



***Zhengica cornuta* gen. nov., sp. nov., a new genus and species of Pentatomidae from East Asia (Hemiptera: Heteroptera)**

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Abstract

Zhengica cornuta gen. nov., sp. nov. (Hemiptera: Heteroptera: Pentatomidae: Pentatominae: Pentatomini) from Shanxi, China, is described, illustrated, and its phylogenetic affinities are discussed. The genus is recognized as a generalized member of the clade of *Pentatoma* Olivier, 1789 and related genera, its phylogenetically closest relative is probably *Cervicoris* Hsiao & Cheng, 1977.

Key words: Pentatomidae, taxonomy, new genus, new species, East Palaearctic

Introduction

The assemblage of *Pentatoma* Olivier, 1789 and related genera forms a relatively species-rich phylogenetic lineage of Pentatomidae (Hemiptera: Heteroptera) in the East Palaearctic. *Pentatoma* in the broad sense contained 29 described species (Hsiao & Cheng 1977, Zheng & Ling 1983, Lin & Zheng 1987, Zheng & Li 1991, Liu & Zheng 1995, Zheng & Wang 1995, Rider 2006, He & Zheng 2006) until the early 2010's when Fan & Liu (2010, 2012) recognized the genus as non-monophyletic and removed part of the species into their newly proposed *Ramivena* Fan & Liu, 2010 and *Bifurcipentatoma* Fan & Liu, 2012. As a result, the current, more narrowly defined *Pentatoma* contains 23 species, *Ramivena* 5 species, and *Bifurcipentatoma* 5 species. Some additional genera are also evidently closely related to this group and they probably form a monophyletic clade within Pentatomini (see Discussion).

A single male pentatomid individual, collected in Shanxi, China, undoubtedly representing an undescribed species, was received for identification from a local collector. This new species is apparently a member of the above mentioned tentative clade of *Pentatoma* and related genera, but due to its unusual and in some respect unique morphological characters it is recognized as representative of an undescribed genus. The new genus and species are described and its relationships are discussed below.

The present contribution is dedicated to Prof. Le-Yi Zheng on the occasion of his 90th birthday, in recognition of his seminal contributions to East and Southeast Asian Pentatomidae.

Material and methods

External structures and genitalia were examined using stereoscopic microscopes (Nikon SMZ-U, Leica M205C). Drawings were made with the aid of a camera lucida. Male genitalia were dissected after careful heating in hypertonic KOH solution. Habitus photographs were taken using a Nikon D90 camera equipped with an AF-S Micro Nikkor 60 mm f/2.8G ED lens, other photos using a Nikon E Plan 4×/0.10 or a Nikon Plan 10×/0.25 lens set on a Nikkor 200 mm f/4 AI teleobjective.

Except for a few terms adopted from the papers of Baker (1931a, b), Zrzavý (1990) and Roell *et al.* (2020),

morphological terminology follows Tsai (2011) and Tsai *et al.* (2011); the majority of the terms are explained in detail in the latter work. Abbreviations used in figures: adif = ridge-like arch of dorsal rim of genital capsule; aed = aedeagus (s. str.); cp-I, cp-II: first and second conjunctival processes, respectively; cp-IIb = a small proximodorsal lobe of second conjunctival process; Cu = cubitus; dif = infolding of dorsal rim of genital capsule; dvr = median denticle of infolding of ventral rim of genital capsule; lap = lateral process of genital capsule; lp = left paramere; M = media; phsh = phallothecal shield; prc = proctiger; R = radius; slp = sublateral process of genital capsule; vr = ventral rim of genital capsule.

Taxonomy

Zhengica, gen. nov.

Diagnosis. Medium-sized pentatomids defined by the following combination of characters: integument with irregular punctation forming a mottled pattern; lateral margins of mandibular plates strongly reflexed; anterior angles of pronotum produced into a pair of large processes laterad of eyes; peritreme associated with ostiole of metathoracic scent gland strongly reduced, minute; membranal sections of M and Cu branching into several short stubs; abdominal ventrite VII greatly produced anteriorly therefore mesal portions of ventrites III–VI shortened (ventrite VII subequal in length to mesal length of ventrites III–VI combined).

Description. *Body* of medium size, elongate oval, more strongly convex ventrally than dorsally (Figs. 1–3). *Integument and vestiture.* Integument densely and coarsely punctured, pronotum and scutellum distinctly rugopunctate, punctures frequently confluent, forming extensive dark areas, together with impunctate areas resulting in a mottled pattern (Fig. 1); body appearing glabrous dorsally, with fine, inconspicuous pilosity ventrally and on appendages.

Head and cephalic appendages. Head (Figs. 4–6) broad, parabola-shaped, dorsal surface flat, anterior portion of clypeus and adjacent parts of mandibular plates slightly declivous, lateral margins of anteocular portion laminate, strongly reflexed (particularly in its posterior half) (cf. Fig. 5); apex of clypeus free; mandibular plates as long as clypeus, lateral margin irregularly undulate (asymmetrically between left and right sides), posteriorly abruptly, roundedly converging to anterior margin of eye, forming a small, rounded lobe immediately anteriorly of eye; eye relatively small, globose; postocular portion strongly produced, situated in deep anterior emargination of pronotum; ocelli placed far posteriorly of posterior margin of eye; antenniferous tubercle completely concealed by lateral margin of head in dorsal view, simple, unarmed; buccula low, gradually blending into ventral head surface posteriorly, with a distinct, angulate, rather sharp denticle slightly anteriorly of insertion of labium. *Antenna* with five antennomeres (pedicel subdivided), scape short, extending to about apex of head, basi- and distipedicellites narrow, slightly compressed, basi- and distiflagellum slightly spindle-shaped, more distinctly compressed. Labium slightly surpassing base of ventrite VII, labiomere III longest.

