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The Indo-Australian species of the Zuphiine genus Agastus Schmidt-Göbel

(Insecta, Coleoptera, Carabidae)

By **Martin Baehr**

Zoologische Staatssammlung München

Abstract

The Indo-Australian species of the Zuphiine genus *Agastus* Schm.-G. are revised and compared in a key. *Agastus biseriatus* spec. nov. from Borneo is newly described. The supposed relations of the four known species are described in a cladogram. Phylogenetic status and distribution of species point to a relatively recent eastward migration within the eastern section of the genus range, with subsequent evolution of new species in Indonesia and in New Guinea. As a consequence, the most derived species occurs today at the southeastern border of the range. The eastwards migration within the eastern areal of the genus and the occurrence of the most generalized species as far west as India leads to the assumption, that the genus originated presumably in tropical Africa and immigrated into South Asia.

Introduction

The Zuphiine genus *Agastus* Schm.-G. has a curious history. Schmidt-Göbel erected the genus 1846 for his species *A. lineatus* Schm.-G. from southern Asia. 1875 a second species, *A. ustulatus* Gestro, from Malaysia and Indonesia was added. Both species are so far known from very few specimens. As late as 1931 described Alluaud his *Patrizia zuphioides* from tropical Africa, on which species Basilewsky (1953) erected a new tribe Patriziini within Zuphiinae. Since that time several species have been described from Africa, all under the generic name *Patrizia*. Only 1972 Mateu observed, that *Agastus* and *Patrizia* are congeneric, thus, *Patrizia* is a younger synonym of *Agastus*. This opinion was confirmed by comparison of the material before me. Strange enough, *Agastus* was classed by Jedlicka (1963) within subfamily Lebiinae and placed to Cymindina.

Meanwhile the tribe Patriziini was extended (Basilewsky 1962) to include a large part of Zuphiinae (Reichardt 1971, 1972, 1977; Mateu 1982). Baehr (1985a), however, suggested, that the character used for distinguishing by Basilewsky (1962) is not so distinct, that it can be used for definition of a tribe. Baehr (1985b) described also an additional species from New Guinea, thus, the genus ranges now over the whole Old World tropics with exception of north Australia.

The very recent discovery of most species is evidence of the rarity of *Agastus* species in their environment or of their occurrence in very specialized habitats. Actually, nothing is known on their habits. Baehr (1985b) draw attention to the huge, glandular apical segments of their maxillary palpi and thought it possible, that these beetles live in ants or termites nests, with the consequence, that they are collected only sporadic when flying to light. The increasing use of light traps in last years could also account for the increasing number of species discovered. However, at present species of *Agastus* are rarities in the collections throughout the world.

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Since an additional new species has been discovered in the material received for comparison from British Museum (Nat. Hist.), the Indo-Australian species of genus *Agastus* are here treated comprehensively.

Acknowledgements

For kind loan of types and of specimens for comparison I sincerely thank following persons: Dr. F. Hieke (Berlin), Mr. G. Kibby (London), Dr. G. Scherer (München), Dr. N. E. Stork (London), Mr. T. A. Weir (Canberra).

Abbreviations of collections cited in text

ANIC – Australian National Insect Collection, Canberra
BM – British Museum (Natural History), London
MCSN – Museo Civico di Storia Naturale, Genova
MNB – Museum für Naturkunde, Berlin

Measurements

Some measurements are presented in Tab. 1. Body length has been measured from apex of labrum to tip of elytra at their longest part. Measurements were made with a stereomicroscope using an ocular micrometer with up to 160× magnification.

Characters

Since ♂♂ of most Indo-Australian species are so far unknown, structure of aedeagus can be not used at present as diagnostic character. Most useful characters include: Body shape, relative size of eyes, shape and length of antennae, shape of pronotum, length and density of pilosity, and to some extent also pattern and colour.

