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New species of the genus *Pentagonica* Schmidt-Goebel, 1846 from the Oriental Region.

Supplement to “The genus *Pentagonica* Schmidt-Goebel
in the Oriental, Papuan, and Australian Regions”

(Coleoptera, Carabidae, Pentagonicini)

Martin Baehr

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As a supplement to the revision of the genus *Pentagonica* Schmidt-Goebel, 1846 in the Oriental Region three new species are described: *Pentagonica palawanica* spec. nov. from the island of Palawan in the western part of the Philippines, *P. nigroantennata* spec. nov. from Sumatra and Malaysia, and *P. rufonigra* spec. nov. from Laos. *P. palawanica* is doubtfully assigned to *P. pallipes* (Nietner, 1856), the other species belong to the *ruficollis* group of Baehr (2012) and are more or less closely related to *P. drescheri* Louwerens, 1952 from Thailand, Sumatra, Java, and Borneo and *C. flavicornis* Baehr, 2012 from Sulawesi. A second record of the rare species *P. grimmi* Baehr, 2012 is reported from Laos, and from *P. sarawakensis* Baehr, 2012 the male genitalia are firstly recorded and figured. The new species are inserted in the recent key to the Oriental-Papuan-Australian species of the genus *Pentagonica* (Baehr 2012).

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Introduction

In material received for identification from Naturhistorisches Museum Basel (Switzerland), and during a recent check of unidentified Oriental Carabidae in Naturhistorisches Museum Wien (Austria), I detected again some new species of Oriental *Pentagonica* which are described herein. Apart from specimens of *P. grimmi* Baehr, 2012, of which only the holotype was known, most other described species identified in the mentioned material are not communicated, even when they have been recently described, because they do not reveal additional information or enlarge the recorded ranges. Only *P. sarawakensis* Baehr, 2012 is mentioned, because

its male genitalia are firstly described and figured. This paper, therefore, is regarded a supplement to my recent revision of the Oriental-Papuan-Australian *Pentagonica* (Baehr 2012).

The carabid genus *Pentagonica* is almost worldwide distributed (except for the West Palearctic Region), but is most diverse in terms of species in the Oriental-Papuan-Australian Realm. From this area altogether 118 species were recorded, including a few as far eastwards as Solomon Islands, Fiji, and Micronesia (Baehr 2012). The bulk of species occurs in the southern Oriental Region and on New Guinea, but single species even occur in eastern Siberia. One species has been introduced into New Zealand.

Information about morphological characters of

the genus, taxonomy and distribution of the species, and on putative phylogenetic relations and biogeography can be taken from the revision (Baehr 2012).

Methods

In the taxonomic section standard methods are used. The male and female genitalia were removed from specimens relaxed for a night in a jar under wet atmosphere, then cleaned for a short while in hot 10 % KOH. The habitus photographs were obtained with a digital camera using ProgRes CapturePro 2.6 and AutoMontage and subsequently were edited with Corel Photo Paint X4.

Measurements were taken using a stereo microscope with an ocular micrometre. Length has been measured from apex of labrum to apex of elytra. Length of pronotum was measured from the most advanced part of the apex to the most advanced part of the base. Length of orbit was measured from the posterior margin of the eye to the position where the orbit meets the neck. For estimation of the relative length of the antenna, the 6th antennomere was measured. Attention was paid to take the measurement at the widest part of the antennomere and to omit the pilosity. Ratios are somewhat variable in most species, but generally offer rather good measures of relative shape.

In some species the definition of the colour of the legs is quite difficult, not only in immature specimens. In particular the femora commonly seem to be light coloured when seen from dorsally. Therefore always the lower surface of the femora should be examined. If questionable, slight differences in colour of femora and knees suggest the actual dark colour of the femur.

In the label records a longer space “ ” defines a new line on a label, a “ / ” defines another label.

Acronyms

All specimens mentioned in this paper are deposited in the collections listed below.

