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Review of *Synapsis* Bates (Scarabaeidae: Scarabaeinae: Coprini), with description of a new species

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Abstract. Presented are a checklist, a discussion of and keys to species groups and their constituent species, and a description of one **new species**: *Synapsis horaki*. The species *Synapsis cambeforti* Krikken and *S. thoas* Sharp are synonymized with *S. ritsemae* Lansberge, Balthasar's synonymy of *S. yunnana* Arrow with *S. tridens* Sharp is revived, and the status of six recently described species is left unresolved because of insufficient data.

Key words. Coprini, *Synapsis* Bates, species groups, new synonyms, new species, keys to groups and species, Palearctic and Oriental regions.

Introduction

Synapsis Bates is an Asian coprine genus that ranges from the Caspian Sea to the Greater Sunda Islands and Taiwan. Most species inhabit southeast Asia, but *S. tmolus* (Fischer) occurs in central Asia and reaches as far north as Turkmenistan, Uzbekistan and Kazakhstan. The genus contains close to 20 species, all of them large (22-50 mm long), robust black beetles with barely noticeable sexual dimorphism. Short of dissection, sex can be determined by the density of pubescence on the upper metatibial carina (brushes in males of some species) and less reliably by examination of the pronotum (stronger transverse carina in males), abdominal ventrites (medially constricted in males) and hind margins of the metafemora (more dentate in males). Sexual dimorphism is best developed in the largest species, *S. tmolus*, where the sexes differ in shape of the metafemoral teeth, presence of metatibial brushes (males), curvature of the metatibia (stronger in females) and completeness of the pygidial margin (apically incomplete in the female).

The head is broad, with the clypeal margin reflexed and medially bidentate, frontoclypeal suture absent, frons either evenly convex or bearing a broad-based, short and blunt medial tubercle or a minor horn, and genae ranging from unexpanded to laterally drawn out into horizontal, flat horns with backward-curved tips. The clypeus and genae are transversely rugose, whereas sculpturing on the frons is largely effaced or absent. The drawn-out genae are distinctive but cannot be said to characterize the genus, as the expansion is present in only about one-third of the species.

The prothorax is distinctive in two regards. First, except for often pointed anterior corners and the above noted transverse carina, the pronotum lacks sharp protuberances. And secondly, the ventral surface of some species bears in its anterior corners subrectangular cavities delimited by carinate margins (sutures), which are covered by long, biserially (anterior / posterior) arranged rust-colored setae that meet on the long axis of the cavity to form a solid, nearly flat roof (Fig. 25, 30). These cavities have been called proepisternal, which is improper because in the Polyphaga the prothoracic pleuron is reduced and not visible externally. The ventral portion of the notum is the hypomeron (Lawrence and Britton 1994: 17), and we therefore call the cavities hypomeral. In other species of *Synapsis*, which lack the hypomeral cavities, there are similar smaller cavities present on the mesepisterna (Fig. 6). The hypomeral and mesepisternal cavities have been also called acarodomatia (Krikken 1987, Kral 2002), although in our experience they do not appear to attract mites any more than other parts of the ventrum. We have not

observed any mites associated with the mesepisternal cavities, and some of the hypomeral cavities with mites attached to the elevated margins had the setose cover disturbed or incomplete, indicating that mites are capable of bending or even breaking off the setae.

In contrast to related genera such as *Copris* Geoffroy, *Heliocopris* Hope and *Catharsius* Hope, all species of *Synapsis* have two carinae along each side of the pronotum, the upper one being regarded as an accessory carina. In *S. tmolus* the accessory carina is usually visible from above because the pronotal epipleuron does not quite reach the vertical plane and its angular upper edge thus shows in dorsal view as a carina that runs from just behind the anterior angle to the pronotal base. In most other species this carina is visible only in lateral view because the pronotal epipleuron is either vertical or forms an overhang.

The mesoscutellum is hidden by the elytra. The elytra range from glossy to coriaceous and each elytron bears eight punctate striae, seven of which are dorsal and the eighth, anteriorly incomplete, is situated on the upper portion of the epipleuron often called the pseudoepipleuron (Fig. 1). The lower epipleuron proper is only about one-fourth as wide as the pseudoepipleuron, against which it is delimited by an anteriorly complete epipleural carina. The angular break between the elytral disc and the pseudoepipleuron bears two very closely spaced carinae, and the seventh stria runs so close to the inner carina that it is easily overlooked.

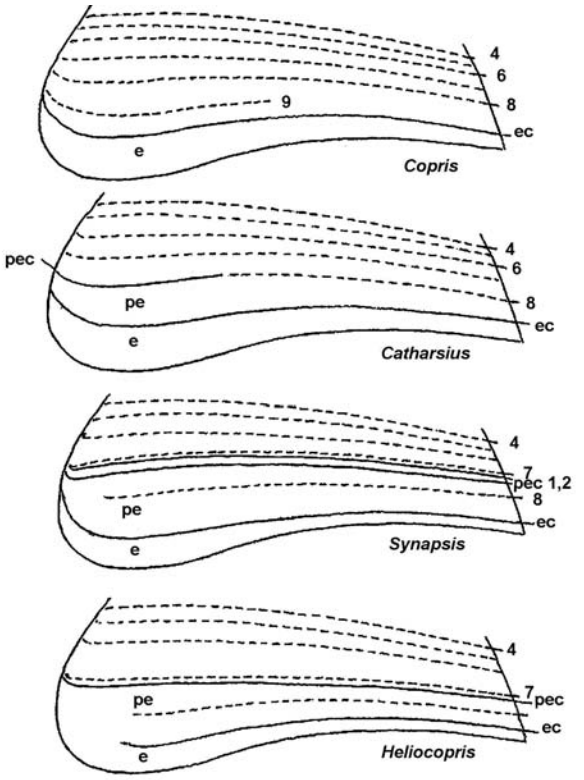

Figure 1. Morphology of the left elytron in four coprine genera. Front to the left. Modified from Pokorny et al. (2009). Interrupted lines = striae, full lines = contours and carinae. Abbreviations: e – epipleuron, ec – epipleural carina, pe – pseudoepipleuron, pec – pseudoepipleural carina.

The protibia is tridentate, with the spur terminal and as long as the reduced protarsus. The mesotibia bears two terminal spurs of unequal length, the larger (inner or posterior) of them about as long as two proximal tarsomeres. The metatibia is markedly curved, in some species more so in females, has one terminal spur about as long as two proximal tarsomeres, and in males of some species its upper longitudinal carina bears a thick brush of rust-colored setae (Fig. 35). The metafemur (often) and mesofemur (rarely) bear posterior teeth and their ventral surfaces are either smooth or punctate.

The aedeagus is symmetrical, with parameres as long or slightly shorter than the phallobase and differing among species mainly in dorso-ventral thickness and shape of the tips. In most species the differences are minor, however, and taxonomic utility is therefore limited.

Nidification and the larva are known for only two species, *S. tmolus* (Medvedev 1952, Protzenko 1968, Kabakov 2006) and *S. masumotoi* Ochi, whose nidification was described by Masumoto (1973) as that of *S. davidis* Fairmaire (see Kral 2002). A dung ball tentatively attributed to *S. tridens* Sharp was reported by Kon et al. (2004).

In *Synapsis* the condition of the lateral part of the elytron is more derived than in other coprine genera and most closely resembles that in *Heliocopris*, which, however, has only one pseudoepipleural carina and the epipleural carina is anteriorly incomplete (see Fig.1 for comparison). Although four of the 51 described species of *Heliocopris* occur in southeast Asia (Pokorny et al. 2009), they differ from *Synapsis* species also in other regards (size, cephalic and pronotal morphology) and the two genera are easy to distinguish from each other.

Balthasar (1963) reviewed the then-known twelve species of *Synapsis*, synonymized *S. yunnana* Arrow with *S. tridens* Sharp, and presented a key to eleven species. Twelve more species have been described since then (see the Checklist). Keys have been published to four Indonesian species (Krikken

Table 1. Distribution of species-group characters.