Classification

Tribe Patriziini of subfamily Zuphiinae

Patriziini Basilewsky, 1953, p. 266
Basilewsky 1962, p. 107
Reichardt 1971, p. 86; 1972, p. 266; 1977, p. 448
Mateu 1972, p. 50; 1982, p. 45
Baehr 1984, p. 117; 1985b, p. 224

Type genus: *Agastus* Schmidt-Göbel

Genus Agastus Schmidt-Göbel

Agastus Schmidt-Göbel, 1846, p. 31
Lacordaire 1954, p. 87
Gestro 1875, p. 867
Bates 1889, p. 280; 1892, p. 388
Andrewes 1923, p. 10

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Csiki 1932, p. 1567
Jedlicka 1963, p. 451
Mateu 1972, p. 49; 1982, p. 45
Reichardt 1972, p. 265
Baehr 1984, p. 117; 1985b, p. 224

Type species: *Agastus lineatus* Schmidt-Göbel

Diagnosis: Head large, square behind, "neck" distinct, narrow. Posterior supraorbital seta far removed from eye, near hind border of head. Mentum with unidentate tooth. Glossa elongate, apically square, bisetose. Paraglossae membraneous, short, tied to glossa. Lacinia bristled. Labial palpus small, acute, maxillary palpus very large, terminal segment huge, apex square. Antennae moniliform. 1st segment densely pilose, with a long tactile seta. Pronotum cordate, base laterally excised. Anterior lateral seta situated directly behind anterior angles, posterior seta at posterior angles. Elytra elongate, parallel. Shoulders produced. Apex rounded, drawn in to suture. 1st to 7th intervals ridge-shaped, much narrower than striae. Whole body yellowish pilose. Colour yellowish to brown. All species winged.

Tab. 1. Some measurements and indices of Indo-Australian species of genus *Agastus*. N: number of specimens measured, 1: length; 2: ratio length/width of elytra; 3: ratio length/width of pronotum; 4: ratio width of pronotum at widest part/width of pronotum at posterior angles; 5: ratio width of head/width of pronotum; 6: ratio width of elytra/width of pronotum; 7: ratio length of temples/length of eye; 8: ratio length/width of 6th antennal segment; 9: ratio length of antenna/length of body.

	N	1	2	3	4	5
A. lineatus	10	4.48–4.85	1.62–1.7	1.04–1.08	1.24–1.32	0.95–1.01
A. lineatus (Celebes)	1	4.24	1.48	1.06	1.21	0.99
A. ustulatus	3	4.12–4.28	1.78–1.86	1.09–1.16	1.3–1.32	0.99–1.03
A. hirsutus	1	4.84	1.6	1.06	1.29	0.94
A. biseriatus	1	4.4	1.67	1.06	1.37	0.97

	N	6	7	8	9
A. lineatus	10	1.64–1.7	0.9–1.1	1.1–1.15	0.45–0.5
A. lineatus (Celebes)	1	1.79	1.14	1.05	0.46
A. ustulatus	3	1.48–1.54	1.22–1.27	0.93–0.95	0.43–0.45
A. hirsutus	1	1.59	1.29	0.91	0.43
A. biseriatus	1	1.73	1.04	1	0.46

Key to Indo-Australian species of genus Agastus

1. Smaller, less than 4.4 mm long. Body narrow, elongate, ratio length/width of elytra 1.8 or more. Pronotum considerably longer than wide, ratio length/width over 1.1. Dark pattern conspicuous, especially at apex of elytra. Pilosity very dense and short, regular, depressed. Hairs on elytra shorter than width of a stria. Puncture very fine. ..... *ustulatus* Gestro

– Generally larger, mostly over 4.5 mm long. Wider, ratio length/width of elytra less than 1.7. Pronotum just slightly longer than wide. Pattern indistinct, each elytron with an elongate, vague, light spot. Pilosity longer, less dense and regular, on elytra partly erected. Hairs on elytra generally longer than width of a stria. Puncture moderate to coarse. ..... 2.

2. Eyes considerably smaller than temples, ratio length of temples/length of eyes about 1.3. Lateral border of pronotum in front of posterior angles not regularly sinuate, strongly serrate. Posterior angles hook-shaped, projecting anteriorly. Terminal antennal segments considerably wider than long, ratio length/width about 0.8. Pilosity of surface long, hirsute, hairs on elytra considerably longer than width of a stria. ..... *hirsutus* Baehr

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– Eyes about as long as temples or still longer, ratio length of temples/length of eyes 0.88–1.15. Lateral border of pronotum regularly rounded, posterior angles not hook-shaped, nor projecting anteriorly. Border less serrate. Terminal antennal segments as long as wide, or longer. Pilosity shorter, hairs not much longer than width of a stria. . . . . 3.

