

## Vietnamese species of the genus *Spathius* Nees (Hymenoptera: Braconidae: Doryctinae) with reduced first radiomedial vein of the forewing

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### ABSTRACT

The species of the genus *Spathius* Nees without the first radiomedial vein in the forewing and the status of the subgenera *Antespathius* Belokobylskij and *Ambispathius* Belokobylskij of this genus are discussed. Six new species from the species groups *S. antennalis* Szépligeti and *S. rusticulus* Wilkinson and the subgenus *Ambispathius* Belokobylskij from Vietnam are described and illustrated: *S. alahamatus*, n. sp., *S. maichauensis*, n. sp., *S. pacoensis*, n. sp., *S. sterlingi*, n. sp., *S. subanervus*, n. sp., and *S. tramlapus*, n. sp. A key to *Spathius* species characterized by reduction of the first radiomedial vein in the forewing is provided.

KEY WORDS: Braconidae, Doryctinae, *Spathius*, subgenera, reduction of veins, new species, Vietnam.

### INTRODUCTION

The members of the genus *Spathius* Nees, 1818, are idiobiont ectoparasitoids of concealed larvae of numerous genera from various coleopteran families (mainly Scolytidae, Curculionidae, Cerambycidae, Anobiidae, and Buprestidae), as well as lepidopteran (mainly Sesiidae, Crambidae, Tortricidae, and possibly Tineidae) and hymenopteran (Xiphydriidae) larvae (Shenefelt and Marsh, 1976; Belokobylskij, 1996b; Belokobylskij and Maeto, 2009).

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The species of the very diverse genus *Spathius* are the most abundant in the Oriental-Australasian region, where more than 150 species from 38 species groups were recognized by Nixon (1943). Additionally several species of *Spathius* from the Asian fauna were later described by Chao (1956, 1977, 1978) and Belokobylskij (1989, 1996a, 1998). Seventy species of *Spathius* were recently summarized for the fauna of China (Chen and Shi, 2004), and 72 species of the genus were recorded for the Japanese archipelago (Belokobylskij and Maeto, 2009). A taxonomic revision with simultaneous morphological and molecular phylogenetic study of the species and superspecies groups of this very polymorphic and most likely non-monophyletic genus is needed to provide adequate understanding of the natural classification of this large taxon.

Two subgenera of *Spathius*, *Antespathius* Belokobylskij and *Ambispathius* Belokobylskij were described (Belokobylskij, 1995) for a few species from the Oriental and Australasian regions. One of the main characters proposed for separating these taxa was the complete reduction of the first radiomedial vein of the forewing. Six additional new species without or with a strongly reduced first radiomedial vein in the forewing are described below in the genus *Spathius* from the Vietnam fauna.

Most specimens analyzed and treated in this study were collected throughout Vietnam, especially the central (1999), northeastern (2000), and northwestern (2002) regions, by both authors. The biotic surveys were supported by the Center for Biodiversity and Conservation (CBC) at the American Museum of Natural History AMNH (1999–2000) and the ASEAN Regional Centre for Biodiversity Conservation (ARCBC) (2002).

Specimens used for this study (including types) are kept in the Institute of Ecology and Biological Resources, Vietnam Academy of Science and Technology (Hanoi, Vietnam) (IEBR) and the Zoological Institute, Russian Academy of Sciences (St. Petersburg, Russia) (ZISP). During the past several years we also investigated various type specimens of species of *Spathius* from European, Asian, and American museums for confirmation of the results presented herein.

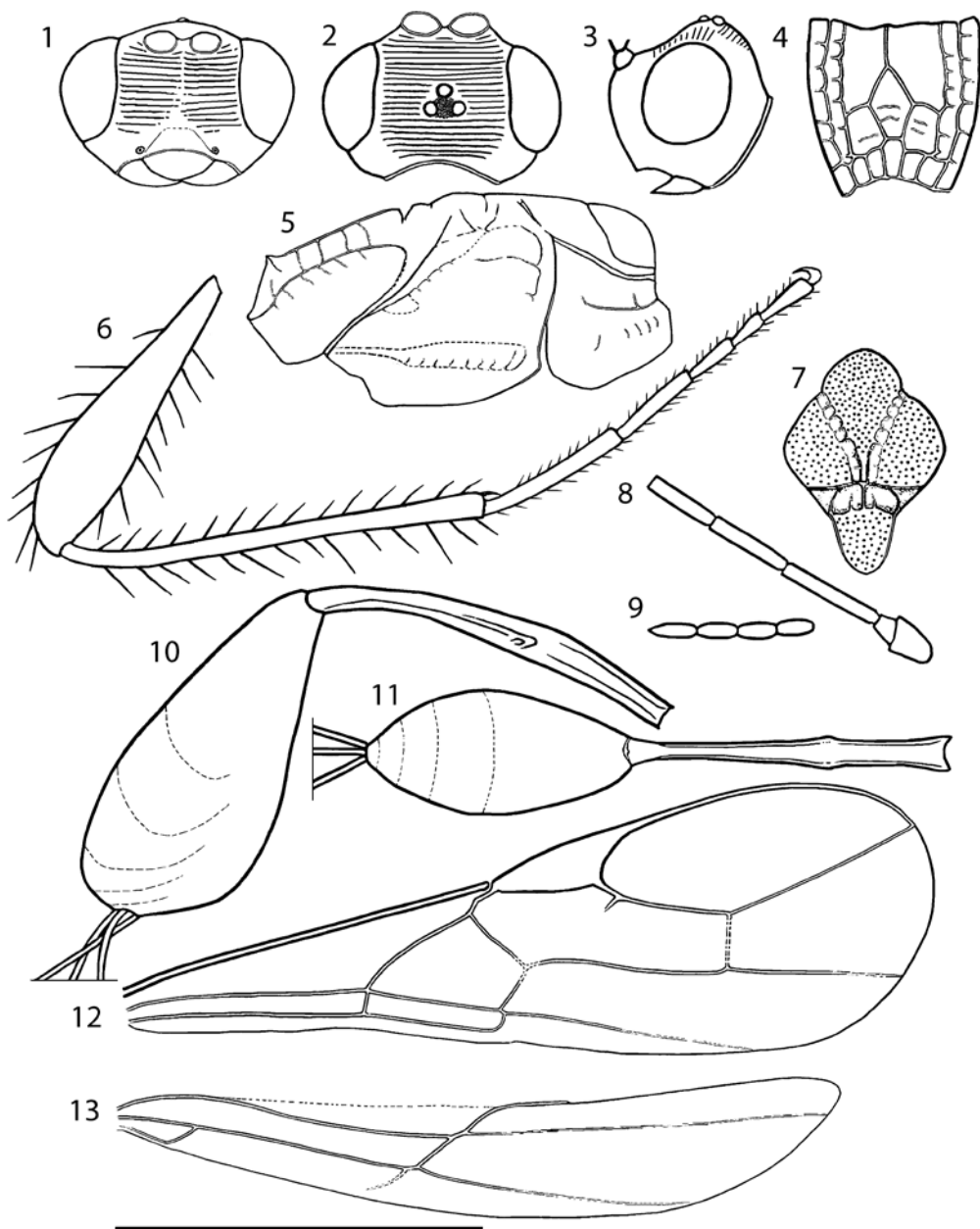
The terminology employed for morphological features and measurements follows Belokobylskij and Maeto (2009). Wing-venation nomenclature follows Belokobylskij and Tobias (1998), Belokobylskij and Maeto (2009), and Sharkey and Wharton (1997); for sculpture terminology, see Harris (1979) and Nixon (1943). The following abbreviations are used in descriptions: POL, postocellar line; OOL, ocular-ocellar line; and Od, maximum diameter of lateral ocellus. In the key, additional features that characterize the species but that are not used for separating taxa are listed after a dash (-).

## SYSTEMATICS

### *Spathius (Spathius) alahamatus*, new species

Figures 1–13

TYPE MATERIAL: Holotype: ♀, “Dory.206, VN, Ha Giang, Yen Minh, Du Gia, bushes, 29-IV-2000, K.D. Long” (IEBR). Paratype: 1 ♀, “Dory.155 (IEBR): VN, Ha Giang, Yen Minh, Du Gia, bushes, 29-IV-2000, K.D. Long” (IEBR).



FIGS. 1–13. *Spathius (Spathius) alahamatus* Long and Belokobylskij, n. sp. 1, Head, front view; 2, head, dorsal view; 3, head, lateral view; 4, propodeum, dorsal view; 5, mesosoma, lateral view; 6, hind leg; 7, mesonotum, dorsal view; 8, five basal flagellomeres of antenna; 9, four apical flagellomeres of antenna; 10, metasoma, lateral view; 11, metasoma, dorsal view; 12, forewing; 13, hind wing.

DESCRIPTION: ♀. Body length 3.2–3.5 mm, forewing length 2.4–2.5 mm; ovipositor length 2.0 mm. Head: Width of head (dorsal view)  $1.6\times$  median length and  $1.3\text{--}1.4\times$  width of mesoscutum. Head behind eyes (dorsal view) distinctly roundly narrowed; transverse diameter of eye  $2.5\times$  length of temple. Ocelli small, arranged in triangle with base  $1.3\times$  sides, POL  $0.2\text{--}0.3\times$  OOL. Frons without median longitudinal furrow. Eye glabrous, maximum diameter  $1.2\times$  minimum diameter. Malar space height  $0.4\times$  height of eye and  $0.7\text{--}0.8\times$  basal width of mandible. Face width  $1.1\text{--}1.3\times$  eye height and  $1.0\text{--}1.5\times$  height of face and clypeus combined. Clypeal suture distinct. Hypoclypeal depression transverse oval, width  $1.5\text{--}1.8\times$  distance from edge of depression to eye and  $0.6\times$  width of face. Occipital carina joined below with hypostomal carina before base of mandible. Mandible  $1.5\times$  longer than base. Antenna with 26–28 flagellomeres. Scape  $1.4\text{--}1.7\times$  longer than width. First flagellomere  $6.0\times$  longer than apical width and  $1.1\text{--}1.2\times$  longer than second flagellomere. Penultimate flagellomere  $3.3\times$  longer than apical width, apical flagellomere  $1.0\text{--}1.2\times$  as long as penultimate flagellomere.

Mesosoma: Length  $1.8\text{--}1.9\times$  height. Pronotum with distinct transverse carina. Pronotal lateral depression wide, distinctly delineated by carinae. Mesoscutum (lateral view) highly and almost perpendicularly elevated above pronotum. Notauli rather wide, deep and crenulate. Prescutellar depression deep, rather long, with three carinae,  $0.4\text{--}0.45\times$  as long as scutellum. Scutellum slightly convex and with distinct lateral carinae. Metanotum without pointed tooth. Precoxal sulcus wide and crenulate,  $0.6\times$  as long as lower length of mesopleuron. Postpectal carina present. Propodeum with rather small and obtuse lateral tubercles; medial length of propodeum as long as basal width.

