

Review of the genus *Madates* STRAND with the description of three new species (Heteroptera, Pentatomidae)¹

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Abstract: The pentatomid genus *Madates* STRAND is revised. Three species are described as new: *M. heissi* nov.sp., *M. parva* nov.sp., and *M. quadricarinata* nov.sp., and the single previously known species, *M. limbata* (FABRICIUS), is redescribed; thus bringing the total number of species to four. A key is provided to aid in their identification.

Key words: *Madates*, new species, Pentatomidae, Strachiini, Systematics.

Introduction

The genus *Madates* STRAND has until now contained a single species. The only known species, *M. limbata* (FABRICIUS), was originally described from Indonesia (Java), but was considered to have an extensive distribution including Indonesia, Malaysia, southeast Asia, southern China, and southern India. On studying a number of specimens from both Indonesia and south India, it became obvious that specimens from these two areas were not conspecific. Further examination of specimens revealed that there are at least four species total; the three new species are described herein.

Madates has always been considered a member of the tribe Strachiini. Its members possess the typical characters that define that tribe: ostiolar opening reduced, unattended by ostiolar ruga; evaporative area greatly reduced or obsolete; first rostral segment extending beyond posterior margins of bucculae; antennifers somewhat swollen, easily visible from above; abdominal venter unarmed; and mesosternum medially carinate. Within the tribe, this genus can be recognized by the characteristic color pattern – no other strachiine genus contains species which are black with bands and lines of yellow or orange color (Figs 2-5). Addi-

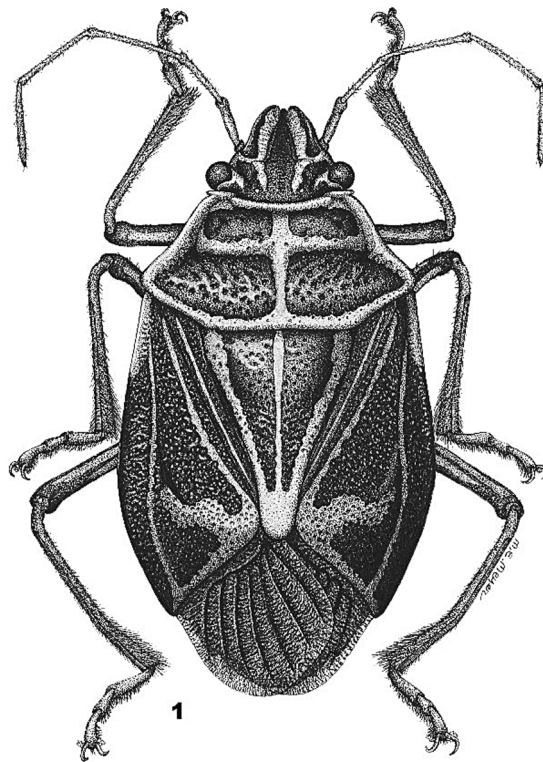
tionally, *Madates* can be recognized by the combination of characters given in the diagnosis below. All measurements (range of measured individuals with holotype in parentheses) are given in millimeters.

Material for this study was provided by a number of important institutions. They were (with the acronyms used in the text and the curator who arranged the loan):

- AMNH . . American Museum
of Natural History, R.T. Schuh.
- BMNH . . British Museum of
Natural History, M. Webb.
- BPBM . . . Bernice P. Bishop Museum,
G. Nishida.
- CASC . . . California Academy
of Sciences, N. Penny.
- DARC . . . author's collection.
- NKUM . . Nankai University, L-y. Zheng.
- UCMS . . University of Connecticut,
J. O'Donnell and C. Schaefer.
- USNM . . U.S. National Museum
of Natural History, T. Henry.
- ZMAS . . . Zoological Institute, Russian
Academy of Sciences, I. Kerzhner.
- ZMHB . . Zoologisches Museum, Humboldt
Universität Berlin, J. Deckert.
- ZMUC . . Zoological Museum, University of
Copenhagen, N. Andersen.

¹ It is with great pleasure that I dedicate this paper to Ernst Heiss, in recognition of the contributions he has made to the systematics of the Aradidae, and also on the heteropteran fauna of Europe.

Fig. 1: *Madates limbata*
(FABRICIUS).



Material

Genus *Madates* STRAND 1910

Cinxia STÅL 1862: 105. (junior homonym of *Cinxia* MEIGEN 1800, Diptera)

Datames HORVÁTH 1909: 631. (new name for *Cinxia* STÅL 1862; junior homonym of *Datames* STÅL 1875, Orthoptera)

Madates STRAND 1910: 19. (new name for *Datames* HORVÁTH 1909)

Type species: *Cimex limbata* FABRICIUS 1803, by original designation.

Diagnosis. Characteristic black coloration with series of yellow to orange lines and bands on dorsum (Figs 2-5). Head subtriangular, apex narrowly rounded, lateral margins narrowly reflexed, dorsal surface impunctate or nearly so. Anterior margin of pronotum obtusely carinate, collar-like; anterolateral margins of pronotum nearly straight, reflexed, anterior ends curving medially over lateral margins of pronotal collar. Mesosternum carinate medially. Hind femora unarmed. Scutellum subtriangular, apex narrowly rounded. Parameres bilobed, posterior lobe elongate, finger-like; anterior lobe large, roundish, bowl-shaped, posteromedial surface deeply concave, with black teeth along rim; anterior parameral lobe membranous at base, thus articulating with shaft of paramere. All genital ducts (e.g. penisfilum)

tend to be very elongate. Female spermatheca with sclerotized rod distinctly hooked apically; spermathecal bulb orbicular, without finger-like extensions.

Key to males of the species of *Madates*

1 Small species, less than 11.5 mm in length; black spot on base of each jugum continuing cephalad along lateral margin of juga distinctly beyond apex of adjacent antennifer; transverse, pale band on apical third of each hemelytron broad mesially near apex of scutellum, becoming narrower laterally (Fig. 5); transverse, depressed band on posteroventral surface of pygophore interrupted medially by low tumescence (Fig. 18) (South India)
..... *M. parva* nov.sp.