3. Hind border of head square, temples straight. Pronotum not strongly convex in middle, less strongly cordate, at posterior angles far narrower than at widest part. Pilosity on elytra irregular, rather elongate. Striae pilose at bottom. . . . . *lineatus* Schmidt-Göbel

– Hind border of head rather convex, temples narrowed and slightly rounded. Pronotum strongly convex in middle, strongly cordate, at posterior angles nearly as wide as at widest part. Pilosity of elytra regular, biseriate, a row of hairs each laterally of each interval. Striae without additional hairs at bottom. . . *biseriatus* spec. nov.

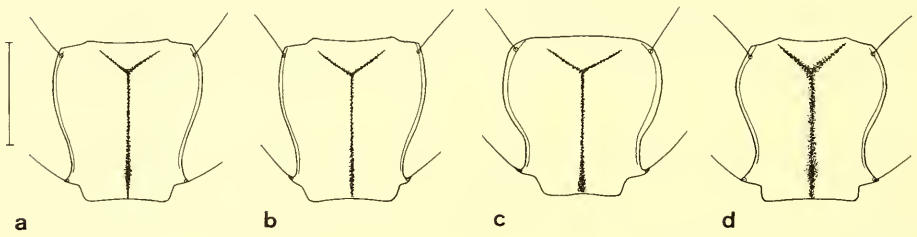

Fig. 1. Pronotum. a. *Agastus lineatus* Schmidt-Göbel; b. *A. ustulatus* Gestro; c. *A. hirsutus* Baehr; d. *A. biseriatus* spec. nov. Scale: 0.5 mm.

Agastus lineatus Schmidt-Göbel, 1846
(Fig. 1 a)

Schmidt-Göbel, 1846, p. 31
Lacordaire 1854, p. 87
Gestro 1875, p. 867
Bates 1889, p. 280; 1892, p. 388
Andrewes 1923, p. 10
Csiki 1932, p. 1567
Jedlicka 1963, p. 452
Mateu 1972, p. 49
Baehr 1985b, p. 226

Types: The holotype is located in the Museum Prague. According to Andrewes (1923) and Jedlicka (1963) it is badly damaged. Both authors, however, examined the type. There was a specimen before me labelled "Compared with type, H. E. Andrewes" (BM).

Type locality: "Birma".

Diagnosis: A rather large, wide species with large eyes, long antennae, moderately long, irregular pilosity, and rather wide, regularly sinuate pronotum.

Description

Length: 4.3–4.85 mm, width: 1.3–1.4 mm. Colour light brown, some individuals with a very vague, elongate, light spot on each elytron. Legs, mouthparts, and antennae slightly lighter.

Head wide, square, temples straight, only the very posterior angle rounded off. Eyes large, somewhat smaller to slightly larger than temples. Antennae nearly half as long as body, median and terminal segments clearly longer than wide. Pilosity rather long.

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Korrigierte Tabelle – Bitte in Spixiana 9 (3), Pagina 320, einfügen!

Tabelle 2. – Merkmalsvergleich der erarbeiteten taxonomischen Gliederung des *L. danfordi*-Komplexes.