Wings: Forewing  $3.5\text{--}3.9\times$  longer than wide. Pterostigma  $3.6\times$  longer than maximum width. Radial vein (R) arising behind middle of pterostigma, from apical  $0.4$ . Metacarpus (R1)  $1.25\text{--}1.3\times$  longer than pterostigma. First radial abscissa (R)  $0.6\times$  as long as maximum width of pterostigma. Second radial abscissa (3RSa)  $3.3\times$  longer than first abscissa (R) and forming with it almost straight line,  $0.4\times$  as long as straight third abscissa (3RSb). Second radiomedial (submarginal) cell not narrowed apically, length (from recurrent [m-cu] to second radiomedial [r-m] veins)  $3.0\times$  maximum width,  $1.3\times$  longer than brachial (first subdiscal) cell. First radiomedial vein (2RS) completely absent or with very short abscissa near first radial (R) vein. First medial abscissa [(RS+M)a] slightly sinuate. Nervulus (cu-a) almost interstitial to basal vein (1M). Hind wing  $5.7\times$  longer than maximum width. First abscissa of costal vein (C+Sc+R)  $0.5\times$  as long as second abscissa (Sc+R). First abscissa of mediocubital vein (M+CU)  $0.6\times$  as long as second abscissa (1M). Recurrent vein (m-cu) long, curved, antefurcal.

Legs: Hind coxa with small basoventral tubercle,  $1.5\times$  longer than maximum width. Hind femur claviform,  $4.0\text{--}4.5\times$  longer than maximum width. Hind tibia apically without spines on outer margin. Hind tarsus  $0.8\text{--}1.0\times$  as long as hind tibia. Hind basitarsus  $0.8\times$  as long as segments 2–5 combined. Segment 2 of hind tarsus  $0.4\text{--}0.5\times$  as long as basitarsus,  $1.6\text{--}1.8\times$  longer than segment 5 (without pretarsus).

Metasoma  $1.4\times$  longer than head and mesosoma combined. Petiole (lateral view) slender, weakly curved ventrally, more or less evenly curved dorsally; in dorsal view weakly widened apically and distinctly widened at level of spiracles. Petiole  $0.75\times$  as long as mesosoma,  $2.1\text{--}2.3\times$

longer than propodeum, 7.4–10.0× longer than apical width, 8.0–9.0× longer than width at level of spiracles, 0.9–1.05× as long as remaining metasomal terga combined. Second tergum without separate lateroterga. Suture between second and third terga indistinct. Median length of second and third terga combined 4.2× basal width of second tergum, almost twice their maximum width. Ovipositor gradually curved down, its sheath 0.8× as long as metasoma, 1.6× longer than mesosoma, 2.0–2.1× longer than petiole, 0.6× as long as body, and 0.65× as long as forewing.

Sculpture and pubescence: Frons with faint transverse striae; vertex entirely and distinctly transversely rugose-striate; temple smooth. Face largely transversely striate, sparsely granulate along eye margin. Pronotal lateral depression smooth posteriorly, anteriorly with two distinct striae. Mesoscutum and scutellum densely and finely granulate, without rugosity along notauli and laterally. Mesopleuron entirely smooth. Metapleuron ventrally faintly striate. Propodeum smooth, with areas distinctly delineated by carinae; medial carina present in basal 0.25–0.3; areola large and pentagonal. Legs smooth except hind coxa finely granulate dorsally and laterally. Basal part of petiole from base to just behind spiracles with two to three longitudinal carinae, smooth in remaining apical part. Hind tibia dorsally with long, sparse and semierect pale setae, length 0.9–1.7× maximum width of tibia, ventrally with shorter and semierect setae.

Color: Head yellow; mesosoma yellowish brown; metasoma yellow or yellowish brown except brown petiole. Antenna basally yellow, light brown in median and apical parts, with five to six whitish-yellow subapical flagellomeres (18th–23th), five to six apical flagellomeres light brown. Palps pale yellow. Legs yellow. Pterostigma yellow ventrally, whitish yellow dorsally.

Male: Unknown.

DISTRIBUTION: Northeastern Vietnam.

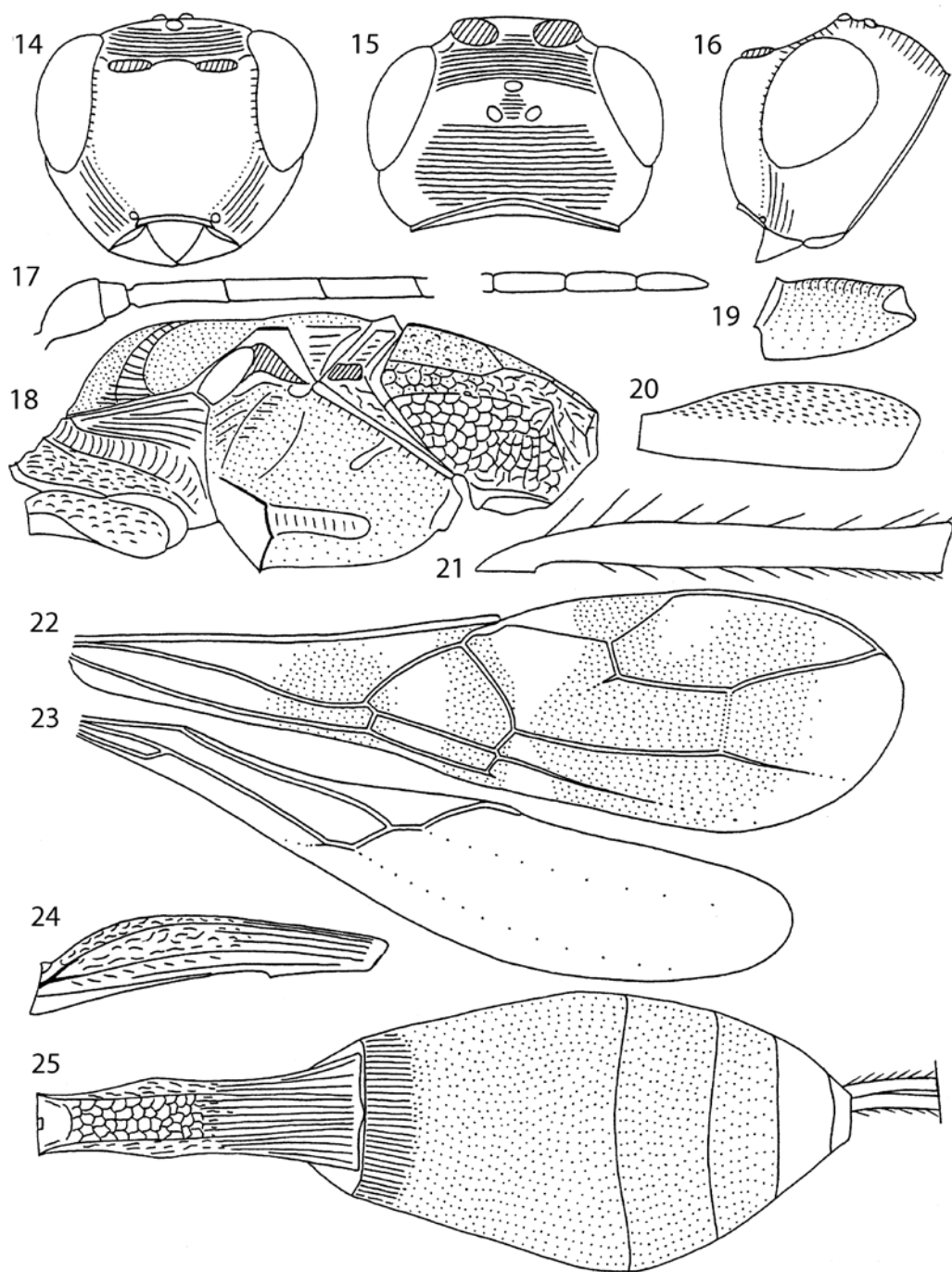
DIAGNOSIS: This species belongs to the *S. antennalis* Szépligeti (*S. alipes* Wilkinson) species group. *Spathius alahamatus*, sp. nov., is similar to *S. sterlingi*, sp. nov., but differs from the latter in having the petiole in lateral view weakly thickened and weakly convex in the basal half, the basal antennal flagellomeres long, the basal carinae of the petiole long, the pterostigma short, and the propodeum with wide areola. This new species also resembles *S. medon* Nixon (1943) but differs from it in the absence of the first radiomedial vein (2RS), in having only long setae on the dorsal margin of the hind tibia, the mesosoma entirely yellowish brown, the pterostigma mainly yellow, the temple short, the precoxal sulcus finely crenulate, and the ovipositor sheath short. *Spathius alahamatus*, sp. nov., differs from *S. opis* Nixon (1943) in the absence of the first radiomedial vein (2RS), in having body yellow or yellowish brown, the vertex distinctly and entirely striate, the malar space short, the head below the eyes (front view) strongly narrowed, and the petiole long.

ETYMOLOGY: From ala, Latin “wing,” and *hamatus*, Latin for “hooked,” because the remainder of the first radiomedial vein (2RS) of the forewing resembles a hook.

### *Spathius (Spathius) maichauensis*, new species

Figures 14–25

TYPE MATERIAL: Holotype: ♀, “Vietnam: Hoa Binh Province, Mai Chau District, Pa Co, Xa Linh, 20°44'N 104°55'E, h = 1120 m, 22–24.04.2002, S. Belokobylskij” (ZISP).



FIGS. 14–25. *Spathius (Spathius) maichauensis*, n. sp. 14, Head, front view; 15, head, dorsal view; 16, head, lateral view; 17, basal and apical flagellomeres of antenna; 18, mesosoma, lateral view; 19, hind coxa; 20, hind femur; 21, hind tibia; 22, forewing; 23, hind wing; 24, petiole, lateral view; 25, metasoma, dorsal view.

DESCRIPTION: ♀. Body length 3.0 mm; forewing length 2.3 mm, and ovipositor length 0.7 mm. Head width (dorsal view)  $1.5\times$  median length,  $1.15\times$  width of mesoscutum. Head behind eyes (dorsal view) distinctly and roundly narrowed; transverse diameter of eye  $2.0\times$  length of temple. Ocelli small, arranged in triangle with base  $1.1\times$  sides; POL  $0.75\times$  Od,  $0.45\times$  OOL. Eye glabrous, more or less directed forward (lateral view), maximum diameter  $1.2\times$  minimum diameter. Malar space height  $0.5\times$  maximum diameter of eye and almost equal to basal width of mandible. Face distinctly convex, width  $1.15\times$  maximum diameter of eye, equal to height of face and clypeus combined. Clypeal suture absent; clypeus with distinct flange ventrally. Hypoclypeal depression small and round, width  $0.6\times$  distance from edge of depression to eye,  $0.3\times$  width of face. Occipital carina not joined below with hypostomal carina obliterated on short distance upper base of mandible, complete dorsally. Hypostomal flange narrow. Vertex weakly convex.

Antennae filiform, rather slender, with 22 flagellomeres,  $1.2\times$  longer than body. Scape  $1.5\times$  longer than maximum width. First flagellomere  $4.5\times$  longer than apical width, almost as long as second flagellomere. Penultimate segment  $4.0\times$  longer than wide,  $0.7\times$  as long as first flagellomere, as long as apical flagellomere; the latter pointed apically.

Mesosoma: Length  $2.2\times$  height. Pronotal keel fine, posterior branch widely fused medially with posterior margin of pronotum, anterior branch more or less distinct and situated submedially. Pronotum subanteriorly with high transverse carina (dorsal view). Pronotal lateral depression rather narrow, partly delineated by carinae, more or less shallow. Mesoscutum (lateral view) more or less highly and gently and roundly elevated above pronotum; median lobe (dorsal view) convex anteriorly and without anterolateral shoulders. Notauli complete, deep anteriorly and shallow posteriorly, more or less narrow, densely crenulate with areolation. Prescutellar depression rather deep, long, with five carinae, finely rugulose,  $0.4\times$  as long as scutellum. Scutellum weakly convex, without lateral carinae. Metanotum with short, wide, and apically subpointed dorsal tubercle. Subalar depression shallow and wide. Precoxal sulcus rather deep, wide, straight, running along anterior 0.6 of lower part of mesopleuron. Postpectal carina absent. Metapleural flange narrow and rather short. Propodeum almost without lateral tubercles.