Thorax. Pronotum (Figs. 4–6) broad, anterior margin deeply emarginate around postocular portion of head, somewhat compressed, flattened anteriorly of calli; anterior angles produced into a pair of large, anterolaterally directed processes laterad of eyes; lateral margins compressed, gradually diverging and irregularly denticulate to about middle of calli, then expanded laterad, forming a pair of broad, obtuse, dorsoventrally flattened lobes only weakly surpassing base of costal margin of forewing; posterolateral angles broadly rounded, indistinct; posterior margin weakly concave. *Scutellum* elongate, slightly shorter than head and pronotum combined, distinctly longer than basal width, frenal portion about twice as long as postfrenal portion, with a pair of weak impressions at anterolateral angles, postfrenal portion narrowly tongue-shaped. *Thoracic pleuron and sternum* (Figs. 7–9). Preepisternum very weakly produced anteriorly; prosternum insignificantly impressed; mesosternum with a low, obtuse carina along meson, terminating between mesothoracic acetabula in a posteriorly directed process interlocking with anterior process of metasternum; metasternum rather flat; metathoracic scent gland ostiole small, oval, associated with very short, elongate oval peritreme (Figs. 7–8); evaporatorium extensive on meso- and metapleura (Fig. 7). *Fore wings.* Corium much surpassing apex of scutellum in rest, distal (membranal) margin broadly rounded at posterior extremity (close to apex of scutellum in rest), nearly straight at anterior portion (close to costal margin), anterodistal angle narrowly rounded; exocorium broad, at level of end of median furrow about two times as broad as endocorium; membrane broadly rounded, with three longitudinal veins (Fig. 10: R, M, Cu), R short, simple, M and Cu both

branching into several short stubs. *Legs* relatively long, femora rather narrow, unarmed, dorsal surface of tibiae with two longitudinal ridges enclosing a flat surface; tarsi 3-segmented.

Pregenital abdomen. Ventrite III with an insignificant median tumescence not surpassing anterior border of segment (Fig. 9); posterolateral angles of ventrites obtuse, unarmed; connexivum greatly concealed by broad exocorium, only extreme posterolateral portion of laterotergites IV–VII visible in dorsal view; ventrite VII of ♂ greatly produced anteriorly therefore ventrites III–VI shortened mesially (ventrite VII subequal in length to mesal length of ventrites III–VI combined) (Fig. 3).

External male genitalia of the single included species are described below.

Female unknown.

Type species. *Zhengica cornuta* sp. nov.

Etymology. The new genus is dedicated to Le-Yi Zheng, professor emeritus of Nankai University, Tianjin, preeminent specialist of East and Southeast Asian Heteroptera. Gender feminine.

Diversity and distribution. Monotypic; the type species is known from Shanxi, China.

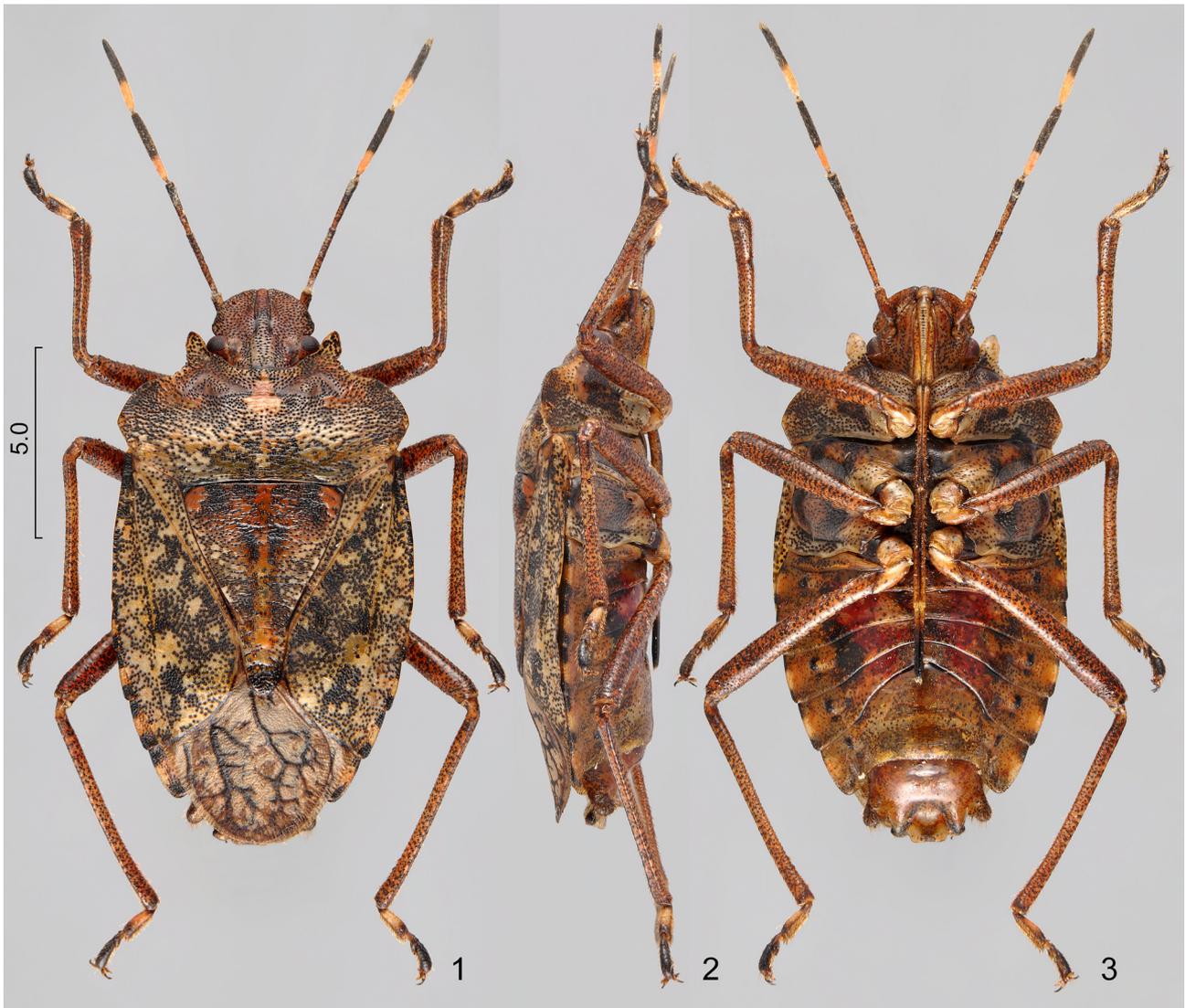
Zhengica cornuta, sp. nov.