Tabelle 2 a

	Anzahl der untersuchten Tiere	Pileus $\frac{B}{L} \times 100$ bei	$\frac{1.\ Supratemporale}{Parietale} \times 100$		Temporalia	$\frac{Massetericum\ \varnothing}{Parietale} \times 100$		Dorsalia-Index	Gularia
			♂♂	♀♀		♂♂	♀♀		
	n	KRL ≧ 60 mm	x̄	x̄	x̄	x̄	x̄	x̄	x̄
Lacerta danfordi (Verband „C“)	151	43 – 46,7 – 50	24 – 40,7 – 57	24 – 39,9 – 51	7 – 9,7 – 12	10 – 18,3 – 31	11 – 18,4 – 30	100 – 126,1 – 159	22 – 25,7 – 32
L. d. danfordi	65	43 – 46,9 – 50	34 – 42,7 – 57	29 – 42,1 – 49	7 – 9,5 – 12	10 – 18,5 – 31	13 – 20,2 – 30	100 – 125,3 – 152	22 – 25,9 – 32
L. d. bileki	86	44 – 46,5 – 50	24 – 38,7 – 52	24 – 38,4 – 51	7 – 9,8 – 12	11 – 18,2 – 30	11 – 17,1 – 26	108 – 126,8 – 147	23 – 25,4 – 29
Lacerta oertzeni (Verband „B“)	318	43 – 46,6 – 50	21 – 43,4 – 64	21 – 42,6 – 43	8 – 11,8 – 15	7 – 15,1 – 29	6 – 14,8 – 26	105 – 132,4 – 159	21 – 26,9 – 31
L. o. oertzeni	36	45 – 47,4 – 50	37 – 45,1 – 52	40 – 45,6 – 54	10 – 12,3 – 15	5 – 14,2 – 25	9 – 13,2 – 18	114 – 128,8 – 151	26 – 29,2 – 31
L. o. pelasgiana	119	43 – 46,3 – 50	33 – 46,4 – 64	33 – 46,8 – 55	9 – 12,3 – 15	7 – 15,2 – 27	6 – 14,8 – 26	114 – 130,1 – 152	23 – 26,8 – 31
L. o. budaki	51	43 – 46,1 – 50	41 – 48,6 – 57	38 – 44,3 – 50	8 – 10,9 – 13	11 – 20,4 – 29	10 – 20,2 – 26	105 – 123,6 – 142	23 – 25,9 – 30
L. o. finikensis	16	44 – 45,6 – 47	32 – 36,8 – 39	27 – 38,5 – 49	9 – 11,4 – 14	11 – 18,8 – 28	11 – 13,2 – 15	120 – 133,4 – 146	24 – 27,3 – 29
L. o. ibrahimi	96	44 – 47,1 – 50	21 – 38,9 – 51	21 – 35,4 – 51	8 – 11,5 – 15	7 – 13,2 – 26	7 – 14,0 – 22	115 – 138,9 – 159	21 – 26,2 – 30
Lacerta anatolica (Verband „A“)	67	41 – 45,4 – 51	31 – 45,4 – 55	42 – 38,3 – 50	7 – 10,7 – 13	8 – 13,9 – 26	8 – 11,8 – 18	118 – 122,0 – 147	21 – 25,4 – 30
L. a. anatolica	62	41 – 45,4 – 48	31 – 41,0 – 49	25 – 38,1 – 45	7 – 10,7 – 13	8 – 14,0 – 26	8 – 11,6 – 14	105 – 121,7 – 147	23 – 25,5 – 30
L. anatolica aegaea	5	46 – 48,3 – 51	47 – 50,5 – 55	42 – 45,3 – 50	9 – 10,6 – 12	12 – 12,5 – 13	12 – 15,5 – 18	118 – 126,4 – 140	21 – 24,0 – 26

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Pronotum (Fig. 1a) nearly as wide as long, not very convex in middle, anteriorly slightly curved. Anterior angles obtuse, apex laterally oblique. Lateral border in front of posterior angles not strongly sinuate, posterior angles acute, but not projecting anteriorly. Sinuosity regular. Lateral border just slightly serrate. Pilosity irregular, rather erect.

Elytra rather wide, posteriorly slightly enlarged, about $1^2/_3\times$ as long as wide. Puncture moderate. Ridge-shaped intervals not grooved laterally by puncture. Pilosity rather long, irregular, partly erect, partly depressed. Hairs slightly longer than width of a stria. Striae pilose at bottom.

Aedeagus: Unknown, all specimens at hand are ♀♀.

Variation: Rather variable in size and proportions. There is a very small individual with wide elytra before me (MB) which bears a hand-written label "*Agastus celebensis* Chaud.", presumably written by Chaudoir himself, but no locality label. If this individual comes actually from Celebes, the known range of the species would be considerably extended. As can be seen from tab. 1, some proportions of this specimen do not fall within the variation range of the other specimens of *A. lineatus*. This may indicate, that a new taxon is evolving at southeastern border of the range of *A. lineatus*.