– Large species, more than 11.5 mm in length; black spot on base of each jugum usually not extending cephalad beyond apex of adjacent antennifer, in some specimens, this spot may extend forward, but only submarginally, the extreme lateral edge of each jugum is pale; transverse, pale band on apical third of each hemelytron of nearly uniform width throughout (Figs 2-4); transverse, depressed band on posteroventral surface of pygophore not interrupted medially (Figs 6, 10, 14)
2

2(1) Posterior lobe of each paramere relatively short, robust, with four longitudinal ridges, apex obtuse (Figs 15-17); superior ridge of pygophore not or only slightly produced caudad medially, production if present very broad (NE India, Myanmar)
..... *M. quadricarinata* nov.sp.

– Posterior lobe of each paramere narrower, more elongate, with three or fewer longitudinal ridges, apex spinose or nearly so (Figs 7-9, 11-13); superior ridge of pygophore produced medially, production narrow, obtusely triangular3

3(2) Posterior lobe of each paramere greatly elongate, nearly parallel sided, apex obtusely spinose (Figs 10-13); anterior half of proctiger only slightly wider than posterior half; transverse, depressed band on posteroventral surface of pygophore inter-

rupted laterally on each side by narrow ridge beginning near medial excavation in inferior ridge and running obliquely laterad (Fig. 10) (Southeast Asia)
 *M. heissi* nov.sp.

– Posterior lobe of each paramere not as elongate, sides not parallel, but tapering to spinose apex (Figs 6-9); anterior half of proctiger distinctly wider than posterior half; transverse, depressed band on posteroventral surface of pygophore uninterrupted laterally (Fig. 6) (southern China, Southeast Asia, Malaysia, Indonesia) . . .
 *M. limbata* (FABRICIUS)

***Madates limbata* (FABRICIUS 1803)**
 (Figs 1, 2, 6-9, 22-24)

Cimex limbatus FABRICIUS 1803: 176.

Strachia limbata: SPINOLA 1837: 320.

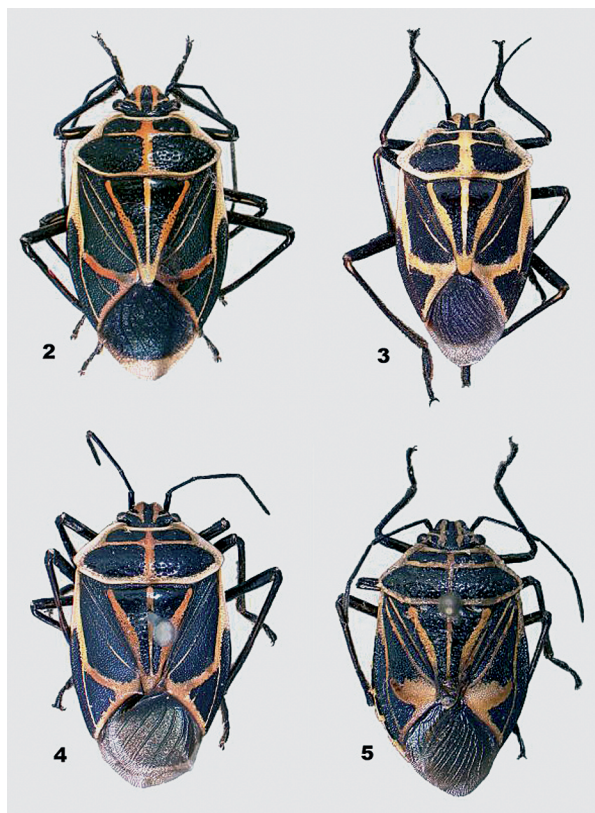
Pentatoma limbata: WESTWOOD 1837: 8.

Cinxia limbata: STÅL 1862: 105; LETHIERRY & SEVERIN 1893: 156; DISTANT 1902: 195, fig. 117; KIRKALDY 1909: 106-107; HSIAO et al. 1977: 139, fig. 447, pl. 20 fig. 290.

Madates limbatus: CHINA 1928: 190.

Redescription. Head subtriangular, lateral margins nearly straight, thinly but distinctly reflexed, reflexion slightly broader near apex. Eyes substylate, base of stalk with shallow, but distinct depressed sulcus; ocelli rather small, about six times their diameter from adjacent compound eye. Tylus slightly longer than juga, jugal apices curve mesad over apex of tylus, but not quite contiguous. Dorsal surface of head nearly impunctate, with at most a few sparse punctures on vertex, and a few oblique, transverse, wrinkles on juga; vertex slightly tumescent, rest of head rather flat, slightly elevated anterolaterad; coloration yellowish-orange except following areas black: broad, medial band including tylus, mesial margins of juga (except apically), continuing to base of head; oblong triangular spot on basal lateral margin of each jugum, each of which proceeds onto dorsal surface of adjacent antennifer; entire dorsal surface of each eye stalk, which continues mesad at an angle towards base of head, just including each ocellus; entire basal margin of head. Antennae black, segment I reaching or slightly surpassing apex of head.

Anterior pronotal margin straight to slightly concave behind head, obtusely carinate forming pronotal collar which is sepa-