(Figs. 1–21)

Type material. Holotype: ♂, CHINA: Shanxi, Xi'an, Huxian, Huashuping [approximately 33.68°N 107.65°E], 2400 m, 18.vi.2020, local collector; deposited in the National Museum of Natural Science, Taichung, Taiwan.

Diagnosis. Being the single known member of *Zhengica* gen. nov., this species can be recognized based on the characters given for the genus.

Description. Macropterous male. *Colour, integument and vestiture.* Ground colour stramineous but body appearing brownish due to dense and coarse black punctation, punctures confluent in various parts of body and form extensive dark areas intermixed with impunctate lighter parts, resulting in a complex, irregular, asymmetrical, mottled pattern (Figs. 1–3); head pale ferruginous, densely and relatively uniformly punctured dorsally, with a pair of oval impunctate areas at mesal margins of eyes (Fig. 4); antennae stramineous, scape, basi- and distipedicellite with dense black punctation, basi- and distiflagellum impunctate, distal half of distipedicellite, distal two-thirds of basi- and distiflagellum each black; labium with scattered punctures on labiomeres I–III, labiomere IV greatly black except base; pronotum (Figs. 4–6) with ferruginous suffusion on and around calli, with a conspicuous, drop-shaped impunctate area between calli, more densely punctured anteriorly of calli sublaterally, posteriorly of calli submedially, and on humeral lobes laterally, punctures on posterior part of posterior lobe of pronotum more sparsely distributed, frequently arranged in short lines, integument somewhat rugo-punctate; basal tumescence of scutellum ferruginous, with a pair of rounded, impunctate, callose patches basolaterally (not including impressed basal angle) neighbored medially by dark areas formed by densely packed punctures (Fig. 4), dense punctation also on posterior part of frenal area and on tip of scutellum; clavus and corium with irregularly and asymmetrically distributed black punctures intermixed with impunctate pale areas, with a relatively large impunctate patch on endocorium marginally immediately distad of distal end of medial furrow, distally neighbored by a larger patch formed by greatly confluent black punctures; membrane smoky brown, veins contrastingly dark brown (Fig. 10); thoracic pleura stramineous, episterna and epimera with reddish suffusion, with coarse, black punctation, particularly dense on proepimeroid and on pleura laterally (below pleural sutures); meso- and metasterna dark brown, median carina of mesosternum stramineous (Fig. 9); coxae and trochanters stramineous, femora and tibiae ferruginous with dense, partly confluent black punctation, tarsomeres I pale stramineous, their distal portions and tarsomeres II–III dark brown; anterior and posterior thirds of dorsal laterotergites III–VII black, middle thirds yellowish with black punctures; abdominal venter broadly suffused with red on ventrites III–VI submedially (probably corresponding with red testes inside of abdomen), sparsely punctate, more densely packed punctures forming a pair of broad, irregular longitudinal bands mesad of spiracles and another pair of narrow and very indistinct bands submedially, lateral margins narrowly black in anterior and posterior thirds of each segments corresponding with black areas of dorsal laterotergites, spiracles III–VII surrounded by a larger black patch, two trichobothria on ventrites III–VII each by a smaller black patch (Figs. 3, 6, 13); anterior (concealed) parts of genital capsule brown, exposed portions stramineous with reddish suffusion, lateral processes brown, submedian processes densely punctured with black, continued in a pair of oblique streaks formed by densely packed punctures converging to midline (Fig. 11). Vestiture as described for the genus.



FIGURES 1–3. *Zhengica cornuta* gen. nov., sp. nov., holotype. 1, dorsal view; 2, lateral view; 3, ventral view. Scale in mm.