Wings: Forewing  $3.5\times$  longer than wide. Pterostigma  $4.2\times$  longer than maximum width. Radial vein (R) arising distinctly behind middle of pterostigma, from anterior 0.4, inner margin of pterostigma from base to radial vein (R)  $1.4\times$  longer than inner distance from this vein to apex of pterostigma. Radial (marginal) cell weakly shortened, metacarpus (R1)  $1.1\times$  longer than pterostigma. Second radial abscissa (3RSa) weakly curved,  $3.3\times$  longer than first abscissa (R) and forming weakly obtuse angle,  $0.75\times$  as long as weakly sinuate third abscissa (3RSb). First radiomedial vein (2RS) mostly absent, present only short abscissa near radial vein (R). Second radiomedial (submarginal) cell not narrowed distally, length (from recurrent [m-cu] to second radiomedial [r-m] veins)  $3.6\times$  maximum width,  $1.7\times$  length of brachial (first subdisca) cell. Distance from nervulus (cu-a) to basal vein (1M)  $0.7\times$  nervulus (cu-a) length. Parallel vein (2Cub) not interstitial, arising from anterior 0.2 of distal margin of brachial (first subdisca) cell. Mediocubital vein (M+CU) in distal half distinctly curved to longitudinal anal vein (1-1A). Hind wing  $4.8\times$  longer than maximum width. First costal abscissa (C+Sc+R)  $0.45\times$  as

long as second abscissa (Sc+R). First abscissa of mediocubital vein (M+CU)  $0.4\times$  as long as second abscissa (1M). Recurrent vein (m-cu) distinctly antefurcal, weakly curved, distinctly oblique toward base of wing.

Legs: Foretibia with small, slender and rather dense spines arranged in single line on inner surface. Segments of middle tarsus rather short. Hind coxa without basoventral tooth, but with more or less distinct corner,  $1.8\times$  longer than wide. Hind femur elongate-oval,  $3.2\times$  longer than wide. Hind tibia apically with four slender spines on outer margin. Hind tarsus  $0.85\times$  as long as hind tibia. Hind basitarsus thickened, with ventral keel,  $0.6\times$  as long as segments 2–5 combined. Segment 2 of hind tarsus  $0.45\times$  as long as basitarsus, as long as segment 5 (without pretarsus).

Metasoma: Petiole (lateral view) ventrally almost straight, dorsally distinctly curved in basal half and almost straight in apical half, distinctly thickened in basal half; widened in apical third (dorsal view), with distinct spiracular tubercles in basal third. Length of petiole  $2.7\times$  apical width,  $1.6\times$  length of propodeum; apical width of petiole  $1.5\times$  width at level of spiracles. Second and basal half of third terga with separate lateroterga. Median length of second and third terga combined  $1.7\times$  basal width of second tergum,  $0.9\times$  their maximum width. Suture between second and third terga absent. Ovipositor straight. Ovipositor sheath  $1.1\times$  longer than petiole,  $0.45\times$  as long as metasoma,  $0.6\times$  as long as mesosoma,  $0.3\times$  as long as forewing.

Sculpture and pubescence: Vertex almost entirely densely and finely transversely striate, almost smooth laterally; frons densely and finely transversely striate, narrowly smooth medially. Wide convex part of face in excessively fine, very dense, and absolutely even transverse aciculation, densely and finely striate laterally. Temple mostly smooth. Pronotal lateral depression densely and rather finely crenulate. Mesoscutum densely granulate, in posterior half with two distinct and convergent posteriorly median striae and with fine rugulosity between them; lobes near notauli without rugae. Scutellum entirely densely and distinctly granulate-areolate. Mesopleuron distinctly and densely areolate-coriaceous; subalar depression densely rugose-areolate and partly with fine striation; precoxal sulcus densely and finely crenulate, Metapleuron coarsely rugose-striate. Propodeum with areas more or less distinctly delineated by rather fine carinae, basal carina long,  $2.5\times$  longer than anterior fork of areola; areola rather wide and short, indistinctly delineated by carinae,  $1.3\times$  longer than wide; petiolate area short and finely separated by carina; propodeum densely rugose-areolate and with striations, basolateral areas widely and densely granulate-areolate. Hind coxa dorsally densely and curvedly striate, and partly with granulation, granulate on remaining part. Hind femur densely striate-areolate on upper half, smooth or almost smooth on lower half. Petiole with dense and usually sinuous striations, rugose-areolate on basal  $0.7$  and with areolation in medioapical  $0.3$ . Second tergum basally finely and shortly striate. Remaining terga very densely and very finely granulate, metasoma smooth apically. Vertex with sparse, long, and semierect setae, medioanteriorly widely glabrous. Mesoscutum mostly glabrous, with sparse, long, and semierect pale setae arranged narrow along notauli and in single line laterally. Setae of hind legs long and rather dense; length of setae on dorsal surface of hind tibia  $0.7\text{--}0.9\times$  maximum width of tibia.

Color: Body brownish yellow, with metasoma apically more or less dark. Antennae yellow to brownish yellow, more or less dark in connections of flagellomeres, eight apical flagellomeres



almost black. Palps pale yellow. Legs brownish yellow, all tibiae pale basally. Ovipositor sheath brown in basal half and black in apical half. Forewing distinctly maculate. Pterostigma dark brown, yellow in basal 0.4.

Male: Unknown.

DISTRIBUTION: Northwestern Vietnam.

DIAGNOSIS: This species belongs to the *S. rusticulus* Wilkinson species group. The new species is very similar to *S. omotodakus* (Belokobylskij, 2009) but differs in having the radial vein (R) arising distinctly behind the middle of the pterostigma, the petiole, second and third terga combined long, the basal carina of the propodeum long and the terga behind the petiole mainly very densely and finely coriaceous.

ETYMOLOGY: From “Mai Chau,” the name of Vietnamese province where the holotype was collected.

### *Spathius (Spathius) pacoensis*, new species

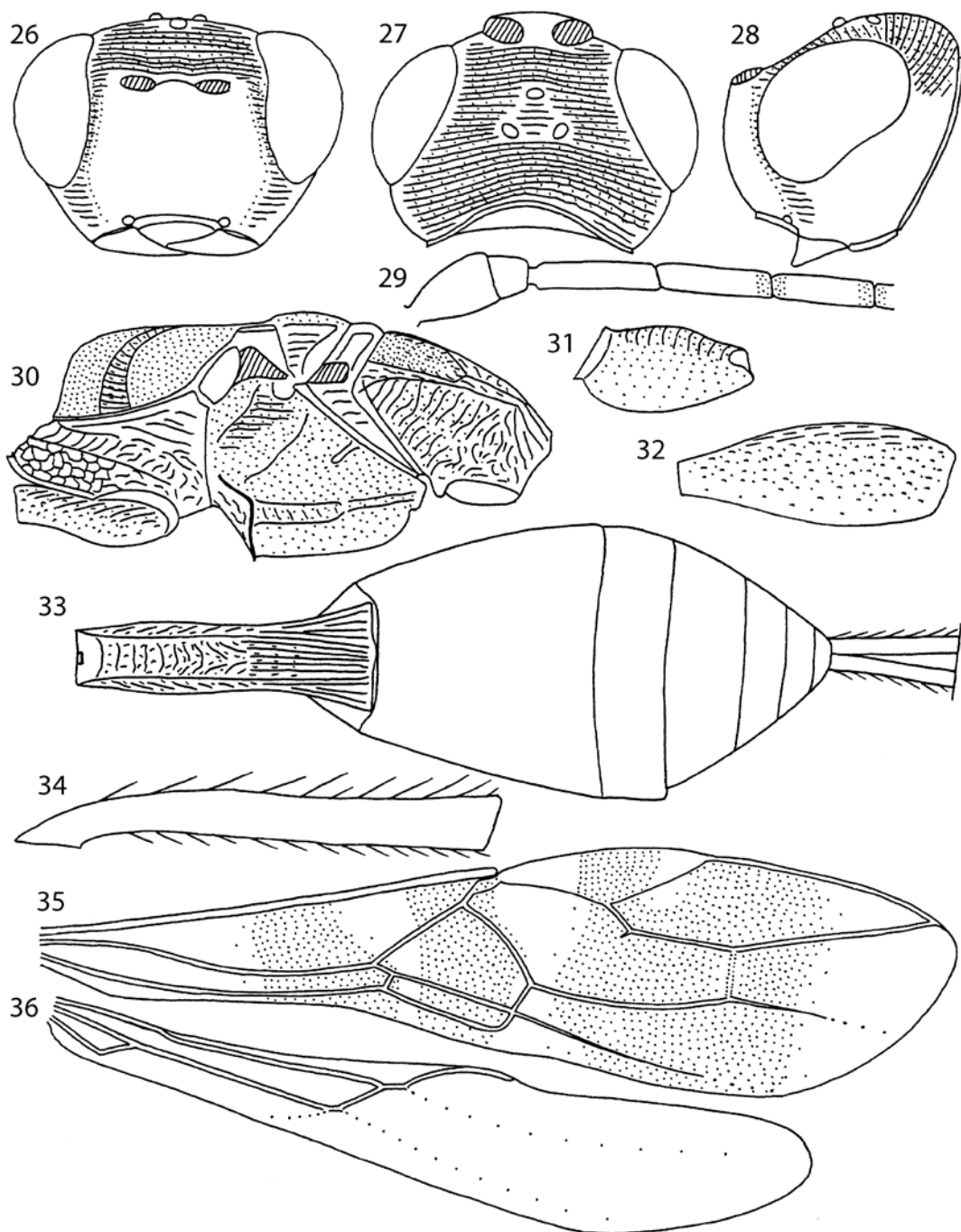
Figures 26–36

TYPE MATERIAL: Holotype: ♀, “Vietnam: Hoa Binh Province, Mai Chau District, Pa Co, 20°45'N 104°54'E, h = 1200 m, 19–21.04.2002, S. Belokobylskij” (ZISP).

DESCRIPTION: ♀. Body length 2.2 mm; forewing length 1.7 mm, and ovipositor length 0.5 mm. Head weakly depressed, width (dorsal view)  $1.4\times$  median length,  $1.25\times$  width of mesoscutum. Head behind eyes (dorsal view) distinctly and roundly narrowed; transverse diameter of eye  $2.1\times$  length of temple. Ocelli small, arranged in triangle with base  $1.1\times$  sides; POL  $1.6\times$  Od,  $0.5\times$  OOL. Eye glabrous, more or less directed forward (lateral view), maximum diameter  $1.25\times$  minimum diameter. Malar space height  $0.45\times$  maximum diameter of eye and  $1.3\times$  basal width of mandible. Face strongly convex, width almost equal to maximum diameter of eye,  $1.2\times$  height of face and clypeus combined. Clypeal suture absent; clypeus ventrally with distinct flange. Hypoclypeal depression rather small, narrow, and suboval, width  $0.8\times$  distance from edge of depression to eye,  $0.4\times$  width of face. Occipital carina joined below with hypostomal carina distinctly before base of mandible, complete dorsally. Hypostomal flange narrow. Vertex weakly convex.