Species groups	Hypomeral cavity	Mesepisternal cavity	Expanded genae	Armed frons	Metatibial brush (male)
ovalis	--	X	--	--	--
birmanica	X	--	--	--	--
ritsemae	X	--	X	X	--
brahmina	--	--	X	X	X
tmolus	--	--	--	X	X

1987) and to two of the groups named below (the brahmina and ovalis groups; Kral 2002), but a comprehensive treatment has so far been wanting. We attempt to remedy that situation.

Over the past 30 years *Synapsis* has been subdivided into as many as five groups (Krikken 1987, Ochi 1992, Hanboonsong and Masumoto 1999, Kral and Rejsek 2000, Kral 2002; see the Checklist below for authorships of constituent species):

the ovalis group (*S. boonlongi, S. gilleti, S. ovalis, S. strnadi*);

the birmanica group (*S. birmanica*, *S. dickinsoni*, *S. masumotoi*, *S. naxiorum*, *S. ochii*, *S. punctata*, *S. roslihashimi*, *S. yama*);

the ritsemae group (*S. cambeforti*, *S. ritsemae*, *S. thoas*);

the brahmina group (*S. brahmina, S. davidis, S. satoi*, *S. tridens, S. yunnana*); and

the tmolus group (*S. kiuchii, S. simplex*, *S. tmolus*). This group has been previously called the simplex group. It is re-named here because *S. tmolus* (hitherto unassigned to any group) readily fits in and is the first described species.

The species groups have been based on presence / absence of the hypomeral or mesepisternal cavities and condition of the frons and genae, to which we add the metatibial brushes that are present in males of two (brahmina and tmolus) groups. The distribution of these characters is given in Table 1 and in the key to groups.

As is apparent from the following Checklist and Comments, we do not deem some of the above named species valid and leave the status of some others unresolved because of insufficient data. It is therefore presently impossible to say exactly how many species the genus contains, but in our opinion the number is less than 20.

Checklist

Names deemed invalid are preceded by dashes (--) and taxa deemed uncertain are denoted by asterisks (*). Figure numbers cited in the Checklist are repeated in the keys. Type and other repositories are abbreviated as follows:

BMNH – The Natural History Museum, London, UK;
DEZB – Division of Entomology and Zoology, Ministry of Agriculture, Bangkok, Thailand;
DKPC – David Kral Collection, Prague, Czech Republic;
ISNB – Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium;
JRPC – Jiri Rejsek Collection, Podebrady, Czech Republic;
JSPC – Jan Schneider Collection, Prague, Czech Republic;
JZPC – Jiri Zidek Collection, Prague, Czech Republic;
KUMC – Kyushu University Museum, Fukuoka, Japan;
MMBC – Moravian Museum, Brno, Czech Republic;
MNHN – Muséum National d'Histoire Naturelle, Paris, France;
NMPC – National Museum, Prague, Czech Republic;

NNML – Nationaal Natuurhistorische Museum, Leiden, The Netherlands;
NSMT – National Science Museum, Tokyo, Japan;
OXUM – Oxford University Museum, Oxford, UK;
SJPC – Stanislav Jakl Collection, Prague, Czech Republic;
SPPC – Svatopluk Pokorny Collection, Prague, Czech Republic;
UMSC – University of Malaysia-Sabah (Institute of Tropical Biology and Conservation), Kota Kinabalu, Malaysia;
ZIAN – Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia.

Other abbreviations: **AT** – allotype, **HT** – holotype, **LT** – lectotype, **PLT** – paralectotype(s), **PT** – paratype(s), **ST** – syntypes, **TL** – type locality; **f** – female, **m** – male.

Synapsis Bates, 1868: 89; type sp. *Copris brahminus* Hope, by monotypy.
Syn. *Homalocopris* Solsky, 1871: 136; type sp. *Ateuchus tmolus* Fischer, by monotypy.

–*S. batesi* Sharp, 1875: 43; = *S. brahmina* (syn. by Arrow 1931: 82); LTm at MNHN (des. by Kral 2002: 280), 4PLT at MNHN.
S. birmanica Gillet, 1907: 600; China (Yunnan), Malaysia (Malay peninsula), Myanmar (TL: Carin-Cheba, Karen Hills), Sumatra, Thailand; HTm at BMNH (not found, see Comments). **Fig. 22-25**
S. boonlongi Hanboonsong and Masumoto, 1999: 460; Thailand (TL: Phukieo); HTm at DEZB, 1PT at NSMT.
S. brahmina (Hope, 1831: 22), as *Copris*; Bhutan, India (Assam, W. Bengal, Meghalaya, Sikkim), Nepal (TL), e. Pakistan (Punjab); HTm at OXUM; [syn. *batesi*]. **Fig. 32-35**
– *S. cambeforti cambeforti* Krikken, 1987: 321; Borneo (Kalimantan, Brunei [TL: E of Telisai], Sabah), Java; HTm+6PTm/f at NNML, 1PTf at MNHN; = *S. ritsemae*, **syn. nov.** (see Comments).
– *S. cambeforti poringensis* Ochi, Kon and Kawahara, 2008: 198; Borneo (Sabah: Poring + vicinity); HTm at UMSC; = *S. ritsemae*, **syn. nov.** (see Comments).
– *S. davidi* of Fairmaire 1897: 25, 26; = unjustified emendation of *davidis*.
S. davidis Fairmaire, 1878: 96; c.–e-se. China (Fujian, Gansu, Hubei, Shaanxi, Sichuan [TL]), Taiwan (Miwa 1930, 1931); LTm at MNHN (des. by Kral 2002: 281), 2PLT at MNHN. **Fig. 36-38**
S. dickinsoni Hanboonsong and Masumoto, 1999: 457; Thailand (TL: Phukieo); HTm at DEZB, 21PT at NSMT, 1PTm at BMNH. **Fig. 16-18**
S. gilleti Arrow, 1931: 83; Bangladesh, Bhutan, India (Sikkim, W. Bengal [TL: Darjeeling, Singla]), Nepal; LTf at BMNH (des. by Bacchus 1978: 103), 1PLTm at ISNB. **Fig. 5-6**
S. horaki **sp. nov.**; n. Vietnam [TL: Tam Dao]; HTm at NMPC; no other specimens known. **Fig. 12-15**
**S. kiuchii* Hanboonsong and Masumoto, 1999: 455; Thailand (TL: Chiang Mai); HTm at NSMT, 11PT at DEZB; = *S. simplex*? (see Comments).
**S. masumotoi* Ochi, 1992: 9; Taiwan (TL: Tainan Hsien); HTm+2PTm at NSMT; female unknown; (see Comments and Comparison under *S. horaki*).
– *S. naxiorum* Kabakov and Napolov, 1999: 65; = n. nudum (see Kral and Rejsek 2000: 268).
S. naxiorum Kral and Rejsek, 2000: 268; China (n. Yunnan [TL: Hutiao Gorge, Jinsha River]); HTm+ATf+15PT at NMPC, 4PT at JRPC, 1PT at MMBC. **Fig. 19-21**
**S. ochii* Masumoto, 1995: 81; Thailand (TL: Chiang Mai); HTm+15PT at NSMT; = *S. yama*? (see Comments).
S. ovalis Boucomont, 1920: 307; Laos (TL: Tran Ninh), Thailand (DKPC), n. Vietnam; LTm at MNHN (des. by Kral 2002: 282). **Fig. 2-4**
**S. punctata* Ochi, Kon and Kawahara, 2008: 194; Myanmar (TL: ne. Kachin: Chudo Rozi); HTm at NSMT; no other specimens known; = *S. birmanica*? (see Comments).
S. ritsemae Lansberge, 1874: 143; Borneo, Java, Sumatra (TL); LTm at NNML (des. by Krikken 1987: 321); [syn. *S. cambeforti*, *S. sumatrensis*, *S. thoas*]. **Fig. 26-31**
**S. roslihashimi* Ochi, Kon and Kawahara, 2008: 191; w. Malaysia (TL: Selangor: Ulu Gombak), w. Sumatra; HTm at KUMC, 21PTm/f (at?); = *S. birmanica*? (see Comments).
**S. satoi* Ochi and Kon, 2007: 91; Laos (near Myanmar border); HTm at NSMT; no other specimens known; = *S. tridens*? (see Comments).