Distribution: According to literature (Gestro 1875, Andrewes 1923, Csiki 1932, Mateu 1972) and to the material at hand: India, Burma, Thailand, Cambodja, Vietnam, Philippines, Java, and perhaps Celebes.

Material examined (11):

India: 1♀, India, Nevieson Coll 1918–14, H. E. Andrewes det. (BM).

Thailand: 1♀, NO Thailand, Khon Koen, 23.i.1981, Lux, leg. Saowakoutha (MNB), 2♀♀, same locality, 25. II. 1981 (MNB).

Cambodja: 1♀, Kompang Kedey, July 1914, R. V. de Salvaza (BM).

Philippines: 1♀, Philipp. Islands, Semper, *Agastus lineatus* Sch. Göb. compared with type H. E. A. (BM), 1♀, Puerto Princeso, Paragua 6/80 (Andr. Coll) (BM).

Java: 1♀, G. Kawi, Java, Drescher 8.1919 (BM).

Without locality: 1♀, (MNB), 1♀, "*costatulus* CHD." (MNB), 1♀, "bought from Janson 1918, "*Agastus celebensis* Chaud.", H. E. Andrewes Coll. (BM).

Agastus ustulatus Gestro, 1875
(Fig. 1b)

Gestro, 1875, p. 867
Mateu 1972, p. 49
Baehr 1985b, p. 226

Types: The holotype is located in the MCSN. It was not compared, but a specimen was before me labelled "compared with type, H. E. Andrewes" (BM). Because the species is well recognizable from description, comparing of holotype was not needed.

Type locality: Singapore.

Diagnosis: A small, elongate, slender species with small eyes, characterized by its distinctive dark apex of elytra and its regular, short pilosity.

Description

Length: 4.1–4.3 mm, width: 1.28–1.32 mm. Colour reddish-brown, apex of elytra darkened. Antennae, mouthparts, and legs yellowish.

Head wide, square, temples straigth, only the extreme tip of posterior angles rounded off. Eyes considerably shorter than temples. Antennae less than half of length of body. Median and terminal segments clearly wider than long. Pilosity of surface rather short and dense.

Pronotum (Fig. 1b) rather narrow, distinctly longer than wide, moderately convex. Anteriorly just slightly curved. Anterior angles obtuse, about 95°, apex laterally oblique. Sinuosity in front of poste-

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rior angles rather shallow, regular. Posterior angles acute, somewhat hook-shaped, slightly produced anteriorly. Hind border of posterior angles very oblique. Sides of pronotum rather strongly serrate. Puncture fine, pilosity very short, regular.

Elytra elongate, narrow, parallel, ratio length/width about 1.8 or more. Shoulders strongly produced. Puncture fine, ridgeshaped intervals not grooved laterally. Pilosity dense, regular, very short, depressed. Hairs shorter than width of a stria. Striae pilose at bottom.

Aedeagus: Unknown, all specimens are ♀♀.

Variation: Little, judging from material at hand.

Distribution: According to literature (Gestro 1875, Csiki 1923, Mateu 1972) and to material at hand: Malaysia (Singapore), Sumatra, Borneo.

Material examined (3):

1♀, S. pore 897 E, *Agastus ustulatus* (over) Gestro, Compared with type, compared by Gestro (written by Andrewes) (BM). 1 (presumably ♀), Sumatra, Manna, M. Knappert, Coll. Dr. W. J. Veth. Det. H. E. Andrewes (BM). 1♀, N. Borneo, Brettotan NR. Sandalean, 2. VIII. 1927, H. E. Andrewes det. (BM).

Agastus hirsutus Baehr, 1985
(Fig. 1 c)

Baehr, 1985 b, p. 224

Holotype: ♀, Papua New Guinea, Western Distr., 1 m s. of Morehead, 29. VIII. 1970, Key & Balderson (ANIC).

Type locality: Morehead, Papua New Guinea.

Diagnosis: A large, wide species with small eyes, very short antennae, and very long, hirsute pilosity.

Description

For detailed description see Baehr (1985 b). Only some most important characters are noted.