Antennae filiform, more or less slender, more than 15 flagellomeres (apical flagellomeres missing). Scape  $2.0\times$  longer than maximum width. First flagellomere  $5.5\times$  longer than apical width, almost as long as second flagellomere. Subapical flagellomeres  $3.3\times$  longer than their width.

Mesosoma: Length  $2.2\times$  height. Pronotal keel distinct, posterior branch rather widely fused medially with posterior margin of pronotum, anterior branch distinct and situated submedially. Pronotum subanteriorly with distinct transverse carina (dorsal view). Pronotal lateral depression rather narrow, shallow, indistinctly delineated. Mesoscutum (lateral view) rather highly and roundly elevated above pronotum, median lobe (dorsal view) distinctly convex anteriorly and almost without anterolateral shoulders. Notauli deep anteriorly and almost absent posteriorly, rather wide, densely crenulate with areolation. Prescutellar depression shallow, long, with single median carinae, entirely densely rugose, half as long as scutellum. Scutellum weakly convex, with more or less distinct lateral carinae. Metanotum without dorsal tubercle. Subalar



FIGS. 26–36. *Spathius (Spathius) pacoensis*, n. sp. 26, Head, front view; 27, head, dorsal view; 28, head, lateral view; 29, five basal flagellomeres of antenna; 30, mesosoma, lateral view; 31, hind coxa; 32, hind femur; 33, metasoma, dorsal view; 34, hind tibia; 35, forewing; 36, hind wing.

depression very shallow and narrow. Precoxal sulcus shallow, rather wide in anterior half and narrow in posterior half, almost straight, running along almost all lower length of mesopleuron. Postpectal carina absent. Metapleural flange rather narrow and short. Propodeum without lateral tubercles.

Wings: Forewing  $3.8\times$  longer than wide. Pterostigma about  $4.0\times$  longer than maximum width. Radial vein (R) arising almost from middle of pterostigma. Radial (marginal) cell weakly shortened; metacarp (R1) as long as pterostigma. Second radial abscissa (3RSa) straight,  $2.8\times$  longer than first abscissa (R) and forming with it obtuse angle,  $0.5\times$  as long as the straight third abscissa (3RSb). First radiomedial vein (2RS) almost entirely absent. Second radiomedial (submarginal) cell not narrowed distally, length (from recurrent [m-cu] to second radiomedial [r-m] veins)  $2.2\times$  maximum width,  $1.5\times$  length of brachial (first subdiscal) cell. Distance from nervulus (cu-a) to basal vein (1M) almost equal to nervulus (cu-a) length. Parallel vein (2CUb) interstitial; brachial (first subdiscal) cell closed weakly before recurrent vein (m-cu). Mediocubital vein (M+CU) distinctly curved to anal vein (1-1A) in distal half. Hind wing  $5.5\times$  longer than maximum width. First costal abscissa (C+Sc+R) about half as long as second abscissa (Sc+R). First abscissa of mediocubital vein (M+CU)  $0.4\times$  as long as second abscissa (1M). Recurrent vein (m-cu) interstitial, strongly curved toward base of wing.

Legs: Foretibia with distinct, slender, not numerous, and rather dense spines arranged in singly line on inner surface. Segments of middle tarsus rather short. Hind coxa without basoventral tooth and corner,  $1.6\times$  longer than wide. Hind femur elongate-oval,  $2.7\times$  longer than wide. Hind tarsus  $0.9\times$  as long as hind tibia. Hind basitarsus weakly thickened, with fine ventral keel,  $0.6\times$  as long as segments 2–5 combined. Segment 2 of hind tarsus  $0.45\times$  as long as basitarsus,  $1.1\times$  longer than segment 5 (without pretarsus).

Metasoma: Petiole (lateral view) ventrally weakly evenly curved, dorsally weakly curved in basal half and almost straight in apical half, thickened in basal half; weakly widened near spiracles and in apical  $0.25$  (dorsal view), without spiracular tubercles in basal third. Length of petiole  $2.7\times$  apical width,  $1.5\times$  length of propodeum; apical width of petiole  $1.5\times$  width at level of spiracles. Second tergum basally with separate lateroterga. Suture between second and third terga absent. Median length of second and third terga combined  $1.35\times$  basal width of second tergum,  $0.7\times$  their maximum width. Ovipositor straight. Ovipositor sheath  $1.2\times$  longer than petiole,  $0.5\times$  as long as metasoma,  $0.6\times$  as long as mesosoma,  $0.3\times$  as long as forewing.

Sculpture and pubescence: Vertex entirely, densely, rather distinctly and sinuously transversely striate and with fine areolation, with dense, small areolations around ocellar triangle; frons finely and densely transversely striate, anteriorly very finely aciculate. Wide convex part of face in excessively fine, very dense, and absolutely even transverse aciculation, laterally shortly striate. Temple densely vertically striate at least in posterior  $0.2$ – $0.3$ , smooth in anterior  $0.7$ – $0.8$  and entirely in lower half. Pronotal lateral depression distinctly crenulate and partly with rugulosity. Mesoscutum densely granulate, anterior lobe additionally with dense, undulating transverse striations, distinctly rugose-striate in medioposterior half; lobes near notauli without rugae. Scutellum entirely distinctly and densely granulate. Mesopleuron finely and densely areolate-coriaceous, densely granulate posteriorly; subalar depression rugose-areolate;

precoxal sulcus densely and finely crenulate with areolation. Metapleuron coarsely rugose-areolate and partly with vertical striations. Propodeum with areas delineated by rather distinct carinae, basal carina almost equal to anterior fork of areola; areola rather long, about  $2.5\times$  longer than wide; petiolate area very short and distinctly separated by carina; propodeum rugose-areolate with striations, basolateral areas basally densely granulate. Hind coxa dorsally with curved striations, laterally densely granulate-areolate. Hind femur granulate-coriaceous, dorsally finely and intermittently aciculate, almost smooth below. Petiole distinctly striate, distinctly rugose in anterior 0.7 and finely areolate in posterior 0.3. Remaining terga entirely smooth. Vertex with sparse, rather long, and semierect setae situated laterally and posteriorly, widely glabrous medioanteriorly. Mesoscutum mostly glabrous, with sparse, long, and semierect pale setae arranged narrow along notauli and laterally. Setae on dorsal surface of hind tibia rather long, more or less sparse, and semierect, length  $0.6\times$  maximum width of tibia.

Color: Body brownish yellow, head and metasoma in posterior half brownish. Four basal flagellomeres of antennae entirely yellow, flagellomeres 3–10 yellow or brownish yellow with dark to almost black short apical and basal sections; remaining terga dark brown to black. Palps pale yellow. Legs yellow, faintly infusate basally. Ovipositor sheath brownish yellow, dark brown apically. Forewing distinctly maculate. Pterostigma brown, yellow in basal and apical 0.3.

Male: Unknown.

DISTRIBUTION: Northwestern Vietnam.

DIAGNOSIS: This species belongs to the *S. rusticulus* Wilkinson species group. The new species is very similar to the southern Japanese *S. omotodakus* (Belokobylskij, 2009) but differs in having the parallel vein (2Cub) interstitial, the hind coxa without a basoventral corner, the occipital carina joined with the hypostomal carina, the prescutellar depression entirely densely rugose, the precoxal sulcus long, the second radial abscissa (3RSa) straight and distinctly shorter than the third abscissa (3RSb), the nervulus (cu-a) strongly postfurcal, the petiole narrow apically, the second tergum smooth basally, and the pterostigma pale in the apical 0.3. *Spathius pacoensis*, sp. nov., differs from Indonesian *S. priscus* Nixon of the *S. rusticulus* Wilkinson species group (Nixon, 1943) in the absence of the first radiomedial vein (2RS) and of a dorsal tooth on the metanotum, and in having the frons and vertex entirely and distinctly aciculate, the ovipositor sheath short, the metasoma behind the petiole smooth and the palps mainly pale.

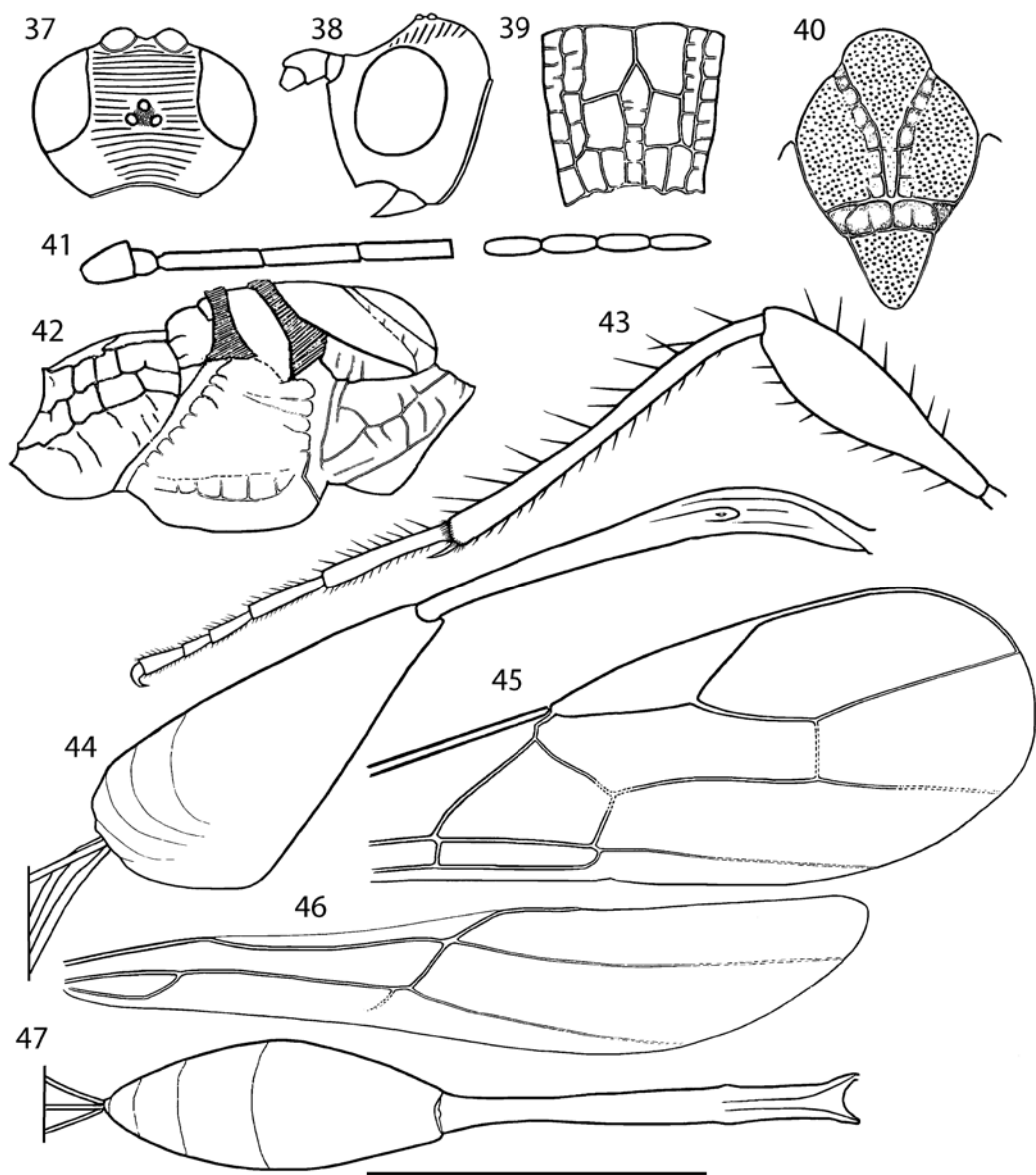
ETYMOLOGY: From Pa Co, the name of the species type locality.