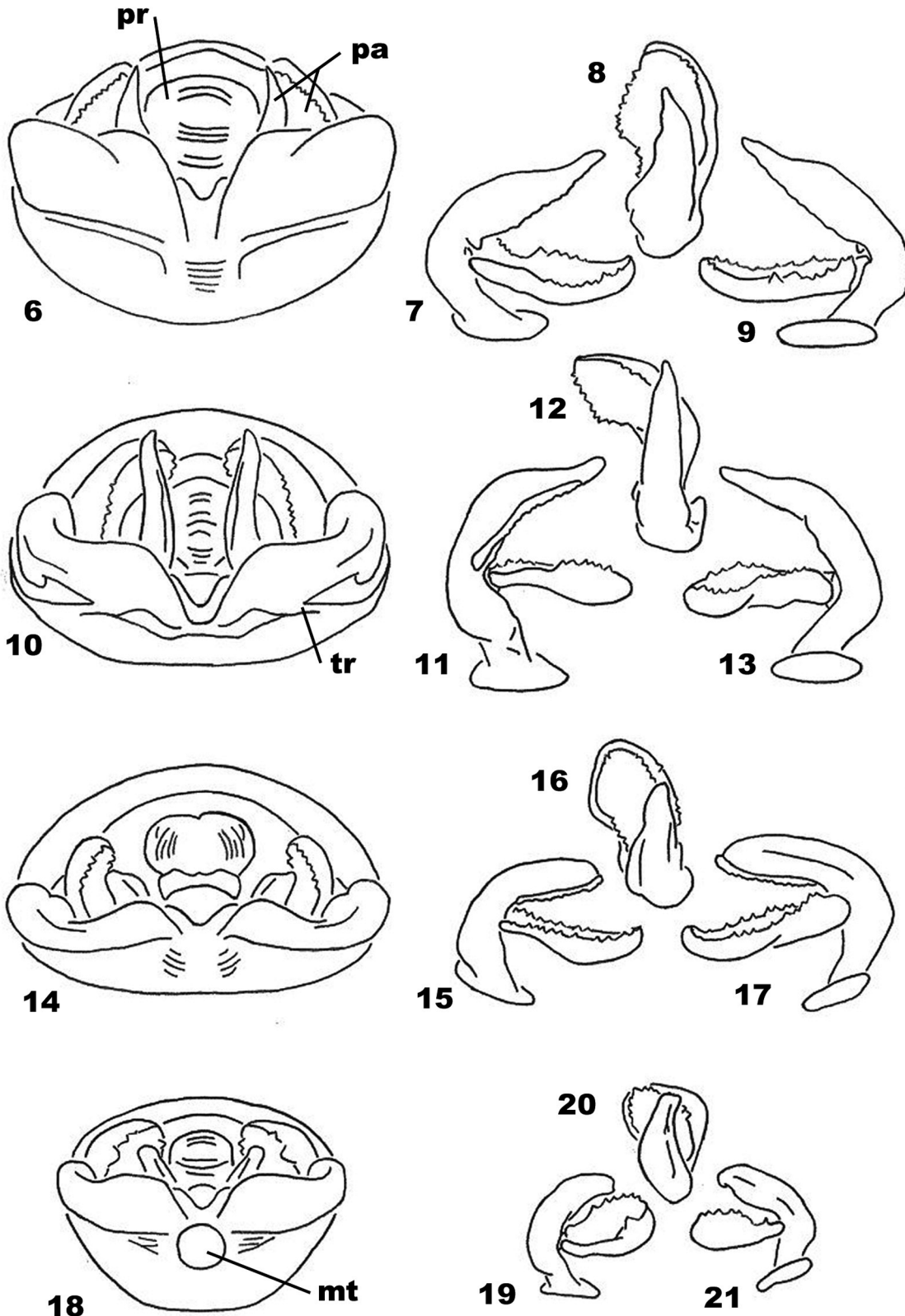


Figs 2-5: *Madates* spp.
 (2) *Madates limbata* (FABRICIUS) (3) *Madates heissi* nov.sp. (4) *Madates quadricarinata* nov.sp. (5) *Madates parva* nov.sp.

rated from pronotal disk by sharp sulcus or row of punctures; anterolateral pronotal margins nearly straight, thickly and obtusely reflexed, separated from pronotal disk by row of submarginal punctures, anteriorly curving mesad and overlapping lateral margins of pronotal collar; each anterior pronotal angle armed with minute, lateral-projecting tooth. Anterior disk of pronotum nearly impunctate, pronotal cicatrices marked by shallow depressions; posterior disk sparsely and coarsely punctate; coloration black except all margins yellow, relatively broad, longitudinal, medial yellow-orange band, and a rather narrow transverse, yellow band just behind pronotal cicatrices, thus dividing pronotal disk into four large black spots, anterior two spots smaller than posterior two; lateral margins of black spots not quite reaching row of submarginal punctures.

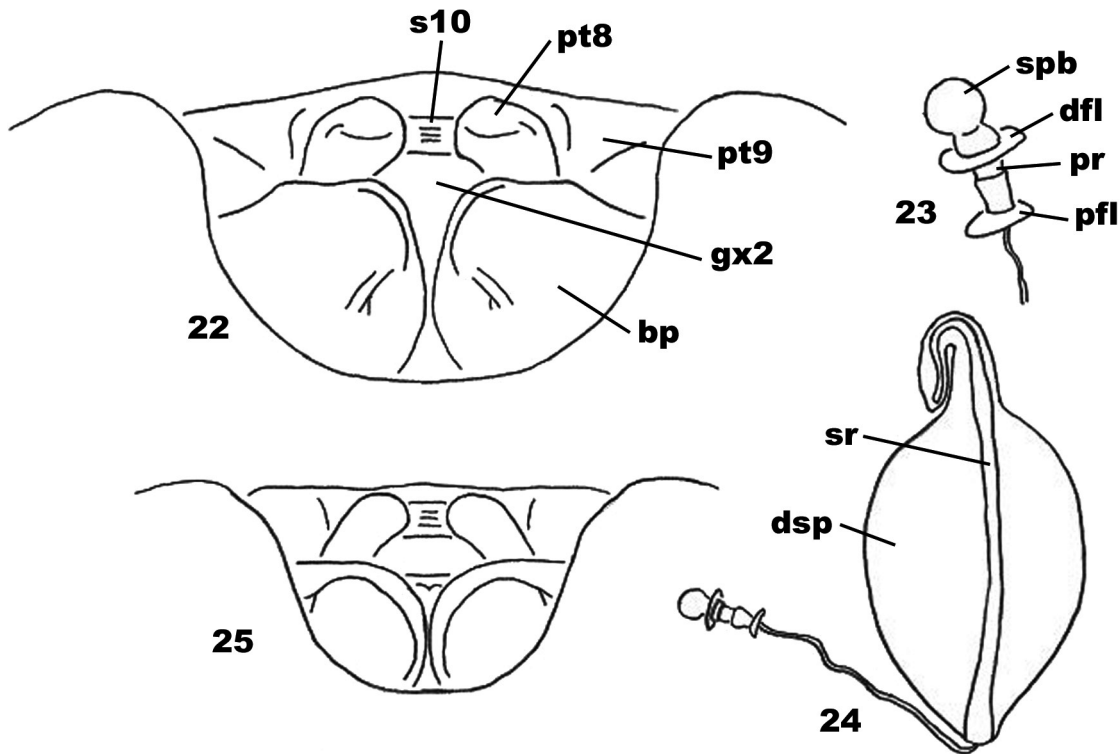
Scutellum triangular, apex narrowly rounded; basal area distinctly tumescent, impunctate or very weakly punctate, becoming more densely punctate posteriorly, apical portion of scutellar tongue impunctate. Scutellum black except narrow, longitudinal, medial, yellow line; apical half of scutellar tongue yellow; and lateral margins yellow, more broadly so near middle, and