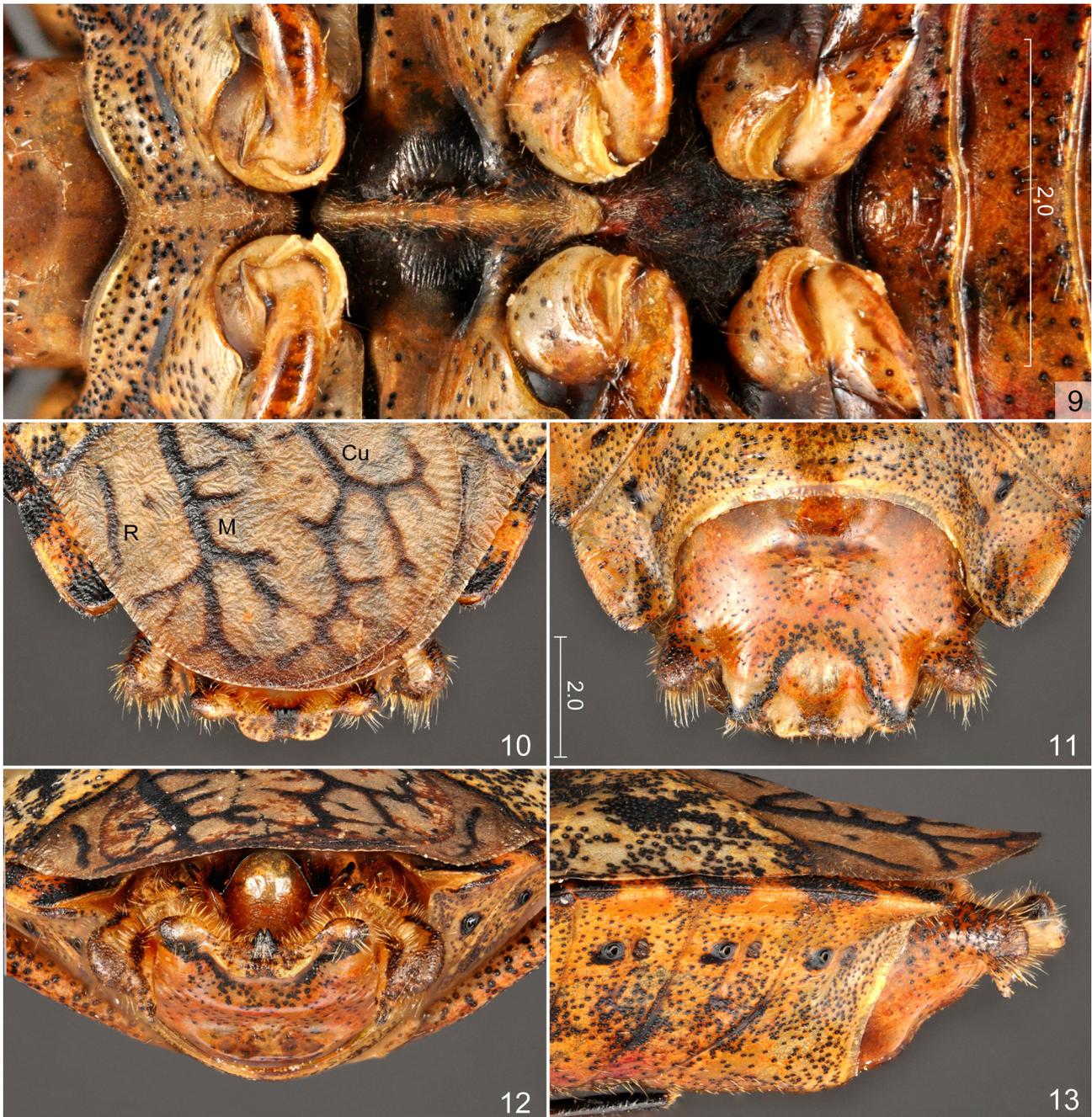
Body relatively elongate oval, about 1.9 times as long as greatest width (Figs. 1–3). *Head* (Figs. 4–6) about as long as greatest width across eyes, about 1.55 times as wide as interocular distance. *Antenna*: basipedicellite about 1.15 times longer than distipedicellite. *Labium* reaching to base of abdominal ventrite VII, labiomere I approaching base of head, labiomere III longest, about 1.1 times as long as labiomere II and 1.6 times as long as labiomere IV. *Pronotum* about 2.3 times as broad as its median length, processes of anterior angles subtriangular, reaching to about anterior margin of eye, flattened, strongly curved upwards, dorsal face concave; humeri produced into a pair of short and broad processes with anterior margin rounded, humeral angle obtuse, enclosing approximately 120°, distance between humeral angles slightly shorter than (about 0.95 times as long as) greatest width of body (= greatest width between costal margins of fore wings in rest); dorsal surface of pronotum uneven, compressed anteriorly of calli and at inner portions of humeral projections posteriorly of calli. *Scutellum* about 1.25 times as long as basal width, with an obtuse, flat, but fairly distinct median carina posteriorly of basal tumescence, approximately as broad as one third of width of postfrenal portion. *Thoracic pleuron*: evaporatorium occupying mesepimeron, mesepimeroid and metapleuron except lateral parts and supracoxal lobes on both segments; peritreme forming a short auricle, scent gland ostiole narrowed laterally and continued as a furrow along posterior margin of peritreme, extending almost to its tip.

External male genitalia (Figs. 10–21). *Genital capsule* (Figs. 10–16) conspicuously large, its width about 45% of greatest width of abdomen (cf. Fig. 3); posterior margin with two (a lateral and a sublateral) pairs of globose, densely setose projections, counterparts of lateral pair (Fig. 14: lap) each produced into a ventromesally directed process

tapering towards its tip (Fig. 16), those of sublateral pair (Figs. 14, 15: slp) connected by a transversely laminate protrusion of ventral rim (Fig. 14: vr) far surpassing level of tips of sublateral projections posteriorly, emarginated at meson, provided with a dorsally directed, apically slightly excised median denticle (Figs. 14, 15: dvr) subapically; infolding of dorsal rim (Fig. 14: dif) forming a broad, ridge-like arch (Figs. 14, 15: adif) [= superior ridge sensu Baker (1931a, b); interpreted as a potential homologue of tergite IX by Tsai *et al.* (2011)] surrounding proctiger (Figs. 14, 15: prc) from above; superior processes (see Discussion) absent. *Paramere* (Figs. 17–18; Figs. 14–15: lp) simple, curved, crown laminate, apical portion with several minute scale-like processes. *Phallus* (Figs. 19–21): articulatory apparatus as in Fig. 19; phallosome rather heavily sclerotized, constricted near apex, forming a distinct phallosomal shield (Fig. 19: phsh) distally; conjunctiva thick and short, forming a single dorsal process (Figs. 19, 20: cp-I) that is tongue-shaped and strongly sclerotized ventrally, a pair of enlarged, elongated ventral processes (Figs. 19–21: cp-II) with flattened, corrugate dorsal surface, together forming a broad bifurcate plate encompassing aedeagus (s. str.) at its base, provided with a pair of short, finger-like, posteromesally directed branches (Figs. 19, 20: cp-IIb) proximodorsally approximately laterad of aedeagus (s. str.); aedeagus (s. str.) (Fig. 22: aed) very short, secondary gonopore opens in ventral direction.