S. simplex Sharp, 1875: 45; China (Yunnan), Laos (TL), Myanmar, Thailand, n. Vietnam. HTm at MNHN. **Fig. 47-49**

S. strnadi Kral, 2002: 283; n. Vietnam (TL: Tam Dao); HTf at NMPC, 1PT at NMPC, 1PT at JSPC; male unknown. **Fig. 7**

– *S. sumatrensis* Fairmaire, 1897: 25; = *S. thoas* (syn. by Gillet 1907: 602); HT at MNHN.

– *S. thoas* Sharp, 1875: 44; Java (TL), Sumatra; HTm at MNHN; tentatively regarded by Krikken (1987: 321) as ssp. of *S. ritsemae*; = *S. ritsemae*, **syn. nov.** (see Comments).

S. tmolus (Fischer, 1821: 11), as *Ateuchus*; n. Afghanistan, ne. Iran, s. Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan, China (Xizang); ST from "desertis meridionalibus ad Orenburg" at ZIAN. **Fig. 44-46**

S. tridens Sharp, 1881: xcii; ne. India (Assam [TL], W. Bengal, Manipur, Meghalaya, Nagaland, Sikkim), Laos, Myanmar, Thailand, n. Vietnam; LTm at MNHN (des. by Kral 2002: 286); [syn. *S. satoi*?, *S. yunnana*]. **Fig. 39-42**

S. yama Gillet, 1911: 313; Laos, n. Vietnam (TL: Tuyen-Quan env.); HTm at MNHN. **Fig. 8-11**

– *S. yunnana* Arrow, 1933: 428; China (Yunnan [TL: "Tengyueh"= Tengchong], Guizhou, Sichuan, Xizang), n. Vietnam; LTm at BMNH (des. by Bacchus 1978: 108), 5PLT at BMNH; syn. with *S. tridens* by Balthasar (1935: 22), revived by Kral (2002: 287); = *S. tridens* (see Comments). **Fig. 42**

Comments

Nomenclatural changes

Hope (1831: 22) described *Copris brahminus* in merely ten words and his length / width measurements were of one specimen. That specimen is the OXUM holotype male from Nepal (Fig. 32). Bates (1868: 89) introduced the generic name *Synapsis* for this species, provided more information on its morphology, and noted that his account was based on a male and a female from "N. India, Assam." Among the eleven specimens of *S. brahmina* at the BMNH there is a pair labeled as syntypes (white discs with green rim), but they are from "Nepal". Arrow (1931: 82) further added to the confusion by noting only one type at BMNH (rather than OXUM) and giving the distribution as Nepal, Bhutan and Sikkim (rather than Assam). We do not see any reason for affording the BMNH specimens the status of types.

The holotype (OXUM) and one of the two "syntypes" (BMNH) of *S. brahmina* bear in addition to "*Brahminus* Hope" also the name "*Coptogonia orientalis* Hope" (the male syntype) and "*Coptogonia luniceps* Burm." (the holotype). Gemminger and Harold (1869: 1012) listed the name *Coptogonia* Hope as "in litt.", i.e. merely a manuscript and / or label name, and we have not been able to find any mention of *Coptogonia orientalis* or *Coptogonia luniceps* in Burmeister's works available to us. If this is an oversight on our part then Burmeister created a synonym (*luniceps*), but for the time being we treat these names as unpublished and do not include them in the checklist.

Gillet (1911), Balthasar (1963) and subsequent authors used masculine endings for the species of *Synapsis*, although Bates (1868) combined it with the specific name "*brahmina"* and thus clearly treated the genus as feminine. In this paper we therefore use feminine endings for the species. The exceptions are *Thoas* and *Tmolus* taken from Greek mythology, which are nouns in apposition and as such need not agree in gender with the generic name (ICZN 1999: Arts. 31.2.1, 34.2.1).

Fairmaire's (1878) name *S. davidis* was to honor Abbé David and should thus be spelled *S. davidi*, as the author himself subsequently corrected it (Fairmaire 1897). However, Fairmaire (1878) named species in other scarab genera (*Geotrupes* Latreille, *Melolontha* Fabricius) "*davidis"*, and this spelling thus definitely was not due to an inadvertent error. It follows that *S. davidis* is the correct original spelling (ICZN 1999: Art. 32.2) and *S. davidi* is an unjustified emendation.

The ovalis group

We have not been able to examine *S. boonlongi* Hanboonsong and Masumoto, nevertheless the original description convinces us that it is a valid species. This is because it is the only member of the group which has the genal tips curved backwards.

The birmanica group

Gillet (1907) based the description of *S. birmanica* on a single male specimen that was deposited at BMNH and subsequently examined by Arrow (1931) and Krikken (1987), but it is not listed in the current internal catalog of BMNH Scarabaeoidea and apparently cannot be found. If it proves to be permanently lost then a neotype ought to be designated to stabilize the nomenclature. We are unaware of another specimen from the type locality, however Gillet's (1907) description permits unequivocal identification and it thus seems reasonable to designate a specimen from another locality. If the necessity arises, the BMNH male illustrated here (Fig. 22) could be considered a suitable candidate. It is from "Peninsular Siam [Thailand], Nakon Sri Tam trat, Khao Luang, 2000 Ft., March 16th 1922, H. M. Pendleburg / Ex F. M. S. Museum, B. M. 1955-354".

We have been able to see only four species of this group and leave the status of the remaining four unresolved because neither their descriptions nor additional photos kindly provided by M. Kon allow us to form a definite opinion. Two of the unresolved species (*S. masumotoi*, *S. ochii*) resemble *S. yama*, and the other two (*S. punctata*, *S. roslihashimi*) resemble *S. birmanica* with which they may be sympatric.

Synapsis punctata Ochi, Kon and Kawahara is said to have the hypomeral cavities devoid of setae. This would be a unique character indeed, but the species is known only from the holotype in which the lack of hypomeral setae most likely is an artifact or an expression of variation. This opinion stems from our experience with *S. yama*, also based on a single specimen whose hypomeral cavities bear setae (Gillet 1911), although in other specimens that we have examined (e.g. OXUM, seven specimens) the cavities range from fully setose to completely lacking setae. The examined specimens are not worn and have setae on other parts of the body intact, indicating that the condition of their hypomeral cavities is either normal variation or, even more likely, due to removal of the setae by mites (see Introduction).

Synapsis roslihashimi Ochi, Kon and Kawahara was based on more specimens, twenty-two from west Malaysia and six from west Sumatra, but its published characters appear to be within the range of variation of *S. birmanica*. Ochi et al. (2008) noted that their species "… appears to be specifically identical with the species from the Malay Peninsula illustrated as *S. birmanicus* by Krikken (1987)."

Synapsis masumotoi Ochi (Taiwan) is known from three male specimens reminiscent of *S. yama* (Laos, n. Vietnam), but some morphological aspects, geographic distance and insular occurrence nevertheless indicate that it could be a valid species. This is further addressed below in the Comparison of *S. horaki* sp. nov.

Synapsis ochii Masumoto (Thailand) is geographically fairly close to *S. yama* (Laos, n. Vietnam), from which it appears to differ so little that synonymy is a strong possibility.

Since we are unable to properly assess these four species, they are included in the key uncritically, using only the published characters, and are denoted by asterisks.