NHMB	Naturhistorisches Museum Basel, Switzerland
NHMW	Naturhistorisches Museum Wien, Austria
CBM	Collection Martin Baehr, in Bavarian Zoological State Collection, Munich, Germany

Taxonomy and faunistics

Pentagonica sarawakensis Baehr, 2012

Fig. 1

Baehr, 2012: 34 (orig. descr.).

Note. This species was so far known only from two females from two localities in Sarawak, northern Borneo. A male is now available, also from Sarawak, which gives the opportunity to describe and figure the male genitalia of this species.

New record: 1 ♂, “MAL., Sarawak 1993 E Bendar Sri Amman Batang Ai NP, 19./20.2. leg. M. Jäch (8)” (NHMW).

Partial redescription

Male genitalia (Fig. 1). Genital ring wide, laterally convex, slightly asymmetric, with rather narrow, convex basal plate and narrow, obtusely angulate apex. Aedeagus moderately stout, slightly sinuate, slightly asymmetric; lower surface in middle slightly convex, deeply concave near apex; apex short, fairly large, markedly knobbed; internal sac with simple folding and without any sclerotized parts; both parameres moderately elongate, with widely rounded apex.

Pentagonica grimmi Baehr, 2012

Baehr, 2012: 64 (orig. descr.).

Note. This species was so far known only from the male holotype from northern Thailand. Together with *P. nigripennis* Bates, 1873 from Japan it forms a distinctive species group (Baehr 2012).

New records: 1 ♀, “LAOS-N (Oudomxai). 1–9.v.2002, ~1100 m, 20°45' N 102°09' E, OUDOM XAI, (17km NEE), Vit Kubán leg.” (NHMB); 2 ♀♀, “LAOS-N (Louanphra-) bang), 11–21.v.2002, 19°35' N 101°58' E, THONG KHAN, ~750m, Vit Kubán leg.” (CBM, NHMB).

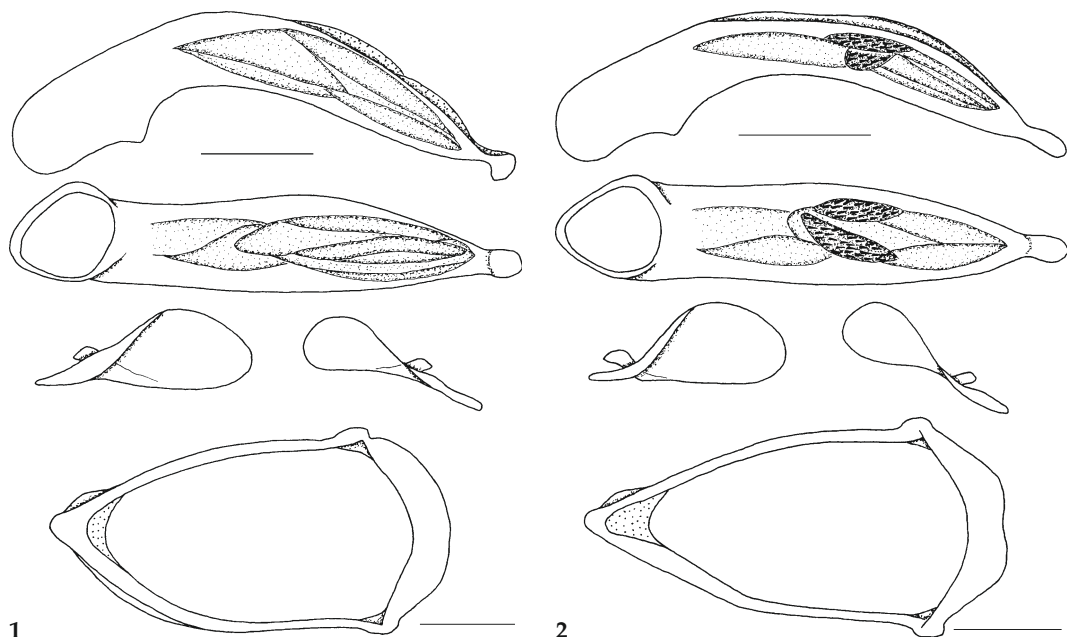
Pentagonica palawanica, spec. nov.