Figs 6-21: Male genital structures (6-9) *Madates limbata* (FABRICIUS) (6) pygophore, caudal view (7-9) right paramere (7) lateral view (8) ental view (9) mesial view (10-13) *Madates heissi* nov.sp. (10) pygophore, caudal view (11-13) right paramere (11) lateral view (12) ental view (13) mesial view (14-17) *Madates quadricarinata* nov.sp. (14) pygophore, caudal view (15-17) right paramere (15) lateral view (16) ental view (17) mesial view (18-21) *Madates parva* nov.sp. (18) pygophore, caudal view (19-21) right paramere (19) lateral view (20) ental view (21) mesial view. Symbols: mt - median tumescence; pa - paramere; pr - proctiger; tr - transverse ridge.



angling slightly mediad near base so that actual lateral margin near base is narrowly black. Hemelytra more densely and uniformly punctate, except for small spot near apex of r + m vein impunctate, those on embolar area somewhat coalescent. Each cori-

um black except apical margin yellow, lateral margin for basal third yellow, this continuing at an angle as yellow band along lateral margin of r + m vein, bifurcating into very thin yellow line paralleling lateral margin, and a broader arcuate orangish band which



Figs 22-25: Female genital structures (22-24) *Madates limbata* (FABRICIUS) (22) genital plates, caudoventral view (23) spermathecal pump (24) Spermatheca (25) *Madates parva* nov.sp., genital plates, caudoventral view. Symbols: bp - basal plate; dfl - distal flange; dsp - dilation of spermatheca; gx2 - 2nd gonocoxa; pfl - proximal flange; pr - pump region; pt8 - 8th paratergite; pt9 - 9th paratergite; spb - spermathecal bulb; sr - sclerotized rod; s10 - tenth sternite.

joins with apical band near inner basal angle of corium; thin, obfuscated, yellow streaks along claval suture, and another more laterad line paralleling claval suture. Membrane fumose, hyaline distally. Connexiva completely covered by hemelytra.

Ventral surface of head impunctate, yellowish-orange, except inner surface of eye stalks black, apical margin of antennifers black, and a relatively broad band along basal margin of each buccula black. Rostrum reaching between hind coxae, segments black except ventral surface of segment I yellow, and joints between segments I and II, and II and III, brownish; segment I reaching distinctly beyond apices of bucculae. Prosternum shallowly depressed medially, bounded laterally by slightly elevated, obtuse carinae, forming V-shape, anteriorly continuing laterad as obtuse carinae along base of head; mesosternum carinate medially; metasternum relatively flat. Thoracic pleura yellow with large and small black spots, and a few weak punctures along posterior margins of each pleurite. Ostiolar opening very small, unattended by ostiolar ruga; evaporative areas limited to small finger-like band caudad of opening, and a narrow transverse band along anterior margin of each metapleuron. Legs black with more

or less distinct, longitudinal yellow streaks. Abdominal venter unarmed medially, impunctate, yellow with two series of black spots on each side, the two medial spots on segment VII fused to form single medial spot. Lateral abdominal angles rectilinear, not produced. Spiracles black, located near lateral margin of lateral series of black spots.

Posteroventral surface of pygophore separated into dorsal and ventral halves by shallow, transverse, depression, this depression not interrupted medially by tumescence, or laterally by thin oblique ridge (Fig. 6); dorsal half yellow, ventral half black, except yellow medially. Posterior margin in caudal view obtusely rounded, slightly sinuous, with medial U-shaped depression which itself has medial U-shaped emargination (Fig. 6). Posterior lobe of each paramere, elongate, not parallel-sided, tapering, with two longitudinal ridges, apex spinose (Figs 7-9); anterior lobe rather broad, slightly angulate apically, tooth near apex slightly larger than other teeth. Proctigeral surface distinctly concave, anterior margin not emarginate medially; lateral margins of anterior half expanded, anterior half of proctiger distinctly wider than posterior half. Superior ridge distinctly produced medially over base of proctiger. Basal plates

large, tumescent, nearly impunctate, black except along mesial margins, and along posterolateral angles; posterior margins transverse, slightly sinuous, mesial margins contiguous only in middle, distinctly separated basally (Fig. 22); ninth paratergites broadly rounded, curving mesad (Fig. 22), extending to or slightly beyond apex of abdomen; eighth paratergites lacking spiracles; second gonocoxae somewhat bulbous, tenth sternite flat, square. Sclerotized rod of spermatheca distinctly hooked apically (Fig. 24); spermathecal bulb rounded, orbicular, without finger-like extensions (Fig. 23).

Measurements (mm): Total length 12.14-14.55 (13.59); total width across humeri 6.60-8.15 (7.37); medial length of pronotum 2.59-3.08 (2.80). Scutellar length 4.98-5.97 (5.23); width of scutellum at base 3.74-4.93 (4.30); width at distal ends of frena 1.03-1.38 (1.34); length of scutellar tongue 1.46-1.67 (1.50). Length of head 2.12-2.43 (2.20); width across eyes 3.11-3.64 (3.44); interocellar width 0.88-1.03 (1.00); interocular width 2.14-2.43 (2.30); ocellar diameter 0.11-0.14 (0.11); distance from ocellus to adjacent eye 0.60-0.69 (0.64). Length of segments I-V of antennae 0.85-1.18 (1.00), 1.52-1.94 (1.88), 2.35-2.76 (2.69), 2.94-3.44 (3.33), and 2.82-3.05 (3.05), respectively. Length of segments I-IV of rostrum 1.19-1.35, 1.85-2.19 (1.85), 1.04-1.24 (1.24), and 1.27-1.34 (1.27), respectively.

Type material: Lectotype ♂ (here designated), a) “♂”; b) “TYPE”; c) “Sumatra Daldorff. *Cimex limbatus* Fabr.”, deposited in the British Museum (Natural History). The lectotype is in fairly good condition, the wings are slightly spread, the left antenna is missing segment V, the right middle leg and the left hind leg have only the coxa and trochanter present, the specimen has been re-pinned so there is an extra hole through left side of scutellum, glue has been applied to pin where it exits venter of thorax, thus obscuring structure of metasternum, base of abdomen slightly contorted.

Distribution: China (Yunnan), Indonesia (Java, Sumatra), Laos, Malaysia (Malaya), Myanmar, Thailand, Vietnam.