***Spathius (Spathius) sterlingi*, new species**

Figures 37–47

TYPE MATERIAL: Holotype: ♀, Vietnam, Quang Nam, Tra My, Ngoc Linh Mts., 800m, 15-III-1999, K.D. Long; Dory.141 (IEBR).

DESCRIPTION: ♀. Body length 4.0 mm, forewing length 2.85 mm, and ovipositor length 2.1 mm. Head width (dorsal view)  $1.5\times$  median length and  $1.35\times$  width of mesoscutum. Head behind eyes (dorsal view) roundly narrowed; transverse diameter of eye  $1.2\times$  length of temple. Ocelli small size, arranged in triangle with base  $1.3\times$  sides; POL  $1.3\times$  Od,  $0.3\times$  OOL. Eye glabrous, with



FIGS. 37–47. *Spathius (Spathius) sterlingi* Long and Belokobylskij, n. sp. 37, Head, dorsal view; 38, head, lateral view; 39, propodeum, dorsal view; 40, mesonotum, dorsal view; 41, basal and apical flagellomeres of antenna; 42, mesosoma, lateral view; 43, hind leg; 44, metasoma, lateral view; 45, distal part of fore-wing; 46, hind wing; 47, metasoma, dorsal view.

fine emargination opposite antennal sockets, maximum diameter  $1.2\times$  minimum diameter. Malar space height  $0.3\times$  height of eye and  $0.5\times$  basal width of mandible. Face width  $1.15\times$  eye height and  $1.15\times$  height of face and clypeus combined. Clypeal suture distinct. Occipital carina joined below with hypostomal carina distinctly before base of mandible. Vertex convex.

Antenna slender, filiform, with 31 flagellomeres. Scape  $1.25\times$  longer than apical width. First flagellomere  $5.5\times$  longer than apical width and  $1.2\times$  longer than second flagellomere. Penultimate flagellomere  $3.5\times$  longer than width, equal to apical flagellomere.

Mesosoma: Length  $1.85\times$  height. Pronotal keel distinct, posterior branch fused with posterior margin of pronotum. Pronotal lateral depression distinctly delineated by carinae. Mesoscutum (lateral view) high and almost roundly elevated above pronotum; median lobe (dorsal view) convex anteriorly. Notauli rather deep and crenulate. Prescutellar depression deep, with three carinae, about  $0.4\times$  as long as scutellum. Scutellum rather flat and with distinct lateral carinae. Metanotum without dorsal tooth. Subalar depression narrow and rather deep. Precoxal sulcus wide. Postpectal carina present. Propodeum with rather small and obtuse lateral tubercles.

Wings: Forewing  $3.5\times$  longer than width. Pterostigma  $3.0\times$  longer than maximum width. Radial vein (R) arising just behind middle of pterostigma. Metacarpus (R1)  $1.3\times$  longer than pterostigma. First radial abscissa (R)  $0.4\times$  as long as maximum width of pterostigma. Second radial abscissa (3RSa)  $3.0\times$  longer than first abscissa (R), forming nearly straight line,  $0.4\times$  as long as straight third abscissa (3RSb). Second radiomedial (submarginal) cell wide, not narrow apically, length (from recurrent [m-cu] to second radiomedial [r-m] veins)  $2.3\times$  maximum width,  $1.5\times$  longer than brachial (first subdiscal) cell. First medial abscissa ([RS+M]a) weakly sinuate. Nervulus (cu-a) weakly postfurcal. Brachial (first subdiscal) cell roundly closed posteriorly recurrent vein (m-cu). Parallel vein (2Cub) not interstitial, arising from anterior  $0.3$  of distal side of brachial (first subdiscal) cell. Hind wing  $5.3\times$  longer than maximum width. First abscissa of costal vein (C+Sc+R)  $0.55\times$  as long as second abscissa (Sc+R). First abscissa of mediocubital vein (M+CU)  $0.7\times$  as long as second abscissa (1M). Recurrent vein (m-cu) distinctly antefurcal.

Legs: Hind coxa  $1.9\times$  longer than maximum width, with small basoventral tooth. Hind femur claviform,  $4.1\times$  longer than maximum width. Hind tibia apically without spines on outer margin. Hind tarsus  $0.9\times$  as long as hind tibia. Hind basitarsus  $0.7\times$  as long as segments 2–5 combined. Segment 2 of hind tarsus  $0.5\times$  as long as basitarsus and  $1.3\times$  longer than segment 5 (without pretarsus).

Metasoma  $1.3\times$  longer than head and mesosoma combined. Petiole (lateral view) slender, ventrally weakly curved, dorsally more distinctly curved in anterior half and almost straight in posterior half, with small spiracular tubercles in basal  $0.3$ . Length of petiole  $10.0\times$  width at level of spiracles and  $10.0\times$  apical width; apical width of petiole  $1.7\times$  minimum width. Petiole  $2.2\times$  longer than propodeum and  $1.2\times$  longer than remaining metasomal terga combined. Ovipositor almost straight, sheath  $1.7\times$  longer than petiole,  $0.9\times$  as long as metasoma and  $0.7\times$  as long as forewing.

Sculpture and pubescence: Face rugose; frons entirely finely transversely striate; vertex entirely with fine and dense striations; temple smooth. Pronotal lateral depression sparsely

crenulate. Mesoscutum and scutellum densely and rather finely granulate. Mesopleuron almost entirely smooth; precoxal sulcus sparsely crenulate. Propodeum smooth, with areas distinctly delineated by carinae, with median carina in basal 0.25; areola distinct, large, and pentagonal. All legs smooth, but hind coxa dorsally finely granulate. Petiole basally with two longitudinally carinae, apically smooth. Remaining terga smooth. Hind tibia dorsally with rather long, sparse and semierect pale setae, length 0.8–1.3× maximum width of tibia.

Color: Head yellow, mesosoma brownish yellow, metasoma reddish yellow, but apically pale yellow. Antenna yellowish brown, seven to eight subbasal flagellomeres yellow, five apical flagellomeres yellowish brown. Palps whitish yellow. Wings hyaline, second abscissa of basal vein (1-M) yellowish brown. Legs yellow. Ovipositor sheath yellowish brown. Pterostigma yellow, but pale yellow basally, in upper 0.3 and apically.

Male: Unknown.

DISTRIBUTION: South-central Vietnam.

DIAGNOSIS: This species belongs to the *S. antennalis* Szépligeti (*S. alipes* Wilkinson) species group. The new species is very similar to *S. alahamatus*, sp. nov.; remarks on their differences are provided after description of the latter species. *Spathius sterlingi*, sp. nov., is also similar to *S. opis rufovariegatus* Nixon (1943) but differs in the absence of the first radiomedial vein (2RS), in having the first (R) and second (3RSa) abscissae of the radial vein situated in a straight line, the antennae with pale subapical flagellomeres and the ovipositor long.

ETYMOLOGY: This species is dedicated to Eleanor J. Sterling, Director of the Center for Biodiversity and Conservation at the American Museum of Natural History.

### *Spathius (Ambispathius) subanervis*, new species

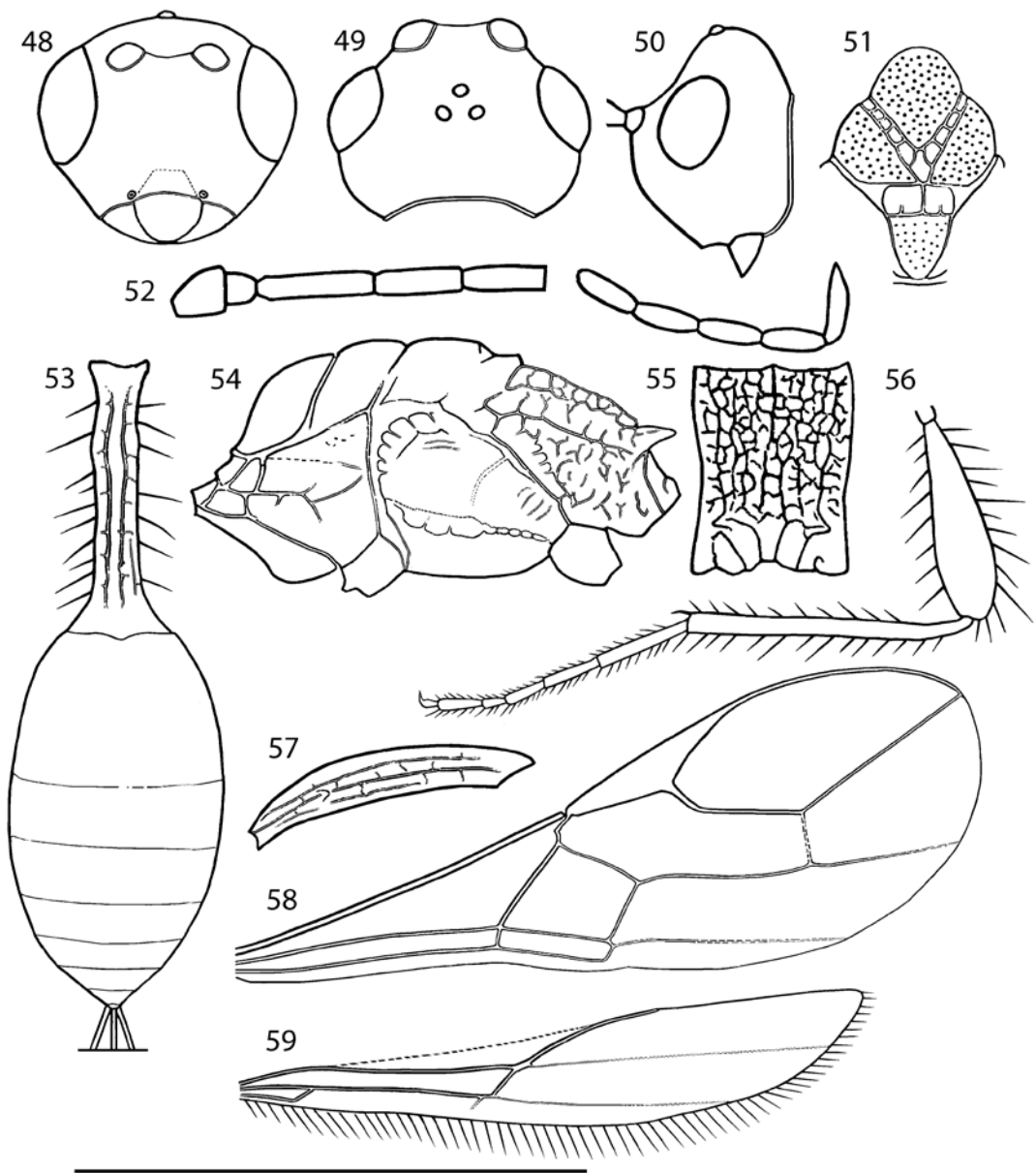
Figures 48–59

TYPE MATERIAL: Holotype: ♀, “Dory.091, (IEBR), North Vietnam: Ha Tay, Thach That, tea garden, 21°00'N 105°32'E, MT, 06–16.IV.2002, K.D. Long” (IEBR).