The ritsemae group

Lansberge (1874) based *S. ritsemae* on specimens from Java and compared his species with *S. brahmina* (Hope), which is only remotely related and confined to north India, Bhutan, Nepal and east Pakistan. His description is unrevealing and the comparison fairly useless, as more closely related species were not known at that time.

Krikken (1987) designated a lectotype for *S. ritsemae* Lansberge, examined the holotype of *S. thoas* Sharp, described *S. cambeforti*, keyed the three species, and surmised that *S. thoas* could be a subspecies of *S. ritsemae*. Additionally, Ochi et al. (2008) described *S. cambeforti poringensis* as a montane subspecies, in contrast to the nominotypical subspecies which purportedly inhabits only lowlands.

To assess the characters used by Krikken (1987) to separate the three species and those used by Ochi et al. (2008) to define the subspecies, we examined material from:

a) Sabah, Croker Range National Park, alt. 1341 m (OXUM, 73 specimens; Fig. 26);

b) Sabah, Ulu Segama Forest Reserve, alt. 200 m (OXUM, 20 specimens);

c) Sabah, Poring, alt. 700 m (two specimens det. by Ochi et al. as *S. c. poringensis*);

d) South Kalimantan, Kandangan district, NE of Laksado (SJPC, five specimens);

e) West Sumatra, Annai Valley Nature Reserve, Mt. Singgalang, alt. 500 m (JZPC+SPPC, six specimens);

f) Sumatra, Lampong (BMNH, one specimen det. by G. J. Arrow as *S. thoas*; Fig. 29); and
g) East Java, Meru-Betiri N.P., alt. 800 m (SJPC, two specimens); Baluran N.P., alt. 400 m (SJPC, three specimens); Mt. Argo Puro (SJPC, 1 specimen; Fig. 31).

Our examination of these samples indicates that (a), (b) and (c), although from vastly different altitudes, cannot be distinguished from each other by either specimen size or morphology, and therefore the subspecies *S. c. poringensis* is not tenable. Variation in (a) and (b) concerns the extent and termination of the genal apex, shape of the anterior pronotal margin and angles, puncturing of elytral intervals and metafemora, proximal thickness of meso- and metatibiae, and lateral emargination at the distal ends of metatibiae, all of which can be detected in other samples (d, e, g) as well, despite their smallness. Specimens with weakly sinusoidal anterior pronotal margin and blunt pronotal angles prevail in the north (Sabah; *S. cambeforti* of Krikken, Fig. 26), whereas specimens with more strongly sinusoidal to excised anterior pronotal margin and more pointed pronotal angles prevail in the south (Sumatra, Java; *S. ritsemae* + *S. thoas*, Fig. 29, 31), but transitional specimens that defy unequivocal identification are present in populations on all three islands. This pattern indicates clinal variation rather than speciation, which may be taking place but is not yet recognizable as discrete phenotypes. We therefore synonymize *S. thoas* and *S. cambeforti* with *S. ritsemae* and regard the ritsemae group as monobasic.

The brahmina group

Synapsis satoi Ochi and Kon is known only from the holotype collected in Laos, and the only convincing character of the description appears to be four anterolateral pronotal teeth (rather than three as in *S. tridens*). However, the photo (Ochi and Kon 2007: fig. 1) shows only three pronotal teeth, and all other features are within variation expectable in *S. tridens*. We therefore suspect the holotype to be a small male of *S. tridens*, which does occur in Laos.

Balthasar (1935) synonymized *S. yunnana* Arrow with *S. tridens* Sharp, but Kral (2002) revalidated this species, restricted its range to central and south China (Guizhou, Sichuan and Yunnan provinces) and north Vietnam, and stated that these taxa (and *S. davidis* Fairmaire) seem to have allopatric distributions. Apart from the presumed allopatry, his reasons for reinstating *S. yunnana* were a deeper emargination between the inner and middle anterolateral pronotal teeth, a more produced genal process and a greater specimen size. This is the case of most but not all specimens, however, and geographic ranges of the two species overlap (in north Vietnam). For instance in northeast India, from where *S. tridens* was described, the emargination between the inner and middle pronotal teeth may be quite shallow or as deep as illustrated by Kral (2002: fig. 5) for *S. yunnana*, and the distance among the three teeth may be equal or slightly unequal. Since we have not been able to find any features that would unequivocally distinguish among all specimens of these two taxa, we concur with Balthasar's (1935) synonymy.

Of the type series of *S. yunnana* published by Bacchus (1978: 108), only one female specimen from Yunnan: Tengyueh (Fig. 42) is labeled as a paralectotype. The other specimens (four males, three females) in the tray holding this taxon are from localities not listed by Bacchus, and one of them (a male from Sichuan: Kinfushan) is *S. davidis* rather than *S. yunnana* (= *S. tridens*). In addition, the BMNH owns four unnamed females (Nevinson Coll.) that can be identified as *S. yunnana* = *S. tridens*, one of them from "Thibet, Tsekou", from where *S. tridens* has not yet been reported.

The only consistent difference between *S. tridens* and *S. davidis* is the elytra, in the former with elevated, glossy, micropunctate intervals and strongly impressed striae (Fig. 39), and in the latter with flat, leathery, microrugose intervals and faint, thin striae (Fig. 36). In the sw. Sichuan – nw. Yunnan – n. Myanmar – ne. India (Manipur State) area specimens are often intermediate in this regard (Fig. 43) and we interpret them as hybrids.

Synapsis brahmina (Hope) (Fig. 32) is a smaller species confined to northeast India, Bhutan, Nepal and east Pakistan. In India it is sympatric with *S. tridens* and poorly prepared specimens in which the front margin of the pronotum is obscured are sometimes misidentified as small *S. tridens*. Apart from being consistently smaller, *S. brahmina* can be readily distinguished from *S. tridens* by narrower and more elevated elytral intervals, wider striae whose punctures extend into the intervals and, most importantly, by having only bidentate anterolateral pronotal margins whose inner corners are rounded.

The tmolus group

Judging by the original description and a photo provided to us by M. Kon, *S. kiuchii* Hanboonsong and Masumoto is so similar to *S. simplex* Sharp (Fig. 47) that it appears to be its synonym. However, due to unavailability of the types we cannot demonstrate the synonymy and must confine ourselves to merely pointing out that our study of pertinent material from Thailand, Laos and Myanmar (~70 specimens) failed to reveal a second species closely allied to *S. simplex*.

Description of a new species

***Synapsis horaki* Zidek and Pokorny, sp. nov.**
Fig. 12-15

Type. Holotype male from N. Vietnam, Vinh Phu District, Tam Dao, alt. 900 m, leg. Jan Horak 6-10.V.1990. Deposited at NMPC. No other material.

Etymology. Named for the collector.

Description. Length from anterior margin of clypeus to posterior margin of elytra 24 mm. Black, moderately glossy, glabrous except for setose margins of clypeus, genae, pronotum and legs.

Head. Anterior margin of clypeus medially excised into a V-shape, upturned and carinate, lateral of excision weakly undulate. Frons medially swollen, without a tubercle. Suture between clypeus and gena well defined. Genae nearly right-angled, with lateral terminations rounded and hind margins slanted toward eyes. Sculpture granulo-punctate on clypeus and frons, granulose on genae; granules flattened.

Prothorax. Pronotum transverse, about 2.5x wider than long, widest at anterior quarter of length, moderately arched, finely punctate throughout, punctures denser toward sides and base; anterior and lateral margins carinate, base complete only medially, against first three intervals of each elytron; anterolateral angles form short, blunt saliences on lateral margins followed by angularities. Hypomeral cavity shallow and granulose, nearly devoid of setae; pleuron posterior of cavity very sparsely punctate, punctures large and shallow.