FIGURES 4–8. *Zhengica cornuta* gen. nov., sp. nov., holotype. 4, anterior part of body, anterodorsal view (most exposed view of head and pronotum); 5, same, dorsolateral view; 6, lateral view; 7, left pterothoracic pleuron, hypocostal lamina and base of abdomen, ventrolateral view (in most exposed view of pleuron); 8, left scent gland ostiole and peritreme. Podomeres distad of coxae digitally removed in Figs. 5 and 6. Scales in mm.



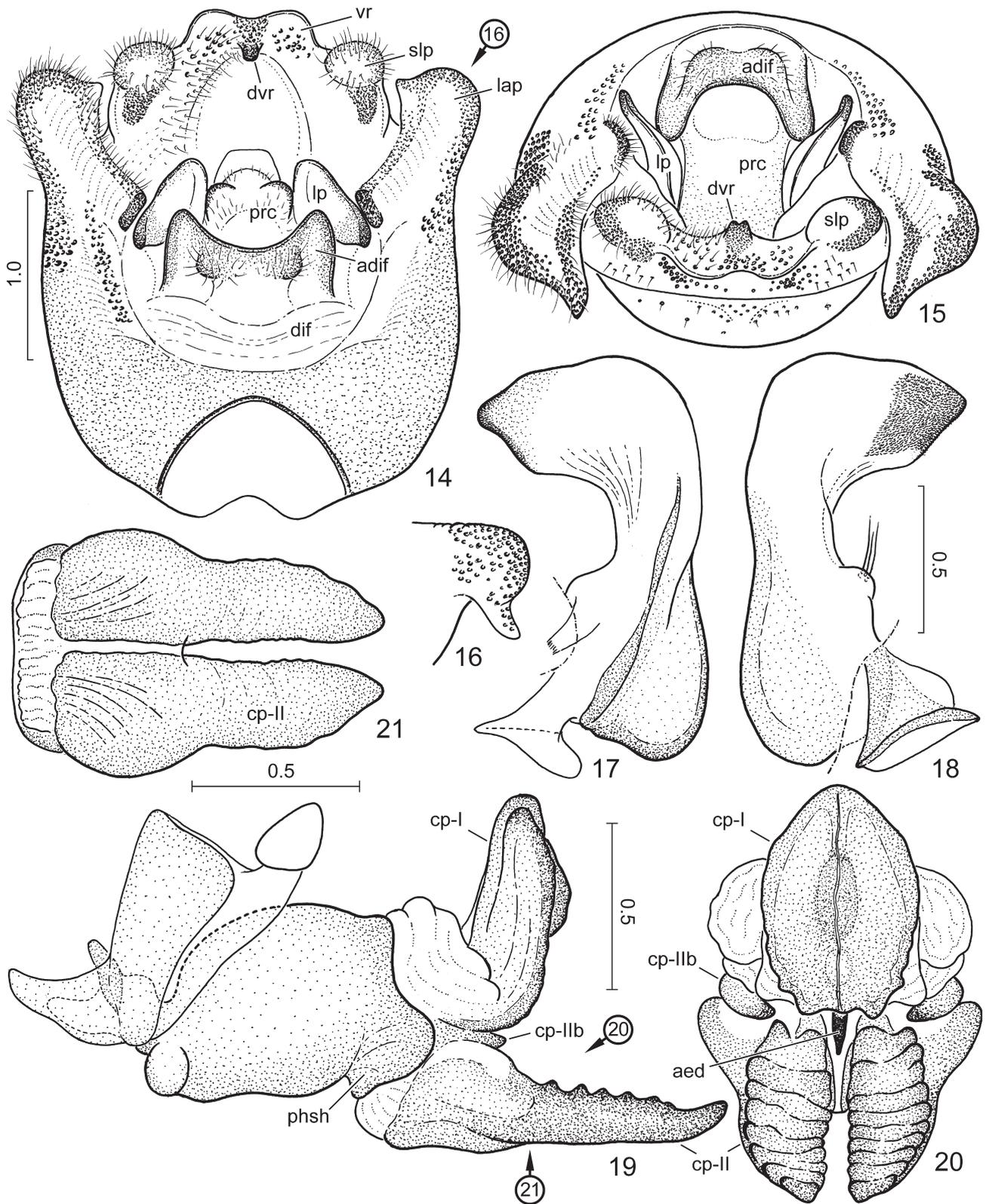
FIGURES 9–13. *Zhengica cornuta* gen. nov., sp. nov., holotype. 9, middle portion of thorax and base of abdomen in ventral view; 10, posterior end of body, dorsal view; 11, same, ventral view; 12, same, posterior view; 13, same, lateral view. Scales in mm.

Measurements of the holotype (in mm). Body length 14.9; length of head 2.95, greatest width across eyes 2.93, interocular distance 1.89; length of scape : basipedicellite : distipedicellite : basiflagellum : distiflagellum as 0.97 : 1.74 : 1.50 : 1.98 : 2.25; length of pronotum 3.20, greatest width 7.41; length of scutellum 5.40, width at base 4.30; greatest width of abdomen 7.65.