DESCRIPTION: ♀. Length of body 2.2 mm, forewing length 1.7 mm, and ovipositor length 0.8 mm.

Head width (dorsal view) 1.4× median length and 1.1× width of mesoscutum. Head behind eyes (dorsal view) roundly narrowed; transverse diameter of eye 1.2× length of temple. Ocelli medium sized, arranged in almost equilateral triangle; POL equal to Od, 0.2× OOL. Frons slightly convex and without longitudinal furrow. Eye glabrous, with very fine emargination opposite antennal sockets, maximum diameter 1.3× minimum diameter. Malar space 0.6× eye height and 1.75× basal width of mandible. Face width 1.6× eye height and 1.2× height of face and clypeus combined. Clypeal suture distinct. Hypoclypeal depression medium size, sub-round, width almost equal to distance from edge of depression to eye, 0.6× width of face. Vertex distinctly convex. Maxillary palps 1.1× longer than height of head.

Antennae slender, filiform, longer than body, with 22 flagellomeres. Scape almost equal to apical width. First flagellomere 4.7× longer than apical width, 1.4× longer than second flagellomere. Penultimate flagellomere 2.7× longer than wide, 0.8× as long as apical flagellomere; the latter pointed apically.



FIGS. 48–59. *Spathius* (*Ambispathius*) *subanervis* Long and Belokobylskij, n. sp. 48, Head, front view. 49, head, dorsal view; 50, head, lateral view; 51, mesonotum, dorsal view; 52, basal and apical flagellomeres of antenna; 53, metasoma, dorsal view; 54, mesosoma, lateral view; 55, propodeum, dorsal view; 56, hind leg; 57, petiole, lateral view; 58, forewing; 59, hind wing.



Mesosoma: Length  $2.1 \times$  height. Pronotum with two distinct transverse carinae anteriorly and posteriorly. Pronotal lateral depression wide, distinctly delineated by carinae. Mesoscutum (lateral view) highly and roundly elevated above pronotum. Notauli deep and crenulate. Prescutellar depression deep, with three carinae,  $0.4 \times$  as long as scutellum. Scutellum weakly convex, with distinct lateral carinae. Metanotum with fine dorsal tooth. Subalar depression deep. Precoxal sulcus shallow, almost straight, wide in anterior half and narrow in posterior half, running along almost all lower length of mesopleuron. Length of propodeum  $1.35 \times$  median width; propodeum with rather long and pointed lateral tubercles.

Wings: Forewing  $3.5 \times$  longer than wide. Pterostigma narrow,  $4.7 \times$  longer than maximum width. Radial vein (R) arising weakly behind middle of pterostigma. Metacarpus (R1)  $1.3 \times$  longer than pterostigma. First radial abscissa (R)  $0.7 \times$  as long as maximum width of pterostigma. Second radial abscissa (3RSa)  $4.0 \times$  longer than first abscissa (R), forming angle  $170^\circ$ ,  $0.5 \times$  as long as third abscissa (3RSb). Second radiomedial (submarginal) cell not narrowed distally. First medial abscissa ([RS+M]a) weakly sinuate. Nervulus (cu-a) interstitial. Parallel vein (2CUb) not interstitial, arising from anterior 0.25 of distal margin of brachial (first subdiscal) cell. Hind wing about  $6.0 \times$  longer than maximum width. First abscissa of costal vein (C+Sc+R)  $0.4 \times$  as long as second abscissa (Sc+R). First abscissa of mediocubital vein (M+CU)  $0.4 \times$  as long as second abscissa (1M). Recurrent vein (m-cu) short, weakly sclerotized, antefurcal.

Legs: Segments of middle tarsus rather long. Hind coxa  $1.8 \times$  longer than maximum width, without basoventral tooth. Hind femur claviform,  $4.0 \times$  longer than maximum width. Hind tibia apically without spines on outer margin. Hind tarsus slender,  $0.9 \times$  as long as hind tibia. Hind basitarsus  $0.4 \times$  as long as segments 2–5 combined. Segment 2 of hind tarsus  $0.5 \times$  as long as basitarsus and  $1.25 \times$  longer than segment 5 (without pretarsus).

Metasoma  $1.1 \times$  longer than head and mesosoma combined. Petiole (lateral view) weakly curved ventrally and rather distinctly convex dorsally, with small spiracular tubercles. Length of petiole  $4.0 \times$  width at level of spiracles,  $2.5 \times$  apical width,  $1.3 \times$  length of propodeum, and  $0.6 \times$  length of remaining metasomal terga combined. Second tergum without separate lateroterga. Suture between second and third terga absent. Median length of second and third terga combined  $1.3 \times$  basal width of second tergum and  $0.5 \times$  their maximum width. Ovipositor straight, sheath  $0.6 \times$  as long as metasoma,  $0.3 \times$  as long as body,  $0.8 \times$  as long as mesosoma and  $0.4 \times$  as long as forewing.

Sculpture and pubescence: Frons, vertex, and temple smooth, face shiny and almost smooth. Pronotal lateral depression sparsely crenulate. Mesoscutum and scutellum granulate. Mesopleuron shiny smooth medially, with sparse rugae anteriorly and posteriorly. Metapleuron entirely rugose; subalar depression rather widely striate; precoxal sulcus sparsely crenulate. Propodeum areolate-rugose, without areas delineated by carinae. All legs smooth. Petiole dorsally with two parallel longitudinal carinae running closely to apex, with sparse rugosity between carinae, smooth apically. Remaining terga smooth. Hind tibia with rather long, sparse and semierect setae, length  $0.7\text{--}1.3 \times$  maximum width of tibia.

Color: Head, pronotum, and mesonotum yellow, propodeum brownish yellow. Petiole brown, remainder of metasoma brownish yellow. Antennae yellow to brownish yellow, six basal

flagellomeres whitish yellow. Palps whitish yellow. Forewing hyaline with yellow tint, basal vein (1M) darker. Pterostigma yellow, whitish yellow in basal half. Legs yellow, hind femur in apical half darker.

Male: Unknown.

DISTRIBUTION: Northern Vietnam.

DIAGNOSIS: This new species is a third taxon of the subgenus *Ambispathius* Belokobylskij and close to *S. anervis* Belokobylskij (1995) from Fiji. *Spathius subanervis*, sp. nov., differs from the later in having the mesoscutum densely granulate; the propodeum with long lateral tubercles, without distinct areolation and widely rugulose; the nervulus (cu-a) interstitial; the parallel vein (2Cub) of the forewing not interstitial; the petiole long; the notauli basally narrow and the hind femur slender.

ETYMOLOGY: After *sub*, Latin for “near” and the name of the species closest to the new one.

***Spathius (Spathius) tramlapus*, new species**

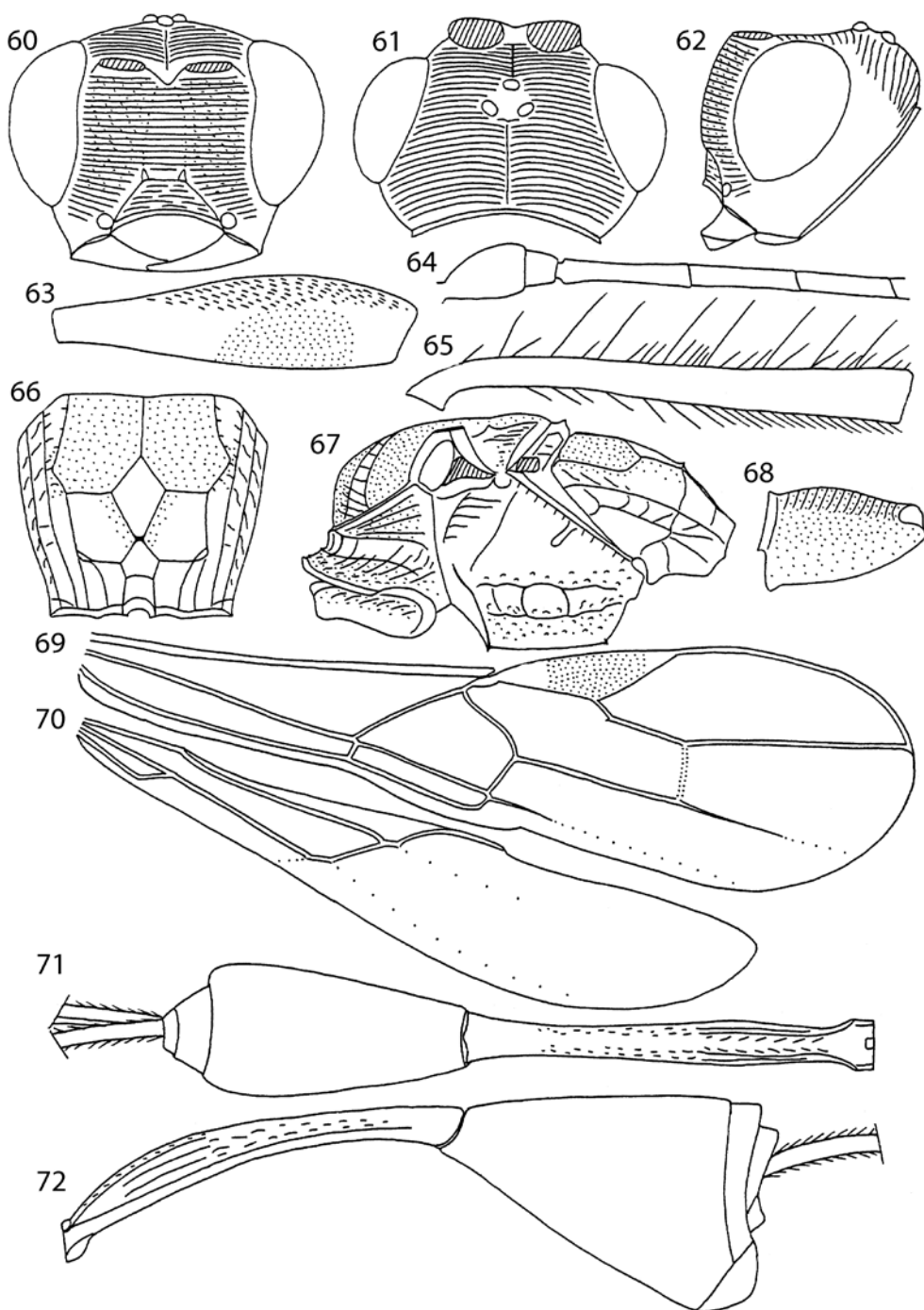
Figures 60–72

TYPE MATERIAL: Holotype: ♀, “Vietnam, pr. Gia Lai – Con Tum, 20 km N Buon-Luoi, Tram Lap, 1–14.12.1988, Sharkov” (ZISP). Paratypes: 1 ♀, with the same label as the holotype, but “21–30.II.1988, A.V. Gorokhov” (ZISP).