Specimens Examined: **China:** Yunnan Prov., Rui-

li Co., 24.0 N, 97.8 E (3♂♂, 2♀♀, 1?: abdomen missing, NKUM); Yunnan Prov., Jing-hong Co., Meng-long, Mang-bing, 21.5N 100.6 E (1♂, 1♀, NKUM). **Indonesia:** Java (1♀, CASC; 1♂, 2♀♀, USNM; 1♀, ZMAS; 5♀♀, ZMUC); Java, Sukabumi (1♂, ZMHB); Sumatra (1♂, 2♀♀, CASC; 1♀, ZMAS; 1♂, 4♀♀, ZMUC); Sumatra, Dolok Baroe (1♀, ZMAS); Sumatra, Ft. de Kock (1♂, 1♀, USNM); Sumatra, Ober Langkat Deli (1♂, 1♀, ZMHB); Sumatra, Palau Samosir (Lake Toba), 2°35'N 98°50'E (1♂, 1♀, DARC); Sumatra, Sandaran Agong, Lake Korinchi (1♂, BMNH); Sumatra, Suliki, Pajacombo (2♂♂, 1♀, ZMAS); Sumatra, Tapanuli (1♂, 1♀, USNM); Sumatra, Tebing-tinggi (1♂, USNM). **Laos:** Tonpheng (10♂♂, 3♀♀, BPBM); Uelcinak (1♀, BPBM); Vientiane Prov., Ban Van Eue (7♂♂, 6♀♀, BPBM; 1♂, DARC); Vientiane Prov., Gi Sion Vill., de Tha Ngone (3♂♂, 3♀♀, BPBM); Vientiane Prov., Phou Kou Khouei (1♂, BPBM); Vientiane Prov., Vientiane (1♀, DARC). **Malaya:** Perak Prov., 2km NE Tapah (1♂, 1♀, USNM); Selangor, Kuala Lumpur (1♂, BMNH; 1♀, USNM); Selangor, Ulu Kanson (1♂, BMNH); Selangor, Ulu Langat (3♂♂, 3♀♀, BPBM). **Myanmar:** Prome (1♂, BMNH), Tenasserim (1♂, BMNH). **Thailand:** Nakon Sri Tamirat, Khao duang (1♂, BMNH). **Vietnam:** (1♂, 1♀, BMNH); Haut Mekong, Pang Tiac (1♀, BMNH); Haut Mekong, Pou Hai Katoui (1♂, BMNH); Luang Prabang, Ban Na Khok (1♀, BMNH); Luang Prabang, Ko Kieng (1♀, BMNH); Luang Prabang, Muong Houoc (1♂, BMNH); Luang Prabang, Muong Kop (1♂, BMNH); Xieng Kouang (1♀, BMNH). **Unknown country:** Lipoholon (2♂♂, 2♀♀, ZMUC). **Unknown locality:** (2♂♂, 1♀, AMNH; 3♀♀, ZMAS; 1♀, ZMUC).

Comments. This is the most common and widespread species in the genus. It is larger than *M. parva* nov.sp., and differs from it and *M. quadricarinata* nov.sp. by the more elongate posterior lobe of each paramere, the apex of which is sharply spinose, or nearly so. *Madates heissi* nov.sp. has the posterior lobe of each paramere more elongate, with sides nearly parallel, the apex is only obtusely spinose. Also in *M. limbata*, the transverse, depressed area on posteroventral surface of the pygophore is uninterrupted medially or laterally; *M. parva* nov.sp. has a medial tumescence, and *M. heissi* nov.sp. has a narrow oblique ridge on each side that traverses this depressed area.

***Madates heissi* nov.sp. (Figs 3, 10-13)**

Description. Ovoid, black with yellow markings (Fig. 3).

Head subtriangular, lateral margins nearly straight, slightly reflexed, tapering anteriorly to rounded apex; juga apically curving over tylus, and almost contiguous. Eyes stylate, basal area of each eye stalk shallowly impressed. Dorsal surface of head nearly impunctate, with at most a few sparse punctures on vertex, and a few oblique, rugulose lines on juga; coloration yellow with medial, longitudinal band consisting of tylus and very narrow mesial margins of juga, a small triangular spot in front of each compound eye, and base of head including stylate eyes black; apex of each lateral triangular spot does not extend cephalad of adjacent antennifer, or it does so only submarginally. Antennae entirely black, segment I reaching slightly beyond apex of head.

Anterior margin of pronotum nearly straight to slightly concave behind head, obtusely carinate, forming distinct collar which is separated from disk of pronotum by row of deep punctures. Anterolateral pronotal margins nearly straight, distinctly reflexed, anteriorly curving mesad and over lateral margins of pronotal collar. Anterior disk of pronotum slightly tumescent medially, remainder uneven, nearly impunctate; posterior disk provided with a few shallow, coarse punctures. Dorsal surface black with all margins narrowly margined in yellow; sometimes with transverse, thin, yellow band behind pronotal calli (three of four specimens lack this transverse band), thus forming either two or four large black spots (Fig. 3).

Scutellum triangular, apex narrowly rounded, base tumescent, surface black with lateral margins pale yellow (except extreme edges black near base), apex pale yellow, and a narrow, longitudinal line pale yellow (Fig. 3). Basal area of scutellum impunctate, disc and apex shallowly and coarsely punctate. Hemelytra more densely and uniformly punctate, except small area near apex of r + m vein impunctate. Coria black with basal embolar area yellow, this band leaving margin and continuing along lateral margin of r + m vein, then curving mesad and continu-

ing to inner basal angle; apical margin also pale yellow; sometimes obscure pale yellow streak vaguely apparent along claval suture, and another more laterad paralleling claval suture (Fig. 3). Hemelytral membrane fumose, distally hyaline. Connexiva entirely yellow, completely covered by hemelytra when at rest.

Ventral surface of head yellow, except areas around compound eyes and antennifers black, and a black band running along base of bucculae, often with a thin black streak near apex of juga. Rostrum reaching between, and nearly to posterior margins of hind coxae; segment I reaching distinctly beyond apices of bucculae; all segments fuscous to black, except segment I more pale, or mottled with yellow. Prosternum slightly depressed medially with low, vague, obtuse carina on each side, forming v-shape, anterior ends continuing as distinct, obtuse carina along each anterior propleural margin; mesosternum medially carinate, somewhat tumescent on each side of carina, glabrous; metasternum flat medially, medial areas of prosternum, mesosternum, and metasternum covered with short appressed hairs. Thoracic pleura yellow with small black spots near bases of coxae, and larger black spots more laterad. Ostiolar opening small, unattended by ostiolar ruga; evaporative area reduced to small finger-like area caudad of opening, and a thin band along anterior margin of each metapleuron. Coxae brownish, rest of leg segments fuscous to black, perhaps a short obscure yellow streak visible on each femur. Abdominal venter unarmed, impunctate, with two longitudinal rows of large black spots on each side, medial pair on segment VII have fused to form single medial spot. Posterolateral abdominal angles rounded, not spinose.