Figs 3, 4, 7

Examined types. Holotype: ♀, “Philippines, 150m Palawan, PORT BARTON 14.–18. Dec 1990 Bolm lgt. / *Pentagonica* sp. n. det. F. Savich 1998” (NHMB).

Etymology. The name refers to the occurrence of this species on the island of Palawan.

Diagnosis. Distinguished from all other Oriental-Papuan species, except *P. laevissima* Baehr, 2012 by



Figs 1-2. Male genitalia: aedeagus, left side and lower surface, left and right parameres, genital ring. Scale bars 0.25 mm. **1.** *Pentagonica sarawakensis* Baehr. **2.** *P. nigroantennata*, spec. nov.

absence of any microreticulation on the surface; distinguished from the latter species by longer and less rounded, dorsally much more convex elytra, much finer punctation of the elytral striae, larger eye, and elongate and parallel-sided basal part of the prothorax.

Description

Measurements. Length: 3.8 mm; width: 1.65 mm. Ratios. Width/length of prothorax: 1.57; width of prothorax/width of head: 1.03; length of eye/length of orbit: 2.9; length/width of elytra: 1.44; width of elytra/width of prothorax: 1.77; length/width of 6th antennomere: 2.2.

Colour (Fig. 4). Black, clypeus, labrum, and margin of pronotum in middle brownish; lateral margins of elytra dirty reddish; antenna dirty yellow, very slightly infuscate apicad; palpi brown, paler towards apex; legs bright yellow; lower surface piceous-brown; epipleurae of pronotum and elytra reddish-brown.

Head (Fig. 7). Wide; eye large, almost 3× as long as orbit, evenly curved into orbit, basal margin of head transversally convex; antenna moderately elongate, surpassing base of pronotum by c. 2 antennomeres; median antennomeres c. 2× as long as wide; antenna pilose from 4th antennomere; microreticulation absent, surface very glossy.

Pronotum (Fig. 7). Moderately wide, apex gently concave, lateral apical margins almost straight; lateral margins near base not angulate; the raised lateral border almost reaching base, without forming a trans-

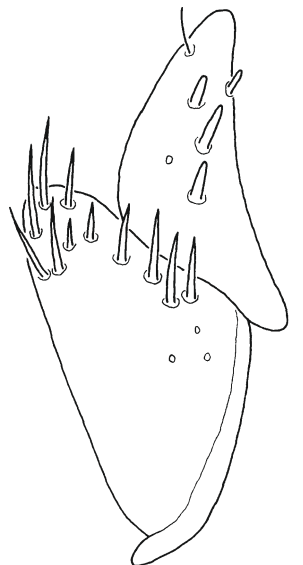


Fig. 3. *Pentagonica palawanica*, spec. nov. Female gonocoxites. Scale bar: 0.1 mm.

verse prebasal ridge; basal part elongate, narrow, almost parallel-sided; prebasal sulcus deep; marginal sulcus narrow, though rather deep; disk very convex; microreticulation absent, surface very glossy.

Elytra (Fig. 4). Rather short, not widened apicad, but lateral margins very slightly convex throughout; apex rounded, sutural angle without distinct denticle; surface very convex; striae complete, distinct though not impressed, marked by rows of fairly coarse punctures; intervals absolutely depressed; microreticulation absent, surface very glossy.

Male genitalia. Unknown.

Female gonocoxites (Fig. 3). Very small, short, and compact. Gonocoxite 1 obliquely triangular, with many elongate ensiform setae at the medio-apical margin. Gonocoxite 2 obtusely triangular, slightly curved, with 3–4 short and stout ensiform setae on the ventro-lateral surface in the apical half, and with an elongate nematiform seta at the dorso-median margin close to apex.