DESCRIPTION: ♀. Body length 3.2–3.8 mm; forewing length 2.5–2.8 mm, and ovipositor length 1.8–2.2 mm. Head width (dorsal view) 1.5–1.6× median length, 1.3–1.4× width of mesoscutum. Head behind eyes (dorsal view) strongly narrowed, somewhat round; transverse diameter of eye 2.3–2.5× length of temple. Ocelli rather small, arranged in triangle with base 1.1–1.15× sides; POL about 0.8× Od, 0.35–0.4× OOL. Frons with fine median longitudinal furrow. Eye glabrous, without emargination opposite antennal sockets, maximum diameter 1.2× minimum diameter. Malar space height 0.2× eye height and 0.5–0.6× basal width of mandible. Face width 0.9–1.0× eye height and 1.1–1.2× height of face and clypeus combined. Clypeal suture distinct. Clypeus ventrally with distinct but short flange. Hypoclypeal depression rather large and transverse, width 2.1–2.3× distance from edge of depression to eye, 0.6–0.7× width of face. Occipital carina joined below with hypostomal carina distinctly before base of mandible, complete dorsally. Hypostomal flange wide. Mandible long, 1.9–2.0× longer than basal width. Vertex convex.

Antennae slender, filiform, more than 19 flagellomeres (apical flagellomeres missing). Scape 1.5–1.7× longer than wide. First flagellomere 5.5× longer than apical width, 1.15× longer than second flagellomere. Subapical flagellomeres 3.5–3.7× longer than their width.

Mesosoma: Length 1.8× height. Pronotal keel distinct, posterior branch widely fused medially with posterior margin of pronotum, anterior branch situated submedially. Pronotum subanteriorly (dorsal view) with distinct transverse carina; anterior upcurved flange short. Pronotal lateral depression wide, distinctly delineated by carinae. Mesoscutum (lateral view) highly and almost perpendicularly elevated above pronotum, median lobe (dorsal view) weakly convex anteriorly (dorsal view), with very small anterolateral shoulders. Notauli deep anteriorly, shallow posteriorly, wide, sparsely but distinctly crenulate. Prescutellar depression deep, rather



FIGS. 60–72. *Spathius (Spathius) tramlapus*, n. sp. **60**, Head, front view; **61**, head, dorsal view; **62**, head, lateral view; **63**, hind femur; **64**, five basal flagellomeres of antenna; **65**, hind tibia; **66**, propodeum, dorsal view; **67**, mesosoma, lateral view; **68**, hind coxa; **69**, forewing; **70**, hind wing; **71**, metasoma, dorsal view; **72**, metasoma, lateral view.

long, with three and often partly incomplete (lateral) carinae, mostly smooth,  $0.35\text{--}0.4\times$  as long as scutellum. Scutellum almost flat, with distinct lateral carinae. Metanotum with short, thick, and pointed dorsal tooth. Subalar depression shallow and narrow. Precoxal sulcus rather shallow, weakly sinuate, wide anteriorly and narrow posteriorly, running along entire lower length of mesopleuron. Postpectal carina present as distinct median keel. Propodeum with small, flat, and obtuse lateral tubercles.

Wings: Forewing  $3.5\text{--}3.6\times$  longer than wide. Pterostigma  $3.7\text{--}3.8\times$  longer than maximum width. Radial vein (R) arising weakly behind middle of pterostigma. Metacarpus (R1)  $1.4\times$  longer than pterostigma. First radial abscissa (R)  $0.5\text{--}0.6\times$  as long as maximum width of pterostigma. Second radial abscissa (3RSa)  $3.3\text{--}4.2\times$  longer than first abscissa (R), forming very obtuse angle,  $0.4\text{--}0.5\times$  as long as the straight third abscissa (3RSb). Second radio-medial (submarginal) cell not narrowed distally, length (from recurrent [m-cu] to second radiomedial [r-m] veins)  $2.7\text{--}3.1\times$  maximum width,  $1.25\text{--}1.35\times$  length of brachial (first subdiscal) cell. First medial abscissa ([RS+M]a) weakly sinuate. Nervulus (cu-a) almost interstitial or weakly postfurcal. Parallel vein (2CUb) not interstitial, arising from anterior  $0.25$  of distal side of brachial (first subdiscal) cell. Mediocubital vein (M+CU) almost straight. Hind wing  $5.3\text{--}5.4\times$  longer than maximum width. First abscissa of costal vein (C+Sc+R)  $0.5\text{--}0.55\times$  as long as second abscissa (Sc+R). First abscissa of mediocubital vein (M+CU)  $0.6\times$  as long as second abscissa (1M). Recurrent vein (m-cu) unsclerotized, strongly curved, antefurcal.

Legs: Foretibia with distinct, slender, and numerous spines arranged in single line in apical  $0.6$  on inner surface. Segments of middle tarsus long. Hind coxa  $1.5\text{--}1.6\times$  longer than maximum width, with distinct basoventral tooth. Hind femur claviform,  $3.7\text{--}4.0\times$  longer than wide. Hind tibia apically without spines on outer margin. Hind tarsus  $0.9\times$  as long as hind tibia. Hind basitarsus  $0.6\times$  as long as segments 2–5 combined. Segment 2 of hind tarsus  $0.5\text{--}0.55\times$  as long as basitarsus, almost as long as segment 2 (without pretarsus).

Metasoma  $1.15\text{--}1.3\times$  longer than head and mesosoma combined. Petiole (lateral view) slender, weakly curved ventrally, more distinctly and evenly curved dorsally, weakly thickened before middle; weakly widened in apical  $0.1\text{--}0.15$  (dorsal view), with rather distinct subbasal lobes and with very small spiracular tubercles in basal  $0.3$ , dorsope almost absent. Length of petiole  $9.2\text{--}9.5\times$  width at level of spiracles,  $7.6\text{--}8.2\times$  apical width,  $2.2\text{--}2.6\times$  length of propodeum,  $1.2\text{--}1.4\times$  longer than remaining metasomal terga combined; apical width of petiole  $1.1\text{--}1.15\times$  width at level of spiracles. Second tergum without separate lateroterga. Suture between second and third terga absent. Median length of second and third terga combined  $4.3\text{--}5.0\times$  basal width of second tergum,  $1.8\text{--}2.0\times$  their maximum width. Ovipositor more or less distinctly curved down, sheath  $0.9\text{--}1.0\times$  as long as metasoma,  $0.5\text{--}0.6\times$  as long as body,  $1.5\text{--}1.7\times$  longer than mesosoma,  $0.7\times$  as long as forewing.

Sculpture and pubescence: Vertex entirely with distinct or rather distinct and weakly curved transverse striations; frons entirely distinctly striate, sometimes medially very narrowly smooth. Face entirely striate and with rugulosity. Temple mostly smooth, sometimes with short rugae along occipital carina. Pronotal lateral depression mostly smooth, partly

with sparse or very sparse and distinct striations. Mesoscutum entirely and densely granulate, without rugae near notauli and laterally, with two coarse and weakly convergent carinae posteriorly and fine or distinct rugosity or striations between them in medioposterior 0.3. Scutellum finely granulate-coriaceous. Mesopleuron mostly smooth, finely coriaceous at least partly, distinctly coriaceous below precoxal sulcus; subalar depression sparsely coarsely crenulate and smooth between crenulations; precoxal sulcus mostly smooth or with more or less distinct crenulation, with two coarse submedian transverse carinae in anterior 0.8, rather distinctly crenulate posteriorly. Metapleuron rugose-areolate. Propodeum finely and rather densely areolate-coriaceous, partly almost smooth (especially in posterior half), basolateral areas more distinctly coriaceous; areas distinctly delineated by carinae, areola short,  $1.6\text{--}1.8\times$  longer than maximum width, petiolate area rather long and distinctly separated; basal carina long,  $1.0\text{--}1.5\times$  as long as anterior fork of areola. Hind coxa dorsally with dense transverse striations and dense granulation, laterally densely granulate and partly with fine rugulosity. Hind femur smooth, dorsally finely and intermittently striate. Petiole with carinae 2–4 in basal 0.5–0.6 and with fine areolation, almost smooth or finely rugulose at least partly in apical half. Remaining terga smooth. Vertex with long, very sparse, and almost erect or semierect setae posteriorly and laterally. Mesoscutum with long, sparse, and almost erect setae arranged in narrow lines along notauli and in single line laterally. Dorsal surface of hind tibia entirely with almost erect and sparse long setae, additionally with dense and semierect short setae in dorsoapical 0.7; length of long setae  $1.2\text{--}1.7\times$  maximum width of tibia.

Color: Body mainly light reddish brown or reddish brown, head yellow, face medially faintly infuscate; metasoma behind petiole reddish brown, but sometimes brownish yellow in basal half. Antennae yellow to yellowish brown in basal half, brown in subapical half, at least single subapical flagellomere yellow. Palps pale yellow. Legs pale yellow, hind or all femora brownish or at least faintly darker in apical 0.6, all tarsi brownish yellow. Ovipositor sheath brown or light brown, dark apically. Forewing usually almost hyaline or very faintly infuscate. Pterostigma more or less brown, yellow in basal 0.3, apically and usually anteriorly.

Male: Unknown.

DISTRIBUTION: Southern Vietnam.

DIAGNOSIS: This species belongs to the *S. antennalis* Szépligeti (*S. alipes* Wilkinson) species group. *Spathius tramlapus*, sp. nov., is similar to *S. alahamatus*, sp. nov., but differs in having the head below the eyes less strongly narrowed, the malar space short, the hypoclypeal depression wide, the metasoma behind the petiole short, the basal carina of the propodeum long and the second abscissa of the radial vein (3RSa) short. This species also resembles *S. medon* Nixon from India and Ceylon (Nixon, 1943) but differs in the absence of the first radiomedial vein (2RS), in having the mesosoma entirely light-reddish brown, the face distinctly and entirely sculptured, the ovipositor much shorter than the body, the head behind the eyes strongly narrowed, the pronotal keel distinct, the basal carina of the propodeum long, and the precoxal sulcus very sparsely crenulate.

ETYMOLOGY. After Tram Lap, the name of the species type locality.