Posteroventral surface of pygophore divided into dorsal and basal halves by transverse, shallow depression, this depression is interrupted laterally on each side by thin, transverse, ridge running from dorsomesad to lateroventrad (Fig. 10, tr); dorsal half yellow, ventral half may be black, but often mostly yellow with some black lateral markings. Posterior margin of pygophore obtusely rounded laterally, with medial U-shaped depressed area, this depressed area with U-

shaped medial emargination (Fig. 10). Posterior lobe of each paramere greatly elongate, nearly parallel-sided, slightly sinuous, with three longitudinal ridges, apex narrowly rounded to spinose (Figs 11-13); anterior parameral arm also somewhat elongate, rim with many small black teeth, apical tooth slightly larger. Proctiger surface distinctly concave, anterior margin not or only feebly emarginate medially; anterior and posterior halves of proctiger nearly subequal in width. Superior ridge narrowly but distinctly produced over proctiger. Female unknown.

Measurements (mm). Total length 11.90-13.53 (12.64); width across humeri 6.90-7.65 (7.46); width across abdomen 7.42-8.07 (7.52); medial length of pronotum 2.68-2.79 (2.77). Medial length of scutellum 5.25-5.46 (5.25); basal width 4.04-4.27 (4.22); width at distal end of frena 1.23-1.36 (1.36). Length of head 2.25-2.38 (2.31); width 3.12-3.28 (3.28); interocular distance 2.15-2.26 (2.26); interocellar distance 0.94-1.00 (0.96); ocellar diameter 0.10-0.11 (0.10); distance from ocellus to adjacent eye 0.59-0.64 (0.64). Length of segments I-V of antennae 1.05-1.14 (1.14), 1.59-1.78 (1.59), 2.19-2.48 (2.33), 3.09-3.16 (na), and 2.95 (na) respectively. Length of segments I-IV of rostrum 1.24-1.38 (1.26), 1.83-2.01 (1.98), 1.03-1.11 (1.03), and 1.32-1.33 (1.33) respectively.

Distribution: China (Guangdong, Yunnan), Vietnam.

Holotype: ♂, labeled a) "Tonkin. Hagiang. May 1914 R. V. de Salvaza." (BMNH). Paratypes (3♂♂): China, Guangdong Prov., Lian-xian Co., 24.7 N, 112.3 E (1♂, NKUM); China, Yunnan Prov., Long-hu (1♂, NKUM). Vietnam, 40 km N. Tai-Nguyen (1♂, ZMAS).

Etymology. This species is named in honor of Ernst Heiss, in recognition of the contributions he has made to the systematics of the Aradidae, and also on the Heteroptera fauna of Europe.

Comments. This species is most closely related to *M. limbata* as they both have rather elongate posterior lobes of the parameres which are either spinose or obtusely spinose apically. The posterior parameral lobe is more elongate in this species, with the lateral margins nearly parallel. The transverse depressed

area on the posteroventral surface of the pygophore is interrupted laterally on each side by a narrow, oblique ridge.

***Madates quadricarinata* nov.sp.**
(Figs 4, 14-17)

Description. Ovoid, black with pale yellow markings (Fig. 4).

Head subtriangular, tapering to rounded apex, lateral margins relatively straight, slightly reflexed; jugal apices converging over apex of tylus, but not contiguous; tylus slightly longer than juga. Eyes substylate, basal area of each stalk slightly depressed. Ocelli relatively small and placed rather distantly from adjacent compound eye. Dorsal surface of head nearly impunctate, with at most a few sparse punctures on vertex, and a few oblique transverse wrinkles on juga; vertex slightly convex. Dorsal surface of head black with longitudinal yellow band running down middle of each juga, stopping just short of base of head; a short oblique, transverse yellow band on each side running from jugal yellow band to lateral margin just in front of each compound eye, thus leaving small black triangle near lateral margin on each side, apex of which does not extend beyond apex of adjacent antennifer. Antennae entirely black, segment I reaching to near apex of head.

Anterior margin of pronotum concave, obtusely carinate, separated from disk of pronotum by row of deep punctures. Anterolateral pronotal margins nearly straight, reflexed, separated from disk by row of punctures; anterior pronotal angle, each with minute, laterally projected tooth. Dorsal pronotal surface black except: all margins narrowly pale yellow, a transverse pale yellow band behind pronotal calli, and a medial, longitudinal yellow band which may be slightly orangish, thus forming four black quadrate spots, posterior pair larger than anterior pair (Fig. 4); lateral margins of spots not quite reaching submarginal row of punctures. Anterior disk of pronotum impunctate, except posterior disk with a few shallow, coarse punctures.

Scutellum triangular, basal third slightly tumescent, nearly impunctate, remainder coarsely punctate, some punctures forming transverse rugose lines, apex narrowly round-

ed. Scutellum black with apex, sublateral margins (extreme lateral margins very thinly black), and a narrow longitudinal line pale yellow (Fig. 4). Surface of hemelytra more uniformly punctate except small area near apex of r + m vein impunctate. Surface of corium black except for the following pale yellow areas: embolar region from base to about middle of corium, this continuing along r + m vein and then bifurcating near apex of r + m vein, a thin streak continuing to apex of corium, and a broader band curving mesad and continuing to inner basal angle near apex of scutellum; a thin streak along claval suture, and another thin, more lateral streak parallel to claval suture; a band along apical margin of corium; and sometimes a short, thin streak from transverse band to apical margin near inner basal angle (Fig. 4). Hemelytral membranes fumose, hyaline distally. Connexiva entirely pale yellow, completely covered by hemelytra at rest.