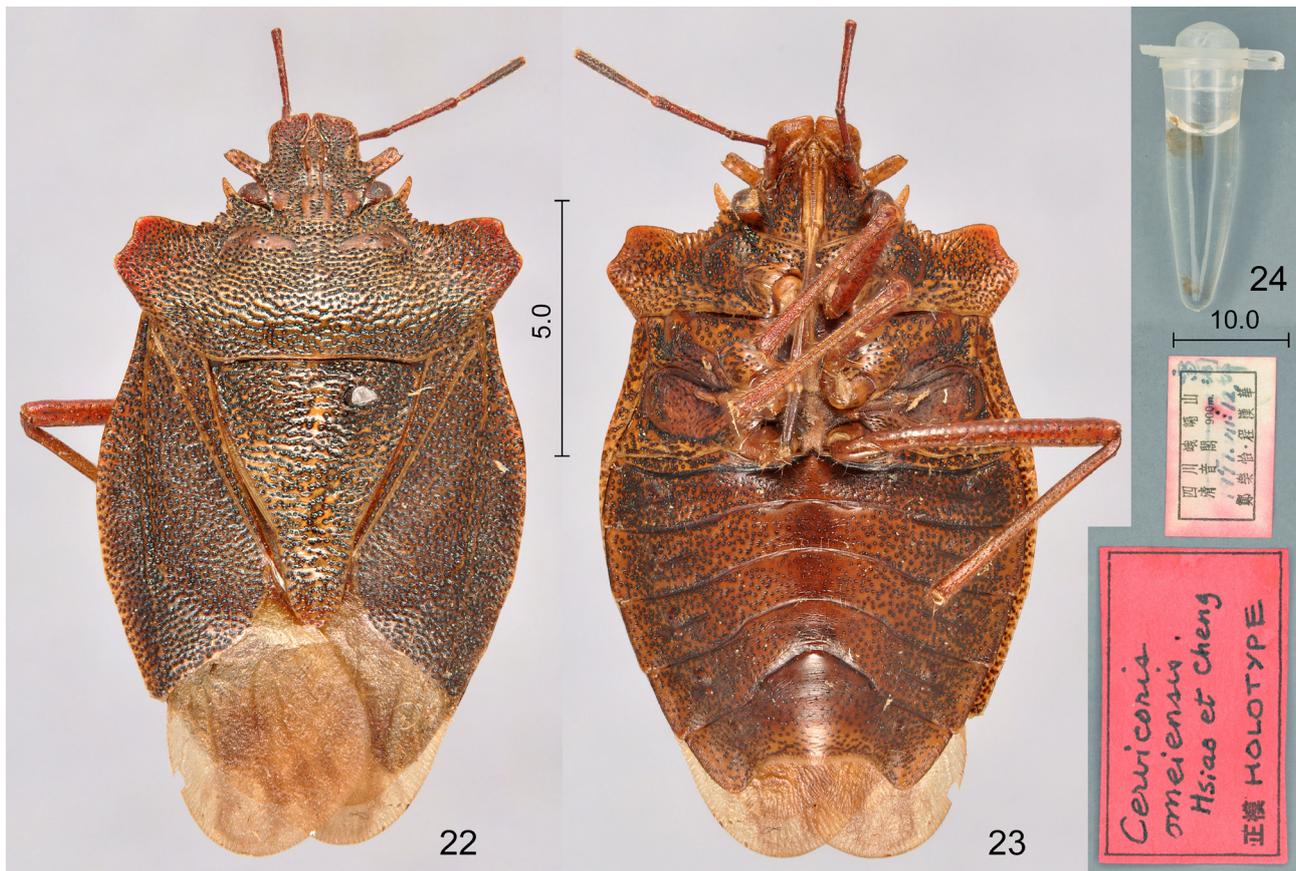
Bionomics. Unknown.

Distribution. Only known from the type locality in Shanxi, central China, characterized by humid continental climate and temperate deciduous montane forest vegetation.

Etymology. The specific epithet is the Latin adjective *cornutus*, *-a*, *-um*, meaning “provided with horns”, in allusion to the produced anterolateral angles of the pronotum.



FIGURES 14–21. *Zhengica cornuta* gen. nov., sp. nov., holotype. 14, genital capsule, dorsal view; 15, same, posterior view; 16, lateral projection of genital capsule, posterolateral view; 17–18, right paramere, two different aspects; 19, phallus, lateral view; 20, same, posterodorsal view (articulatory apparatus not shown); 21, cp-II, ventral view. Arrows in Figs. 14 and 19 indicate aspects of Figs. 16, 20 and 21, respectively. Scales in mm.



FIGURES 22–24. *Cervicoris omeiensis* Hsiao & Cheng, 1977, holotype. 22, dorsal view; 23, ventral view; 24, labels. © Nankai University, Tianjin. Scales in mm.