Variation. Unknown.

Distribution. Palawan, Philippine Islands. Known only from type locality.

Collecting circumstances. Not recorded.

Relationships. Uncertain. In some external features, particularly in the shape of the prothorax the species reminds *P. pallipes* (Nietner, 1856), but without knowledge of the male genitalia of *P. palawanica* the relationships remain obscure.

Pentagonica rufonigra, spec. nov.

Fig. 5

Examined types. Holotype: ♀, “LAOS-N (Oudom-xai). 1–9.v.2002, ~1100m, 20°45'N 102°09'E, OUDOM XAI, (17km NEE), Vit Kubáň leg.” (NHMB). – Paratypes: 3 ♀♀, same data (CBM, NHMB).

Etymology. The name refers to the contrasting red and black colouration.

Diagnosis. Distinguished from other species of the *ruficollis* group that possess reddish head and pronotum by black antenna with the 3rd and 4th antennomeres pale, dark femora, distinctly striate, moderately convex elytra with raised intervals, and moderately large eye.

Description

Measurements. Length: 5.6–6.3 mm; width: 2.35–2.70 mm. Ratios. Width/length of prothorax: 1.59–1.68; width of prothorax/width of head: 1.13–1.16; length of eye/length of orbit: 2.4–2.6; length/width of elytra: 1.49–1.52; width of elytra/width of pro-

thorax: 1.83–1.87; length/width of 6th antennomere: 3.0–3.2.

Colour (Fig. 5). Head and pronotum reddish; elytra black with yellow lateral margins; antenna black with reddish 3rd and 4th antennomeres; palpi brown with paler apex; femora black or piceous-black, tibiae piceous to brownish, towards apex becoming paler, tarsi reddish; lower surface of head and prothorax red, of abdomen black; epipleurae of elytra reddish.

Head (Fig. 5). Eye fairly large, c. 2.5 × as long as orbit, evenly curved into orbit, basal margin of head transversally convex; antenna elongate, surpassing base of pronotum by c. 3 antennomeres; median antennomeres c. 3 × as long as wide; antenna pilose from 5th antennomere; microreticulation distinct, fine, isodiametric, surface rather dull.

Pronotum (Fig. 5). Moderately wide, apex gently concave, lateral apical margins oblique and straight; lateral margins near base not angulate; the raised lateral border almost reaching base, without forming a transverse prebasal ridge; prebasal sulcus rather deep; marginal sulcus moderately wide, rather deep; disk rather convex; microreticulation distinct, fine, almost isodiametric, surface rather dull.

Elytra (Fig. 5). Moderately elongate, slightly widened apicad, lateral margins gently convex; apex slightly sinuate, sutural angle with obtuse, extremely fine denticle; surface rather convex; striae distinct, impressed, impunctate but very finely crenulate; intervals distinctly raised; microreticulation distinct, fine, isodiametric; surface moderately dull.

Male genitalia. Unknown.