Length: 4.84 mm, width: 1.6 mm. Colour dark reddish-brown, antennae, mouthparts, and legs lighter. Puncture on whole surface coarse, pilosity very long, hirsute. Head square, temples straight. Eyes small, antennae short, terminal segments considerably wider than long. Pronotum wide, anterior angles rounded off, not obtuse, nor apex laterally oblique. Posterior angles hook-shaped, strongly produced anteriorly. Lateral sinuosity rather irregular, sides strongly serrate. Elytra rather wide, shoulders less produced. Ridge-shaped intervals laterally grooved by coarse puncture. Pilosity very long, but rather sparse, striae pilose at bottom. Hairs considerably longer than width of a stria.

Aedeagus: Unknown, holotype is a ♀.

Variation: Unknown.

Distribution: New Guinea.

Material examined (1): Only holotype.

Agastus biseriatus spec. nov.
(Figs. 1 d, 2–4)

Holotype: ♂, Riom Kanan, Martapoera. Z. O. Borneo, Doherty VI.–VII. bought from Janson 1918. H. E. Andrewes Coll. B. M. 1945–97, *Agastus* sp. (BM).

Type locality: Riam Kanan, Borneo.

Diagnosis: Easily distinguished by head posteriorly rounded off, pronotum cordate, convex, with strongly projecting posterior angles, and by biseriate pilosity of elytra.

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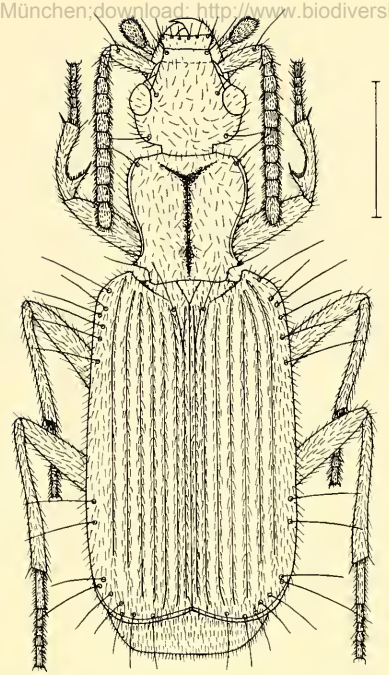

Fig. 2. *Agastus biseriatus* spec. nov., ♂ holotype (BM). Scale: 1 mm.

Description

Length: 4.4 mm, width: 1.35 mm. Colour brown. Clypeus and labrum, apex, base, and sides of pronotum, and a vague, elongate spot on each elytron yellowish-brownish. Epipleurae of pronotum and elytra, antennae, mouthparts, and legs yellow.

Head about as wide as pronotum, posteriorly rather widely rounded off, temples narrowed, slightly convex. Eyes as long as temples, laterally projecting. Antennae short, median and terminal segments about as long as wide.

Pronotum (Fig. 1 d) remarkably convex in middle, median line and anterior sulcus deeply impressed. Sides strongly sinuate, strongly curved to anterior angles which are obtuse. Apex laterally oblique. Sinuosity in front of posterior angles deep, regular, angles strongly projecting laterally, but not produced anteriorly, nor hook-shaped. Hind border of posterior angles not very oblique, hind border meets lateral parts of base in a nearly right angle. Lateral border rather finely serrate. Pronotum at posterior angles nearly as wide as at widest part. Puncture moderate, pilosity rather short, erect.

Elytra moderately elongate, slightly widened posteriorly. Shoulders strongly produced. Puncture fine, ridge-shaped intervals laterally not grooved. Pilosity regular, biseriate, one row of hairs each side laterally of 2nd – 7th interval. Pilosity rather short and depressed. Striae not pilose at bottom. Hairs about as long as width of a stria. The holotype bears a protuberance between 5th interval and lateral border of right elytron.

Legs: ♂ anterior tarsus not widened, nor perceptibly clothed with adhesive hairs.

Aedeagus (Fig. 4) small, weakly sclerotized, rather elongate, dorsally curved. Orificium large, extending nearly over whole ventral surface. At apex two slightly stronger sclerotized lamellae. Inner sac large. Left paramere large, apex widely rounded off, right paramere much smaller.