Ventral surface of head impunctate, pale yellow with black markings around each compound eye, on and around each antennifer, and a band along base of bucculae. Rostrum reaching between or slightly beyond hind coxae, segment I reaching beyond apices of bucculae; segments II-IV fuscous to black, segment I black on dorsal two-thirds, yellow on ventral one-third (when viewed in resting position). Prosternum slightly depressed medially with low, vague, obtuse carina on each side, forming v-shape, anterior ends continuing as distinct, obtuse carina along each anterior propleural margin; mesosternum medially carinate, somewhat tumescent on each side of carina, glabrous; metasternum flat medially, medial areas of prosternum, mesosternum, and metasternum covered with short appressed hairs. Thoracic pleura yellow with large black spots laterally, those on propleura and mesopleura usually intruded medially by long yellow streak or band, also some black spots near base of coxae. Ostiolar opening reduced, unattended by ruga; evaporative areas reduced to small finger-like area caudad of opening, and an elongate, narrow band along anterior margin of meta-pleura. Coxae brown with pale areas apically, remaining leg segments black with more or less obscured yellow, longitudinal streaks. Abdominal venter unarmed medially, im-

punctate, yellow with two series of large black spots on each side, medial pair on segment VII fused into single medial black spot. Posterolateral abdominal angles rounded, not produced.

Posteroventral surface of pygophore divided into two halves by shallow, transverse depressed area, dorsal half yellow, ventral half black, except yellowish near middle, depressed area not interrupted medially by tumescence, nor laterally by oblique ridges (Fig. 14). Posterior margin of pygophore in caudal view obtusely sinuous, with medial, U-shaped depressed area, this depression also having a smaller U-shaped emargination (Fig. 14). Posterior lobe of each paramere robust, short, with four longitudinal ridges; apex obtusely rounded (Figs 15-17). Anterior lobe slightly elongate, black teeth along rim of bowl, apical tooth slightly larger than others. Proctiger surface distinctly concave, anterior margin with small U-shaped emargination medially; anterior half of proctiger expanded laterally, distinctly wider than posterior half of proctiger (Fig. 14). Superior ridge of pygophore narrowly convex over anterior margin of proctiger. Basal plates large, somewhat tumescent, inflated area black, lateral angles yellow; posterior margins transverse, slightly sinuous, mesial margins nearly contiguous except basally separated; surface near mesial margins with numerous long hairs. Ninth paratergites relatively broad, curving inwards, apices broadly rounded, protruding slightly beyond apex of abdomen; eighth paratergites lacking spiracles; posterolateral angles rounded, not produced.

Measurements (mm). Total length 11.51-13.37 (12.00); width across humeri 6.93-7.71 (6.93); width across abdomen 7.81-8.34 (7.81); medial length of pronotum 2.39-2.76 (2.39). Medial length of scutellum 4.99-5.72 (4.99); basal width 3.96-4.51 (4.21); width at distal end of frena 1.08-1.37 (1.08). Length of head 2.15-2.34 (2.15); width 3.05-3.34 (3.05); interocular width 2.01-2.25 (2.01); interocellar width 0.89-1.01 (0.89); ocellar diameter 0.12 (0.12); distance from ocellus to adjacent eye 0.53-0.65 (0.53). Length of segments I-V of antennae 0.96-1.13 (0.96), 1.70-1.82 (1.76), 2.22-2.53 (2.38), 2.72-3.03 (na), and 2.66-2.79 (na) respectively. Length

of segments I-IV of rostrum 1.15-1.38 (1.23), 1.96-2.07 (2.02), 0.94-1.09 (0.94), and 1.22-1.41 (1.27) respectively.

Distribution: northeastern India, Myanmar.

Holotype: ♂, labeled a) "Upper Burma: Nam Tamal Valley, 22.IX.1938, R. Kaulback. B.M. 1938-741."; b) "Alt. 3,000 ft. Lat. N. 27°42'. Long. E. 97°4' (BMNH). Paratypes (2♂♂, 2♀♀): **India:** Assam (1♀, ZMHB). **Myanmar:** (2♂♂, ZMAS). Bengalia, Altona L. (1♀, USNM).

Etymology. The specific name, quadricarinata, refers to the four longitudinal ridges on the posterior lobe of each paramere.

Comments. This species is somewhat isolated in the genus; its size and coloration resembles *M. limbata* and *M. heissi* nov.sp., but the shape of the paramere is similar to *M. parva* nov.sp.. It differs from *M. parva* nov.sp. by lacking the medial tumescence on the posteroventral surface of the pygophore, and from *M. heissi* nov.sp. by the lack of the lateral, narrow ridges on the same surface. The posterior lobe of the paramere is much shorter in this species than in *M. limbata*, and it has four longitudinal ridges along the shaft; all other species have three ridges or fewer.

***Madates parva* nov.sp.** (Figs 5, 18-21, 24)

Description: Ovoid, black with pale yellow markings, somewhat smaller than other *Madates* species (Fig. 5).

Head subtriangular, narrowing gradually to rounded apex, lateral margins weakly sinuous, narrowly reflexed. Eyes substylate, shallow obtuse sulcus on base of each stalk. Ocelli relatively small, and distant from adjacent eye. Tylus slightly longer than juga which are slanted upwards laterally and pinch inwards over top of tylus distally, not quite contiguous. Vertex slightly inflated, with a few weak punctures or transverse wrinkles; tylus shiny, devoid of punctures or wrinkles; juga with many transverse wrinkles, those on apical half angled forward laterally. Dorsal surface of head black with two longitudinal, pale yellow bands, one on each side of the tylus, continuing posteriorly mesad of each ocellus, not quite reaching base of head; a narrow, transverse band on

each side anterior to each compound eye, angled slightly forward, and connecting to pale band along inner margin of each compound eye. Lateral margins of juga black to near apex of head; tylus black, slightly paler near apex. Antennae entirely black, apex of segment I reaching to near apex of head.

Anterior margin of pronotum arcuately concave, obtusely carinate along anterior margin, separated from pronotal disk by row of deep punctures. Anterolateral margins slightly sinuous, obtusely carinate, separated from pronotal disk by row of punctures; anterolateral margins overlapping anterior pronotal margin; minute tooth on each anterior angle. Posterolateral and posterior margins shallowly arcuate, not reflexed. Pronotal disk black, all margins pale yellow, with median longitudinal pale yellow stripe, and a transverse pale stripe just anterior to transhumeral depressed band, thus forming four black, squarish spots, posterior pair larger than anterior pair (Fig. 5); lateral margins of black spots reaching row of punctures near anterolateral carinae. Posterior half of pronotum shallowly, yet coarsely punctate, anterior half more finely punctured medially, pronotal cicatrices impunctate.