Pterothorax. Elytra moderately arched, with carinate base and ten weakly impressed moniliform striae whose punctures do not extend into intervals. Intervals flat, microrugose (x15). Second interval of each elytron near base with a small but well defined swelling. Mesepisternum granulose. Metasternum punctate on disc and granulose laterally, in posterior half with a longitudinal trough that deepens toward metacoxae.

Abdomen. Ventrites microrugose, sparsely punctate (x15). Pygidium with margins complete throughout, densely, transversely punctate, punctures asperate. Aedeagus with parameres symmetrical, slightly shorter than phallobase; parameres dorsally narrow, without medial lobes, dorso-laterally thick but not inflated, with blunt tips.

Legs. Ventral faces of all femora densely punctate, most coarsely on profemur. Metafemur with indistinct midventral row of slightly coarser, confluent, distally setose punctures and posterior tooth reduced to minor angulation at proximal one-third of length. Protibia tridentate, protarsus slightly longer than protibial spur and about as long as terminal protibial tooth. Meso- and metatibial spurs slender, straight. Medial (posterior) mesotibial spur and metatibial spur half as long as respective tarsi, lateral (anterior) mesotibial spur about half as long as medial spur.

Comparison. *Synapsis horaki* belongs in the birmanica group and is closely allied to *S. yama* Gillet (Fig. 8-11), which is larger (27-29 mm) but otherwise inseparable from *S. horaki* by dorsal habitus. The near absence of hypomeral setae in the holotype of *S. horaki* is taxonomically meaningless (see Comment under *S. punctata*), the characters that distinguish between *S. horaki* and *S. yama* are the pronotal base, femora and aedeagi. In *S. yama* the pronotal base is carinate throughout its length, femoral puncturing is virtually absent (except for a short midventral row of large, setose punctures at distal end of the metafemur), the metafemoral posterior tooth is much stronger and situated at midlength, and the parameres have dorsomedial lobes and are markedly dorso-ventrally inflated. Both species are known from north

Vietnam, but the specimens of *S. yama* that we have seen were collected at altitudes around 300 m, whereas *S. horaki* comes from 900 m.

Another similar species appears to be *S. masumotoi* Ochi from Taiwan, which has the pronotal base carinate throughout (like *S. yama*), the elytral intervals "almost flat", microgranulose and finely wrinkled (like both *S. yama* and *S. horaki*), the ventral face of the metafemur punctate (like *S. horaki*), the posterior metafemoral tooth situated at midlength (like *S. yama*), and parameres seemingly intermediate (drawn and therefore hard to compare). We have not been able to see this species, our comparison is based solely on the original description and a photo provided by M. Kon. However, the character mosaic and insular occurrence seem to indicate that *S. masumotoi* is a valid species.

Keys to groups and species

Key to groups (see also Table 1)

1. Hypomeral or mesepisternal cavities present, usually with complete or partial cover of rust-colored setae. Male and female metatibiae identical, lacking brushes, with setae sparse and dark brown **2**
– Cavities of either kind absent. Upper longitudinal carina of male metatibia with brush of rust-colored setae, in female with sparse, dark brown setae **4**

2(1). Cavities hypomeral **3**
– Cavities mesepisternal, genae unexpanded, frons unarmed (only slightly swollen) .... **ovalis group**

3(2). Genae unexpanded, frons unarmed (only slightly swollen) ..... **birmanica group**
– Genae expanded, frons with medial tubercle or minor horn ..... **ritsemae group**

4(1). Genae expanded, frons with medial tubercle or minor horn ..... **brahmina group**
– Genae unexpanded, frons with medial tubercle or minor horn (in *S. tmolus* with two closely spaced peaks) ..... **tmolus group**

Key to species of the ovalis group

1. Anterolateral angles of pronotum nearly square, anterior margin between them weakly emarginate. Lateral angles of genae obtuse, rounded, their posterior margins near eyes markedly emarginate **2**
– Anterolateral angles of pronotum slanted, not well defined, anterior margin between them straight. Lateral angles of genae acute, rather sharp, their posterior margins near eyes straight **3**

2(1). Tips of genae broadly rounded and not curved posteriorly. Length 23-26 mm. Laos, Thailand, north Vietnam. (Fig. 2-4) ..... ***S. ovalis* Boucomont**
– Tips of genae more acute and curved posteriorly. Length 26-27 mm. Thailand .... ***S. boonlongi* Hanboonsong and Masumoto**

3(1). Base of pronotum carinate throughout, pronotal puncturing fine and dense. Ventral face of metafemur devoid of puncturing. Length 23-25 mm. Bangladesh, Bhutan, northeast India, Nepal. (Fig. 5-6) ..... ***S. gilleti* Arrow**
– Base of pronotum complete only medially, against first interval of each elytron. Pronotal puncturing fine and sparse. Ventral face of metafemur densely punctate, punctures confluent. Length 28-30 mm. North Vietnam (Fig. 7) ..... ***S. strnadi* Kral**

Key to species of the birmanica group

1. Second elytral interval markedly swollen near base **2**

– Second elytral interval not swollen near base **6**

2(1). Anterolateral angles of pronotum projecting **3**
– Anterolateral angles of pronotum not projecting **4**

3(2). Ventral face of metafemur impunctate. Length 27-29 mm. North Vietnam and Laos. (Fig. 8-11) ..... ***S. yama* Gillet**
– Ventral face of metafemur sparsely punctate. Length 27-30 mm. Taiwan ..... ***S. masumotoi* Ochi**

4(2). Ventral faces of all femora finely and sparsely punctate **5**
– Ventral faces of all femora coarsely and densely punctate. Length 24 mm. North Vietnam. (Fig. 12-15) ..... ***S. horaki* sp. nov.**

5(4). Tips of genae blunt, hind margins not slanted toward eyes. Posterolateral angle of pronotum with oblique impression, causing roundness of angle's upper margin and angularity of its lower margin (in dorsal view). Lateral carinae of pronotum close together, maintaining distance toward base. Metafemoral posterior tooth situated at midlength. Length 24-28 mm. Northeast Thailand. (Fig. 16-18) ..... ***S. dickinsoni* Hanboonsong and Masumoto**
– Tips of genae acute, hind margins slanted toward eyes. Posterolateral angle of pronotum obtusely angular, without impression. Lateral carinae of pronotum wider apart, space between them diminishing toward base. Metafemoral posterior tooth situated at proximal one-third of length. Length 22-26 mm. North Thailand ..... ***S. ochii* Masumoto**

6(1). Elytral intervals convex, punctate and glossy. Length 18-29 mm. China (Yunnan). (Fig. 19-21) ..... ***S. naxiorum* Kral and Rejsek**
– Elytral intervals flat, impunctate and coriaceous **7**

7(6). Hypomeral cavities without setae, pronotal disc densely punctate. Length 21 mm. Myanmar ... . ***S. punctata* Ochi, Kon and Kawahara**
– Hypomeral cavities covered by rust-colored setae, pronotal disc sparsely punctate **8**

8(7). Elytral striae moniliform, their punctures markedly notch margins of intervals. Dorsum moderately glossy. Genae nearly right-angled, only slightly expanded. Length 22-26 mm. West Malaysia, west Sumatra ..... ***S. roslihashimi* Ochi, Kon and Kawahara**
– Elytral striae weakly moniliform, their punctures slightly notch margins of intervals. Dorsum opaque. Genae more expanded, their lateral angles more acute. Length 21-26 mm. China (Yunnan), Malaysia, Myanmar, Sumatra, Thailand. (Fig. 22-25) ..... ***S. birmanica* Gillet**

The ritsemae group

Monobasic. Hypomeral cavities present, genae expanded, frons with medial tubercle or minor horn, male and female metatibiae identical. Length 22-28 mm. Greater Sunda Islands. (Fig. 26-31) ..... ***S. ritsemae* Lansberge**

Key to species of the brahmina group

1. Anterolateral margins of pronotum bidentate. Length 24-30 mm. Bhutan, northeast India, Nepal, east Pakistan. (Fig. 32-35) ..... ***S. brahmina* Hope**
– Anterolateral margins of pronotum more than bidentate **2**