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Variation: Unknown.

Distribution: Borneo.

Material examined (1): Only holotype.

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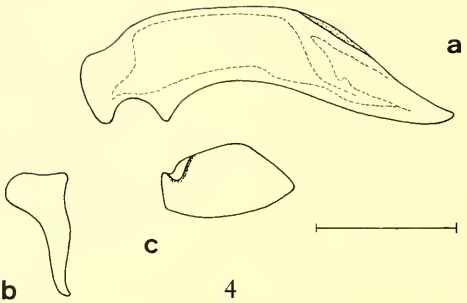

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Fig. 3. *Agastus biseriatus* spec. nov., lower side of head. Scale: 0.5 mm.

Fig. 4. *Agastus biseriatus* spec. nov., aedeagus. a. left side; b. right paramere; c. left paramere. Scale: 0.25 mm.

Discussion

Phylogenetic relations of the Indo-Australian species of genus *Agastus*.

Species of the genus *Agastus* are at present very rare beetles. Therefore, very few can be said about distribution or even on faunal history of the genus, especially, because absolutely nothing is known on habits or life histories of the species. With regard to present knowledge, the genus is distributed over whole tropical Africa, as well as over the Indo-Australian region from India to New Guinea. So far studied, the African species do not seem to differ so much from the Indo-Australian species, as to justify a division into species-groups or even subgenera. Therefore, it is at present impossible, to establish any founded phylogenetic relations between the species of the two zoogeographical regions. We do not know, if the genus originated in Africa or in the Oriental region, nor we know the direction, in which the genus spreaded.

However, I shall trace the phylogenetic relations of the Indo-Australian species, although this is a rather speculative scope with respect to the most unsatisfactory knowledge of species and of the systematic relation of the genus as a whole. There are some characters, which are differing in the Indo-Australian species, the supposed character state is treated below. Fig. 5 shows the distribution of character states within the species. Because comparison of characters beyond genus *Agastus* is at present not possible, apomorphic state cannot be fixed with certainty in some characters. Moreover, in several characters convergent evolution is possible, such characters can be used only with precaution.

Characters used and their supposed phylogenetic state:

1. Narrow, parallel body shape – presumably apomorphic. Most other Zuphiines are rather wide and have posteriorly enlarged elytra.
2. Head posteriorly square – apomorphic by comparison with other generalized Zuphiines.
3. Eyes small – perhaps apomorphic, because reduction of eyes is a general trend within Zuphiines.
4. Shortening and widening of antennae – apomorphic, presumably related to cryptic or myrmecophilous habits. Perhaps convergent within *Agastus*.

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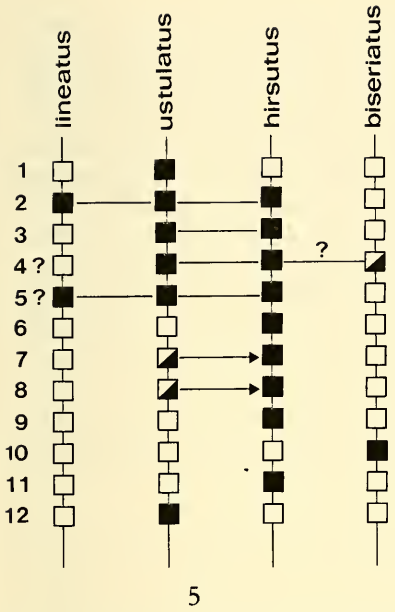

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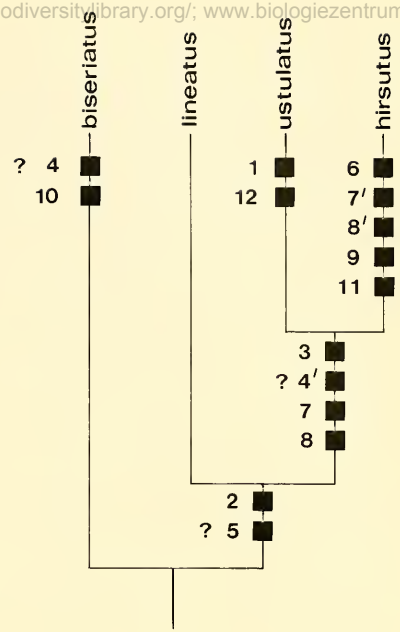

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Fig. 5. Distribution of character states within Indo-Australian species of genus *Agastus*. □ : plesiomorphic state; ■ : apomorphic state; ◪ : less strongly apomorphic state. ?: character state not certain or convergent origin possible.