KEY TO SPECIES OF *SPATHIUS* NEEES

## WITHOUT FIRST RADIOMEDIAL (2RS) VEIN OF THE FOREWING

1. Face mostly in excessively fine, very dense, and absolutely even transverse aciculation (as gramophone record or disk track) (see Nixon, 1943: 363, fig. 201) ..... 2
  - Face striate, undulately striate or rugose-areolate with striation, sometimes mostly smooth, never as above. – Metasoma behind petiole entirely smooth. .... 5
2. Nervulus (cu-a) distinctly antefurcal. – Propodeum without areas delineated by carinae. Parallel vein (2CUb) of forewing not interstitial. Mediocubital vein (M+CU) in its distal half distinctly curved to anal vein (1-1A). Basoventral tubercles of hind coxa absent. Terga of metasoma behind petiole densely aciculate. (Subgenus *Antespathius* Belokobylskij). – Vietnam ..... *S. (An.) buonluoicus* Belokobylskij
  - Nervulus (cu-a) distinctly postfurcal or sometimes interstitial (figs. 22, 35) ..... 3
3. Parallel vein (2CUb) interstitial (fig. 35). Second radial abscissa (3RSa) of forewing 0.5× as long as third abscissa (3RSb) (fig. 35). Pterostigma pale in apical 0.3 (fig. 35). Hind coxa without basoventral corner (fig. 31). Occipital carina joined below with hypostomal carina. Precoxal sulcus long, running along almost entire lower part of mesopleuron (fig. 30). Second tergum smooth basally (fig. 33). – Vietnam ..... *S. (S.) pacoensis*, new species
  - Parallel vein (2CUb) not interstitial (fig. 22). Second radial abscissa (3RSa) of forewing 0.75–0.9× as long as third abscissa (3RSb) (fig. 22). Pterostigma dark in apical 0.3 (fig. 22). Hind coxa with rather distinct basoventral corner (fig. 19). Occipital carina not joined below with hypostomal carina. Precoxal sulcus short, running along anterior 0.5–0.6 of lower part of mesopleuron (fig. 18). Second tergum usually striate basally (fig. 25) ..... 4
4. Radial vein (R) arising from middle of pterostigma. Petiole of metasoma short, 2.0–2.4× longer than apical width. Median length of second and third terga combined 1.3–1.5× basal width of second tergum. Basal carina of propodeum short, almost equal to sides of anterior fork of areola. Terga behind petiole mainly smooth. – Japan (Ryukyu) ..... *S. (S.) omotodakus* Belokobylskij
  - Radial vein (R) arising distinctly behind middle of pterostigma (fig. 22). Petiole of metasoma long, 2.7× longer than apical width (fig. 25). Median length of second and third terga combined 1.7× basal width of second tergum (fig. 25). Basal carina of propodeum long, 2.5× longer than sides of anterior fork of areola. Terga behind petiole mainly very dense and fine coriaceous (fig. 25). – Vietnam ..... *S. (S.) maichauensis*, new species
5. Hypoclypeal depression narrow and strongly transverse, width much larger than distance from edge of depression to margin of eye (figs. 1, 60). Postpectal carina present at least medially (fig. 67). First (R) and second (3RSa) abscissae of radial vein of forewing situated usually in almost single line (figs. 12, 45, 69) (*S. antennalis* Szépligeti species group) ... 6
  - Hypoclypeal depression wide and subround or more or less oval, width not larger than distance from edge of depression to margin of eye (fig. 48). Postpectal carina always absent (fig. 54). First (R) and second (3RSa) abscissae of radial vein of forewing forming distinct obtuse angle (fig. 58) ..... 8

6. Petiole (lateral view) distinctly thickened and strongly curved in basal half (fig. 44). Areola of propodeum narrow (fig. 39). – Dorsal margin of hind tibia with only long setae (fig. 43). – Vietnam ..... *S. (S.) sterlingi*, new species
- Petiole (lateral view) less distinctly thickened and not strongly curved in basal half (figs. 10, 72). Areola of propodeum wide (figs. 4, 66) ..... 7
7. Face weakly and incompletely sculptured (fig. 1). Head below eyes (front view) strongly narrowed (fig. 1). Malar space long,  $0.4\times$  eye height (fig. 1). Hypoclypeal depression narrow, width  $1.4\text{--}1.8\times$  distance from edge of depression to eye (fig. 1). Metasoma behind petiole long, petiole  $0.9\text{--}1.05\times$  as long as remaining metasomal terga combined (figs. 10, 11). – Vietnam ..... *S. (S.) alahamatus*, new species
- Face entirely sculptured, striate with rugulosity (fig. 60). Head below eyes (front view) less strongly narrowed (fig. 60). Malar space short,  $0.2\times$  eye height (fig. 60). Hypoclypeal depression wide, width  $2.1\text{--}2.3\times$  distance from edge of depression to eye (fig. 60). Metasoma behind petiole short, petiole  $1.2\text{--}1.4\times$  longer than remaining metasomal terga combined (figs. 71, 72). – Vietnam ..... *S. (S.) tramlapus*, new species
8. Basoventral tubercles on hind coxa distinct. Parallel vein (2Cub) of forewing not interstitial. Radial vein (R) arising distinctly before middle of pterostigma. Setae on dorsal margin of hind tibia short, length  $0.2\text{--}0.4\times$  maximum width of tibia. Petiole short and wide, length  $1.6\times$  apical width. (*S. fasciatus* Walker species group). – Japan (Honshu). ..... *S. (S.) alevtinae* Belokobylskij and Maeto
- Basoventral tubercles on hind coxa absent. Parallel vein (2Cub) of forewing usually interstitial (except for *S. subanervis*, sp. nov.). Radial vein (R) arising almost from the middle of pterostigma (fig. 58). Setae on dorsal margin of hind tibia long, length  $0.8\text{--}1.4\times$  maximum width of tibia (fig. 56). Petiole long and rather narrow, length  $2.0\text{--}2.7\times$  apical width (fig. 53) ..... (subgenus *Ambispathius*)
9. Propodeum with long and pointed lateral tubercles, without areas delineated by carinae and rugose-areolate basally (figs. 54, 55). First flagellomere  $1.4\times$  longer than second flagellomere (fig. 52). Parallel vein (2Cub) of forewing not interstitial (fig. 58). – Frons and vertex entirely smooth (figs. 48, 49). – Vietnam. .... *S. (Am.) subanervis*, new species
- Propodeum without or with short and obtuse lateral tubercles, with areas distinctly delineated by carinae, smooth or granulate basally. First flagellomere equal to or  $1.1\text{--}1.2\times$  longer than second flagellomere. Parallel vein (2Cub) of forewing usually interstitial ..... 10
10. Eyes distinctly setose. Transverse diameter of eye (dorsal view) almost equal to length of temple. Malar space  $0.5\times$  height of eye. Length of mesosoma  $2.2\times$  height. Length of first metasomal tergum almost twice apical width. Mesoscutum entirely smooth. – Fiji ..... *S. (Am.) anervis* Belokobylskij
- Eyes glabrous. Transverse diameter of eye (dorsal view) about twice length of temple. Malar space  $0.3\times$  height of eye. Length of mesosoma  $1.6\times$  height. Length of first metasomal tergum  $2.7\times$  apical width. Mesoscutum entirely granulate. – Malaysia ..... *S. (A.) sabahus* Belokobylskij

## DISCUSSION

The reduction of the first radiomedial vein (2RS) in the forewing occurs in several genera of the subfamily Doryctinae, and this is one of the main diagnostic characters of the large and worldwide tribe Heterospilini (Belokobylskij, 1992, 2006). This vein is also occasionally reduced in some genera of several other doryctine tribes: *Caenophanes* Foerster and *Bulbonervus* Shenefelt (Doryctini), *Labania* Hedqvist (Labaniini), *Fijibracon* Belokobylskij and *Nipponecphylus* Belokobylskij and Konishi (Percnobraconini), *Heterospathius* Barbalho and Penteado-Dias, and *Spathiospilus* Marsh (Spathiini).

Two subgenera with a reduced first radiomedial vein (2RS), *Antespathius* Belokobylskij and *Ambispathius* Belokobylskij, have been described in the genus *Spathius* Nees (Belokobylskij, 1995). Two species of the subgenus *Ambispathius* (with type species *S. (A.) anervis* Belokobylskij from Fiji) are additionally characterized by the interstitial position of the parallel vein (2Cub) of the forewing, the absence of the basoventral tubercle on the hind coxa, the entirely smooth metasomal terga behind the petiole, the absence of suture between the second and third metasomal terga, and also (only for the type species) the distinctly setose eyes and entirely smooth mesoscutum. Vietnamese *Spathius* (*Am.*) *subanervis*, n. sp., is a new member of this subgenus, but with a rather separated position because of the virtual absence of propodeal areas delineated by carinae, the presence of the long and pointed lateral propodeal tooth, and parallel vein (2Cub) not interstitial.

The species of the subgenus *Antespathius* (type species *S. (An.) buonluoicus* Belokobylskij from Vietnam) are similar to *Spathius* species groups, members of which have the face with even and extensively fine transverse aciculation and often without a clypeal suture (species groups of *S. ocyroe* Nixon, *S. vulnificus* Wilkinson, and *S. rusticulus* Wilkinson (*S. urios* Nixon)) (Nixon, 1943; Belokobylskij, 2003). This subgenus differs from all species of the aforementioned groups, not only in the absence of the first radiomedial vein (2RS), but also in a distinctly antefurcal position of the nervulus (cu-a) and the absence of the areas delineated by carinae on the propodeum. Additional important diagnostic characters of this subgenus include: parallel vein (2Cub) not interstitial, basoventral tubercles on the hind coxa absent, metasomal terga behind the petiole densely aciculate, and mediocubital vein (M+CU) distinctly curved toward the anal vein (1-1A) in its distal half. The status of *Antespathius* was preliminarily raised to the generic level during a recent study of the molecular phylogeny of the doryctine wasps (Zaldivar-Riverón et al., 2008). Data published recently about the doryctine wasps of Japan included the species from the *S. rusticulus* species group, which also lack the first radiomedial vein (2RS) of the forewing (*S. omotodakus*; Belokobylskij, 2009). These data obscure the real differences between *Antespathius* and the aforementioned species group of *Spathius*.

On the other hand, *S. alevtinae* (Belokobylskij and Maeto, 2009), described from Japan, was originally compared with the species of the subgenus *Ambispathius* because its first radiomedial vein (2RS) is completely reduced, the nervulus (cu-a) is postfurcal and the face lacks even and extensively fine transverse aciculation. The differences among these three species of the subgenus are such that their position in *Ambispathius* is very problematic. These data allow us to suggest the parallel reduction of the first radiomedial (2RS) vein in these taxa. The complex of our knowl-



edge about *Spathius* species and species groups shows the correct position of *S. alevtinae* is in the large and diverse *S. fasciatus* species group (Nixon, 1943; Belokobylskij, 2003).

A similar disputable situation is evident in the above-described species from Vietnam. All these new taxa have a completely or almost completely reduced first radiomedial vein (2RS), but a number of the other morphological characters show that their position is separate from the subgenera discussed above. *Spathius alahamatus*, n. sp., *S. sterlingi*, n. sp., and *S. tramlapus*, n. sp., undoubtedly belong to the *S. antennalis* Szépligeti (*S. alipes* Wilkinson) species group (Nixon 1943; Belokobylskij, 2003) because they have specific diagnostic characters of this group, such as the narrow and rather strongly transverse hypoclypeal depression, the first (R) and second (3RSa) abscissae of the radial vein situated almost in a single line, the postpectal carina of the mesosoma developed at least medially, and the metasomal terga behind the petiole entirely smooth. Two other new species, *Spathius pacoensis*, n. sp., and *S. maichauensis*, n. sp., belong to *S. rusticulus* Wilkinson species group that have peculiar sculpturation on the face (see above). In spite of the absence of the first radiomedial vein (2RS), these species have a distinctly postfurcal nervulus (cu-a) in the forewing (versus its apomorphic antefurcal position in *Antespathius* taxa), which is the main reason to keep it in *Spathius* s.s.

All the species discussed above additionally support hypotheses about the possibility of the parallel reduction of the first radiomedial vein (2RS) in several not closely related species groups of *Spathius*. The future complex revision on both the morphological and molecular bases of the *Spathius* species and species group should help to understand the real composition of this large genus and to separate the really monophyletic supraspecific taxa.

#### ACKNOWLEDGMENTS

The present work was supported by Vietnam's National Foundation for Science and Technology Development (NAFOSTED, grant no. 106.15.04.09, for the first author and partly by the Russian Foundation for Basic Research (grant no. 10-04-00265) for the second author. We express our thanks to James M. Carpenter (American Museum of Natural History, New York) and an unknown reviewer for the valuable comments and corrections of the English text. The first author also expresses thanks to the Center for Biodiversity and Conservation (CBC) at the American Museum of Natural History (AMNH) and Eleanor J. Sterling, Director of the Center, for the material is mainly based upon work supported by the National Science Foundation under grant no. 98-70232 to Sterling and Carpenter at the AMNH, and this paper would not have been published without the financial support of CBC.

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