2(1). Anterolateral margins of pronotum quadridentate. Length 29.5 mm. Laos ..... ***S. satoi* Ochi and Kon**
– Anterolateral margins of pronotum tridentate **3**

3(2). Elytral striae deep, intervals elevated, moderately glossy, their microsculpture weakly indicated. Length 28-40 mm. Southwest China, northwest India, Laos, Myanmar, Thailand, north Vietnam. (Fig. 39-42) ..... ***S. tridens* Sharp**

– Elytral striae shallow and thin, intervals flat, coriaceous. Length 28-33 mm. China, Taiwan. (Fig. 36-38) ..... ***S. davidis* Fairmaire**

Key to species of the tmolus group

1. Frons with brief transverse, bicuspid carina. Length 36-52 mm. Central Asia. (Fig. 44-46) .... ***S. tmolus* (Fischer)**

– Frons with transverse tubercle. One or two smaller species (length 24-26 mm) in southeast Asia. (Fig. 47-49) ..... ***S. simplex* Sharp, *S. *kiuchii* Hanboonsong and Masumoto**

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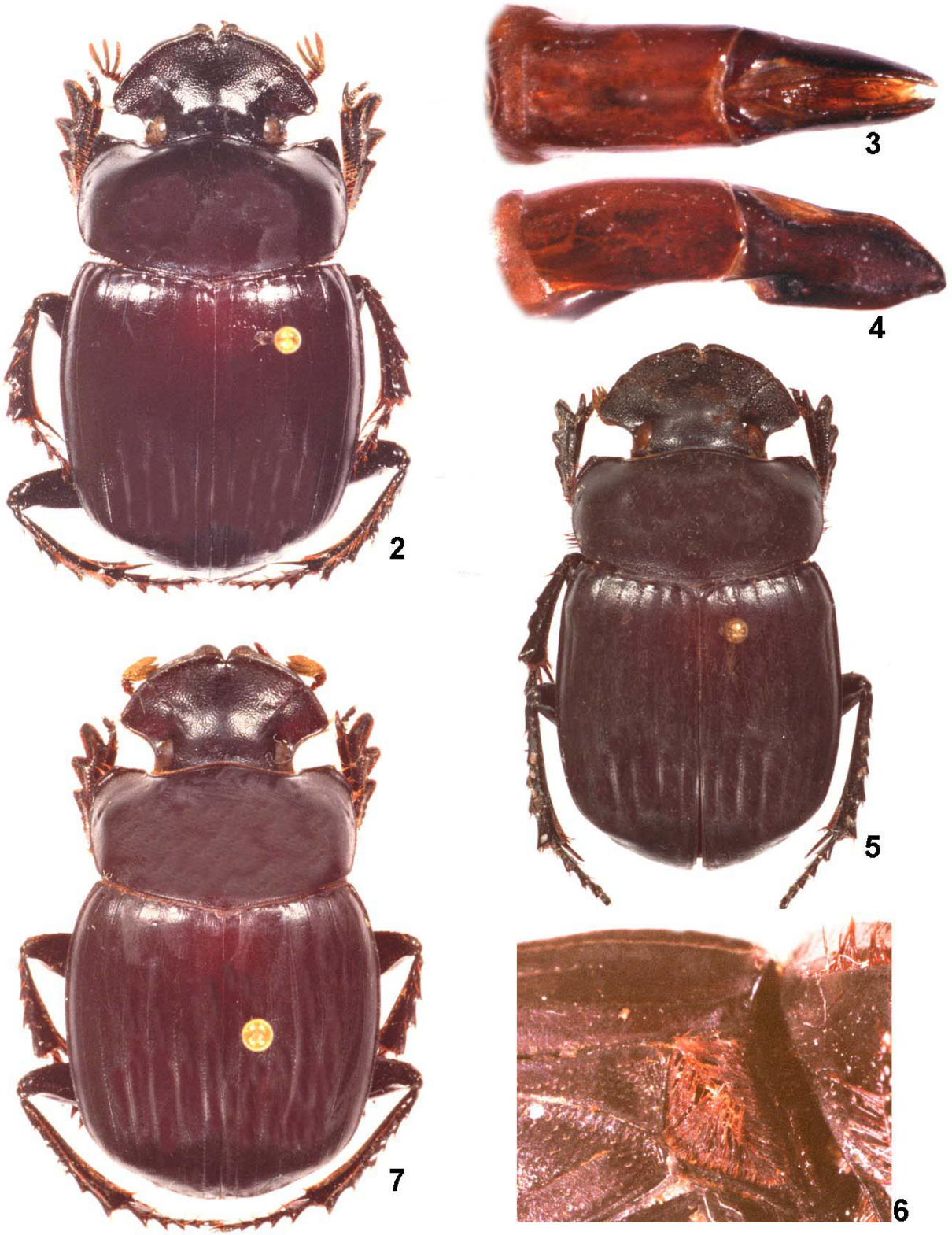

Figure 2-7. The ovalis group. **2-4)** *S. ovalis* Boucomont. **2)** Male, 26 mm. **3)** Aedeagus, dorsal. **4)** Aedeagus, left lateral. **5-6)** *S. gilleti* Arrow. **5)** LT female, 24 mm. **6)** Right mesepisternal cavity. **7)** *S. strnadi* Kral, HT female, 23.5 mm.