Fig. 6. Cladogram of the Indo-Australian species of genus *Agastus*. Only apomorphic characters noted. 4', 7', 8': strong apomorphic state, end of a morphocline. ?: character state not certain or convergent origin possible.

5. Less cordate pronotum – perhaps apomorphic by comparison with other generalized Zuphiines, but "Leserichtung" of character transformation rather uncertain.
6. Irregular lateral border of pronotum – apomorphic, special character.
7. Strongly serrate lateral border of pronotum – presumably apomorphic by comparison. Special character.
8. Hook-shaped, produced posterior angles of pronotum – presumably apomorphic by comparison with other generalized Zuphiines. Special character.
9. Elongate, hirsute pilosity of surface – presumably apomorphic.
10. Regular, biseriate pilosity of elytra – apomorphic, special character.
11. Coarse puncture of elytra, intervals laterally grooved – perhaps apomorphic, special character.
12. Distinct elytral pattern – perhaps apomorphic by comparison with other generalized Zuphiines.

In Fig. 6 the supposed phylogenetic relations of the species are listed in form of a cladogram. It can be seen, even with respect to the reservations mentioned above, that *A. ustulatus* and *A. hirsutus* are perhaps next related. At the same time they possess most autapomorphic characters. Autapomorphic characters can be also attributed to *A. biseriatus*, but this is so far not possible with respect to *A. lineatus*. This means in other words, that *A. lineatus* should be considered the most generalized Indo-Australian *Agastus* species, while *A. hirsutus* ist presumably the most derived species.

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Zoogeographical conclusions

When describing the distribution of the Indo-Australian species of *Agastus*, the insufficient knowledge should be kept in mind. *A. lineatus* has by far the widest range of all Indo-Australian species, it is distributed over the whole area from India to the Philippines and to Java, and perhaps even to Celebes. In that last island the species occurs possibly in a different taxon, perhaps in a subspecies. The other species have by far more limited ranges. *A. ustulatus* occurs in (southern) Malaysia, Sumatra, and Borneo. *A. biseriatus* is so far known from Borneo, and *A. hirsutus* only from New Guinea. The Indomalaysian region seems to represent an evolutionary centre, where three of the four known species occur, including the most generalized species *A. lineatus*. Only the most derived *A. hirsutus* ist lacking from this area and it is only found at the southeastern border of the whole genus range. In the westernmost part of the Indo-Australian part of the genus range, on the other hand, only the most generalized species occurs, moreover, this species covers nearly the whole of this area. On account of distribution and of phylogenetic status of the species, it seems a convincing argument, that several species have been derived from an ancestor much alike *A. lineatus*, the most derived species of these descendants living today at the extreme southeastern border of the genus range. If this assumption is true, then immigration into New Guinea occurred perhaps rather recently and the genus as a whole spreads perhaps still southeastward to reach eventually northern Australia – if it did not yet arrive there at all, but without having been discovered so far.

Supposed, such an eastward migration within the Indo-Australian range occurred or still takes place, this migration pattern is likely to be supposed for the whole genus. This would mean, that the eastern areal as a whole has also been colonized by an west to east migration, starting from Africa, where the genus originated. However, as mentioned above, these suggestions are at present not yet proved.

Anyway, the genus *Agastus* ist a further example of an Old World tropical group, which immigrated into the Indo-Pacific region and into New Guinea and evolved several new species in the course of that immigration. The rather slight differences between the species are evidence of a relatively recent origin of these species. Most species evolved perhaps not before late Pleistocene, because during this period several land bridges arose and disappeared again in the Indo-Australian insular belt, which provided excellent conditions for evolution of species.

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Dr. Martin Baehr
Zoologische Staatssammlung
Münchhausenstr. 21
D-8000 München 60

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