Scutellum sharply triangular, apex narrowly rounded, basal disk tumescent. Basal area weakly punctured, becoming more thickly and finely punctured apically, except apical fourth impunctate. Scutellum black with narrow, median, longitudinal pale yellow stripe, and a pale marginal yellow band on each side, extreme lateral margins of scutellum may be thinly black (Fig. 5). Surface of coria more densely and uniformly punctate except for small impunctate area near apex of r + m vein. Coria black with pale-yellow markings as follows: narrow apical margin joining medially with relatively broad transverse band; broad transverse band reaches laterad to or near apex of r + m vein; narrow margin on basal third of each corium; very thin streak running just laterad of r + m vein which sinuously continues to apex of coria; a thin pale streak just mesad of each claval suture, and another thin streak on each side laterad of claval suture (Fig. 5). Hemelytral membrane fumose, hyaline distally. Connexiva completely covered by hemelytra at rest, pale yellow, at least three segments with large black spot in middle.

Ventral surface of head impunctate, pale-yellow except superior surface of antennifers black, thin margin of each juga black, and one or two oblong black spots along basal margin of each buccula. Rostrum reaching between metacoxae, segments III and IV black, segment II black with some pale markings ventrally, segment I yellow with narrow black apex; segment I reaching distinctly beyond apices of bucculae to base of head. Prosternum shallowly sulcate, sulcus narrow posteriorly, becoming broader anteriorly, lateral margins becoming obtusely carinate, carinae diverging and continuing along anterolateral pleural margins. Mesosternum carinate medially, somewhat tumid on each side of carina, tumid areas each with several weak, transverse striae. Metasternum relatively flat, broad, covered with short appressed hairs. Thoracic pleura yellow with two rows of black spots on each side, with a few weak punctures scattered on each pleura. Ostiole reduced, unattended by ruga; evaporative area darkened, reduced to small fingerlike area posterior to ostiolar area, and an elongate streak running along anterior margin of metapleura. Coxae dark brown basally, yellow distally; each trochanter yellow except ventral surface blackish; femora and tibiae black with yellow longitudinal streaks; tarsi black. Abdomen unarmed, lacking punctures, yellow with two series of black spots on each side. Medial spots transversely elongate, joining together on segment VII; lateral row of spots smaller, somewhat squarish, surrounding each spiracle. Posterolateral angles slightly rounded, not spinose or produced.

Posteroventral surface of pygophore divided into dorsal and ventral halves by transverse depression, depressed area interrupted medially by a small tumescence (Fig. 18, mt); ventral half black (except tumescence and surrounding area yellow), dorsal half yellow. Posterior margin of pygophore, in posteroventral view, with a small, sharply delimited, U-shaped depression medially, depressed area itself has shallow, U-shaped, medial emargination (Fig. 18). Posterior lobe of each paramere robust, with a posteromesial and a posterolateral longitudinal ridge, apex blunt with small, vague, posterolateral tooth (Figs 19-21); anterior lobe of each paramere large, shallow, bowl-like, op-

posing adjacent posterior lobe of paramere, rim of each bowl lined with small, black, blunt teeth, posterolateral tooth larger than others (Fig. 19). Proctigeral surface deeply concave, anterior margin with shallow U-shaped emargination, anterior half and posterior half subequal in width. Superior ridge of pygophore broadly yet narrowly produced over proctiger. Basal plates tumescent, mostly black except lateral and mesial margins yellowish, posterior and mesial margins arcuately rounded such that they are well-separated basally (Fig. 25). Ninth paratergites broadly finger-like, rounded apically, extending slightly beyond apex of abdomen; eighth paratergites lacking spiracles, posterolateral angles broadly rounded, not produced.

Measurements (mm). Total length 9.69-11.31 (9.69); width across humeri 5.32-6.32 (5.32); width across abdomen 5.93-6.98 (6.01); medial length of pronotum 2.11-2.50 (2.11). Medial length of scutellum 4.13-4.48 (4.14); basal width 3.17-3.83 (3.17); width at distal end of frena 0.98-1.19 (1.10). Length of head 1.94-2.13 (1.94); width 2.73-3.01 (2.73); interocular width 1.77-2.01 (1.77); interocellar width 0.79-0.90 (0.79); ocellar diameter 0.09-0.10 (0.90); distance from ocellus to adjacent eye 0.45-0.55 (0.45). Length of segments I-V of antennae 0.75-0.86 (0.75), 1.10-1.17 (1.14), 1.48-1.64 (1.48), 1.92-2.14 (1.92), and 2.12-2.32 (2.12) respectively. Length of segments I-IV of rostrum 0.99-1.07 (0.99), 1.51-1.66 (1.51), 0.75-0.79 (0.79), and 0.94-1.00 (0.94) respectively.

Distribution: southern India.

Holotype: ♂, labeled a) "South India, Anamalai Hills, Cinchona, 3500 ft., May 1956, P. Sussi Nathan, Collector"; b) "J C Lutz Collection 1961" (USNM). Paratypes: 74♂♂, 61♀♀. India, Kerala State, Thklady (1♂, UCMS). India, Madras State, Animalai Hills, Cinchona, (21♂♂, 23♀♀, AMNH; 1♂, BMNH; 7♂♂, 7♀♀, BPBM; 40♂♂, 28♀♀, CASC; 1♂, 1♀, DARC; 1♂, UCMS; 1♂, 2♀♀, USNM).

Etymology. The specific name, *parva*, refers to the fact that this species tends to be smaller in size than the other three species of *Madates*.

Comments: All four species of *Madates* are very similar in coloration, yet several

color characters seem to be constant enough to serve for the separation of this species. It is the only species to have the black lateral markings on the head continuing forward along the lateral margins to near apex of head. The broad transverse pale band on the apical half of each corium, the medial tumescence on the posteroventral surface of the pygophore, and the shape of the parameres are also diagnostic.

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Zusammenfassung

Die Pentatomidengattung *Madates* STRAND wird revidiert. Drei Arten werden neu beschrieben, *M. heissi* nov.sp., *M. parva* nov.sp. und *M. quadricarinata* nov.sp., und die einzige bisher bekannte Art, *M. limbata* (FABRICIUS) wird wieder beschrieben. Somit sind vier Arten in der Gattung bekannt. Ein Bestimmungsschlüssel zur Unterscheidung der Arten wird präsentiert.

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