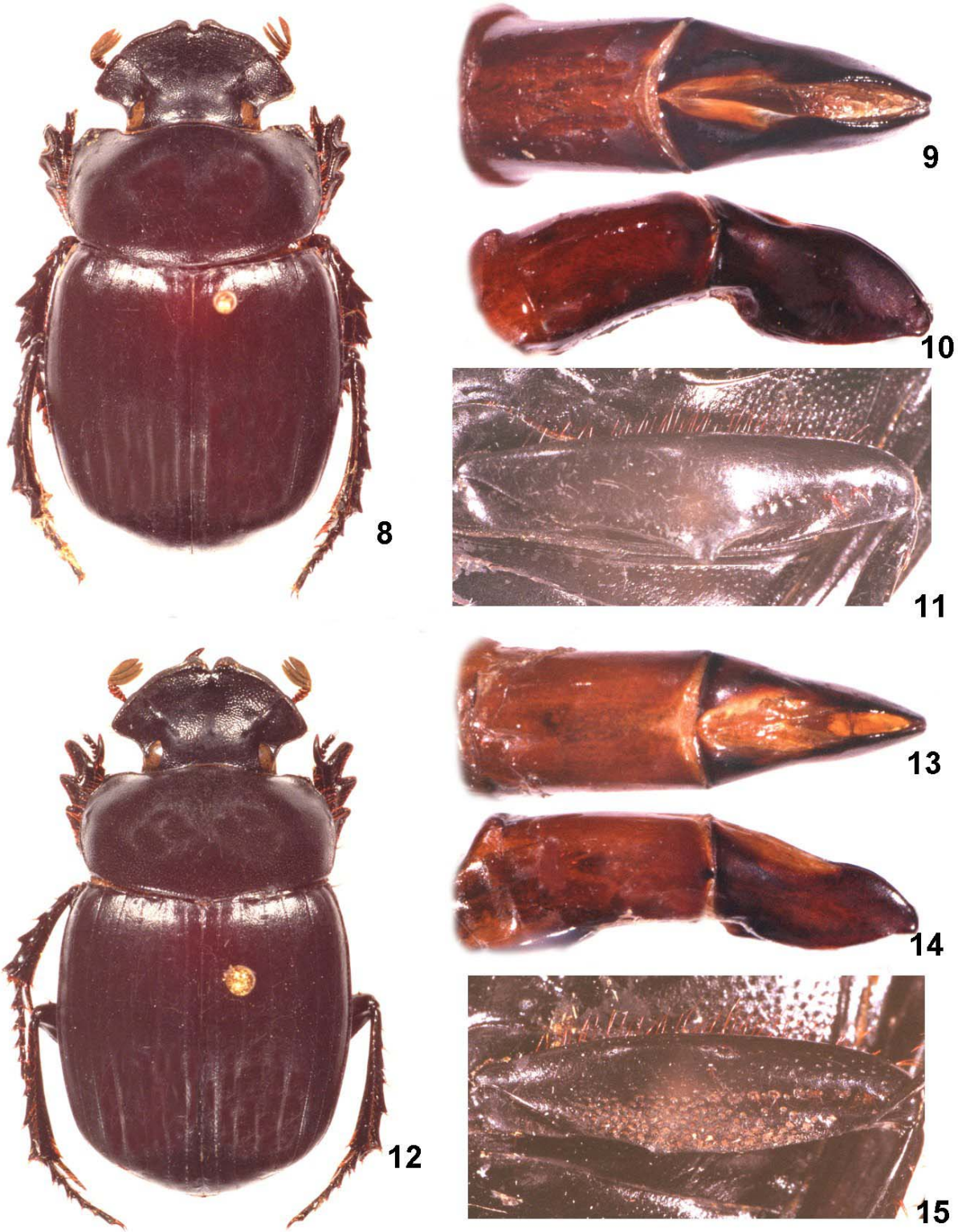

Figure 8-15. The birmanica group. **8-11)** *S. yama* Gillet. **8)** Male, 26 mm. **9)** Aedeagus, dorsal. **10)** Aedeagus, left lateral. **11)** Left metafemur, ventral. **12-15)** *S. horaki* sp. nov. **12)** HT male, 24 mm. **13)** Aedeagus, dorsal. **14)** Aedeagus, left lateral. **15)** Left metafemur, ventral.

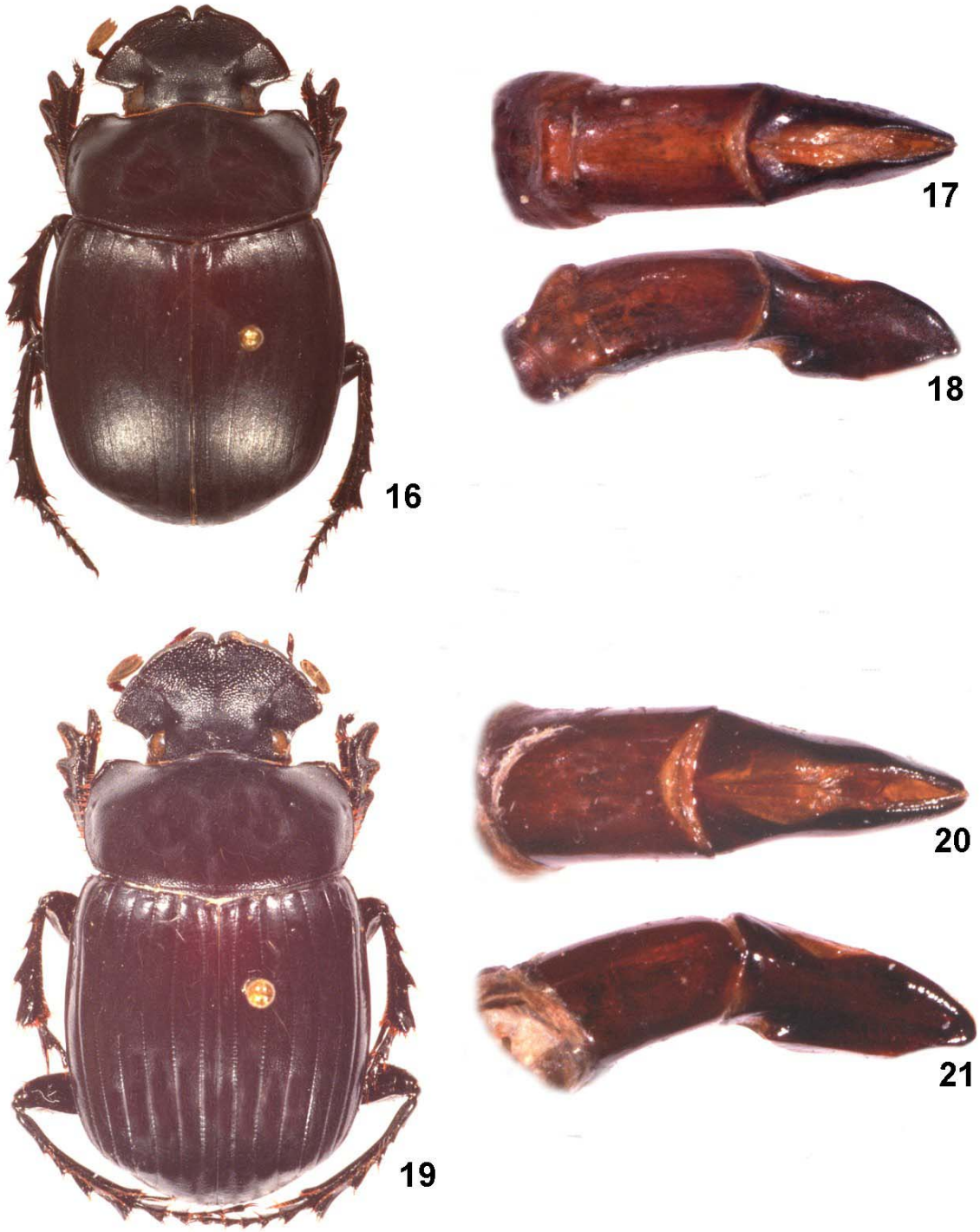

Figure 16-21. The birmanica group. **16-18)** *S. dickinsoni* Hanboonsong and Masumoto. **16)** PT male, 23.5 mm. **17)** Aedeagus, dorsal. **18)** Aedeagus, left lateral. **19-21)** *S. naxiorum* Kral and Rejsek. **19)** HT male, 24 mm. **20)** Aedeagus, dorsal. **21)** Aedeagus, left lateral.

Figure 22-25. The birmanica group, *S. birmanica* Gillet. **22)** Male, 25.5 mm. **23)** Aedeagus, dorsal. **24)** Aedeagus, left lateral. **25)** Left hypomeral cavity.