Discussion

Tribal placement and general phylogenetic affinities

Problems in the higher classification of the tribes of Pentatominae, particularly controversies of the definition of Pentatomini and Carporcorini, were highlighted by Rider *et al.* (2018); both of these traditionally recognized, speciose tribes were recovered as non-monophyletic by Roca-Cusachs *et al.* (2021). In respect of its general habitus and several morphological characters of tribal level importance, e.g. the structure of the thoracic venter (carinate mesothorax, cf. Fig. 9) or the shortened peritreme (Fig. 8), *Zhengica* gen. nov. cannot be unambiguously placed into any of these two tribes; the presence of a small median tumescence at the base of abdominal ventrite III, however, suggests that it might belong to Pentatomini. A more careful comparison shows that it is apparently phylogenetically related to or rather belong to a complex of genera of Pentatomini containing *Pentatoma* Olivier, 1789 (the type genus of the tribe) and a number of apparently phylogenetically related genera, including at least *Acrocorisellus* Fieber, 1860; *Bifurcipentatoma* Fan & Liu, 2012; *Ramivena* Fan & Liu, 2010; *Okeanos* Distant, 1911; *Cervicoris* Hsiao & Cheng, 1977; *Lelia* Walker, 1876; and *Priassus* Stål, 1868. These relatively large-bodied pentatomids usually possessing anteriorly finely denticulate or serrate lateral margins of pronotum and produced humeri are tentatively recognized in the present paper as a potential monophyletic clade; their potential synapomorphies include a large endophallic reservoir, an endophallic duct usually bent strongly downward, and a very short aedeagus (s. str.) concealed by either the median penial plates or the enlarged and heavily sclerotized cp-II. *Pentatoma*, *Okeanos*, *Acrocorisellus* and *Lelia* were ingroups in the analysis of Roca-Cusachs *et al.* (2021) and they were recovered as members of an (unnamed) monophyletic clade; the other five genera (including *Zhengica* gen. nov.) are added because of close morphological similarity of their exoskeleton and genitalia with some of the included genera, particularly *Pentatoma*. The origin of this complex of genera is likely East Asia, where most of their included species occur. All but a few described species currently (correctly or incorrectly) placed into the above genera, and a number of undescribed species have been examined by us.

Within this clade *Zhengica* gen. nov. is most similar to *Ramivena* (currently containing 5 species from southern China; all except *R. emeiensis* (Lin, 1988) have been examined by us) and *Cervicoris* (currently monotypic, the type species, *C. omeiensis* Hsiao & Cheng, 1977, was described based on a holotype from Sichuan, southwestern China; the holotype has been examined and it is illustrated in Figs. 22–24). The most important diagnostic characters of the three genera are summarized in Table 1. All of them are characterized by a highly similar genital capsule (cf. Fan & Liu 2010: 220–223; Hsiao & Cheng 1977: 127, figs. 645, 646), provided with two pairs of posterior projections (Figs. 14, 15: lap and slp) that are apparently homologous among the three genera. A single dorsal and a pair of enlarged ventral conjunctival processes (Figs. 19–21: cp-I and cp-II), all well sclerotized, occur in all of these genera, although *Ramivena* differs from the other two by its conjunctival processes, firstly, by being less sclerotized (they are generally largely membranous in the other related genera listed above), and secondly, by the dorsal process being immovable and situated closely above the ventral processes in fully inflated condition; in *Zhengica* gen. nov. and *Cervicoris* the dorsal process is directed far away from the ventral processes (Fig. 19).

The reduced metathoracic scent gland peritreme (Figs. 6–8) is another potential shared apomorphy, but as this character state is strongly homoplasious (found in several other members of this generic complex), it has little value for supporting a close phylogenetic relationship among the three genera in concern. The base of abdominal ventrite III is provided with a small, frequently insignificant tumescence in *Zhengica* gen. nov., *Cervicoris*, *Bifurcipientatoma*, and the majority of the species currently placed into *Pentatoma*, while it bears a long, anteriorly projecting process in *Acrocorisellus*, *Priassus*, *Lelia*, *Ramivena*, and a few other species of *Pentatoma*.

TABLE 1. Diagnostic characters of *Cervicoris* Hsiao & Cheng, 1977, *Zhengica* gen. nov., and *Ramivena* Fan & Liu, 2010. Putative apomorphies are marked with asterisk.

	<i>Cervicoris</i>	<i>Zhengica</i> gen. nov.	<i>Ramivena</i>
1	uniform punctation and colour	heterogeneous punctation, mottled colour*	
2	anterior angles of pronotum produced into large process*		anterior angles of pronotum form minute denticle
3	humeri produced, notched apically	humeri broad, moderately produced, not notched	humeri produced, notched apically
4	veins not branching	membrane with branching veins*	
5	abdominal ventrite III with indistinct tumescence		abdominal ventrite III with spine-like process
6	anterior margin of ventrite VII of male greatly produced anteriad medially*		anterior margin of ventrite VII of male weakly arched
7	ventral rim of genital capsule straight	ventral rim of genital capsule produced posteriad	ventral rim of genital capsule distinctly emarginate
8	ventral rim of genital capsule without median denticle	ventral rim of genital capsule with median denticle*	ventral rim of genital capsule with* or without median denticle
9	superior process on genital capsule absent*		superior process present
10	paramere simple, apical portion laminate		paramere trifurcate*
11	dorsal process of conjunctiva away from ventral processes		dorsal process of conjunctiva immovable, situated close above ventral processes*
12	entire cp-II heavily sclerotized, greatly produced posteriad far surpassing tip of aedeagus (s. str.)*		cp-II partly membranous, at most slightly surpass aedeagus (s. str.)
13	medial penial plates absent*		medial penial plates present

Comparison with Ramivena

With *Ramivena* the new genus shares, additionally to the above listed characters, a similarly mottled integument formed by densely punctures dark areas intermixed with pale impunctate areas (members of other genera of the group have a rather uniform punctation, or different, highly autapomorphic patterns in *Lelia* and *Priassus*) and branching veins on the membrane (apparently an autapomorphy of *Zhengica* gen. nov. + *Ramivena*). The strongly elevated lateral margins of the head (simple, flat dorsum of head in *Ramivena*), strongly produced anterior angles of pronotum (forming a minute tubercle in *Ramivena*), abdominal ventrite III being provided with an indistinct

tumescence medially, not surpassing anterior margin of segment (with a distinct, anteriorly directed, spine-like process medially, projecting between hind or mid coxae in *Ramivena*), and ventrite VII of the male being greatly produced anteriorly, subequal in length to mesal length of ventrites III–VI combined (much shorter than mesal lengths of ventrites III–VI combined in *Ramivena*) are sufficient to recognize *Zhengica* gen. nov. as distinct from *Ramivena* at generic level.