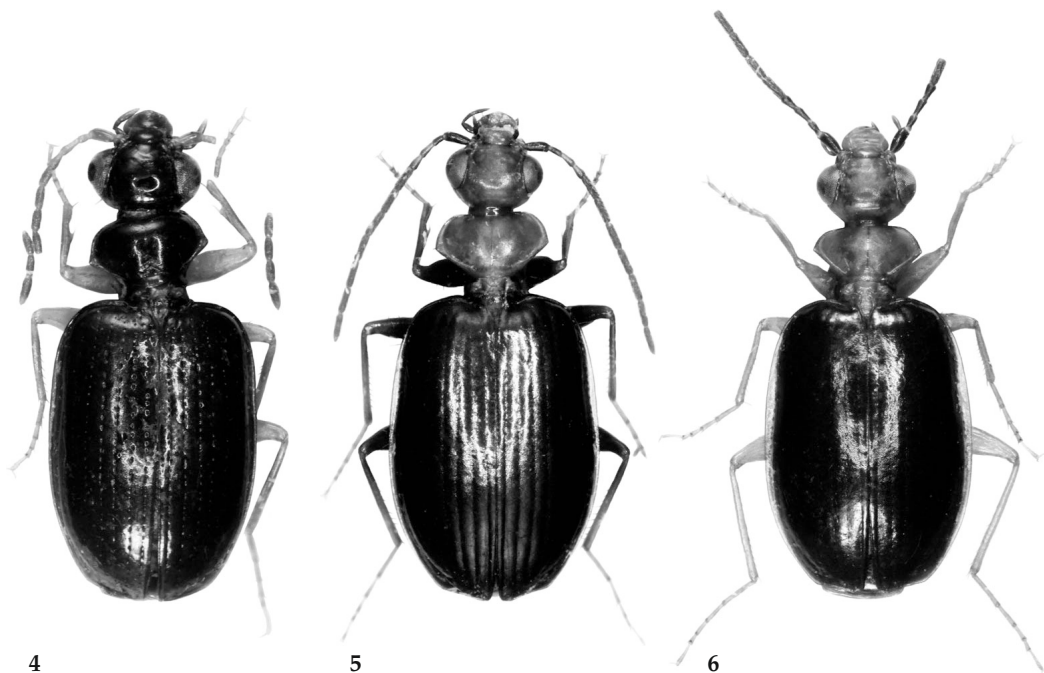
Female gonocoxites. Very similar to those of *P. palawanica*, spec. nov.: gonocoxite 1 short, triangular, with many elongate ensiform setae at the medio-apical rim; gonocoxite 2 short, obtusely triangular, with 4 short ensiform setae on the lateral part of the ventral surface, and with a single short nematiform seta at the dorso-median margin close to apex.

Variation. Little variation noted, apart from some differences of body size. The larger specimens seem to possess a wider prothorax.

Distribution. Laos. Known only from the type locality.

Collecting circumstances. Little recorded. The specimens were collected at median altitude.

Relationships. Probably related to *C. drescheri* Louwerens, 1952, *C. flavicornis* Baehr, 2012 and the following *P. nigroantennata*, spec. nov. However, in view of the unknown male genitalia of *P. rufonigra*, the dark legs, and the well impressed elytral striae, the relationships are still uncertain.



Figs 4–6. Habitus. Body lengths in brackets. 4. *Pentagonica palawanica*, spec. nov. (3.8 mm). 5. *Pentagonica rufonigra*, spec. nov. (5.7 mm). 6. *Pentagonica nigroantennata*, spec. nov. (4.7 mm).

***Pentagonica nigroantennata*, spec. nov.**

Figs 2, 6

Examined types. Holotype: ♂, “W-Sumatra, Jambi Pr. Bukit Tigapuluh NP 140 m, 15.3.–20.3.2003 leg. R. Gerstmeier” (CBM). – Paratype: 1 ♂, “MALAYSIA Perak Bukit Larut, 5 km E Taiping, 200–500 m 3.8.1993 leg. Schuh” (NHMW).

Etymology. The name refers to the completely black antenna.

Diagnosis. Distinguished from other species of the *ruficollis* group that possess reddish head and pronotum by completely black antenna, yellow legs, almost non-striate, remarkably convex elytra, and almost straight lower surface of the aedeagus. Except for the differently coloured antenna, most similar to *P. drescheri* Louwerens, but slightly smaller, with narrower prothorax and slightly larger eye.

Description

Measurements. Length: 4.5–4.7 mm; width: 1.95–2.10 mm. Ratios. Width/length of prothorax: 1.55–1.57; width of prothorax/width of head: 1.05–1.08; length of eye/length of orbit: 2.9–3.0; length/width of elytra: 1.44–1.48; width of elytra/width of prothorax: 1.93–1.95; length/width of 6th antennomere: 3.2–3.3.

