledge of the tropical fauna of the braconid wasps, both generally and particularly regarding Vietnam, is incomplete even for such large-sized wasps. Probably one of the main reasons for the small number of specimens collected is related to peculiarities of the life cycle and behaviour of wasps, and food preferences of their. Therefore,

further investigations in tropical forests and wasp collection using other methods may certainly allow us to reveal more specimens of so-called "rare" taxa in the tropics.

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