The male genitalia exhibit a number of differences. One of them is the shape of the ventral rim of the genital capsule, which in *Ramivena* is simply emarginated, not protruding posteriorly, and the presence of a pair of superior processes [a pair of sclerites of the intersegmental membrane between segments IX and X associated with the ipsilateral paramere via ligament (Tsai 2011), termed “parandria” by Fan & Liu (2012), “dorsal processes” by Tsai (2011) or “dorsal sclerite” by Tsai & Rédei (2014); for a review of morphology and terminology see Roell *et al.* (2020)] proximally in *Ramivena*, whilst they are missing in *Zhengica* gen. nov. (in both cases the condition found in *Ramivena* is shared by all other members of the generic complex and apparently represent a symplesiomorphy for these genera). A median denticle present subapically on the ventral rim of the genital capsule of most species currently placed into *Ramivena*, but lacking in *R. zhengi* (Rider, 1998), is, however, apparently homologous with the similar structure found in *Zhengica* gen. nov. (Figs. 14, 15: dvr). The parameres are highly dissimilar in the two genera, those of *Ramivena* possess a complex crown with three projections apically, whilst those of *Zhengica cornuta* gen. nov., sp. nov. are simple, laminate (Figs. 14, 15: lp; Figs. 17, 18). A significant difference of the phallus is the presence of median penial plates [sensu Gross (1975), a pair of sclerotized thickenings derived from the proximomesal surfaces of second conjunctival processes closely associated with the aedeagus (s. str.); see also Tsai (2011) and Tsai & Rédei (2014)] in *Ramivena*, an apomorphy present in most of the related Pentatomini genera, but missing in *Zhengica* gen. nov.

Comparison with Cervicoris

The general habitus of *Cervicoris omeiensis* (Figs. 22, 23) is fairly dissimilar from that of *Zhengica cornuta* gen. nov., sp. nov. (Figs. 1–3) and species of *Ramivena*, since the former is characterized by a dense, fairly uniform dorsal punctation and colouration instead of a heterogeneous punctation and mottled pattern. Furthermore, the pair of long anteocular projections, and the simple, non-branching membranous veins easily differentiate *Cervicoris* from both of the other two genera. The weakly produced humeri in *Zhengica* gen. nov. differ from the condition found in *Cervicoris* and *Ramivena*, whilst the produced, apically notched humeri found in the latter two are more or less similar. The highly produced anterior angles of the pronotum found in *Zhengica* gen. nov. are shared only with *Cervicoris*, and although their shape is somewhat different (broadly laminate in *Zhengica* gen. nov., narrow and rather spiniform in *Cervicoris*), it is a potential synapomorphy of the two genera.

Besides those already mentioned above, the external male genitalia of *Zhengica* gen. nov. and *Cervicoris* exhibit the following additional similarities: a ventral rim not emarginate but rather transverse (*Cervicoris*) or even produced posteriorly (*Zhengica* gen. nov.) (Fig. 14: vr) between the sublateral projections; a lack of superior processes (a potential synapomorphy, since these structures are widely distributed in Pentatomidae, although there is no information available on the extent of homoplasy); a simple, apically laminate paramere lacking specialized projections (probably a symplesiomorphy within the generic complex; all other members possess morphologically more sophisticated parameres); an overall similarity of cp-I and cp-II, including a similar shape, an overall heavy sclerotization, a presence of a small proximodorsal lobe of cp-II (Figs. 19, 20: cp-IIb), and a broad divergence between cp-I and the two cp-II's in fully inflated condition (Fig. 19); and a lack of median penial plates (apparently a result of the overall strong sclerotization of cp-II; a likely synapomorphy, since median penial plates occur widely within Pentatomidae). The distinctly anteriorly produced and medially angulate anterior margin of abdominal ventrite VII is another derived character state which represents a potential synapomorphy of *Cervicoris* and *Zhengica* gen. nov. (even if the condition in *Cervicoris* does not approach the extent seen in *Zhengica* gen. nov.); members of *Ramivena* have a weakly produced and arched boundary, whilst other related genera of Pentatomini have a simple, transverse intersegmental boundary between ventrites VI and VII.

Conclusion

Zhengica gen. nov. is recognized as a relatively ancestral member of the generic complex of *Pentatoma* and relatives. Its phylogenetically closest relative is apparently *Cervicoris*; although the sister group relationship of the two genera is difficult to state with certainty, the shared synapomorphies, particularly the posteriorly produced

ventral rim of the genital capsule, the lack of superior processes, and the highly specialized aedeagus (s. str.) with strongly sclerotized cp-I and cp-II and a simultaneous lack of median penial plates make this hypothesis probable. *Ramivena* is another relatively strongly generalized genus of the clade, with certain similarities to *Zhengica* gen. nov. and *Cervicoris* (most importantly the highly similar shape of its genital capsule and the somewhat less similar overall structure of the aedeagus s. str.), but it is significantly more derived than the latter two genera, sharing a number of synapomorphies with the more highly specialized members of the group (presence of superior processes, complex, frequently bifurcate or trifurcate parameres). Accordingly, the superficially similar mottled integument of *Ramivena* and *Zhengica* gen. nov. is apparently either a homoplasy or a symplesiomorphy.

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