Colour (Fig. 6). Head and pronotum pale reddish; elytra black with bright yellow lateral margins; antenna completely black; palpi pale brownish to dirty yellow towards apex; legs pale reddish; lower surface of head and prothorax yellow, of abdomen piceous-black; epipleurae of elytra in basal part brown, in apical three quarters dirty yellow.

Head (Fig. 6). Eye large, c. 3 × as long as orbit, evenly curved into orbit, basal margin of head transversally convex; antenna elongate, surpassing base of pronotum by c. 3 antennomeres; median antennomeres c. 3.2 × as long as wide; antenna pilose from 5th antennomere; microreticulation distinct, fine, isodiametric, surface rather dull.

Pronotum (Fig. 6). Comparatively narrow, apex gently concave, lateral apical margins oblique and straight; lateral margins near base not angulate; the raised lateral border almost reaching base, without forming a transverse prebasal ridge; prebasal sulcus rather shallow; marginal sulcus moderately wide, rather deep; disk comparatively convex; microreticulation distinct, fine, almost isodiametric, surface rather dull.

Elytra (Fig. 6). Comparatively short, slightly widened apicad, lateral margins gently convex; apex slightly sinuate, sutural angle without distinct denticle but apex slightly produced opposite 3rd interval; surface convex; striae very indistinct, not impressed,

marked as very fine rows of punctures; intervals absolutely depressed; microreticulation distinct, fine, isodiametric; surface moderately dull.

Male genitalia (Fig. 2). Genital ring moderately wide, rather parallel-sided, almost symmetric, with narrow, in middle slightly excised wide basal plate and narrow, obtusely angulate apex. Aedeagus moderately stout, almost straight, almost symmetric; lower surface almost straight in middle, very slightly concave near apex; apex almost straight, moderately short, fairly large, elongately knobbed; internal sac with simple folding, but with two denticulate, conspicuously dark coloured folds at bottom of left side; both parameres short, with widely rounded apex.

Female gonocoxites. Unknown.

Variation. Very little variation noted.

Distribution. West Sumatra and Malaysia.

Collecting circumstances. Little recorded. Both specimens were collected at rather low altitude.

Relationships. Together with the foregoing *C. rufonigra*, spec. nov. this species is related to *C. drescheri* Louwerens, 1952 and *C. flavicornis* Baehr, 2012 which together form a distinctive group within the *ruficollis* species group in the sense of Baehr (2012).

Recognition

For better use figure numbers from the revision of the Oriental-Papuan-Australian *Pentagonica* (Baehr 2012) are included as **B12** fig.

P. palawanica, spec. nov.

Due to the complete absence of microreticulation on the surface couplet 2. is easily reached which must be changed as follows:

2. Whole dorsal surface without microreticulation, very glossy; elytra dark with yellow margin. ... 2a.

- At least head with perceptible microreticulation; when elytra with yellow margin, striae not as coarsely punctate. 3.
- 2a. Elytra wide and depressed, striae with very large punctures (**B12** fig. 155); aedeagus unknown. New Hebrides. *laevisima* Baehr, 2012
- Elytra narrower and dorsally very convex, striae with fine punctures (Fig. 4); aedeagus unknown. Palawan, Philippines. *palawanica*, spec. nov.

P. rufonigra, spec. nov., *P. nigroantennata*, spec. nov.

Due to the reddish colour of head and pronotum and to the structure of the aedeagus couplet 4. is easily reached which must be changed as follows:

- 4. Head and pronotum pale reddish or yellow, elytra unicolourous dark with pale lateral margins (Figs 4, 5); pronotum without transverse, prebasal ridge; aedeagus with two conspicuously dark, multispinose folds in the internal sac (Fig. 2; **B12** figs 22, 23), or unknown. 5.
- Colouration different; aedeagus without such folds. 6.
- 5. Elytral striae distinctly impressed; femora dark; antenna dark with pale 3rd and 4th antennomeres (Fig. 5); aedeagus unknown. Laos. *rufonigra*, spec. nov.
- Elytral striae barely recognizable, at most very finely punctulate; femora yellow; antenna either completely yellow, or contrastingly yellow from 5th antennomere, or completely dark; aedeagus with two conspicuously dark, multispinose folds in the internal sac (Fig. 2; **B12** figs 22, 23). Thailand, Malaysia, Sumatra, Java, Borneo, Sulawesi. 5a.
- 5a. At least parts of the antenna dark; elytra longer, ratio length/width > 1.45; lower surface of aedeagus barely convex in basal part (Fig. 2; **B12**

Table 1. Measurements and ratios of the species of the *drescheri* subgroup of the genus *Pentagonica*. N = number of specimens measured; body length in mm; w/l pron = ratio width/length of pronotum; w pron/head = ratio width of pronotum/width of head; l eye/orb = ratio length of eye/length of orbit; l/w elytra = ratio length/width of elytra; w el/pron = ratio width of elytra/width of pronotum; l/w 6th = ratio length/width of 6th antennomere.

	N	body length	w/l pron	w pron/head	l eye/orb	l/w elytra	w el/pron	l/w 6 th
<i>drescheri</i>	4	4.7–5.3	1.58–1.66	1.06–1.11	2.6–2.8	1.45–1.53	1.84–1.92	3.1–3.3
<i>flavicornis</i>	6	4.3–5.9	1.61–1.74	1.11–1.17	2.4–2.9	1.38–1.42	1.96–1.97	2.7–3.1
<i>rufonigra</i>	4	5.6–6.3	1.59–1.68	1.13–1.16	2.4–2.6	1.49–1.52	1.83–1.87	3.0–3.2
<i>nigroantennata</i>	2	4.5–4.7	1.55–1.57	1.05–1.08	2.9–3.0	1.44–1.48	1.93–1.95	3.2–3.3

- fig. 22). Thailand, Malaysia, Sumatra, Java, Borneo. 5b.
- Antenna completely yellow; elytra shorter, ratio length/width < 1.42; lower surface of aedeagus distinctly convex in basal part (**B12** fig. 23). Sulawesi. *flavicornis* Baehr, 2012
- 5b. Four basal antennomeres dark, rest contrastingly yellow (**B12** fig. 139); body size slightly larger, > 4.7 mm; eye slightly smaller, < 2.8× as long as orbit; aedeagus see **B12** fig. 22. Thailand, Sumatra, Java, Borneo. *drescheri* Louwerens, 1952
- Antenna completely dark (Fig. 6); body size slightly smaller, < 4.7 mm; eye slightly larger, > 2.9× as long as orbit; aedeagus see fig. 2. Malaysia, western Sumatra. *nigroantennata*, spec. nov.

Remarks

The three new species described in the present paper demonstrate the still insufficient knowledge of the species diversity and distribution of the Oriental *Pentagonica*, in spite of the recent revision (Baehr 2012) that covered ample material of a large number of museums and collections. These new species also demonstrate the necessity to collect systematically in various countries, in particular on the numerous islands in the Indonesian and Philippine insular belts. It seems that many species of *Pentagonica* possess rather restricted ranges, so that short-range

endemism seems to be more common than it was previously known. But this suggestion can be only proved, or rejected, by more systematic sampling. It has been shown in the mentioned revision that many species still are known only from single or few specimens, or from a single locality. Hence, it is to be expected that future collecting activities again should raise the number of recorded species.

P. palawanica presently cannot be attributed to any of the species groups which were distinguished in the revision, although in some external characters it reminds the widespread *P. pallipes* (Nietner). *P. nigroantennata* certainly is very closely related to *P. drescheri* Louwerens, and it seems that both species at least in part share the same range. *P. rufonigra* is provisionally attributed to the *drescheri* lineage, but knowledge of its male genitalia would be needed to prove or reject this suggestion.

Acknowledgements

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