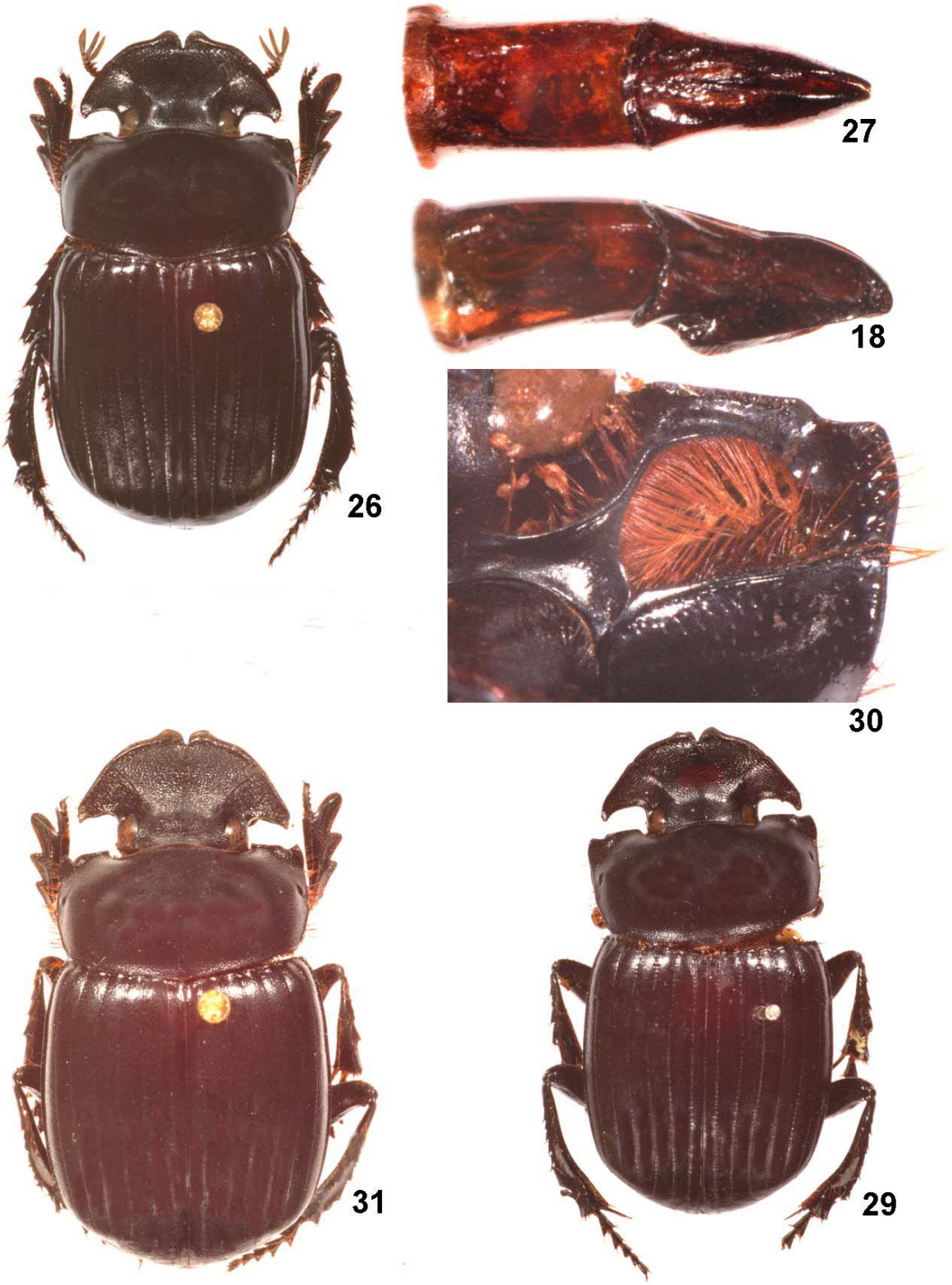

Figure 26-31. The ritsemae group, *S. ritsemae* Lansberge. **26)** Borneo (Sabah), 22 mm (*S. cambeforti* of auct.). **27)** Same, aedeagus, dorsal. **28)** Same, aedeagus, left lateral. **29)** Sumatra, 26 mm (*S. thoas*, det. G. J. Arrow). **30)** Same, left hypomeral cavity. **31)** Java, 25 mm (*S. thoas*, det. D. Kral).

Figure 32-38. The brahmina group. **32-35)** *S. brahmina* (Hope). **32)** HT male, 27 mm. **33)** Aedeagus, dorsal. **34)** Aedeagus, left lateral. **35)** Left metatibial brush. **36-38)** *S. davidis* Fairmaire. **36)** Male, 34 mm. **37)** Aedeagus, dorsal. **38)** Aedeagus, left lateral.

Figure 39-43. The brahmina group, *S. tridens* Sharp. **39)** Male (Myanmar), 34 mm. **40)** Aedeagus, dorsal. **41)** Aedeagus, left lateral. **42)** PLT female of *S. yunnana* Arrow (Yunnan: Tengyueh), 32 mm. **43)** Unsexed BMNH specimen (26 mm) from northeast India: Manipur State, hereby regarded as a *S. tridens* / *S. davidis* hybrid (elytral intervals flat but not coriaceous).

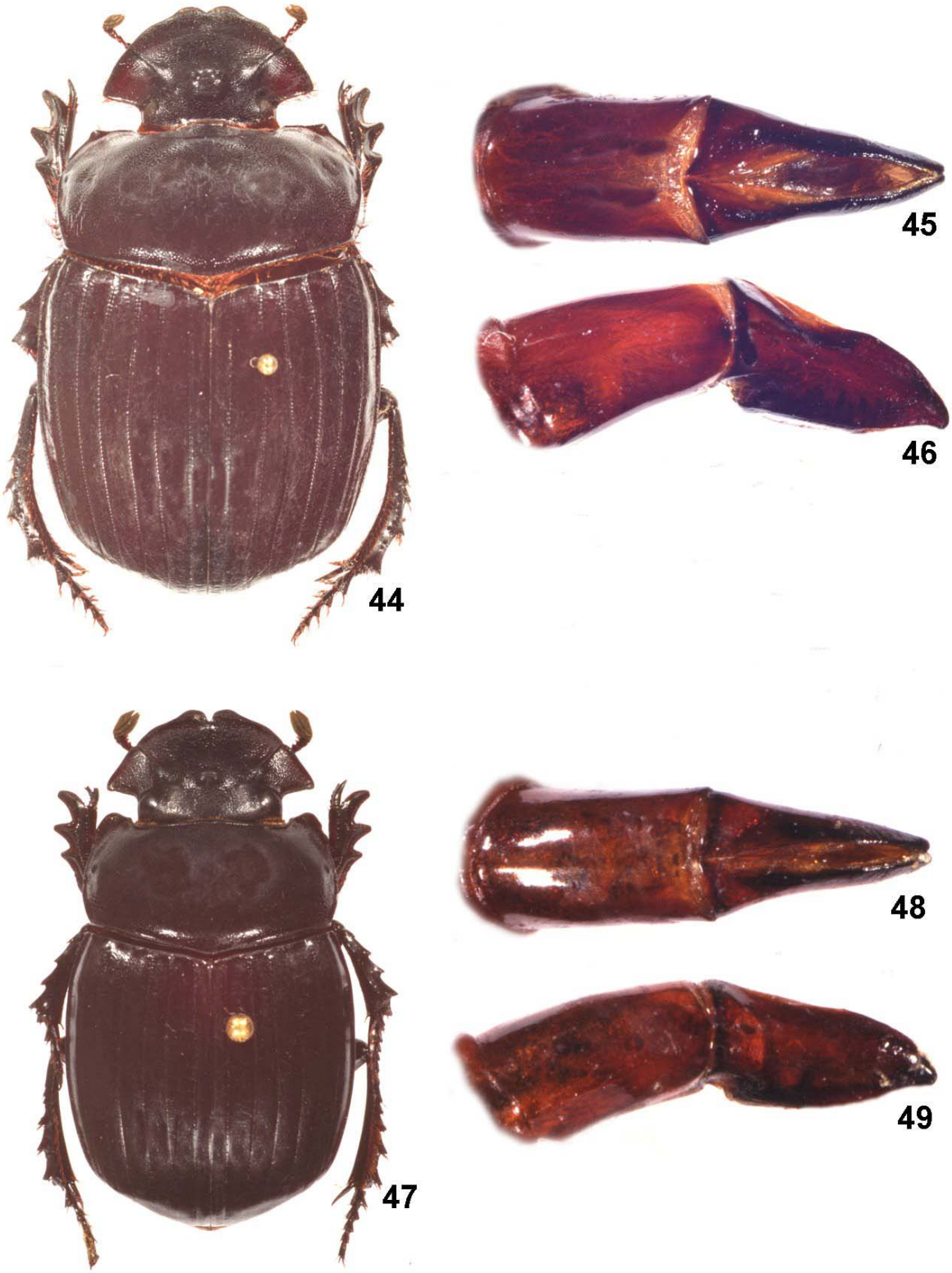

Figure 44-49. The tmolus group. **44-46)** *S. tmolus* (Fischer). **44)** Male, 44 mm. **45)** Aedeagus, dorsal. **46)** Aedeagus, left lateral. **47-49)** *S. simplex* Sharp. **47)** Male, 24 mm. **48)** Aedeagus, dorsal. **49)** Aedeagus, left lateral.